

ATIP Foundation Regional Bioeconomy Forums:
“Addressing the Challenges & Opportunities of Advancing the Billion Ton Bioeconomy”

A Report to Participants in the PNW Regional Bioeconomy Forum
Sea-Tac Conference Center (Washington State University, co-hosts)
Seattle, WA
October 3, 2016

Wes Jurey, Foundation CEO and R.J. Brenner, Director, ATIP Foundation

Note: full report with 4 attachments can be found at www.atipfoundation.com

Forum Structure and Role of the Foundation and Co-hosts

The PNW U.S. Bioeconomy Forum was moderated by Wes Jurey, CEO of the ATIP Foundation, who was assisted by a team from Washington State University (WSU) including John Gardner, CEO of the WSU Foundation. Members of the BR&DB Operations Staff made presentations that reviewed the FARB and posed questions related to advancing the bioeconomy.

Demographics by sector: Table 1 describes the demographics of invitees by sector, and the actual number able to participate on October 3, 2016

Table 1. Demographics (by sector) of invitees and participants, convened by ATIP Foundation co-host Washington State University for NW Regional Bioeconomy Forum, October 3, 2016.					
Sector Designation	Invited	% of invited	No. Participated	%RSVP to Attend	% of Attendees
Industry	25	23	3	12	7
State and local government	11	10	4	36	9
Economic and workforce development	17	15	11	65	25
Investment & finance	9	8	4	44	9
Academia	28	25	14	50	32
Agricultural and environmental organizations	21	19	8	38	18
Total	111	100	44	40	100

The agenda (see attachment) included welcoming comments by the ATIP Foundation, BR&DB representatives, and Beth Osborne, Deputy State Director for US Senator Patty Murray. Slide set presentations were made by the ATIP Foundation followed by Todd Campbell (USDA) with assistance from Valerie Reed, Deputy Director, Bioenergy Technologies Office, Department of Energy. In addition, a “discussion document” was provided to the participants (see attachment). The remainder of the day consisted exclusively of stakeholder attendees from the six sectors participating in discussions on these “discussion document” questions. Notes were taken (attributed to the commenter) on the fly by Alyssa Patrick who projected these so all participants could review and correct as needed. The audio was also recorded from a laptop in case it was needed later to clarify comments.

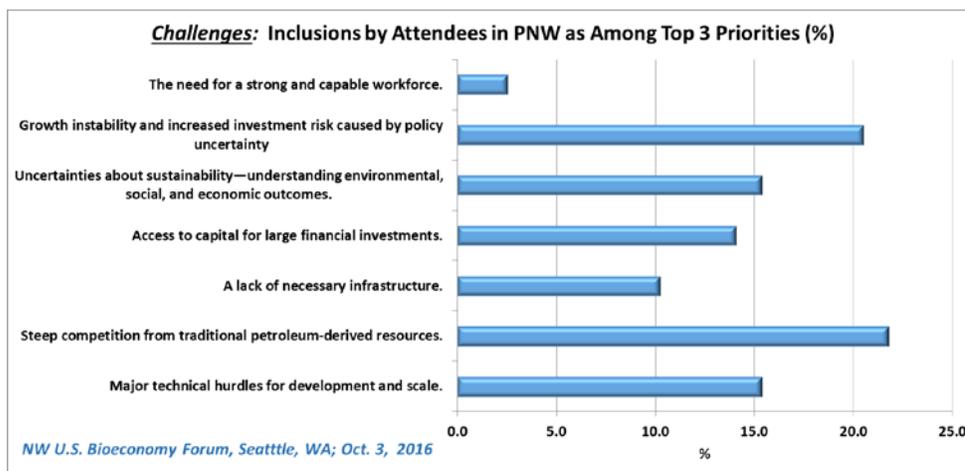
Participants of the forum received a link to a Google Document and a two week window of opportunity to edit their specific comments, or add additional comment. Thereafter, the document was closed by Washington State University, and ownership was transferred to Dr. Rick Brenner, ATIP Foundation, who reviewed comments,

clarified with authors as needed, redacted all names of comment contributors, and annotated with ATIP Foundation comments (designated in margins as Comment [RJB#]). The complete PNW Bioeconomy Report that includes all comments by participants, as well as the slides presented, is available on the ATIP Foundation website, and serves as a comprehensive record of the event.

Reporting of Participant Priorities

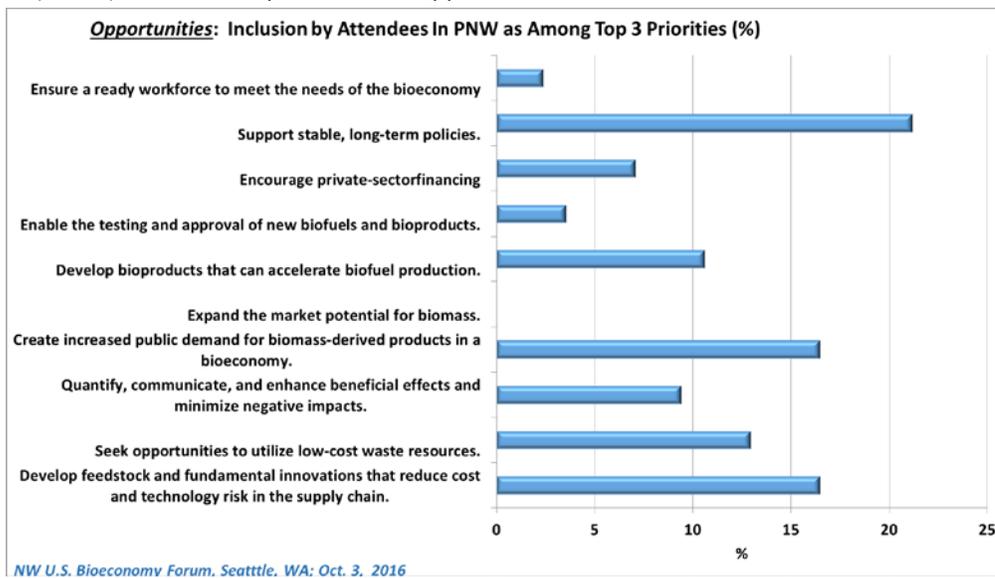
Participants prioritized each “challenge” and “opportunity” --- from their perspective --- to determine whether each was in the top 3 priorities of the PNW U.S.

Figure 1a (below) reflects their perspective on these “Challenges”.



The top two issues for PNW participants were “steep competition from traditional petroleum-derived resources” (21.8%) and “Growth instability and increased investment risk caused by policy uncertainty” (20.5%). “Uncertainties about sustainability—understanding environmental, social, and economic outcomes,” and “major technical hurdles for development and scale” were tied for the 3rd top priority at 15.4% of respondents.

Figure 1b (below) reflects their priorities on “Opportunities.”



Participants clearly identified “support stable, long-term policies” as the most important opportunity for advancing the bioeconomy (21%), followed by “create increased public demand for biomass-derived products in a bioeconomy” and “develop feedstock and fundamental innovations that reduce cost and technology risk in the supply chain” (16% each). “Seek opportunities to utilize low-cost waste resources” was just behind at 13% of respondents suggesting that it was among the top 3 opportunities.

Discussion: ATIP Foundation & Co-host Assessment of Themes, Issues, Regional Challenges & Opportunities

There were a number of comments from the PNW region that characterized regional issues, but also a number of comments that were fairly common issues across the 5 regional forums. Below, are selected non-attribute comments from participants, as well as notations by the ATIP Foundation. Regarding the latter, these are preceded by “[NOTE:...],” and are also reflected as “Comment[RJB#] in the full report available on the Foundation website.

Regarding comments to the “challenges” list:

- “A lack of necessary infrastructure” ---
 - Commenter [1]: I would say: Need of new infrastructure and identification of synergistic opportunities with existing infrastructure!
 - [other commenter] is not certain this is correct for many cellulosic sources in the PNW - particularly woody biomass. In fact there are a number of “stranded assets” in the form of pulp and paper mills, lumber mills, transportation assets (trucks and rail), log depots, chipping and densification equipment, etc.
- “The need for a strong and capable workforce.”
 - It seems that the farm digester company Regenis (www.Regenis.net) might offer models for building a trained, functional and profit-focused workforce in/for the bioeconomy.
 - It is important to highlight the experience of the Walla Walla Community college and their AAAS degree in plant operations

Additional challenges offered by participants:

- Insufficient incentives to drive investment and markets **[Note: this has been a theme heard in most forums]**

General notes on “Challenges”

- In reviewing the Federal Activities Report on the BioEconomy (FARB), I would like to see what the funding levels are -- in terms of authorizations and appropriations for each program and agency described in the report. It would also be very useful to present the total federal funding directed towards BioEconomy developments over the past few years. *This would provide insight into how big is the federal government effort in funding programs for the bioeconomy initiative.* Although it might be controversial, providing high-level comparative funding levels for BioEconomy initiatives relative to aggregate federal funding for fossil fuel and nuclear energy resource and technology programs would contribute to a clearer policy assessment of federal government funding priorities across all major energy options.
- [another commenter] ... would also recommend that the FARB include a section that highlights the BioEconomy related research being conducted at our National Laboratories (e.g. NREL, Argonne, Lawrence Livermore, Idaho, etc.). It would be useful to describe the national labs’ major programmatic leadership assignments and funding levels. This could help the private sector identify sources of technology innovation and potential public/private partnerships for further research and development. **[Note: the Foundation would suggest we provide funding levels for both intramural and extramural research from the various BR&D member agencies that relate to the Bioeconomy. An obvious follow up would be an annual research report highlighting outcomes to date, available technologies, and a request for partnerships to address specific issues (e.g., CRADA or cooperative agreement. This idea is further supported by [RJB7] comment in Attachment 4, and provided attached to comment below.**
- Should we revise FARB and put numbers behind programs to show size of federal funding? **[RJB7] I think an annual report on bioeconomy-related R&D outcomes would be a great idea. Currently federal agencies are required to publish an annual report on Technology Transfer that covers all innovations arising from intramural R&D in all agencies. Extramural R&D funded outcomes are published by AUTM (Association of University Technology Managers) but only addresses IP licensing.**
- [research] ... The ability to continue to research transportation logistics is important, any region with raw material is going to need this work. Infrastructure and transportation logistics of biomass are crucial elements. Most recent cellulosic plants are in Iowa. Raw materials are found within 50 miles, but the big issue is how to transport that efficiently? How to transport with a minimal amount of costs and distance. Iowa State University and private companies doing work on this.
- We should be working with the tribes as well. Lots of opportunity as well as mutual interests. **Note: Sounds like an opportunity for a Pilot Project Consortium to better utilize lands of Native Americans for creating new opportunities.**
- Distance - we are very far north and we do not have volume produced here in the Pacific Northwest. We need to see a combination of infrastructure and incentives to help improve. **Note: this has been a common theme among regional forums.**
- Much of the inland PNW is dry with less than 14” of precipitation per year. Dryland biomass yields are too low under the dry growing conditions to contribute significantly to the Billion Ton goal. Those crop residues are needed to protect soil from wind erosion and maintain soil organic carbon. We will need to balance between biomass production and environmental stewardship. This is an important issue; as crop residues (e.g. Wheat straw, corn stover, etc.) are viewed as significant feedstocks for advanced cellulosic biofuels and bioproducts. Sustainable production of these feedstocks will require location specific and crop rotation specific residue management and allocation practices to protect against soil erosion; improve soil moisture retention and add Soil Organic Carbon. **Note: These are formidable problems in PNW. Dedicated biofuel crops help wheat production, but the money crop is still the wheat. This region may want to explore other biomass feedstocks for developing biorefineries (e.g., tallow, ocean / seafood residues, etc.).**

- State and local economic incentives helped spur the development of the biofuels industry in Iowa. State and local economic incentives helped spur the development of the biofuels industry in Iowa. **Note: perhaps the process should be replicated in PNW.**
 - Don't have the same kind of support in Washington, need more business and policy engagement and support

Responses to the "opportunities" list

- "Seek opportunities to utilize low-cost waste resources." -- We should make opportunities for local communities to benefit from the bioeconomy, rather than strictly adapting a model that's scaled up to a refinery miles away.
 - Other commenter: We still need to be aware of the differing definitions of some common terms related to development of a bioeconomy. The term biorefinery may look very different depending on the source of biomass and the intended products. A dairy farm by itself can be reclassified to be called a biorefinery. Offsite organics and woody biomass can be brought on to the farm to be anaerobically digested or thermochemically converted; however, the radius from which to derive this biomass is relatively small and serves as an economic boost rather than a critical pillar of the process. This is as contrasted with a biodiesel biorefinery which might need to draw feedstock from a 50+ mile radius or not be viable.
- "Create increased public demand for biomass-derived products in a bioeconomy."
 - We've done prototypes, but public isn't seeing those - we need to increase awareness and understanding; social cost of carbon, other ecological services and environmental benefits.
 - Would suggest that highlighting clean air, water, and improved soil while gaining the benefit of renewable biofuels and bioproducts is a message that would be more universally accepted.
 - Bluntly, highlighting climate change/global warming as a reason to change and then insisting on individual acknowledgement of a need to change to support society just will not work for nearly 50% of the US population. Instead of confrontationally dragging this group in, publicize and highlight the local benefits of these projects.

Additional opportunities suggested:

- At regional level, it is challenging to bring infrastructure together; if there isn't money going to the region to collectively solve a problem, we shouldn't be surprised it is not getting coordinated. How can the federal government coordinate regional efforts? Need to put at least millions into the region to coordinate the efforts
 - The regional biomass economy programs were in place for decade or more, stood up by DOE, but managed by governor offices. Not big dollar, but were for meetings, convening partnerships. These are the kind of actions we can put to your observations and recommendations. **Note: This comment suggests that a regional pilot project may be a recommendation from PNW attendees.**
- Leveraging public entities for long term energy purchase agreements or market stability - merchant generation not possible for biofuels... EX: RNG producer needs a gas purchase agreement in order to capitalize a new facility, not many entities have the planning horizon to purchase energy on a long term agreement, except traditional energy companies which fail to value the "green" attributes.
 - Other Commenter: Look at King County (WA) separate sale of environmental attributes of landfill gas, along with "merchant gas" from their Cedar Hills landfill to Puget Sound Energy. This is a model for monetizing RNG added value.

General notes on opportunities

- The crops that qualify as specialty crops are specially designated. You have to go through a process to get that designation. **Note:** <https://www.ams.usda.gov/about-ams/programs-offices/specialty-crops-program>
- When considering purposely grown crops, competition with food production (in terms of land, water and input requirements) becomes a much more sensitive issue. It entangles the price of biomass feedstocks

with the larger and often volatile agricultural commodity markets. It also has the difficult challenge of convincing US farmers that they should change their farming practices in order to cultivate new types of crops (e.g. camelina, switchgrass, etc.). Unless there are long term public policies that provide incentives and reduce risks, major changes in farming systems are unlikely to be quickly adopted. As we develop opportunities and action items, we need to apply different techniques/resources to each.

- Note: Recurring theme among regional forums; however, in this region, crop rotation should be considered to get both a biofuel crop as well as improved wheat production in rotation.
- I want to make a comparison to the information revolution - in beginning they were not developing computers to do what they do today. Bill Gates and other visionaries turned the informatics revolution into what it is today. With the biomass economy we are in a similar starting phase - how it evolves depends on the “genius” that will help it take shape. We may need to produce a fuel that doesn’t look like petroleum. Right now we are looking to replace existing molecules, but since we are working with new feedstock, there may be a possibility for fuel that we haven’t seen yet.
 - Other commenter: There may be opportunities for fuels and chemicals that we haven't seen yet. The technologies and knowledge that we are developing for the biomass economy could catalyze a revolution in other areas (for example in the way we handle and use our urban wastes!)

What sets the NW / PNW Bioeconomy apart from other regions of the country? What inherent advantages do you have? What regulatory issues constrain success? What incentives would help advance business opportunities to advance the bioeconomy?

- We are a gateway to the Pacific Rim; export options open towards Asia.
- Demand from the aviation industry; track record working with Port of Seattle, SeaTac, WSU, Port of Spokane, and more; all have said they would like to use aviation biofuels. We have relationships with Alaska and Horizon Airlines who are saying if you build it we will come, which says a lot about partnerships in the state.
 - This is an important issue. Similar to the incentives provided to early stage photovoltaic and wind power generation through grid utility power purchase agreements with substantially higher than market prices per kwhr; initial biofuel purchase price premiums could be offered to biofuel producers, where the final blended fuel cost/price could be more competitive with conventional petroleum derived fuels. **Note: government incentives**
 - The better we can quantify the environmental services, the better we can reflect true value of fuel provided. Offtake agreements, the small percent of blended fuel being used, if you can space that over a lot of gallons, it is a small cost to companies. Airlines are currently using 30-40% of budgets on fuel. Let’s create an alternative now while companies have money to invest. USDA Rural Development is willing to share some of the risk with standing up plants/biorefineries. We should share risk to get the first plants off the ground. Doesn’t have to be the most profitable, just need to reduce the risk so we can move on to more developed options. **Note: Start with this URL <http://www.usda.gov/wps/portal/usda/usdahome>**
- I’m surprised the conversation hasn’t focused on bioproducts more. If we want to focus on fuel, I don’t think we will get there if we don’t talk about the high value products that will be needed to make it successful.
 - Commenter: Agriculture systems did not play a large roll in this meeting; however, the focus on anaerobic digestion of animal wastes is now less on how to produce electricity from the biogas and more on how to extract usable and potentially valuable co-products. While the digester is the central component of the facility, it is the nutrient recovery and water upgrading components that are going to drive future adoption. The challenge is now to monetize those co-products for the local bioeconomy--we don't want to be shipping biofertilizers across the country unless there is some other critical need.
- On the East Coast of NE Florida, there are two major manufacturing plants that receive about 400 log trucks a day. Six months ago Rainier Advanced Materials entered into a joint agreement with Borregard in Norway related to lignin. This joint venture called Lignotech LLC, received tax credits from the county,

and a new plant is getting built there, on Amelia Island where the existing plants are. Essentially, this makes better use of a biomass (lignin) that was previously burned for energy at the plant. Once the new plant is in operation (2017), the lignin will be used to create high value products --- and the local economy benefits with more job creation, and higher value products on the market.

- **Note: Example of turning low value biomass waste into high value products because of research, IP, and new partnerships that provides industry with a 20 year advantage of establishing new markets and products.**
- NARA is the Northwest Advanced Renewables Alliance of which Mike Walcott of Washington State University is an integral member. I thought I said that you can't get RINs from federal lands, as is the case. The federal government owns 53% of the state of Oregon and almost 29% of Washington. I was trying to make the point that environmentalism and its inherent love of national forests is very strong in the Pacific Northwest, unlike the southeast section of the U.S. Thus, those who work in the PNW forests, especially in the public sector, generally refer to the jet fuel made from trees as a bioproducts instead of feedstock since feedstock carries with it the emotional baggage associated with clearcutting and commodity production using wood. Thanks for your opportunity to attend this interesting and valuable meeting. PNW is different because of federal land ownership. Example: we were not included in the NARA analysis because you can't use renewable identification numbers on rural land. Here there is a deep attachment to forests, environmentalists don't want to see activity. We refer to it as a bioproduct rather than feedstock because of sensitivity towards national forests.
 - **Note: Uniqueness of land ownership would suggest that a partnership of feds, state lands, and industry / key private sector players should be considered to formulate a unique pilot project for PNW.**
- Policy has focused on replacement of certain molecules; instead of fixing molecule, we are going to have opportunity to develop molecules that react to the biofuel. Nature of molecule we are working on is different than petroleum molecules. We are going to find molecules that perform better than petroleum based molecules.
 - Commenter: The idea here is that by focusing on petroleum replacements we may be missing opportunities in other areas where biomass derived molecules could have competitive advantages.
- We've been focused on large scale plans, but the smaller scale plans haven't been provided. We have so many options, we don't have enough resources to know where to start. How do you do one thing at a time, get it done, and move to the next thing? The process is so distributed at the moment, how can we focus?
 - **Note: Appropriate for a public private partnership to garner federal, multi-state, and local resources to optimize novel traits of the PNW region.**
- Haven't talked about municipal solid waste, or water resources. Thinking about public perception; we need to address amount of waste, how it can be used in urban core - need to communicate that better to public.
- Other commenter: Related: Progressive companies and municipalities (SF, Portland, Seattle, Google, Microsoft...) are now moving aggressively to zero-waste strategies. These strategies involve collecting and separating large amount of materials, notably including valuable biologically-sourced types [food waste, etc.]. This is currently a burden, as was collection of quality recyclables such as glass and metal when recycling programs were initiated. But as with high-value recyclables, using digestion and other sophisticated reclaim processes, these "wastes" will be valued when and where they are produced. Again, digestion and other biologically-based waste management systems are highly amenable to down-scaling, reducing need for interconnecting infrastructures to transport these wastes to central plants, as is now the practice. This change of mode will require more trained service workers (to maintain the distributed bio-processors), which creates jobs.
- Cannot sell bioeconomy as if it is same for the whole country. Every region resonates with something different. For Iowa it's about corn, for Washington it is about aviation industry. In years to come, resource limitation is going to be the problem that drives to technology. We can start answering that question with development we are doing today.

- Other commenter: Our bio-economy marketing efforts have to be regional and have to be well integrated with the economic needs of the region!
- USDA has business services to provide access to capital in rural areas in a myriad of ways. Water quality - recent study shows that there are 66 million dead trees in Nevada, contributes to wildfires, and our waters are filtered through our forests. The recent environmental developments from insect infestations to wildfires - which cost money and environmental health - are why a bioeconomy makes sense here. These should be drivers of why we need to make use of biowaste, and look to new options in bio-feedstocks. Job creation, economic development, environmental services - all have a benefit. How do we quantify those benefits?
 - **Note: This argues for local / regional “biomass accumulators” and a coop structure to produce bioproducts for both regional use (e.g., biochar for soil / water enhancement), or energy-dense pellets for markets elsewhere.**
- Regional innovation centers - put out a proposal for this so region can decide what makes most sense for them to develop. Let them propose the deliverable. That combines research with the market infrastructure.
 - **Note: Back a proposal with a PPP with others at the table for greater likelihood of success.**
- We should also note that a major study (Proceedings of the National Academy of Sciences, “Impact of anthropogenic climate change on wildfire across western US forests”) has just been published that finds that more than half of all recent western US forest wildfires are directly attributable to climate change that has increased forest aridity. There was discussion in the Forum of how US Forest Service fire prevention programs should be significantly increased with funding for forest thinning operations that use smaller scale systems for harvesting and converting such thinnings into biochar.
 - **Note: <http://www.pnas.org/content/113/42/11770.full.pdf>**
- We need to be less concerned about the relatively higher capital cost per unit of production of smaller bioproducts operations. This is especially relevant in our current period of exceptionally low interest rates and cost of capital. This perspective would encourage smaller scale production facilities that could be distributed throughout the region; and could benefit many rural communities with increased jobs and incomes from a new, localized BioEconomy. The lead time required for such distributed development of different bioproduct production enterprises may also be shorter than for much higher capacity facilities.
- There’s not a conversation about biochar as an application of biomass. It offers opportunity of collocation of feedstock and end use. You gasify biomass, produce biochar, disposes of biomass in low cost way. Then you produce biochar that can help fertilize crops and remediate soil. It is an elegant use of biomass. There is incredible complexity of performance of biochar based on feedstock and way it has been processed - it has created a whole area of science about which much remains unknown. Our local universities are developing knowledge of biochar feedstock characteristics; production technologies; and field applications. However, our universities need much greater financial support for continued research and development of biochar materials in order to become centers of excellence that would help industry and the forestry and farming sectors to make sense of its value and open up new opportunities for economic growth.
 - **Note: These last two comments put forth good arguments for regional PPP that includes federal partners. Sounds like a good topic for a separate meeting on next steps in PNW.**

Follow Up Question: Should we keep collaboration among this group moving forward after this meeting? If so, how?”

- What partnerships do we need to form in this region? Can we do same thing next year with 150 people from many different aspects of this topic?
 - **Note: Group wanted to expand and bring more players into it.**
- We’ve had two regional projects for 5 years; they have filled a void in conversation across these regions. Both projects are sun setting. They have provided tremendous synergy across the states (WA, OR, MT). There are two different areas here - west and east - that span multiple states and offer different things to this conversation. Maintaining the regional collaboration will be key.
- Our PNW region has also greatly benefitted from the knowledge and capacity building that was

accomplished by the major USDA-NIFA five year grant to Washington State University, Oregon State University and the University of Idaho for “Regional Approaches to Climate Change - Pacific Northwest Agriculture” (REACCH). Although the REACCH program focused on wheat farming systems, the comprehensive knowledge gained regarding crop rotation strategies; soil and water impacts of different practices; and the impact of forecast climate changes on the region’s farming sector will contribute to our understanding of sustainable agricultural strategies for both food and other biomass products.

- We have tried to address needs for aviation industry through several collaborative forums and initiatives. ATiP would be able to bring all of those things together, bring this into a forum on the larger bioeconomy conversation.
- Yes, we should follow up. Grid modernization, built environment, and biofuels are all on the radar for the state, but biofuels have fallen off the radar a bit. We can bring that back by reconvening this group. These conversations are happening all the time, some larger force to bring us all together is helpful.
- The bioeconomy initiative has been in development for several years. We have gotten to this point and our goal is an action plan that will motivate the new administration. There is another umbrella - Mission Innovation. It is a global initiative, Obama has suggested support of. All countries that came together in Paris proposed doubling spending in R&D for next five years for clean energy technologies. Working on how USDA, EPA, others will play under that umbrella. No guarantees because of admin change. The EU is part of Mission Innovation, and have finalized \$320B - this could still play a role for U.S. too.
- \$1B leaves country every 3 days for petroleum. Would like to keep that circulating here in rural economies.

Summary Statement from ATIP Foundation

PNW Regional Bioeconomy Forum Summary Wes Jurey, CEO, ATIP Foundation

The ATIP Foundation was established in 2011 at the request of the US Department of Agriculture (USDA), Agricultural Research Service (ARS), to serve as a third-party intermediary, engaging a variety of stakeholders with ARS research, programs, and initiatives. The initial goal of the Foundation was to enable a more collective, collaborative approach on behalf of the private sector, with each member representing one of the eight agricultural research regions in the USDA ARS infrastructure.

The fundamental premise behind this approach was the need to create greater awareness of the breadth and scope of USDA intramural research activity (and that of their federal and state partners such as Department of Energy, Department of the Interior, National Science Foundation), and possibly other collaborative agencies of USDA (e.g., Rural Development, Natural Resource Conservation Services, National Institute of Food and Agriculture), conducted in collaboration with 90 + ARS labs throughout the United States, and to foster an understanding that the federal research outcomes are available for use by business and industry, ultimately resulting in economic growth and development, in the agribusiness sector.

The Foundation was incorporated by eight state and regional technology-based economic development organizations, each individually serving as a federal partnership intermediary to USDA’s ARS, with many members also having facilitation agreements with other federal agencies, as well as their own network of in-state / regional non-federal stakeholders on many aspects of federal / private sector partnerships.

The Foundation’s approach to establishing the five “Advancing the Bioeconomy” forums was premised on identifying regions within the United States whose stakeholders were receptive to the idea that each forum would serve as a springboard to launch one or more demonstration projects within the region. These projects would utilize the scope of research and related outcomes resulting from the massive amount of federal research

coordination overseen by the seven federal agencies comprising the Biomass Research & Development Board, formed by statute in 1999.

The ultimate purpose of the regional projects is to demonstrate that the federal research outcomes--- combined with other federal / state / local agencies whose scope is in “implementation” of research outcomes, can result in economic growth and development, particularly in rural areas of the country, creating new businesses and enabling existing businesses to expand, resulting in job creation.

From the Foundation's perspective, based on the response from forum participants, we believe our premise is sound. At the conclusion of the Pacific Northwest forum, participants were unanimous in support of reconvening in a year, and working to formulate a specific demonstration project tailored to their region in the interim.

It is noteworthy to the foundation that, while each of the five regional forums offered some unique perspectives, relative to their region, six common themes resonated throughout all five forums, relative to each region’s ability to make use of the federal research to enhance the growth of regional economies.

First, the need for public awareness is considered a major challenge. At the beginning of the forum, there was significant discussion on what the bioeconomy actually was, beyond biofuel.

Second, the lack of knowledge of and about the federal resources within the seven agencies was cited. Throughout the discussion it became apparent that most attendees knew little, if anything, about the scope of research conducted; the number of federal labs that existed; or the significant number of research scientists employed. Additionally, there was little knowledge in terms of how to access the federal resources available, even if one were aware of them.

Third, the need to develop a talent pipeline for current and future workers was a strong concern. It was noted that although seven federal agencies were members of the BR&D Board, the Departments of Education & Labor were not engaged at the federal level. At the Pacific Northwest Regional forum, there was discussion on the need to include them in subsequent forums and pilot projects; none participated in this regional forum.

Fourth, development of the type of supply chain necessary to sustain the bio economy was expressed as a critical priority. It was noted that moving agricultural by products and waste more than 100 miles was a significant inhibitor of the growth of this industry.

Fifth, the need to finance the growth of demonstration projects, establish new businesses, and expand existing businesses, by seeking federal, state, and private sector financial assistance is a critical concern. It was further noted that the financial community was the least represented in the forum.

Sixth, it was noted that federal policy is one of the most critical issues, and is an underlying issue to the first five cited. Policy uncertainty means high risk to institutions that provide financial assistance. It determines the allocation of federal resources, the priorities of the public workforce system, discourages the establishment of a supply chain uncertain of the sectors future, and makes articulating a vision for the bio economy more challenging.

In our report to the BR&D Technical Advisory Committee in November 2016, and the BR&D Board in December, our findings, and particularly the six commonalities, were well received.

In conclusion, the Foundation looks forward to working with the Washington State University and the participants in the initial forum, to expand the stakeholder base, in order to begin the development of a regional demonstration project.

We look forward to doing so in partnership with the seven member agencies of the BR&D board, optimistic that the vision of a billion ton bio economy can become a reality.

Summary Statement from Co-Host

Pacific Northwest Regional / ATIP Bioeconomy Forum Summary

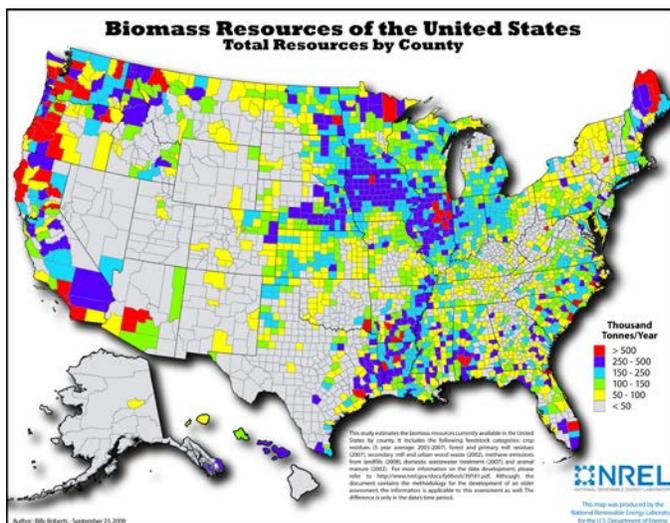
John Gardner
Regional Host

CEO Washington State University Foundation
Professor, Crop and Soil Science, Washington State University

This meeting was co-sponsored by Washington State University under the leadership of the team including Jim Moyer, Associate Dean/Director Agricultural Research Center, College of Agriculture, Human and Natural Resources, Mike Wolcott, Regents Professor, Civil and Environmental Engineering and Director for Institute of Sustainable Design, and Ralph Cavalieri, Associate Vice President for Alternative Energy.

The Seattle meeting represented an attempt at sampling the thought leaders in the bioeconomy from mostly the state of Washington, but also Oregon, Idaho and western Montana. This ATIP regional forum brought together representatives from academia (14), economic and workforce development (11), environmental/agricultural NGOs (8), active investors (4), state and local government (4) and industry broadly (3).

The Pacific Northwest region is among the highest in biomass production capability in the US, and has both public and private forests, grazing land as well as dryland and a substantial amount of irrigated vineyards, orchards and cropland dedicated to high value products.



The production potential of biomass in the region is great (NREL, 2009), but also is tightly linked to public policy (such as the forests) and food/consumer markets (high value crops). Forest/wood waste by-products, energy crops (including perennial and annual, woody and herbaceous), industrial and food wastes thus comprise the major categories of biomass potential.

Challenges

Given Washington's geography in the US and the presence of five petroleum refineries on the Pacific coast built for Alaskan crude (now also from Bakken) – these are among the contributors to the challenge expressed related to the competition from petroleum as a major barrier to further developing the bioeconomy in the Pacific Northwest. The region assumes a technological breakthrough in efficiency and pricing might be necessary to increase use of biomass, thus the emphasis on research/development and participation of the research universities and national laboratory.

Sustainability is another major challenge in further developing the bioeconomy in the northwest. Given public lands, forest management history, the sophistication of water use/allocation, the wide-spread development of renewable sources of energy from hydro, wind and solar, and the environmental mindset – there is a high bar to achieve an acceptable use of biomass. While it could also be considered an asset, one can't deny the importance of federal policy, be it land and water use or forest management in this region. Thoughtful, stable, long-term federal, state and local policy was deemed a requirement at this forum.

Another challenge expressed at the forum was the importance of place related to workforce and development of the bioeconomy. From the Pacific coast, to forests, to mountains, to desert and plains, the diversity of landscapes, ecosystems and opportunities are often closely tied to education and workforce capability. While a favorable attribute if the workforce stays in place, working across locales has revealed a real vulnerability with regard to the transferability of training and experience. Much of the northwest workforce is not capable of mobility.

Opportunities

Thoughtful, stable policy change could have a large impact on the bioeconomy of the northwest. With forest management policy the single biggest example, participants at the forum suggested both environmental and economic benefits were entirely possible given the land, water and bio productivity of the region. The region has relatively large reserves of untapped and under-utilized waste streams from forests, marine and urban communities that have potential for conversion and utilization for energy, products and co-products. Biochar is but one example.

Accompanying policy change, it was suggested a ready market for sustainable products and services could come from a developing bioeconomy. The environmental ethos of the region could provide a market pull if a sustainable supply chain was put in place. The most notable example is that of the aerospace manufacturing and the commercial aviation sector. The northwest is home to national, if not international, thought leaders of research and policy to lower the environmental impact of flight. Development of a sustainable bio-based jet fuel has been among their objectives for nearly a decade, which has demonstrated considerable progress with several alternative fuels now qualified, global policy among 191 countries agreed to, and daily commercial flights on biofuel originating from Los Angeles and Oslo, Norway.

The northwest region holds a strong belief that technological progress and disruptive innovations are possible, and could enable a growing northwest, national and global bioeconomy. This no doubt comes from the region's history but also the public and private research/development capability and a sophisticated investor community. Though most regional investors are used to shorter term, lower capitalization, and faster growth opportunities than found in most of the bioeconomy, there is a community of knowledgeable, committed investors in clean technology native to the northwest.

---- End of synopsis report ----

Attachment: agenda and "discussion document"

Northwest Regional Bioeconomy Forum Seattle, WA

“Garnering stakeholder perspectives and input to help shape the vision, strategic planning, and implementation to promote and expand the bioeconomy”

Date: October 3, 2016 Time: 9:30 AM – 4:30 PM (local time)

Location: Conference Center at Sea-Tac Airport, 17801 International Blvd, Rm 6012M (inside Sea-Tac Airport), Seattle, WA

Meeting Purpose: To introduce the “Federal Activities Report on the Bioeconomy,” and the subsequent “Bioeconomy Challenges and Opportunities for the Billion Ton Vision” report and to hear from stakeholders in (1) industry; (2) state and local government; (3) economic and workforce development; (4) investment & finance; (5) academia; and (6) agricultural and environmental organizations in order to accelerate the development of the bioeconomy.

8:30 AM – Registration / Check in

9:30 AM Welcome and introductory remarks

- Fred Jarrett, Senior Deputy Executive, King County
- Wes Jurey, Chairman, ATIP Foundation
- Valerie Reed, Deputy Director, Bioenergy Technologies Office
- Todd Campbell, BR&D Board, Operations Committee (Senior Energy Adviser, US Department of Agriculture)

10:00 AM – 11:00 AM Overview of “Federal Activities Report on the Bioeconomy”, and the “Billion Ton Bioeconomy Initiative: Challenges and Opportunities” Report

- Presentation by Todd Campbell, BR&D Board, Operations Committee (Senior Energy Adviser, U.S. Department of Agriculture)
 - Establishes issues from the federal agencies and frames the topics for discussion

11:00 AM–3:45 PM—Stakeholder Comments and Discussion

- 12:30 PM—Working Lunch

4:00 PM–4:30 PM—Facilitator Report Out and Next Steps

- Key comments, findings, and recommendations of the 6 sectors
- Includes next steps (timeline to review, prepare, and disseminate report) and feedback on session format

4:30 PM–5:00 PM—Closing Remarks / Adjournment

¹ The Biomass R&D Board consists of representatives from the U.S. Department of Energy, U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Department of Defense, U.S. Department of Transportation, the National Science Foundation, the Environmental Protection Agency, and the Executive Office of the President of the United States.

The Billion Ton Bioeconomy Initiative: Challenges and Opportunities

Overview and Outline of Topics

Purpose of the Billion Ton Bioeconomy Initiative: Challenges and Opportunities Report:

In February 2016, the Board released the *Federal Activities Report on the Bioeconomy* (FARB) to highlight the potential for a stronger U.S. bioeconomy, specifically some of the impacts of increasing biomass utilization three-fold by 2030.¹ The goal of the Billion Ton Bioeconomy Initiative (Bioeconomy Initiative) is to develop and coordinate innovative approaches to expanding the sustainable use of America's abundant biomass resources, while maximizing economic, social, and environmental benefits.

Since the release of the FARB, the Board has engaged with the bioenergy stakeholder community to further develop the Bioeconomy Initiative. The new report, *The Billion Ton Bioeconomy Initiative: Challenges and Opportunities*, is the second in a three-part series intended to lay the foundation and serve as the public communication of the Bioeconomy. This report is foundational to the Board's objective to strengthen the commitment and coordination between the U.S. Government and the bioeconomy community. Early feedback from stakeholders has underscored the importance of biofuels, bioproducts, and biopower. This report details several challenges and opportunities that stakeholders have identified as critical to the success of the Bioeconomy Initiative.

Summary of Challenges and Opportunities:

This report discusses seven of the high-priority **challenges** recognized by the bioeconomy stakeholder community, identified below:

- Major technical hurdles for development and scale.
- Steep competition from traditional petroleum-derived resources.
- A lack of necessary infrastructure.
- Access to capital for large financial investments.
- Uncertainties about sustainability—understanding environmental, social, and economic outcomes.
- Growth instability and increased investment risk caused by policy uncertainty
- The need for a strong and capable workforce.

Specific **opportunities** within each challenge as potential growth areas for the future of the Initiative are detailed below:

- Create increased public demand for biomass-derived products in a bioeconomy.
- Quantify, communicate, and enhance beneficial effects and minimize negative impacts of an enhanced bioeconomy.
- Enable the testing and approval of new biofuels and bioproducts
- Encourage expansion of the market potential for biomass.
- Develop feedstock to meet market demands and potential
- Develop bioproducts that can accelerate biofuel production.

- Support fundamental innovations that reduce cost and technology risk in the supply chain.
- Seek opportunities to utilize low-cost waste resources.
- Develop pathways for:
 - private-sector financing.
 - Support stable, long-term policies.
 - Ensure a ready workforce to meet the needs of the bioeconomy.

Disclaimer:

The Billion Ton Bioeconomy Initiative: Challenges and Opportunities is a product of interagency collaboration under the Biomass Research and Development Board and does not establish any new or explicitly reflect United States Government policy. Some information is based on activities conducted by the Executive Agencies as of May 2016. However, some of the views expressed in this document reflect stakeholder perspectives and do not represent United States Government policy. This report is not a policy or budget document nor an action plan, and it does not commit the federal government to any new activities or funding.

¹ http://www.biomassboard.gov/pdfs/farb_2_18_16.pdf

**Critical Discussion Points
(from Biomass R&D Board representatives)**

1. What are state/local/regional challenges to the bioeconomy?
2. How can the federal agencies help address these regional challenges?
3. What are state/local/regional opportunities to the bioeconomy?
4. How can the federal agencies help leverage these regional opportunities?
5. What is the value proposition of a bioeconomy?
6. How can you contribute to the Billion Ton Bioeconomy?

**Additional Regional Discussion Points for Consideration
(from ATIP Foundation)**

- a) From the “Challenges” section of the above document, what would you list as the 3 highest priorities to discuss and address from the PNW region?
 - a) From that same list, what SHOULD be added to that list from our regional perspective? Does it change your prioritization scheme? (1=most important)
- b) From the “Opportunities” section of the above document, is anything missing from the list, and how would you prioritize these issues? (1=most important)
- c) What sets the NW / PNW Bioeconomy apart from other regions of the country? What inherent advantages do you have? What regulatory issues constrain success? What incentives would help advance business opportunities to advance the bioeconomy?
- d) What other biomass would you like to consider in the discussion of advancing the bioeconomy? Animal wastes / carcasses / concentrated animal feeding operations? Municipal landfill biorefineries? Others?
- e) As a region, how can you enhance your bioeconomy through new partnerships in the region, or on a more global basis?