ATIP Foundation Regional Bioeconomy Forums[i]:
"Addressing the Challenges & Opportunities of Advancing the Billion Ton Bioeconomy"

Summary Report on Five Regional Bioeconomy Forums Convened in 2016

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EXECUTIVE SUMMARY

This report reflects input received from 223 thought leaders on both the opportunities and challenges of expanding the bioeconomy in the United States. That is, utilizing organic materials such as those that farmers and foresters grow as inputs for refining and manufacturing. The participants are drawn from six broadly defined sectors of stakeholders in five geographically diverse regions of the country.

The fundamental premise of the forums was the projection that the United States has the ability to sustainably produce over one billion tons of biomass annually, by 2030, for industrial purposes including fuels, chemicals and consumer products. The activity could expand current production and contribute additional economic, conservation, and national security benefits to the nation. This vision was articulated by the Biomass Research and Development Board and published in their *Federal Activities Report on the Bioeconomy*, released in February 2016 at the Advanced Bioeconomy Leadership Conference in Washington, DC.

These forums were conducted in partnership with the U.S. Departments of Agriculture and Energy, and regional co-host entities. The purposes were to provide information to and receive input from key stakeholders, relative to the challenges and opportunities inherent in advancing the bioeconomy, as well as to determine their priorities and interest in enacting regional strategies as an outcome of the forum. As an economic development tool, the bioeconomy has been shown to stimulate both wealth and job creation, particularly in rural America.

In evaluating the input received, we have drawn three fundamental conclusions: (1) there is strong, consistent interest, across the various stakeholder groups, in advancing the bioeconomy; (2) there are significant regional differences, in terms of participant stakeholder views, on both opportunities and challenges that must be addressed on a regional basis; and (3) there are six significant, relevant, overarching themes, universally expressed and supported by all five forums, relative to specific issues and recommendations, to be addressed by federal and state agencies, and the broader stakeholder community. The six themes are as follows:

> **Finance**: stated as the ability to successfully finance the growth of the bioeconomy, focused on (1) public funding and (2) general access to capital. Regarding public funding, government loan guarantees were cited, relative to a lack of knowledge, awareness, or understanding of the process required. Also, federal agencies should consider funding more small scale demonstration projects, rather than fewer large scale ones; incentivize public private partnerships; and provide a level playing field for bioenergy investments and allocations, comparable to those of fossil fuel and nuclear energy.

Regarding general access to capital, the high risks perceived by private sector investors, was based on inconsistency in federal incentives, the lack of off-take agreements, and broadly stated, a lack of understanding of the bioeconomy.

Public Education & Awareness: stated as the need for clear, understandable definitions for the "bioeconomy" and "sustainability"; and a robust, orchestrated public educational awareness campaign, inclusive of thoughtful articulation of the value proposition of the bioeconomy, and "Case for Support", relative to why it makes both business and economic sense.

Public Policy: stated as the need to create a level playing field for the bioeconomy, with long term, stable government incentives and tax credits that are competitive and comparative with other energy programs. Also regulatory requirements and controls, in general, and in particular by EPA, are viewed as overly burdensome, especially to small & medium sized businesses.

Supply Chain: stated as the need to ensure the supply chain logistics/capacity/capabilities are in place, to support the movement of biomaterial from the source to final production/processing facilities, and then to market. As a specific example, one recommendation was that more biomass accumulators (biomass depots) are needed to reduce distance from farm/forest to processing facilities. This also reduces cost, and aligns with the recommendation to fund more small models/projects rather than fewer large models/projects.

Workforce: stated as the need to engage the US Departments of Education & Labor, to ensure the publicly funded workforce system is aware of and focused on the development of the workforce needed to support the growth of the bioeconomy. Recommendations include building the talent pipeline; addressing the lack of technical training; the need to create early awareness of opportunities by the 8th grade; and addressing the lack of training opportunities and options in rural areas.

Federal Resources: stated as a general lack of awareness, and a request for federal support of regional collaboration. In terms of awareness, there was a general lack of knowledge of the research and resources available through and from the federal agencies. Outside of academia, most participants were unaware of patent license agreements, cooperative research and development agreements, the scope of federal research, and technical assistance and support, such as loan guarantees.

In terms of collaboration, participants stressed the need for economic growth to be seen, perceived and approached on a regional basis, since generally speaking; regional economies do not follow geographic or political boundaries. They viewed federal agency collaboration at a regional level, in partnership with academia, the private sector, and the broader stakeholder community, as a critical component necessary to grow the bioeconomy.

From the ATIP Foundations perspective, based on the input received, these six themes, relative to their issues and recommendations, should be a primary focus of federal and state government and the stakeholder community, in terms of providing the leadership necessary to address the issues raised, in order to stimulate the growth of the bioeconomy.

Overview

This "Summary Report on Five Regional Bioeconomy Forums" provides a synthesis of issues identified by participants in the regional forums that captures both common issues across the geography of five regions as well as their unique strengths and regional priorities in advancing the bioeconomy. We strongly recommend that, in addition to reading this summary report, interested parties also take the time to read the synopsis of each regional full report (Attachments 1-5) to more fully understand the challenges and opportunities that each region has expressed and prioritized. For the full report of each regional bioeconomy forum, go to www.atipfoundation.com.

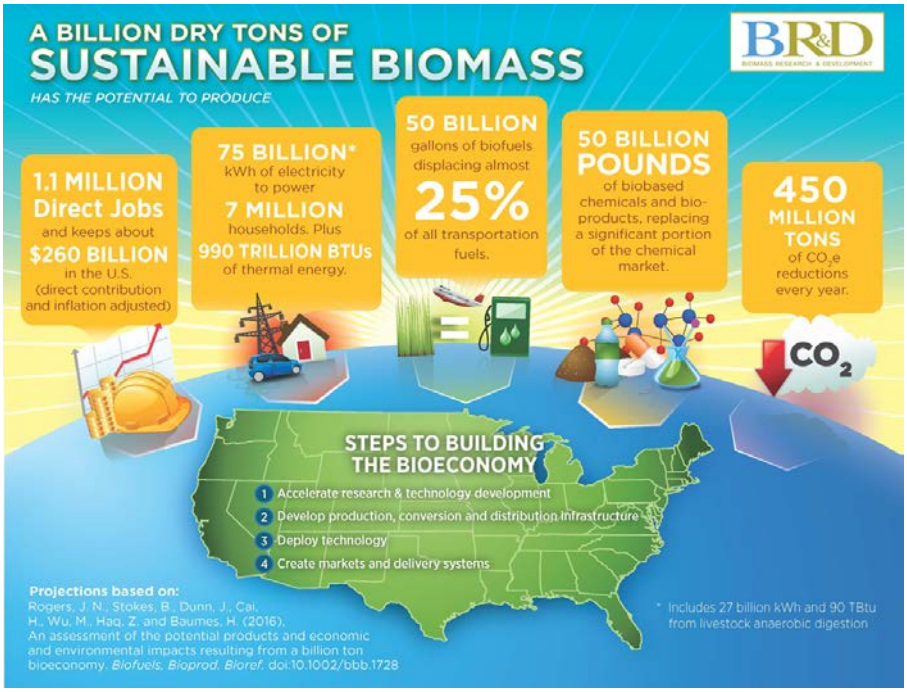
Introduction

In late 2013, the seven agencies and the Office of the President that constitute the Biomass Research and Development Board[1] (hereafter referred to as the "Board") began development of a vision to promote the expansion of the bioeconomy. With the projection that this nation, by 2030, will sustainably produce a billion tons of biomass annually, the "Vision" was published as the "*Federal Activities Report on the Bioeconomy*," released in by United States Department of Agriculture (USDA) Under Secretary Cathie Woteki at the 2016 Advanced Bioeconomy Leadership Conference (ABLC) in Washington, D.C. (February 2016; for a copy, go to https://www.biomassboard.gov/pdfs/farb_2_18_16.pdf). "The goal of the Billion Ton Bioeconomy Vision is to develop and implement innovative approaches to remove barriers to expanding the sustainable use of America's abundant biomass resources, while maximizing economic, social, and environmental outcomes."

Based on this Vision, stakeholder outreach began with a "listening session" at the conclusion of this national ABLC conference where representatives of the Board introduced a graphic depicting the potential of sustainable biomass (Figure 1.) Subsequently, beginning the month of April, 2016 USDA and the Department of Energy (DOE) co-led informal listening sessions at three other major national conferences: 2016 International Biomass Conference and Expo in Charlotte, NC (April 11-14); World Congress on Industrial Biotechnology in San Diego, CA (April 17-20); and the Symposium on Biotechnology for Fuels and Chemicals in Baltimore, MD (April 25-28). In addition, a webinar on the Vision was conducted jointly by USDA and DOE on May 5, 2016. Input garnered from these five events helped shape a subsequent document, titled *"The Billion Ton Bioeconomy Initiative: Challenges and Opportunities,"* released in November 2017 by the Board (for a copy, go to https://www.biomassboard.gov/pdfs/the_bioeconomy_initiative.pdf).

[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.

Figure 1. Potential of a billion tons of sustainable biomass on job creation, energy production, bioproducts, and reduction in carbon dioxide emissions.



Methodology for Regional Bioeconomy Stakeholder Forums

Board representatives contracted with the ATIP Foundation --- a non-profit consortium of State Economic Development organizations --- to develop and co-host with coordinating state entities, a series of regional bioeconomy forums in the latter part of calendar year 2016. These were developed for two purposes: first, to garner input from a broad range of stakeholders on the Challenges & Opportunities in advancing the bioeconomy from their regional perspective, in order to help shape a federal "multiyear implementation plan," expected to be prepared and submitted by the Board during fiscal year 2017 to the Office of Science and Technology Policy (OSTP). The second purpose was to engage the primary regional stakeholders to determine their priorities in addressing the challenges and opportunities, and their interest in developing regional strategies as a result of the forum.

The goal of each regional bioeconomy forum was to bring together a mix of stakeholders (about 40-60 participants) from various sectors to seek their input, relative to the initiative's vision, strategies, and implementation. These sectors (with their inherent subcategories) were broadly defined as (1) industry; (2) state and local government; (3) economic and workforce development; (4) investment & finance; (5) academia; and (6) agricultural and environmental organizations. State co-hosts, with the assistance of the Board's Operations Committee members, derived the list of by-invitation-only participants.

Forums were convened in the Southeast with the Georgia Institute of Technology as co-host **(September 16, Renewable Bioproducts Institute, Atlanta, GA)**, in the Southwest with the Mineral Wells Chamber of Commerce,

Mineral Wells, TX, **(September 29, Holiday Hills Country Club, Mineral Wells, TX)**, in the Pacific Northwest with Washington State University **(October 3, Sea-Tac Conference center, Sea-Tac airport)**, in the Northeast with The University of Maine, **(October 18, Orono),** and in the Midwest with The Ohio State University **(November 15, Schisler Conference Center, Wooster, OH)**. Co-hosts arranged for the meeting room, a modest noon meal, and a dedicated note taker with real-time display so the participants could verify their remarks, as necessary.

Forum Structure and Role of the Foundation and Co-hosts

The agenda for each forum included welcoming comments by the ATIP Foundation, representatives of the Biomass Research and Development Board (hereafter referred to as the "Board"), and the regional co-host. At each forum, a slide set presentation was made by one of the representative of the Board (Harry Baumes, USDA Director, Office of the Chief Economist; Todd Campbell, USDA Senior Advisor on biofuels / biobased, and Rural Development; Valerie Reed, USDA Senior Advisor for Bioenergy; Alison Goss Eng., DOE Program Manager, Feedstock Supply and Logistics and Advanced Algal Systems; Jonathan Male, DOE Director for the Bioenergy Technologies Office). In addition, a "discussion document" was provided by the Board representatives to the participants. The remainder of the day consisted exclusively of stakeholder attendees from the six sectors participating in discussions on the discussion questions. Notes were taken (attributed to the commenter) on the fly by representatives of the co-host. Follow the forum, participants received a link to a Google Document and a 2 week window of opportunity to edit their specific comments, or add additional comment. Thereafter, the document was closed by Richard Brenner of the ATIP Foundation, who reviewed comments, clarified with authors as needed, redacted all names of comment contributors, and annotated with his comments from the Foundation.

In advance of each forum, confirmed participants were presented with a "read ahead" document, prepared by representatives of the Board's Operations Committee that listed seven challenges and ten opportunities in advancing the bioeconomy. These were based on the Vision of sustainably producing a billion tons of biomass annually by 2030. Following the overview presentations by representatives of the Board at each forum, the moderator asked participants to identify the top three priorities among the lists (3 "votes").

Results and Conclusions

Invitations and Participation by Region and Sector

An inspection of participation rates by each sector may provide some insight into how engaged each sector is in advancing the bioeconomy. Tables 1 and 2 provide descriptive statistics, expressed as numbers (Table 1) and percentages (Table 2), on invitations and participation by the broad sector designations for all five regional forums. Overall, 637 invitations were issued by co-hosts resulting in 223 attendees. The largest proportion of invitations was made to industry and academia, and the fewest to the investment and finance sector (4.6%), and agriculture & environmental organizations (5.7%). On average 37% of the invitations went to industry, but only 21% of attendees were from that sector. Academia accounted for 22% of invitations, yet averaged 29% of participants. The Investment and Finance sector accounted for an average of only 4.6% of invitations issued across the five forums; they accounted for approximately 4% of participants (9 persons, with 4 attending the forum in Washington).

Table 1. Descriptive statistics on number of invitations issued by five regional co-hosts within broad sector designations, and the actual number that attended each regional forum.

	No. Invited by sector							No. Participated by sector						
Region	Industry	State&Local gvmt.	Economic & workforce	Investment / finance	Academia	Ag. & environ.	Total	Industry	State&Local gvmt.	Economic & workforce	Investment/ finance	Academia	Ag. & environ.	Total
GA	60	12	18	1	26	7	124	7	4	3	0	15	3	32
TX	41	27	23	2	49	11	153	6	8	15	1	9	2	41
WA	25	11	17	9	28	21	111	3	4	11	4	14	8	44
ME	42	13	4	6	13	4	82	12	13	4	3	13	5	50
OH	60	42	18	9	25	13	167	22	11	6	1	10	6	56
Totals	228	105	80	27	141	56	637	50	40	39	9	61	24	223

Table 2. Invitations and participation in five regional forums, expressed as percentages representated by broad sector designations.

	% Invited (no. invited per sector/total no. invited per region)							Participated (no. participants by sector/total no. participants per regio						
Region	Industry	State&Local gvmt.	Economic & workforce	Investment / finance	Academia	Ag. & environ.	Total	Industry	State&Local gvmt.	Economic & workforce	Investment/ finance	Academia	Ag. & environ.	Total
GA	48.4	9.7	14.5	0.8	21.0	5.6	100	21.9	12.5	9.4	0.0	46.9	9.4	100
TX	26.8	17.6	15.0	1.3	32.0	7.2	100	14.6	19.5	36.6	2.4	22.0	4.9	100
WA	22.5	9.9	15.3	8.1	25.2	18.9	100	6.8	9.1	25.0	9.1	31.8	18.2	100
ME	51.2	15.9	4.9	7.3	15.9	4.9	100	24.0	26.0	8.0	6.0	26.0	10.0	100
OH	35.9	25.1	10.8	5.4	15.0	7.8	100	39.3	19.6	10.7	1.8	17.9	10.7	100
Mean (n=5)	37.0	15.6	12.1	4.6	21.8	8.9	Mean (n=5)	21.3	17.3	17.9	3.9	28.9	10.6	
(n=5)	12.7	6.4	4.4	3.4	7.1	5.7	(n=5)	12.1	6.6	12.5	3.6	11.3	4.8	

Agricultural and environmental organizations had a high average response rate, but they accounted for an average of less than 10% of invitees. Clearly, there is reasonable interest from this sector in addressing the bioeconomy, and perspective of environmental organizations is important in addressing multiple uses of agricultural and forested lands to accommodate multiple purposes for growing food, growing feed (for food animals), producing fiber (e.g., cotton), biofuels, and wildlife habitat. Regarding investment and finance, among all participants this sector were greatly underrepresented in attendee discussions on this important challenge in advancing the bioeconomy; consequently, there is little confidence in assessment of their priorities on challenges and opportunities for advancing the bioeconomy.

Conclusion on Invitations and Sector Representation: On the assumption that optimal representation by sectors would be met with each sector contributing about 17% of the attendees, co-hosts of future bioeconomy forums should seek to increase engagement of investment and finance, as well as agricultural and environmental organizations, perhaps with slightly less focus on academia. This likely will require greater attention to RSVP rates and further outreach as warranted.

Regional Variation in Prioritizing "Challenges" and "Opportunities" in Advancing the Bioeconomy

Table 3 illustrates that each regional forum generally had different priorities on which challenges should be addressed first.

Table 3: Regional variation by participants in identifying the top 3 priorities to address from the list of "challenges" in advancing the bioeconomy, as presented by the Board. Numbers reflect priorities as determined by a vote of hands (1 is highest priority). Each participant had 3 votes to distribute among the challenges.

	Regional forums listing Challenge as among top 3 priorities				
Challenge	**SE**	**SW**	**NW**	**NE**	**MW**
Major technical hurdles for development and scale.	**3 (tie)**		**3 (tie)**	**2 (tie)**	**1**
Steep competition from traditional petroleum-derived resources.	**2**		**1**		**2**
A lack of necessary infrastructure.		**2**			
Access to capital for large financial investments.	**3 (tie)**	**1**		**1**	
Uncertainties about sustainability—understanding environmental, social, and economic outcomes.	**3 (tie)**		**3 (tie)**		**3**
Growth instability and increased investment risk caused by policy uncertainty	**1**		**2**	**2 (tie)**	
The need for a strong and capable workforce.		**3**			

Both the SW (Mineral Wells, TX) and the NE (Orono, ME) identified "access to capital for large financial investments" as the most important regional challenge. Other regions identified "growth instability … caused by

policy uncertainty" (SE), "steep competition from petroleum-derived resources" (NW) and "technical hurdles for development and scale" (MW). Regarding the latter, it should be noted that their focus was on bioprocessing for bioproducts (not energy) and more fully utilizing a variety of biomass feedstocks in developing a wide range of polymers. It is also noteworthy that three regions identified "growth instability and increased investment risk caused by policy uncertainty" as either highest (SE, Atlanta) or second highest (NW, Seattle; NE, Orono) priority among challenges.

Some cautions on over interpreting or overemphasis are warranted. In part, "voting" may partially be reflective of sector representation at these forums. Additionally, votes in the SE forum (the first of the regional forums) should be taken perhaps with some skepticism, in that voting occurred post-forum as this process was not refined until the second forum, and only a third of SE forum participants responded to the email request for voting. Please see the report for the SE forum for specific information on sector participation, and voting responses.

Table 4: Regional variation by participants in identifying the top 3 priorities to address from the list of "opportunities" in advancing the bioeconomy, as presented by the Board. Numbers reflect priorities as determined by a vote of hands (1 is highest priority). Each participant had 3 votes to distribute among the opportunities.

	Regional forums listing opportunity as among top 3 priorities				
Opportunities	**SE**	**SW**	**NW**	**NE**	**MW**
Develop feedstock and fundamental innovations that reduce cost and technology risk in the supply chain.	**3 (tie)**		**2 (tie)**		**1**
Seek opportunities to utilize low-cost waste resources.	**3 (tie)**				
Quantify, communicate, and enhance beneficial effects and minimize negative impacts.				**2 (tie)**	
Create increased public demand for biomass-derived products in a bioeconomy.	**3 (tie)**	**1**	**2 (tie)**		**2 (tie)**
Develop bioproducts that can accelerate biofuel production.	**1**				
Enable the testing and approval of new biofuels and bioproducts.					
Expand the market potential for biomass.	**3 (tie)**			**2 (tie)**	
Encourage private-sector financing	**3 (tie)**	**2 (tie)**		**1 (tie)**	
Support stable, long-term policies.	**2**		**1**	**1 (tie)**	**2 (tie)**
Ensure a ready workforce to meet the needs of the bioeconomy		**2 (tie)**		**1 (tie)**	

Table 4 illustrates variation in "voting" responses to identify the top three priorities to address in "opportunities" presented in advancing the bioeconomy. As with the "challenges" voting, priorities differed among regions, but with much more variable responses (many ties). Four regions identified a different top priority; this may be viewed as encouraging in that each region sees opportunities to expand the bioeconomy in ways that may be unique to their region (i.e., all regions can benefit from a broad initiative to expand the bioeconomy). However, 4

of 5 regions felt that "support stable, long-term policies" was first (NW, NE) or second priority (SE, MW). Noticeably absent was an interest to "enable the testing and approval of new biofuels and bioproducts."

Conclusion on "Challenges" and "Opportunities": We are encouraged that participants perceived their regions as having definable and relevant priorities in both challenges and opportunities to advance the bioeconomy. These data do suggest that subsequent forums on the bioeconomy can be tailored to the region and their perspectives on top priority issues. Logical next steps in these future forums would be to begin the process of identifying solutions or processes to address their priority issues.

This naturally led to discussions on potential pilot projects within each region, but at no time during these forums was there any suggestion (either from organizers and co-hosts) that government funding sources would be identified, beyond the existing programs under USDA, Department of Energy, or other federal agency authorizations. It was apparent, however, that there is a need to increase education and awareness of existing federal programs to stakeholders wishing to participate in advancing the bioeconomy. In general, there was recognition of the value of developing public private partnerships in addressing regional issues, so that all regional stakeholders with a vested interest in addressing the many facets of advancing the bioeconomy can participate and commit to the initiatives.

Again, with the caveat that these data may be inherently biased by the sector representation at each forum, the Foundation makes the recommendation to sponsors and regional co-host organizers that future forums be conducted in each region in a manner that ensures adequate sector representation, and that co-hosts use these tables as a guide to discussing issues and formulating action plans.

Common Themes Across All Regions

Discussion in each forum that followed the voting reflected their interests that are apparent in these tables. Again, we note that the first forum in Atlanta was convened without the voting; please see the report for the SE regional forum for further specifics.

Six common themes were gleaned from the discussions at the forums. The following paragraphs identify these themes, issues, and recommendations.

Financial issues.

- Access to capital was an important component of this; challenges and availability of government loan guarantees was cited as an important issue, as well as high risks perceived by private sector investors.
- Public funding --- there were recommendations to incentivize public-private partnerships, to focus on scalability, and to provide a level playing field for bioenergy investments and allocations with those of fossil fuels and nuclear energy.

Education and Awareness.

- Clear definitions for "bioeconomy" and "sustainability" are needed.

- A robust orchestrated educational awareness campaign should be developed, including thoughtful articulation on the value proposition of the bioeconomy, and the case for support (why supporting and advancing the bioeconomy matters and why it makes economic sense).

Policy.

- Create a level playing field for the bioeconomy, with stable incentives and tax credits that are competitive and comparative with other energy programs. This should also address federal loan guarantees for bioenergy and bioproducts.
- Provide incentives to reduce risks using purchasing agreements.
- Create greater awareness of technology know how within the federal lab system that could enhance productivity and reduce costs.
- Regulatory requirements and controls by EPA are viewed as overly burdensome, especially to small and medium-size businesses.

Supply chain.

- Logistics must focus on improving the slowest node, by increasing capability to move biomass from the source to the final processing facility, which is not well developed.
- Integration --- many different feedstocks will be needed in the billion ton bioeconomy; processing facilities must be able to handle these varied feedstocks.
- Many biomass accumulators (biomass depots) may be needed to reduce distance from farm / forest to pre-processing facilities (removal of water to reduce shipping costs; grinders; pelletizers).
- Research is needed to develop better ways of pre-processing biomass.

Workforce.

- Department of Labor and Department of Education are not members of the BR&DB (consider expanding BR&DB) however, they are important agencies to engage if we are to develop the workforce needed, particularly in rural America.
- Skills development: there is a lack of technical training related to the bioeconomy.
- There is a need to build a talent pipeline.
- Awareness of the bioeconomy and job opportunities should start in 8th grade education.
- Rural areas have a shortage of available employees resulting from a lack of training options and opportunities.

Federal Resources.

- There is a general lack of awareness / knowledge of federal research and opportunities that the private sector, state administrators, and academia can access and utilize. These include:
    - Access to relevant intellectual property through Patent License Agreements (PLA) with agencies;
    - Cooperative Research and Development Agreements (CRADA) with federal agencies;
    - Cooperative Research Agreements with universities; and
    - Federally funded research focus needs to address industry problems; industry needs to articulate its needs.
- Federal support for regional collaboration is needed.
    - Among federal regional offices;
    - Developed within economic regions;

- Supported by federal and state agencies; and
- Support for co-ops also is needed (e.g., biomass accumulators)

Additionally, there were four general comments not tied to these themes. (1) Waste: there is the need for more focus on how to utilize wastes from landfills, food wastes, and municipal wastes along with discussions on waste utilization versus purposely grown biomass. In part, this was addressing optimization of land use for multiple markets that makeup the bioeconomy purposes of food, feed, fiber, bioenergy, and wildlife habitat. (2) Balance: comments were made on the need for bioeconomy discussions to have better balance of fuel versus bioproducts. (3) Annual regional conferences: unanimous desire was expressed to have annual regional conferences on biomass. (4) Regional project: there was strong interest to develop regional projects with the possibility of federal technical assistance.

Unique Regional Strengths and Issues

As noted in Tables 3 and 4, participants in the five regional forums had different perspectives on the challenges and opportunities inherent in advancing the bioeconomy. At each forum, participants were asked what they saw as the unique strengths in their region, as well as the unique challenges. The succeeding paragraphs paraphrase those thoughts and comments.

SE Regional Forum (Atlanta).

Participants in this forum included representatives of several industries, including forest, pulp and paper, biofuel, wood pellet, aviation, and agriculture, as well as researchers in academia from several southeastern states. The pulp and paper industry is a major component of the biomass industries in this region and has robust expertise, infrastructure, supply chains, workforce, and successful operating markets. Participants suggested that this component of the bioeconomy could serve as a springboard for expansion with other segments of the bioeconomy. The wood pellet industry is strong with a predominant focus on export markets. Participants suggested this industry should expand domestic markets with somewhat different products.

There are a number of biofuel companies in the SE U.S., and some that have failed in the recent past, resulting in some skepticism on the sustainability of biofuels. Participants felt such skepticism could be harnessed for developing stronger programs. The SE U.S. also has a strong infrastructure of rail and air transport systems, deep water ports, and coastline on the Atlantic and Gulf waterways, making access to domestic and international markets easy.

The greatest challenge identified by participants was in regard to policy. Substantial progress on the bioeconomy requires either a significant policy signal or a disruptive market change. Weak policy signals have resulted in incremental change. There was discussion throughout the forum of the need for a sustained policy, technology or economic impetus sufficient to support bioeconomy initiatives. Other issues which might affect bioeconomy prospects in the southeast included current forest ownership and management patterns (public lands vs private forest operations), workforce availability and training, competing industries, state and local policies, and others. Participants concluded that while all of these factors have some influence, there was general consensus that these issues could be managed if there were sufficient impetus for bioeconomy initiatives. The meeting was well-received. Participants suggested that this event should become an annual meeting; this is a signal of the positive potential of engagement and commitment to the bioeconomy.

SW Regional Forum (Mineral Wells, TX).
Discussions in Mineral Wells highlight several issues specific to their region beyond the primary need of a strong national policy statement accompanied by incentives to support the development and sustainability of a bioeconomy. This forum had a high attendance by the Department of Labor (workforce development), many of whom were entirely unfamiliar with the bioeconomy. Workforce training and availability of skilled workers in this region have not received much attention to date. In fact, educating the public as to the definition of "bioeconomy" and "biomass" was identified as a high regional / local priority challenge necessary to address as a precursor to identifying or developing job opportunities and defining requisite skill sets needed. Jobs created will be technical and derived from an emphasis in STEM (Science, Technology, Engineering, and Math).

But education issues must be addressed beyond skills and rudimentary education that include overcoming soft skills deficiencies. Clearly, most citizens are already familiar with biofuels and their uses, but other bioproducts and the potential uses are largely unknown, and awareness will be a crucial element in overcoming doubts and skepticism related to the industry and its advancement. Furthermore, participants stressed that educating the masses must be approached beginning with the 8th grade level, and developed strategically to include overcoming emotions related to the competition with oil and gas that is strong and regionally unique in TX, OK, and Louisiana. This educational outreach would also foster an increase in demand for bioproducts and incentives to decrease risks for investment. Thus, participants suggested that a pilot project should be developed and focused on the creation of a comprehensive educational program that must include the Department of Labor and the Department of Education in addition to the agencies comprising the Biomass Research and Development Board.

Given that the highest concern in all regions was the issue of national policy on the bioeconomy, and the availability of capital, education is critical for investors, businesses, and consumers to realize the benefits of bioproducts. This must also support the building of an infrastructure for the bioeconomy beyond the existing infrastructure for a petroleum industry. Other considerations related to acquiring capital is in Identifying (a) what currently exists in the market, (b) whether there is a demand, and (c) quantifying the potential for profits to commodity producers and end-product manufacturers. Other concerns raised at the forum touched on whether markets for these commodities are static or volatile, and whether investors and/or lending institutions are willing to take a risk on supporting the development and growth of the bioeconomy industry. The Foundation's assessment is that these questions reflect valid concerns and should be openly recognized and addressed in determining the probability of success in advancing the bioeconomy.

This region also identified a number of unique advantages. Presence of a strong oil industry can provide good cross-training for biofuels, as there are a number of common elements between petroleum and biomass refineries. Additionally, coastal areas are also amenable to algae biomass opportunities and these should be explored. This region, as with the SE U.S., should be a preferred bioenergy crop area due to the inherent traits of abundant sun and warmth.

NW Regional Forum (Seattle-Tacoma, WA).
Among advantages identified by participants in the Pacific Northwest (PNW) regional forum, is the recognition that the PNW has some of the highest biomass production potential from varied sources such as public and private forests, grazing land, and irrigated fruit operations and crops for producing high value products. The geographic

location positions PNW as the gateway to the Pacific Rim, thereby creating opportunities for export of biomass products. The presence of the Northwest Advanced Renewables Alliance promotes jet biofuel from forest residuals that are underutilized in this region. However, presence of a large number of petroleum refineries for processing abundant Alaska crude oil represents steep competition to biofuels in the region. Participants recognize the need for breakthrough technology to reduce costs of developing fuels from biomass, and therefore are strong supporters of research; strong universities in this region are a decided asset. Use of biomass as an energy feedstock, however, also faces challenges from abundance of other alternative energy sources such as hydroelectric generation, wind, and solar --- all considered substantially cleaner and cost effective. The strong research community could also be harnessed to address development of high value co-products from biomass.

This region has strong aerospace manufacturing and commercial aviation sectors that could benefit greatly from a sustainable biomass supply chain. The need for strong, thoughtful policy was cited by participants as a requirement in promoting the bioeconomy and biomass supply chain, as has been echoed by other regional forums. One example of how important this could be to the region is on the issue of land ownership. The federal government owns 53% of the state of Oregon and almost 29% of Washington. In the PNW, policy at the federal, state, and local level could be instrumental in advancing the use of bio-wastes as energy sources (including aviation fuel) from the forests, as well as marine, and municipalities. Uniqueness of land ownership and the strong aviation industry would suggest that a partnership of federal, state lands, and industry / key private sector players, including the regional sophisticated investors, should be considered to formulate a unique pilot project for PNW.

NE Regional Forum (Orono, ME)*.*

In some respects, the NE region is a case study in contrasts. As a positive, the New England natural-growth forestland is largely viewed as being sustainably managed and harvested. As a negative, this is a disadvantage in terms of qualifying for Renewable Fuel Standards and generation of Renewable Identification Number credits for the entire Northern Forest region encompassing Maine, New Hampshire, Vermont and New York. This region also has both geographic advantages and disadvantages in terms of infrastructure. For example, they have deep water ports that could be utilized for exports to Europe, but lack an east-west railway infrastructure because of mountainous terrain. The region is characterized by a strong pulp industry, but a declining paper industry. Twenty percent of the U.S. population is in the northeast region, but Maine is at the terminus characterized by diminished supply chain logistics. On the positive side, presence of strong research universities and industry engagement can promote development, of co-products utilizing nanocellulose for a variety of new products ranging from polymer reinforcement, 3D printing resins, adhesives, and biocomposites for lightweight structural elements.

Participants felt that policy changes (unspecified), and federal / state / regional incentives are critical to expanding the bioeconomy, and would subsequently have a positively impact on infrastructure development and diminishing investment risk. Improvements in supply chain logistics would benefit pulp, saw log, and bioproducts export opportunities.

MW Regional Forum (Wooster, OH)*.*

Participants cited their central location, a robust infrastructure of roads, rails, rivers, and the Great Lakes, abundance of grains and a strong food industry as unique regional strengths. The region has a strong history of polymer development, citing that 45% of all U.S. polymers are produced within a 500 mile radius of Columbus, OH.

Strong universities and a robust history of public private partnerships will continue to facilitate new opportunities in the bioeconomy. Challenges faced in the MW again emphasized the need for stability of policies at the federal level, and then mirroring these at the state level. Regulatory policy was cited as a detriment to expanding the bioeconomy. Attendees felt that strong stable policies should be accompanied by incentives, such as for processing community waste instead of depositing it in landfills, and bio preferences to increasing market demand. Participants proposed incentives that would be similar to the biofuel sector such as tax benefits, streamlined permitting process, and first market assistance; these were perceived as necessary to overcome barriers to advancing the bioeconomy. Workforce development was not seen as an issue in the MW, but educating the public --- starting at junior and senior high levels – should focus on the benefits of the bioeconomy to society as a means of increasing demand. Participants also felt that Ohio should expand regional engagement to other Midwest states with special emphasis on industry networking.

Concluding Remarks

The ATIP Foundation appreciates the opportunity to work in partnership with the US Department of Agriculture and the US Department of Energy, to coordinate and facilitate these five regional forums on the bioeconomy. Based on the input received from the agencies, we chose co-host partners who possessed a broad regional knowledge of the stakeholders in the bioeconomy. We also chose them on their expressed willingness to continue to provide leadership within their region to advancing the bioeconomy following their forum. Four of the five co-hosts were strong universities in their region; the fifth an exemplary Chamber of Commerce in rural West Texas. All are capable of leading and coordinating each region in addressing many of the issues raised at the forums, including the important role of articulating state/regional policy needs to those who can implement them. Each of the regional co-hosts expressed both a desire and a willingness to continue partnering with the ATIP Foundation in establishing a working group/advisory council to begin the process of developing a viable and sustainable coordinating group, representing all sectors in their region. The major purpose of a coordinating group would be to plan subsequent forums, and shape a region-specific pilot demonstration project. These would address the highest priority issues identified in each forum, and demonstrate the viability of the bioeconomy strategies in enabling job and wealth creation, subsequently resulting in economic growth.

We believe, based on the input received from all five forums that the case has been made that the ATIP Foundation and regional co-hosts stand ready to facilitate development of regional working groups to provide a sustainable mechanism for advancing the bioeconomy in each region. This includes the development of at least one demonstration project in each region.

We would expect those groups and projects to address the six (6) critical areas that were common themes across all regions: (1) Finance, including public funding and general access to capital; (2) Education and Awareness, including articulation, public awareness, and a clearly understandable value proposition/case for support; (3) Policy, focused on creating a level playing field and addressing regulatory challenges; (4) Supply Chain, inclusive of the logistics necessary, and integration of various feedstocks, supported by access to research; (5) Workforce, inclusive of skills development, and the need to develop a talent pipeline, particularly in rural areas; and (6) Federal Resources, focused on creating awareness and knowledge of resources available, and enabling regional collaboration among federal, state and regional entities.

We close by noting that the ATIP Foundation looks forward to continuing our partnership with the Board and our regional co-hosts to facilitate sustainable efforts to advance the bioeconomy, in order to enable wealth and job creation, thereby resulting in economic growth and opportunity, particularly in rural America.

Attachments:

Attachment 1_Synopsis of Report to Participants in the SE Regional Bioeconomy Forum September 16, 2016 v.3.23.17

Attachment 2_Synopsis of Report to Participants in the SW Regional Bioeconomy Forum (Mineral Wells), September 29, 2016 v.3.23.17

Attachment 3_Synopsis of Report to Participants in the PNW Regional Bioeconomy Forum v.3.23.17

Attachment 4_Synopsis of Report to Participants in the NE Regional Bioeconomy Forum Oct. 18, 2016, Orono, ME v.3.23.17

Attachment 5_Synopsis of Report to Participants in the MW Regional Bioeconomy Forum Nov. 15, 2016, Wooster, OH v.3.23.17

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[i] Monetary and in-kind support for this forum series was provided to the ATIP Foundation by USDA Office of the Secretary, Department of Energy's Bioenergy Technologies Office, POET DSM Advanced Biofuels, New Holland Corporation of North America, Georgia Institute of Technology, Mineral Wells (TX) Chamber of Commerce, Washington State University, University of Maine at Orono, and The Ohio State University.