

# Washington State BioEnergy Team



## *2006 Status Report*

*January 2007*

Reduce dependence on foreign oil.

Improve environment, health, and quality of life for citizens.

Stimulate new industry that benefits farmers and rural communities.

[www.bioenergy.wa.gov](http://www.bioenergy.wa.gov)



# Executive Summary

## WASHINGTON GROWN AND WASHINGTON OWNED *Governor Gregoire*

Washington State has embarked on a major effort to develop and expand our capacity to create fuel from biological feedstocks, crops, and waste streams. Washington exports an average of \$25 million per day from our economy for fossil-based fuel. The bioenergy and biobased products industry will develop new economic opportunities for rural Washington, protect and enhance our environment, and strengthen energy security. Private and public interest have come together to advance biofuels and bioeconomy in Washington State.

The 2006 legislature adopted and Governor Christine Gregoire signed legislation that made Washington the second state in the nation to pass renewable fuel requirements for gasoline and diesel fuel. To accomplish those goals, state agencies were directed to implement a variety of activities that will be described in this report.

Everyone would like to reduce our dependence on foreign oil, especially with resources that keep dollars in the state, reduce environmental risk, provide living wage jobs, and create a broad range of business opportunities in both our urban and rural areas. However, establishing a new industry is complicated and challenging work. Developing new markets, financing new processing or refining infrastructure, and growing new crops requires both the public and private sector to evaluate and manage some added risk. This ever-changing market environment makes accelerating development of this industry challenging. It will occur in neither a sequential or orderly fashion.

To help solidify the environment for this new industry, state agencies have worked hard to develop an efficient framework and established the Washington State Bioenergy Team to coordinate and facilitate efforts. The agencies have embraced the entrepreneurial “can-do” spirit, creating partnerships with public and private entities. Washington State is united in developing this new industry. This report shows we have made progress and are working together, but there is still work to be done and opportunities ahead. This is truly an effort that can serve as an example of Washington State establishing itself as a leader in creating a more sustainable economy and future.

*Innovation is in our Nature – the best is yet to come.*

## Introduction

State agencies have been working for many years to develop and expand the capacity to create fuel from biological feedstocks, crops, and waste streams. This goal was advanced dramatically by legislation signed on March 30, 2006 when Washington became the second state in the nation to pass renewable fuel requirements for gasoline and diesel fuel. The Washington State Bioenergy Team was formed during the consideration of that legislation.

A biofuel, bioenergy, and bioproducts industry is in early development across the state. It involves many diverse interests where energy independence, rural business, and jobs are created, waste is turned into resources, and atmospheric carbon is managed. This team is dedicated to supporting the development of this industry through strong coordination, mutual support, and by preventing the duplication of agency efforts on behalf of agricultural producers, rural communities, energy/fuel industry, consumers, Governor Gregoire, and the legislature.

The State Bioenergy Team is led by the Washington State Department of Agriculture (WSDA).

The team is a group of professionals from agencies, universities, and extension/outreach, and research institutions:

- Washington State University (WSU) Energy Extension
- WSU Agricultural Research Center
- WSU Center for Bioproducts and BioEnergy
- Community, Trade and Economic Development (CTED)
- Washington State Department of Ecology (DOE)
- Washington State Conservation Commission
- Washington State Department of Transportation (WSDOT)
- Pacific Northwest National Laboratory (PNNL)
- Department of Licensing (DOL)
- Washington State General Administration (GA)
- Washington State Department of Natural Resources (DNR)
- United States Department of Agriculture (USDA)

## **Goals:**

- Support a viable agricultural community and help farmers stay in business.
- Turn feedstocks and waste materials into energy, using closed-loop recycling of organic materials.
- Create a bioeconomy: a system of markets where bioenergy, biofuels, and bioproducts provide sustainable economic vitality over the long-term.
- Reduce Washington State's dependence on foreign oil.
- Create an energy-wise society in Washington State.
- Support Governor Gregoire's vision for Washington State as the leader in bioenergy.

## **Objectives:**

- Continue to develop the framework for a successful bioenergy economy in Washington State by working collaboratively across agencies with no overlaps or gaps.
- Communicate unified (non-conflicting) information about bioenergy in Washington.
- Advise the WSDA Biofuels Advisory Committee.
- Advise and coordinate funding to support research, dissemination of information, loans to spur industry growth, and market incentives.
- Advise and make policy recommendations to our respective agencies and to Governor Gregoire to remove impediments and create opportunities.

# **Actions Accomplished and Ongoing Activities**

## ***Interagency Coordination***

The Washington State Bioenergy Team began meeting regularly prior to the 2006 legislative session. It started as a loosely defined group of staff from agencies who were supporting renewable fuels, transforming waste to energy, and other valuable products. Now the team is engaged in strategic preliminary design to create a road mapping that will provide guidance to development of renewable fuel, renewable energy, and a bioeconomy industry in Washington State. (Appendix B outlines individual agency efforts and responsibilities.)

The State Bioenergy Team has also been largely responsible for coordinating the implementation of a new Web site: [www.bioenergy.wa.gov](http://www.bioenergy.wa.gov).

## ***Permitting Assistance for Bioenergy Facilities (Office of Regulatory Assistance)***

The Office of Regulatory Assistance (ORA) prepared two guidance documents to help biodiesel facility operators save time and money in the permitting process. Both documents (for small and large-scale facilities) are available on-line at <http://www.ora.wa.gov>.

## ***Renewable Fuel Standards (WSDA)***

In 2006, Governor Gregoire and the Washington State Legislature established Washington State as a national leader in the development of biofuels by establishing minimum renewable fuel standards. As part of that effort, ESSB 6508 provided direction for fuel quality standards and monitoring. It also directed WSDA, as the lead agency, to form a Biofuels Advisory Committee. The role of the Biofuels Advisory Committee is carefully defined in the legislation to advise the Director on implementing or suspending the Minimum Renewable Fuel Standards. The first meeting of the committee was held December 12, 2006. Monthly telephone conferences and further meetings will advance the committees' work. Currently there are 14 committee members and 13 ex-official members. The appointments to the committee represent a broad-spectrum interest from the biofuels arena. The committee will advise WSDA who will make recommendations to the Governor and legislature on implementation or suspension of this chapter by September 2007. (More information is available on-line at <http://agr.wa.gov/bioenergy/links.htm>.)

## ***Motor Fuel Quality (WSDA)***

WSDA Weights and Measures Motor Fuel Quality Program was amended in the 2006 session to require fuel pumps offering biodiesel and ethanol blends to be identified by a label stating the percentage of biodiesel or ethanol. WSDA was also directed to "adopt rules for maintaining standards for biodiesel fuel or fuel blended with biodiesel fuel". The Weights and Measures Program has hired a new Biofuels Standards Coordinator and established the Biofuels Technical Work Group to provide recommendations regarding biofuel technical issues such as labeling, quality, and testing. WSDA's proposed quality and labeling rule was filed on January 3, 2007. Resources for program development and implementation are in the Governor's budget. More information is available on-line at <http://agr.wa.gov/bioenergy/links.htm>.

## ***Energy Freedom Loan Program (WSDA)***

In 2006, the legislature appropriated \$17 million to the Department of Agriculture for the Energy Freedom Loan Program. Direction for implementation was provided for in E3SHB 2939 and the 2006 supplemental Capital Budget (ESSB 6384).

- The Energy Freedom Loan Program is a ten-year loan program that offers eligible public entities an interest rate of one percent. Repayment can be deferred up to 24 months or until a project starts to generate revenue.
- \$10.25 million of the program funds were earmarked by the legislature for five specific projects targeted for the development of oilseed crushing capacity.
- \$6.75 million was appropriated for a competitive loan program. The scope of eligible projects included not only oilseed crushers but all “processes that converted agricultural waste into energy.” The process was designed with the help of agency partners consisting of representatives of WSDA, WSU Energy Office, DOE, CTED, WSU-Whitman County Extension, USDA Rural Development, and Evergreen Community Development Association. Fourteen eligible projects with a value of \$29 million were received. A total of six projects were funded in the competitive loan program.

More information is available on-line at <http://agr.wa.gov/bioenergy/links.htm>.

## ***Research (DOE & WSU)***

### **Statewide Biomass Inventory**

The final report on the Statewide Biomass Inventory and Assessment was completed in December 2005. Results of the project have been presented at multiple regional conferences and covered in Bio-Cycle magazine. This report identified nearly 17 million dry wt. tons of annually renewable biomass resources across the state. Forest resources were the largest quantity of material at 49 percent, followed by agricultural at 35 percent (field residues and animal manure), and municipal organics at 24 percent. The report can be found at <http://www.ecy.wa.gov/biblio/0507047.html>.

### **Waste to Fuels Technology Projects**

In 2006, the legislature appropriated \$225,000 to DOE for “Waste to Fuels Technology” projects (2006 Supplemental Budget Item XQ). DOE and WSU have entered into an Interagency Agreement (C0700136) “Establishing a Partnership between DOE and WSU.”

Research work described in the project plans is well underway and the projects are on schedule for completion as planned in June of 2009.

#### **1. Biomass Inventory Technology and Economics Assessment**

The purpose of this project is to build upon the success of the Biomass Inventory and BioEnergy Assessment from 2005, by evaluating potential energy production from biomass feedstocks and conducting a preliminary economic assessment.

## 2. Producing Energy and Fertilizer from Organic Municipal Solid Waste

The purpose of this project is to evaluate current anaerobic digestion technology for converting municipal organic waste to energy and design and test (through computer modeling and laboratory verification) a non-liquid, "high solids", anaerobic digestion method for increased energy recovery, and recovery of fertilizer and solids remainder for final beneficial use.

### ***Puget Sound Air Quality/Ferry System***

The Washington State Ferry (WSF) system performed a biodiesel test project in the Pacific Northwest on three vessels during normally scheduled operations in the fall of 2004. The goal was to successfully burn approximately 1.5 million gallons of B20 (20 percent virgin soy biodiesel mixed with 80 percent low sulfur {350 ppm sulfur} petroleum diesel) over the course of a year with greenhouse gas mitigation funding from Seattle City Light (Seattle's municipal electric utility). This project was canceled in December 2004, less than half way though the project, because of excessive clogging of fuel filters and onboard fuel purifiers.

In December 2005, the Puget Sound Clean Air Agency (PSCAA) hired Propel Biofuels (PB) of Seattle, Washington to collect and analyze biodiesel fuel and fuel filter samples and to recommend product quality, transport, and handling procedures for biodiesel fuels. The purpose of this study was to assist local land-based fleets experiencing numerous filter-clogging problems. The clogged filters experienced by the land-based fleets appears to be different from the WSF problems, but may be related. The findings from the PB study identified the need for additional research into biodiesel fuel quality and handling issues. The subject study will help fill in those gaps. Final report is scheduled for March 2009.

### ***25 X '25 Initiative***

"25x'25" is a rallying cry for renewable energy and a national goal for America – to get 25 percent of our energy from renewable resources like wind, solar, and biofuels by the year 2025. A group of volunteer farm leaders first envisioned the goal of 25x'25, and it quickly gained the support of a broad cross-section of the agriculture and forestry communities. Now leaders from business, labor, conservation, and religious groups are joining this alliance as well.

# Near Term Recommendations (1-2 years)

## Introduction

The original vision established in 2006 by Governor Gregoire and the Washington State Legislature established aggressive goals for the use and manufacture of biofuels in Washington State. A significant lesson that was learned in 2006, is that the development of this industry will occur in an ever-changing environment. The state and entrepreneurs must be proactive and adaptable. Effective policies and well-planned efforts that target continued development of our current initiatives, along with the development of a long-term road mapping, are an essential part of its development and long-term sustainability.

A broad-based approach that includes not only the continued development of the processing infrastructure, but the development of co-products, by-products, and exploits the full range of Washington's biomass is paramount. Without consideration for a well-planned expanded effort we will not be effective in reaching these accelerated goals in the near future.

The bioeconomy of Washington will be based on the agriculture, municipal systems, and the natural advantages of forest systems located within the state. The Midwestern corn and soybean-dominated agricultural systems are not applicable. None of Washington's major agricultural crops (wheat, potatoes, and hay) are promising candidates as feedstocks. The direct production of biodiesel feedstocks in Washington requires additional research to develop highly productive, environmentally suited oilseed stocks and the adoption of new crops not widely produced in our region. Silvicultural materials from our forests represents a high-density feedstock that needs further evaluation.

The adaptation of technologies for the recovery and production of alternate fuels such as pyrolytic bio-oil, methanol, and butanol will be critical. The biomass inventory of Washington shows that woody biomass (forest products, municipal solid waste, purposely grown woody plants, and agricultural residues like wheat straw) is expected to be the dominant biomass resource in Washington. These materials may represent the highest long-term benefit to the bioeconomy.

## Development of Washington Feedstock Supply

### Agronomics

The emergence of a biofuel market in Washington has the potential to change the economic outlook for many potential alternative crops, which can be used for biofuels (such as canola, mustard, safflower, sunflower, soybeans, corn, and perennial grasses – all of which have been grown with varying degrees of success in the state). Currently, oilseed crops have the best likelihood to be adopted in Washington State by dry land producers since they are competitive with other alternative crops in the region. Yet the lack of fundamental information on variety performance and best agronomic management practices for this agroclimatic zone limits the economic viability of these crops.

## **Science**

Basic, transitional, and applied research will be needed to develop plant varieties that have the best combination of characteristics to make them economically and environmentally suited for production in Washington. WSU has a very strong program in basic plant science research, including bioinformatics, genomics, plant pathology, and translation, to marketable plant varieties through breeding and testing programs. Existing breeding programs include wheat, barley, tree fruit, berries, and hybrid poplars. Historically, these (except for the poplar) have been bred for their quality as food products, so the programs would have to be augmented to also include breeding for bioproducts and biofuels. Furthermore, while WSU has excellent basic plant science strength for working on oilseed crops, a plant breeding and variety-testing program would have to be established.

## **Resources /Education**

The development of biofuels has been in progress in other regions of the world for the past several decades. There is considerable experience and knowledge that has been developed and is available. Our challenge in the Pacific Northwest is to bring that knowledge here, adapt it, and make it available so that our industry will have the best technology available to them in order to make informed decisions. Current efforts include the development of a Web site, [www.bioenergy.wa.gov](http://www.bioenergy.wa.gov), sponsored by WSU and WSDA that will, when fully developed, serve as a “one stop shopping” resource center for all aspects of the development in Washington State. A strategic and implementation plan should be developed to optimize the availability of this crucial information.

## **Consumer Confidence**

Consumer confidence in the products that are produced is another key component of the future sustainability of this industry. The continued and future development should include:

- Fuel Quality and Monitoring
- Feedstock Quality and Monitoring
- Co-Products and By-Products Quality and Monitoring

## **Anaerobic Digestion**

Anaerobic digester for dairy manure application has the potential to be a successful bioenergy story in Washington because it uses a feedstock (manure) that has little or negative value. Anaerobic digestion also addresses environmental concerns, such as excess nutrient and air quality problems coupled with potential new by-products. Resource investments are necessary to develop co-products, to reduce system cost, and to recover the nutrients to improve the economics of the technology.

## **Waste to Fuels Technology**

The potential economic and environmental benefit of the conversion of cellulosic materials could potentially be greater than most feedstocks grown for fermentation or oil extraction. The development and adaptation of the technologies for the recovery and production of biofuels from these feedstocks should be developed and optimized.

## **Development of the Biofuels Infrastructure**

### **Oilseed Crushing Capacity**

Currently, there is one oilseed crushing facility operating in Washington State. The continued development of oilseed crushing capacity is critical to the development of Washington grown feedstocks (See Attachment A).

### **Accessibility to Biofuels**

Initiatives that will increase the availability and distribution of the products that are produced are critical to the development of biofuels (See Attachment A).

### **Quality Control/Standards**

Quality control and standards are important for not only the distribution of fuel but for any by-products or co-products that are produced in the manufacturing process. The WSDA Weights and Measures Program will continue to develop the quality control and standards program currently being implemented for biofuel. The continued development of by-products and co-products may require the implementation of new standards and quality control programs.

### **Transportation**

Transportation and logistics will be key factors in the long-term sustainability of bioeconomy in Washington State. A thorough assessment of existing and future capability will help to guide public policy to support the development of this sector.

### **Private/Public Financing**

The development of new technologies and a new industry is difficult to finance through private investment. Key strategies should be continued to facilitate the development of the industry and attract private capital. Government should carefully intervene in industry development at initial stages of development until private capital begins to fill the void.

### **Permitting**

The sustainability of this new industry will require projects that meet state and federal laws and goals. The state needs to provide an efficient and clear permitting environment to ensure the projects are in the public interest and can move forward in a timely fashion.

### **Multi-agency Collaboration**

Multi-agency collaboration has been an important factor in the development of this industry. An organized approach to this goal should continue to refine the state approach and address new challenges. That effort should include the development of a bioenergy roadmap and strategic plan.

## **Long-Term Strategy (3-5 years)**

### **Bioeconomy Roadmap**

The main components of this vision and roadmap should provide a well defined, integrated bioproduct and bioenergy vision including an assessment of anticipated impacts based upon:

- 1) A comprehensive biomass resource assessment,
- 2) An evaluation of biomass utilization technologies from across the country,
- 3) An assessment of industrial development models and their impact on a biobased industry - resulting in detailed short-term and long-term,
- 4) Legislative and policy priorities,
- 5) Funding and resource strategies,
- 6) Prioritization of research and development activities,
- 7) Action plans for bioenergy and bio-product supply chains, and
- 8) Avenues for public/private integration.

### **Investment**

The effort to create financing options should continue. Cooperative programs partnering with federal funding resources and private investors should be actively pursued. In addition, long-term cooperative public/private partnerships should be developed.

### **Research**

Continued support for research is recommended. Critical areas of research should include:

- 1) Developing technologies and systems converting Washington's wastes and residues to biofuel and bioproducts,
- 2) Demonstration of promising technologies at pilot and commercial scales,
- 3) Development of biomass feedstocks and cropping systems that will result in high productivity and a sustainable economy, and
- 4) Study new business models and public policies that promote development of a bioeconomy.

## APPENDIX A

### Biofuel Development in Washington December 27, 2006

#### Introduction

This listing provides a brief overview of the status of ethanol and biodiesel production and delivery in the State of Washington. It is a snapshot that can change quickly.

#### ETHANOL

Ethanol Production - 435 million gallons per year (MGY) in permitting/proposal stage. Total motor gasoline consumption is 2,700 MGY (EIA 2004). Proposed ethanol production is 16 percent of motor gasoline consumption. Ethanol consumption is 68 MGY (EIA 2003) or approximately 2.5 percent of motor gasoline consumption.

1. Plymouth (Pacific Ethanol) - 55 MGY (permitting)
2. Moses Lake (Global Ethanol) - 40-80 MGY (permitting)
3. Finley (Columbia Renewable Energy) - 55 MGY (permitting)
4. Wallula (Financing from India) - 100 MGY (Proposal to Port of Walla Walla) - Corn unit trains feedstock
5. Vancouver (Great Western Malting) - 55 MGY - Barley feedstock
6. Keystone, near Ritzville (Cilion/Khosla Ventrues/Vinod) - 55 MGY
7. Longview, (US Ethanol) - 55 MGY - 2008 startup

Note: Tumwater (Miller Beer) produced approximately .4 MGY in 2004. Plant is now closed.

Ethanol Fueling – 5, E-85 fueling stations:

1. McChord Air Force Base (no public access at this time)
2. Fort Lewis (no public access at this time)
3. Pacific Pride, Richland (card lock-public access)
4. Richland (private access)
5. Vancouver (BPA Ross Complex) - For BPA vehicles

## APPENDIX A-2

### BIODIESEL

Biodiesel Production - 270.5 million gallons on-line or in serious planning/proposal development. (That is about 27 percent of in-state middle distillate demand derived from EIA 2004 data.)

1. Seattle (Seattle Biodiesel) - 5 MGY (operational) - Soybean oil
2. Creston (Columbia BioEnergy, LLC) - 3 MGY (operational) - Soybean oil
3. Grays Harbor (Imperium Renewable aka Seattle Biodiesel) - 100 MGY (under construction with production in mid 2007, Paul Allen venture capital)
4. Burbank (NorthWest BioFuels, Inc.) - 31 MGY (SEPA submitted)
5. Port of Warden (Washington Biodiesel) - \$380,780 Energy Freedom Program & CERB funding - 35 MGY (planning)
6. Spangle (WI Biofuels) - 15 MGY (planning)
7. Port of Sunnyside/Natural Selection Farms, Ted Durfey - .5 MGY
8. Tacoma (Baker Commodity) - 10 to15 MGY (proposed)
9. Tacoma (Sound Refining) - 30 MGY (proposed)
10. Spokane (Spokane Conservation District/Palouse Bio) \$853,871 Energy Freedom Program - 5 MGY (planning/state financing)
11. Mount Vernon (Whole Energy) - 10 MGY (financing complete)
12. Odessa (Fred Fleming) - \$848,102 Energy Freedom Program - 5 MGY (state financing)
13. Columbia County (Pacific AgriEnergy) - 10 to17 MGY
14. Moses Lake (Adrian Higgenbotham) - 5 MGY
15. Pierce County, Planetary Fuels - NA

Note: Three smaller biodiesel facilities are also on-line. They are Sound Biodiesel of Port Townsend, Beaver Creek Bioproducts of Twisp, and Biodiesel Works of Bellingham. They each produce less than 10,000 gallons per year.

Biodiesel refueling stations - 38 stations

There are 35 stations selling biodiesel in Washington State. Source: National Biodiesel Board (NBB).

## APPENDIX A-3

### Crushers

Crushers can be measured in several ways (tons crushed per day, tons crushed per year, or by gallons of oil produced per year). The preferred measure for this report is tons crushed per year.

1. Spokane County Conservation District/Palouse BioEnergy/four farmer co-ops, \$2,000,000 Energy Freedom Program - NA
2. Port of Warden/Washington Biodiesel, \$2,915,397 Energy Freedom Program - 350,000 tons per year
3. Odessa PDA/Inland Empire Oilseeds, LLC (2 co-ops, Rearden Seed and Fred Fleming, \$2,500,000 Energy Freedom Program - 44,200 tons per year
4. Port of Columbia County, \$2,500,000 Energy Freedom Program - NA
5. Port of Sunnyside/Natural Selections, Ted Durfey - \$750,000 Energy Freedom Program - 8,000 tons per year
6. Spangle/WI Biofuels - InstaPro
7. Moses Lake/Adrian Higgenbotham - NA
8. Whitman Conservation District - has crusher

### Oilseed Acreage

This is a year for small test trials to learn how to grow these crops. A rough estimate is 7,500 acres of oilseed is under production in the region.

For more information on this overview:

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## APPENDIX B

### Roles and Responsibilities

Each government agency brings its own necessary statutory authority and perspective to build the bioeconomy of the state. A brief overview is as follows:

#### 1) WSDA –

- Responsibilities include designation as lead state agency for bioenergy by Governor Gregoire, implementation of the Energy Freedom Program, support of rural Washington farmer opportunities in the bioeconomy, and biofuels (minimum biodiesel/ethanol content) implementation through the Weights and Measures Program. See RCWs 43.23, 43.112 (renewable fuel content), and 15.110 (Energy Freedom Program).

#### 2) DOE –

- The Solid Waste Program's increased responsibility for organic waste resulted in a major shift in approach through amendments to the State Solid Waste Management Plan called Beyond Waste (See RCW 70.95). The Solid Waste Management Plan is required by statute and establishes program goals for the management of solid waste and recyclable material.
- This core change opened up a new perspective of viewing organic waste as feedstocks. This led to the nationally acclaimed Biomass Inventory and BioEnergy Assessment funded by DOE and produced by WSU. The 2006 Supplemental Budget directed that a partnership be formed between DOE and WSU to complete a Biomass Technology Assessment and a High Solid Digester with funding in 2007-09 at current level. Work is fully underway on the two projects with the interagency agreement and 3-year work scope near signature. The DOE/WSU partnership makes up a key piece of the bioenergy/bioeconomy foundation.
- DOE carries three key perspectives: 1) converting waste to useful feedstocks, 2) building a bioeconomy based on organic material reclamation and technology development, and 3) managing these activities in a manner to promote economic, social, and environmental viability of all projects.
- DOE permits many of the bioenergy projects.
- The Air Quality Program has responsibility for protecting, preserving and enhancing the air quality of Washington in order to safeguard public health. The use of biofuels has the potential to reduce air pollution while also yielding other societal benefits, and the program encourages such uses. Production and use of biofuels may also increase certain kinds of emissions. DOE's Air Quality Program or Local Air Authorities may need to require permits for some kinds of production facilities.

#### 3) WSU –

- As Washington's Land-Grant University, WSU (RCW 28B.30) has responsibility for research and public education, especially in the area of agriculture and natural resources. Its Agricultural Research Center (ARC) comprises the state's largest cadre of research scientists specifically funded to conduct research that is particularly relevant to Washington. These scientists, together with WSU Extension, which delivers public education to Washington's people, are a primary resource for Washington as it develops the bioeconomy.

- WSU, long known for the depth and quality of its agricultural programs, formalized its Center for Bioproducts and BioEnergy (CBB) last spring. The CBB draws on scientific expertise from across WSU and beyond, such as its partnership with PNNL, to focus on the issues of developing biomass conversion technologies and new plant and animal-based products, using environmentally and economically sustainable strategies.
- Resources and various other disciplinary departments of WSU's College of Agricultural, Human, and Natural Resource Sciences, have been particularly active in serving as the bioproducts and bioenergy research and development arm of the state, leading the effort to develop anaerobic digestion systems for dairy operations, developing new bioproducts, conducting agronomic studies of energy crops, and developing the bioproducts/bioenergy technology assessment for the state's biomass in partnership with the DOE.
- WSU's Extension Energy Program brings a number of strengths to the team. It has worked in bioenergy development since 1981 under RCW 43.21F.045 (the program delivery portion of the Energy Office). Energy program staff focuses on the strategic leadership role of bioenergy roadmap development, technical assistance/trouble shooting, information, and implementation of bioenergy as a renewable energy resource. It ensures energy research is implemented in the society and economy.

#### 4) **CTED –**

CTED has two key roles:

- Energy policy (RCW 43.21F.045 - energy policy portion); and
- Economic development through bioenergy projects. The funding of the Grays Harbor Paper project in the supplemental budget from the Energy Freedom Account is an example.

#### 5) **PNNL –**

- PNNL brings a strong long-term national research perspective to bioproduct development. Special mention is made of their research using fungal bacteria to break down cellulose for future ethanol production and the Catalysis Laboratory. WSU and PNNL partner through WSU's Center for Bioproducts and BioEnergy, with particular emphasis at the Bioproducts Science and Engineering Laboratory being constructed at WSU Tri-Cities campus.