

Economic Diversification of Alberta through Bioindustrial Innovation

**Detailed Meeting Notes
(What We Heard)**



Innovation Thought Leaders Forum

February 7th, 8th and 9th, 2012

Calgary, Alberta

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1. Background

The Innovation Thought Leaders Forum is part of an initiative to take stock, re-evaluate, re-focus and align the collective efforts on bioindustrial initiatives in Alberta. In collaboration with stakeholders in government, academia and industry, Alberta Innovates Bio Solutions is leading, on behalf of the Alberta Innovates system, the development of a 10-year provincial strategy (with a 20 year horizon) to advance Alberta's bioindustrial economy, focusing on the non-food, non-pharma bioindustrial sector. The strategy will stimulate an aligned, interconnected, networked system that focuses on enhanced research, development and commercialization of bio-initiatives over the next 10 years, contributing to a more diversified provincial economy and increased economic security for Alberta.

Work completed to date includes:

- A **Current State Assessment** detailing the present system and players, industrial and research capacity, incentive structures, and success stories
- A **Retrospective Analysis** showing gaps, constraints, strengths, improvements, collected through consultation and interviews and the valuable input from an Industry to Industry Roundtable held on November 1st and 2nd, 2011 in Edmonton, Alberta
- An examination of **Jurisdictional Advantage** highlighting market and economic drivers. This was an evidence-based analysis. The analysis also included an interview process with 121 Alberta based executives
- Work currently in progress on the **BioResource Information Management System**, an integrated database platform to map and manage biomass inventories, etc.

The Innovation Thought Leaders Forum, held Feb. 7-10, 2012 in Calgary, was designed to obtain additional advice on approaches to diversifying Alberta's economy through bioindustrial innovation. Twenty seven participants from Alberta, across Canada, the United States, and Europe were asked to provide their insights, opinions, direction, and guidance in developing a strategy for advancing Alberta's bioeconomy. Participants were chosen on the basis of their participation in the bioindustrial sector or their familiarity with the current economic drivers for the Alberta economy. Over the three days of the forum, participants had an opportunity to review and discuss areas of focus within four main themes:

- I. Innovation Models
- II. Policy and Fiscal Instruments
- III. Market / Economics – Alberta's Jurisdictional Advantage
- IV. Environmental Entrepreneurship

This report provides a compiled record of the insights, comments and opinions of the Thought Leaders Forum participants, with great efforts made to accurately reflect participants' open and

thorough comments. **It is important to note that these are the opinions of the participants.** While the notes provided are not necessarily verbatim statements in the order spoken, to the best extent possible they are a detailed summary of the discussion and comments made by participants in the forum. These insights provide another valuable input into the Alberta bioindustrial strategy being completed.

2. Key Opinions

This section draws together the comments and opinions of the forum participants into areas of convergence that were heard during the Innovation Thought Leaders forum.

A clear and focused vision is required, with a definition of success and associated metrics.

There are opportunities to improve the innovation system in Alberta.

There was support for the concept of working through the core engine of Alberta's economy, the energy sector.

Collaboration and dialogue between parties that may not normally talk is critical for discovering opportunities: there is a need for a facilitated dialogue between sources of supply of biomass feedstock, potential users of biomass and other segments of the value chain. It will not happen on its own.

Efforts can't simply be Alberta government led: this will require efforts from many players including large industry, small to medium size enterprises (SMEs), post-secondary institutions, the financial sector, and governments at other levels and in other jurisdictions.

A number of public policies were highlighted that could be considered examples for advancing bioindustrial (or clean technology, more generally) opportunities. Public policy consistency is required.

Alberta has abundant biomass but it is dispersed over large areas and away from where potential demand is: economically viable access to feedstock is a problem, and infrastructure is required.

Alberta has major barriers in labour supply and equipment cost that affect competitiveness of new companies that could drive innovation.

There is a need to focus on getting a bioindustrial strategy to clearly align with the identified priorities of government; otherwise it will be difficult to get government support. The time is now to communicate strategy directly with the new provincial government.

The bioindustrial sector in Alberta could assist with solidifying and re-establishing the oil sand industry's social license to operate.

There is an international aspect to the bioindustrial sector:

- Alberta has the opportunity to build new international partnerships that can work to develop new solutions and/or bring in existing solutions/technology to solve Alberta challenges;
- There are international markets and demand for Alberta's bioindustry sector technology which would expand the economy by creating new markets and flow of money into the province.
- Putting Alberta's bioindustrial sector and associated strategy in a global context will best position it for the major markets and to attract capital from outside the province.

The Alberta Government has a critical role to play in:

- Facilitating dialogue to uncover opportunities that align with oil and gas bioindustrial needs and encourage collaboration instead of competition;
- Supporting technology solutions that lower the cost to access feedstock
- Providing the right kind of financial incentives - tax incentives, renewable portfolio standard (RPS) government procurement policy and smart regulations - as these create the financial indicators that drive company bottom line decisions.

Focusing on supporting small to medium size companies will be a critical enabler of the strategy, including how to facilitate collaboration between them. Companies of these sizes both drive innovation and are also the bridge between the oil and gas sector and the bioindustrial sector.

Established value chains for bioindustrials do not necessarily exist yet. This is a critical gap in having private capital flow into these opportunities

3. Welcoming Reception

Bob Morton, Chairman, Silvacom Group and Mike Kennedy, President and CEO, Green Analytics gave a presentation* on how data, information and knowledge are keys to enabling innovation. Mr. Morton explored the history of information and data collection processes in the forestry sector over the past half century, and associated improvements over time, as well as the principles of good data collection. Mr. Kennedy focused on the BioResource Management System (BRIMS) being developed for Alberta Innovates. He covered how BRIMS will reflect the current state of private and public data and information available on bioresources in Alberta and how the data and information will contribute to a scientifically validated approach to estimating biomass resource availability in Alberta's forest (green zone) and agriculture zones (white zone). It was noted that the information management system will be populated with proprietary and non-proprietary data.

4. Introducing the BioE Initiative

During this session, the work completed to date* and a retrospective analysis* was summarized by Matt McCulloch, Director, Consulting Services, Pembina Institute. A background on the Alberta context and realities* was presented by Dr. Stan Blade, CEO, Alberta Innovates Bio Solutions. Dr. Blade summarized the current state of the agriculture and forestry base in Alberta and detailed a number of the investments that have been made to build the basis for bioindustrial opportunities. The overall message was that Alberta has some assets, some industry engagement and some targeted investments but now we need to equip ourselves for the next phase of development/deployment.

The principal participant comments following these presentations were:

Alberta has abundant biomass, especially compared to countries such as Germany. Access is the issue. Companies need 20 years of secure feedstock. Forest Management Agreement (FMA) holders currently have long term secure supply for forest products and other feedstock alternatives must provide the same security.

Three main issues exist with biomass accessibility:

- Access to slash-pile and waste wood
- Collaboration on transportation with other sectors
- If FMA holders have the capacity to move fibre, and with changes to FMA criteria, they can expand that to other products

There is a need to evaluate accessibility: the collection of disperse biomass from a vast landscape is not economic. Finding a technological solution to that problem is a game changer e.g. liquefaction, densification.

There is a need to understand where does Alberta sit, globally, in terms of biomass production, accessibility and technology relative to other jurisdictions?

Alberta must redefine our thinking on evaluating the value of biomass and better understand trade-offs between different uses. Value comes from multiple sources- bioindustry, timber, functioning ecosystems, water storage, etc. Decisions will be needed on allocation of biomass to these different uses.

Some companies with lots of experience on biomass are looking for and finding ways to get more value out of the biomass.

The initial Alberta bioeconomy strategy in 2005 seized upon the government's sense that there was an opportunity. However, investments were made in an ad hoc fashion and targets weren't set. Now we need clear targets and outcomes with focus on what works in the Alberta context (the strategy) while not picking winners.

A lifecycle analysis of the processes associated with bioindustrial opportunities has not been completed (large transportation costs, etc)? We don't have any analysis of what amount of biomass is possible in Alberta.

In five years:

- Ideally we have leveraged x investment into 2x investment in economic growth.
- Alberta Innovates should have achieved new business relationships that have expanded the value chain and gone beyond the traditional markets and products for forestry and agriculture.

Albertans want sustainable development of the oil sands. Reclamation represents a big opportunity to integrate and demonstrate improved sustainability. What are some of the non-obvious partnerships? How can the relationship be built with the oil and gas sector?

An example of non-obvious partnerships was provided: Catchlight Energy: (Weyerhaeuser and Chevron joint venture to create liquid transportation fuels.)

Alberta must consider the infrastructure needed to accommodate the value chain associated with new products.

The bioindustrial sector is the gateway to how oil sands can implement more sustainable actions – need to bring in bio-based approaches to reclamation, water usage, tailings.

Weyerhaeuser Solutions has a vision of sustainable use of feedstocks. Weyerhaeuser Solutions is a business unit that goes beyond logging. It is available to do work on wetland restoration and reclamation. This is a good example of a cross-boundary opportunity and business from bio industrial to other sectors.

Missing from the list of bioindustrial projects in development are:

- The Lloydminster ADM biodiesel plant. (Canadian Bioenergy Corporation - North Biodiesel Limited Partnership plant)
- Wood Buffalo regional municipality which will be diverting waste from the landfill and gasifying it to produce biodiesel (for transit system applications) and heat for district energy in the downtown core.

Why doesn't the Alberta chemical industry use the biomass & fatty acid sources available in Alberta?

Natural gas is cheap and that is what the whole Alberta industry has been built around - fossil fuel (mindset that alternative inputs are more expensive).

We are a major contributor to the world's biofuel production – biofuel makers in other countries buy Canadian canola for their biofuel production. 10% of Canadian seed/oil goes to other markets and is made into ethanol.

On biofuels, we should be looking to what's next because this product has become commoditized and highly competitive, so we should be looking at "next" technologies.

Subsidies are not something Eastman Chemicals build into their economic modeling.

5. Growing Alberta's Bioindustrial Sector

During this session, the strategic approaches gathered to date* were reviewed by Bill Hunter, Chair, BioE Initiative.

The overarching strategic approaches should be to:

- i. Develop a clear vision
- ii. Enhance Alberta's innovation model
- iii. Enhance public policy development and mechanisms
- iv. Determine and support near-term priority market opportunities
- v. Create environmental entrepreneurship opportunities

The principal participant comments following this presentation were:

Public policy barriers have not been fully assessed in Alberta. The Roundtable feedback was a shallow dive. There is a need to look at policy drivers and barriers in more detail.

Current bioindustrial sector efforts are driven by one or two Alberta Government departments and perceived as "silo" projects rather than as an overall government priority.

New Provincial leadership has new priorities and actions. There are lots of new government policies that do match the bioindustrial goals. It is important to make sure a new bioindustrial strategy is aligned and fits within the larger government policy framework

There is a policy push and pull, but both efforts are not necessarily coordinated:

- Alberta needs a collaborative approach that allows government to push policy, and industry to pull
- The Alberta Oil Sands Technology Research Authority (AOSTRA), while effective, did make industry a little lazy as government was "running the show".
- Currently, activities like Oil Sands Leadership Initiative (OSLI) allow industry to take a much larger leadership role and government needs to create that supportive environment for the bioindustrial sector. The OSLI collaborative model is the future of innovation.

What examples are there of government policy that drives industry action and investment?

Cumulative impacts and understanding is an emerging driver that needs to be linked within the bioindustrial strategy. The Alberta government's announcement on February 14, 2012 "Immediate action taken to boost environmental monitoring" about developing an integrated, comprehensive monitoring system for air, land, water and biodiversity is a signal of where the Alberta government is going. (Read news release at www.alberta.ca, click on 'news.')

People will be able to get their heads wrapped around biodiversity and water in a way that is more tangible than greenhouse gases (GHGs). The bioindustrial strategy will need to consider

cumulative effects, and have components that recognize these effects and consider regional context.

Government regulation can drive action while creating innovation and economic spin off benefits as industry turns to take action and seeks new solutions. Government policy can't create 100% financial certainty but policy action does create justification for investment in new technologies.

Some policy examples provided were:

1. Canadian Innovation Commercialization Program.
2. Green Procurement Program.
3. Government of Alberta Request for Proposals (RFP) for green power: originally it aimed to receive enough applications to cover 20% of Alberta's power load from green sources, but ended up getting 95%.
4. Industrial regional benefits program where companies receiving grants/support must buy from Canadian suppliers.
5. Policy instruments like the Science, Research, and Experimental Development (SR&ED) tax credit (tax credits that support R&D for companies) are very effective and should be maintained and enhanced.

What are some examples of bioindustrial products that can get higher market value?

- Some Biodiesel products that perform better can get higher market value

Oilsands producers are recognizing how important environment and social considerations are, and instead of being just outside costs, are seeing them as an integrated part of business and very much part of their social license to operate.

Albertans have a desire to feel proud about the oil sands industry and seeing it improve its environmental performance; reclaiming tailings and better land reclamation are ways to create that pride. "The bioindustry could be the salvation of the oil sands" – only 2% of the oil sands resource has been developed, so current environmental challenges are only the beginning.

Oil sands companies are looking for long term, reliable, value added new relationships. E.g. Imperial Oil is being very active on its new tailings pilot project including publicly announcing the project and partnering with other companies.

There is a need for infrastructure support so that biomass can get from where it's produced to where it's needed.

In the strategy, how do you manage short-term opportunity within sectors that are currently part of the long term goals of the strategy?

- Work will continue on those other opportunities that are small niche opportunities and that may need more time for the market to develop.

It seems like much of the innovation we are talking about is incremental and those innovations typically don't come out of big companies:

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- E.g. Silicon Valley initially got started with government support to create semi-conductors needed for missiles.
 - Like Silicon Valley, Alberta needs to create/identify a single, solidifying priority technology area that can create that more spinoffs in the future.

DuPont:

Developing internal company and organizational support for new strategy and investment is critical. At DuPont, one key part of that was their external stakeholder engagement:

- Invited in outside people (stakeholders) to consult about the lignocellulose opportunity. This helped them develop criteria for what to consider (other factors that helped them evaluate the various options for their opportunities i.e. consider the other things outside of the financial bottom line) and allowed DuPont to communicate what their plans were.
- The key is to get consensus in the community by identifying issues and then you can address them
- DuPont's motivation was always the bottom line. They leveraged their technology capacity to partner with others who wanted that capacity to develop new bioproducts that the partner would license from DuPont and sell.
- They had an indication that bio-based inputs for producing 1,3-propanediol (PDO) could be more economic than traditional sources. They made their initial investment as a research contract with a company that had genetic capacity to manipulate an organism that they thought had the potential for bio-PDO.
- It took 12 years before they had a commercial product – along the way they had many financial, technical “no-go, go” milestones that had to be met for the project to continue.
- Government can make a smoother pathway through policy initiatives but companies will not make decisions on policy alone.

If there are different innovation “programs” that exist in Alberta, would it make sense to work in the same “pod system” as the Government of Alberta is currently doing, creating cross-departmental files for issues?

6. Luncheon Presentation by Robert Brawn, Chair, Alberta Economic Development Authority (AEDA)

Presentation Title: **“Elements of a Successful Economic Diversification Strategy for Alberta from a Broad Based Perspective”**

Mr. Brawn offered the following “tenets” of the strategy for AEDA for consideration in developing a bioindustrial strategy for Alberta.

Collaborate – All participants need to work towards the same goal. There is a need for a high-level vision from government.

Capitalize – Alberta needs to build on its strengths: resource rich, leading in job growth, innovative and educated people, leading in retail sales and opportunity in Alberta.

Comprehend – We need to understand our markets – this is the first principle in marketing. Where are they? Are they growing? Are there unsatisfied needs? Can we expand the needs of our current customers? Instead of investing and then trying to find a customer, do it the other way around.

Communities - We need to work together within synergistic areas and not compete.

Compete – We need to compete with the world. We need to stand out from the crowd, understand what our competitors are doing and what our advantages are.

Immigration: More temporary immigration is required to fill the short term labour shortage. There is a need to create opportunity for temporary migrants to become permanent immigrants if they wish.

7. Innovation Models - Panel

Presentation by Marvin Fritzler, *Chair Alberta Research and Innovation Authority (ARIA)*

Presentation title: “Critical Success Factors for Innovation Systems*”

Mr. Fritzler offered important perspectives on developing a bioindustrial strategy:

1. Transformative Innovation is key to gains in productivity and competitiveness which will drive improved and lasting economic prosperity and quality of life for Albertans.
2. Countries and regions that are innovation leaders:
 - Consistently demonstrate higher levels of economic performance
 - Are more resilient in times of change
 - Pursue a broad application of innovation
 - Think, act and perform globally

He noted that successful innovation systems:

- Take into account “Global Seismic Shifts”
- Have a unified vision and SMART (Specific, Measurable, Achievable, Realistic, and Time bound) goals
- Demonstrate long term leadership

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- Build trust and have cross-system collaboration
 - Integrate Social Innovation

And that they build on a strong base, leveraging the following resources:

- Human resources (highly qualified people)
- Natural resources
- Capital
- Research and Development activities
- Business with international capacity
- Industry with tangible investment in innovation
- Public sector

Mr. Fritzler identified critical elements required in building the Alberta “smart” business ecosystem in a twenty-year timeframe:

- Increase “smart” deal flow by growing Alberta capital and investment capacity and management expertise in non-energy sectors
- Develop and support strong businesses throughout their “life cycle” - mentor the most promising & increase private leverage as they develop
- Build companies to scale through significant co-investments with industry in top priority areas
- Diversify: Grow non-energy systems/sectors and expertise
- Develop increased global export opportunities

Also provided were examples of indicators to measure the success of an innovation system, recognizing that it is difficult to measure the impact directly and that there is no international consensus on these indicators. The following examples were taken from TEKES, the Finnish government’s innovation system:

- GDP Share / Share of Business turn over
- Total factor productivity development
- Flows inward, GDP share
- GDP per inhabitant
- Firm renewal (SME entries vs. exits)
- Expertise-intensive export industries (industries & services)
- Share of turnover from new-to-market product innovations (as a % of turnover)
- Labour productivity
- Intangible investments
- HQP – proportion employed, share of economy
- Business sophistication
- SMEs innovating or reinvesting in-house
- Share of firms that introduced a non-technological innovation
- Share of (innovation active) firms that co-operated on innovation activities with government
- IT / Technological Competitiveness

A final comment from Mr. Fritzler was on the need to set milestones, but be prepared to make “mid-course” corrections. The example of Austin, Texas, was provided, which targeted entrepreneurship in the high tech sector in the late 80’s and into the 90’s, and found itself successfully diversifying its economy in ways that it could not have foreseen (cleantech, gaming).

Comments after Marvin Fritzler presentation

The ARIA Board has said that the Alberta innovation system has pieces that are right, and now needs to review how to position Alberta globally.

There isn’t another jurisdiction’s innovation approach that can be a plug and play in the Alberta context – we need to develop our approach based on our set of circumstances.

In other jurisdictions, it’s obvious that all the right pieces are in place (government, universities, clusters, entrepreneurial attitude) that can allow for SME (small and medium enterprise) success.

There is a lack of investment in Alberta recently, as the complete pieces aren’t in place including company capacity and sophistication.

“Death Valley” is a natural and important part of the innovation chain – weeds out the weak companies.

Increasing deal flow is more about creating new ideas and technologies for people to invest in – more opportunity means more interest (Definition of “deal flow”: number of disclosures and opportunities that come in through the door).

Panellists

Panellist: Alfredo Aguilar-Romanillos, Head of Unit Biotechnologies, Directorate General Research and Innovation, European Commission

Critical success factors for innovation are:

- Support of research programs.
- Understanding the difference between research and innovation: innovation is more of a mental attitude.
- Regulations which can be a powerful motivator to find solutions, because non-compliance means a serious consequence.
- Focus on specific parts of bioindustry to promote.
- Thinking about what generation of biorefineries to support – EU (European Union) is only providing research dollars for next generation biorefinery technologies.
- Keeping an eye and ear open for what’s happening around you so you can adapt and change.

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- Collaborations between different regions/province/countries. Look at the EU experience of broad geographic collaboration - while challenging it creates great work and ideas.
 - A policy framework and support so that investors have some more confidence that things will not change and dry up the market opportunity.
 - Hard consideration of the sustainability of technologies and ideas – e.g. can't just take biofuel that's from tropical forests as that hasn't got us ahead.
 - Leadership to organize initiative/strategy.
 - The creation of public acceptance and support: e.g. GMO (genetically modified organisms) technology has great opportunities but there is no public support in EU
 - Understanding that this is a global issue that is being discussed amongst various groups including the Canadian, EU and Australian governments.
 - Think and talk globally.

Panellist: Manfred Kircher, Chairman, CLIB2021 Cluster Industrielle Biotechnologie

Dr. Kircher posed many questions* in his presentation. In Dr. Kircher's cluster in Europe, chemical industry products (needs) drive the collaboration. What is the equivalent for Alberta?

Biomass isn't transportable (oil is), so biomass consolidation needs to be the key technology focus.

If you find a technology you like, don't necessarily look to develop it yourself as that means catching up but instead look to partner e.g. New Zealand company that they partnered with his cluster.

Have an organization that actually works to implement projects – not just provide funds and support, but actually can support the necessary steps for project implementation.

Understand that the bioindustrial sector will be playing on a different level than the conventional oil and gas sector. The yearly carbon output of PetroCanada's Edmonton refinery is bigger than all the potential from the entire yearly wheat production in Alberta.

Attempt to bring representatives of companies from different parts of the value chain to actually speak to each other because, as evidenced in Europe, it does not happen on its own.

Actively invite companies to be part of active clusters rather than waiting for companies to realize where they should be.

Clusters should be sector oriented - not technology oriented.

Panellist: Tom Corr, President & CEO, Ontario Centres of Excellence

Lessons and critical success factors from the Ontario model are:

- Assessment of how to best achieve alignment and avoid duplication of research and other resources

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- Emphasis on the importance of collaboration
 - Creation of connectivity and becoming a conduit to connect companies to investors, research, etc
 - Determination of Alberta's critical success factors
 - Picking the industry sector that has the critical size and build a cluster around it
 - Determination of what's missing
 - Creating the critical science and collaborations
 - Developing a "critical mass" of activity
 - Building a clear and defined vision
 - Focusing on end results and performance indicators: why and how are we going to be better than someone else
 - Using the purchasing power of Government procurement to support Canadian innovation.

Comments after panellist presentations

There is a complexity to these issues "like an onion, you don't see the next level of complexity until you've peeled away the above layer".

There is a need to find the ways to merge the bioproducts into existing industries/products – supplement, replace, or merge together.

Clusters are not static: e.g. German cluster started when it was given government funding; The next stage was about supporting research that would be innovative and develop real projects; The cluster's Board actively asks where projects are going, what things are being solved.

Universities may not be very interested in the applied research and can be difficult to motivate to do that type of work. Some culture management or change is needed to remove this potential barrier. Some institutions or programs have a culture that is very well developed - it will be slower at other institutions.

- E.g. trying to get academics to change to a more applied research approach is challenging. Waterloo has made this culture change. Some of their success is from supportive Intellectual Property policy where if you develop it you own it even if you develop it while at university.

Competition among small to medium size businesses is the norm and they have a culture of competing directly. How do you facilitate to encourage collaboration and therefore innovation?

How important are the young innovators who are willing to take risk?

- Ontario Centres of Excellence has a program to support students at the end of their program so they can do their own start-up.
- The new managers of biorefineries are still in high school or junior high. We need to invest in education and cultivation of research from young scientists.

Alberta's major industries are price takers.

We need to distinguish between what is incremental innovation versus game-changing innovation.

8. Policy and Fiscal Instruments - Panel

Presentation by Bill Werry, Deputy Minister, Alberta Advanced Education & Technology

We need to understand brand, what branding works, what brands exist already, and when does branding get in the way? 18% of the people in the world know the Canada brand while only 0.2% know Alberta - so any Alberta brand needs to be closely linked to Canada first.

The Alberta Government is open to ideas. The best way to get buy-in for the bioindustrial vision is build it together with the government. I.e. do not go off and build an innovation strategy between industry and communities unless it is very compelling and inclusive. One way or the other there has to be shared ownership eventually.

The policy formation process is:

1. Identify issue(s)
2. Research and analyze the facts around the issue (why is it an issue?)
3. Bring forward options
4. Choose an option
5. Implement the picked option
6. Evaluate how the implementation is progressing

The current Alberta Government is focused on change outcomes, which it would need to understand for the bioindustrial strategy.

Comments after Bill Werry presentation

Some of the best ways to bring issues forward to government are direct contact with elected officials and senior staff.

Some policies have timing specified on when a review will be conducted.

The Alberta government is doing analysis and research to identify issues itself as well as inviting the public to bring issues forward.

The more that all are involved working together to develop vision, the better the uptake will be.

Regulations are down lower in the policy hierarchy and tend to be operational.

Panellists

Panellist: Doug Hooper, Partner, Waterfall Group

Federal/provincial tax based systems (e.g. exploration tax exemption) create stability as tax programs, unlike program funding, aren't as likely to fluctuate with annual budgets. This type is better than winners/losers type program grants as it supports all innovation/technology development. This type of government support was instrumental in oil and gas industry development.

Biofuels market access would be impossible without mandated market access that renewable fuel standards create – it creates demand and potential for economies of scale that make project economics work.

For investment in the renewable fuels industry, there needs to be consistent and long term renewable fuels standards (RFS) – can't be a flavor of day program. The market signal from RFS is very clear - how much is required and price is clear. RFS have the potential to be longer term as they are not government funded but rather paid by consumer charges.

There are big disadvantages in Alberta – tight labour supply and high costs, and high equipment costs.

When one conventional diesel refinery goes down, the economy is throttled back so there is an opportunity for biodiesel to create a more robust supply while also reinforcing the carbon social license.

Biofuels create a good starting point for other bioindustrial innovations –e.g. glycerin stream off biodiesel is a feedstock for other products which have many other opportunities and applications.

Social license to operate will be linked to whether biomass is or can be managed sustainably.

Panellist: Greg Luoma, President Luoma Tech Inc.

As government, you need a very clear vision before creating the policy - if you are reactive you tend to get it wrong.

Government can be a leader, but if it needs industry to implement it, there better be a market or industry will not follow.

Incentives are a strong tool: reward producers and consumers (reward them because that helps balance the price differential for new bioproducts).

The Small Business Innovation Program in the US has been a very effective tool for innovation and new solutions.

On IP (intellectual property) issues, if people want to succeed, they find ways to work around the IP issues.

Panellist: Matt Machielse, Assistant Deputy Minister, Economic Policy, Executive Branch, Government of Alberta

To have strategy that will get adopted and supported by the Government of Alberta, there is a need to align with the government agenda. Government has a driven agenda as outlined in the recent [throne speech](http://www.alberta.ca/thronespeech2012.cfm) (www.alberta.ca/thronespeech2012.cfm) and [budget](http://www.budget2012.alberta.ca) (www.budget2012.alberta.ca). The focus is ‘knowledge-inspired’ and not just ‘value-added.’ Government leadership is still figuring out policies and steps to implement their agenda, so timing for the bioindustrial opportunity is good.

Are the right people in the room? There is a need to have more energy industry people in the room so they can be part of the development of the vision and strategy.

Tying a national energy strategy together with the emerging [New West partnership](http://www.newwestpartnership.ca) (www.newwestpartnership.ca) could have an amazing capacity to move the bioindustrial agenda forward in Alberta.

The Government of Alberta policy philosophy is to create market mechanisms.

Where are some of the priorities for Capital investment? Infrastructure capacity could be a high priority.

What could we do to eliminate regulatory hurdles and create the market climate for biochemical industry development?

ACCA (Accelerated Capital Cost Allowance) and tax credits have already been talked about. What could we do in the industrial heartland to facilitate investment and build a cluster there? E.g. ethane program - gave royalty credit to a small company that took ethane from a stream of gas in an upgrader that would have otherwise been burned; was not economic for the company but with the incentive, action was taken.

Comments after panellist presentations

Is there one policy that could really encourage bioindustrial action?

- There is a need to have incentive programs where companies get encouraged to succeed, not just subsidies e.g. with refundable tax credits, if you’re not a going concern as a company you don’t see the benefit of the credits.
- The Government of Alberta needs to think about something like they did on CCS (carbon capture and sequestration) in the province - a big investment that really got the ball moving. E.g. an endowment fund that would create a long term funding model to create certainty.
- With a new government in place, the time is right to put forward thoughts on endowments and partnerships (i.e. multi-lateral across institutions and other provinces)

What are the differences in the US and Canada in terms of driving SME (Small and Medium Enterprises) company partnership?

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- In the US culture the big company wants the little guys to win because they'll both win (the little guy realizes that he needs the big guy to get into the market). In Canada, the little guys are more guarded and reluctant to partner.
 - The scale of support in the US is so much larger than we can offer here. Funding needs are equivalent for small companies on both sides of the border yet the US has more dollars to throw at projects.

As long as the Government of Alberta is dependent for revenue from the oil and gas sector and the oil and gas sector continues to feel uncertain about the bioindustry sector, it will be hard for Government to really promote bioindustry.

What about using a carbon price increase as an incentive for action?

- It is hard to take action and increase the carbon price when other jurisdictions are not taking action.
- The offset market can really drive projects especially ones right on the edge of getting developed.
- We have to be careful not to take dollars from one sector within the province just to give to another sector within the province. We need to find ways to bring dollars into the province from other jurisdictions.
- The new Alberta administration is thinking longer term than before so there is opportunity if it can be positioned the right way.
- It seems that we are taking for granted that the bioindustrial initiative should be hitched to the energy sector. Does the RFS (Renewable Fuel Standard) really make us globally competitive?
- The RFS creates a guaranteed revenue source that is user paid.

9. Evening Presentation by Andrew Heintzman, President, Investeco

Presentation title: **"Spurring Innovation in the Evolving Alberta and Canadian Economies"**

Mr. Heintzman provided some Canadian environmental context as well as some history of innovation and entrepreneurship in Canada since the days of fur trading. He offered several examples of highly successful Canadian clean technology companies, some of which were bioindustrial related. He noted our transition from an economy that provides staple goods to an economy that focuses on innovation.

On this, he offered a quote from Peter Drucker:

“The most valuable asset of a 20th-century company was its production equipment. The most valuable asset of a 21st-century institution, whether business or non-business, will be its knowledge workers and their productivity.”

With that, however, he noted the outflow of venture capital in Canada to other more promising markets. He considered the role of increased environmental regulation as a means of spurring innovation in the country, as per the “Porter Hypothesis”.

Mr. Heintzman provided some conditions for success:

- Sufficient risk capital
- The right regulatory environment
- The right people/labour market
- The building of innovation hubs

On the theme of innovation hubs, he offered that they:

- support new companies/incubation
- provide services to new companies (legal, tax)
- access to funding options
- allow for knowledge spillovers
- leverage off local strengths and existing innovation

10. Markets/Economics - Panel

Presentation on Alberta’s Jurisdictional Advantage by Jeremy Heigh, *Principal Economist, Sift Every Thing*

Mr. Heigh provided a summary of the [Jurisdictional Advantage assessment*](#), as laid out in the background document to the Forum.¹ He provided an overview of the assessment objective and approach, covered some economic context for the province, and laid out the need for bioindustrial opportunities to be developed through Alberta’s core engine of its oil and gas sector.

He re-iterated his primary conclusions that:

- Oil and gas and associated manufacturing offer rich industrial ecosystems, strong market opportunities and broad global applications. Ignoring this market seems to be the consequence of a too narrowly defined notion of diversification.

¹ “Economic Diversification through Bioindustrial Innovation in Alberta: Draft Strategy, Background to Innovation Thought Leaders Forum February 7, 8, 9 2012”.

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- Certainly diversification includes developing opportunities outside the core engine of the economy. But it also includes, and should place heavy emphasis on, the opportunity to diversify in and through the core engine.
 - Opportunities that exist in advanced materials, environmental services, waste management, biochemicals (some longer term than others), and benefaction and are incubated in oil and gas will spill out into other areas of the economy and global markets. This is valid diversification and mitigates risks while stacking on advantages.
 - Diversification through the core is a thoroughly viable development strategy. It benefits and builds from the established, vibrant industrial ecosystems in the province. It is an important initial step in creating a tangible bioindustrial economy in Alberta.

He also reminded the audience of the need to find ways to understand how to support mid-sized companies, as they can handle larger projects like big companies yet are still nimble enough to respond to opportunities.

He noted that if investing outside of oil and gas, we need to really make sure the research and analysis is solid to justify that risk.

Other key points identified were:

- Many interviewees were interested in impacts to, and opportunities associated with (as it relates to bioindustrial activity), biodiversity in Alberta.
- Bioindustrial companies see attractive opportunities in providing alternatives to embedded operating processes in O&G (oil and gas) - because it is high volume - but O&G companies do not want to open up these processes if it's their core business.
- Almost all venture capital is going into oil and gas in Alberta, which captures much of the NSERC (Natural Science and engineering Research Council) funding and generates most of the new patents. There are indicators that this industry is highly innovative and that they are receptive to new ideas.
- There is a great reluctance to adopt new technology in Alberta's power industry. The challenge is the drive to switch to low cost natural gas compared with continuing to use coal in combination with biomass.

Comments after Jeremy Heigh presentation

Is there any appetite for using biological waste CO₂ gas recovery from coal electricity production?

- There is not much of an appetite within the coal electricity industry: The industry seems to be quite conservative and not interested in innovation. Companies that are contemplating a switch to natural gas for new supply are not interested in combining coal and biomass.

Why is there the interest in biodiversity from the people interviewed?

- The interest in this is from a social license to operate perspective.
- Interest and attention has come off greenhouse gases

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- Biodiversity fits naturally with cooperation between forestry and agriculture, and the oil and gas sector.

The ideas about open innovation that are evolving would be very consistent with working with the oil and gas industry. Large industries like many in the oil and gas sector are not just completing research and development in-house, but are now sharing precompetitive information with competitors and relying on smaller innovative companies to provide solutions to their problems. By being good customers of the smaller companies it helps them succeed and eventually you tend to build innovation clusters in this "space".

Panellists

Panellist: Linda Beltz, Director, Technology Partnerships, Weyerhaeuser

When Weyerhaeuser Solutions was created, it was in response to a market driver (people asking about biomass opportunities, issues, etc) and the opportunity to use their expertise in delivering solutions.

They created a services and products business with modest expectations and growth projections.

This solutions services company allowed them to partner with other big businesses to find new opportunities.

Weyerhaeuser recognized that the bioindustrial opportunity would grow slowly and that it is an emerging opportunity that needs patience.

It was important to engage across sectors – actually talking and engaging with those sectors provided some real insights. Standing on the outside doesn't allow you to talk and understand what opportunities exist.

With the Zoltek partnership Weyerhaeuser needed to take a first step outside its comfort zone to create this partnership. They supported the partnership decision with strong market analysis and due diligence.

Their Northwest Advanced Renewables Alliance project looks at bio-based inputs to create jet fuel. It is a USDA (United States Department of Agriculture) funded project managed by Washington State University.

Bio-based technologies require some kind of incentive as a way to help not-yet-optimized technology. Weyerhaeuser does require that opportunities pass a financial test that doesn't include incentives before investing.

Be patient. Developing new technologies takes a long time and a lot of patience.

To offer new services to the province's core sector, oil and gas, we first need to assess mindset and develop a cultural readiness.

Panellist: Ray Miller, Retired Technology & Business Development Manager, DuPont Applied BioSciences

Mr. Miller offered his thoughts through a presentation "Growing a Sustainable Future Bio-Based Economy.*" He says genetic understanding is evolving three times faster than Moore's law – this is creating innovation and opportunities in the bioindustrial space very quickly.

The petrochemicals industry creates huge additional value per barrel of oil (with 3.4% of oil production, petrochemical industry creates almost as much pre-tax value as fuel does with 70% of oil production)

The worldwide forecast is a \$200 Billion market by 2014 for industrial biotechnologies.

There may not be a consumer of bioindustrial products within Alberta but there are potential international customers who will look internationally for product.

The major drivers for a bio-based economy are:

- Growing costs and environmental advantage economically
- The need for "green technology" to satisfy the growing preference for "sustainable" products
- That genetic technology and understanding is improving rapidly

To develop the market for bioindustrial products the key is creating partnerships, relationships, and collaboration.

It may be possible to secure customer preference for bioproducts but that doesn't mean they are willing to pay higher prices.

Key roles for government in setting policy are:

1. Help create market pull
 - Create and maintain market incentives (i.e.: biopreferred purchases, carbon cap-and-trade, etc.).
2. Make sure all levels of the value chain have a stake in the outcome
 - Develop consistent tax and loan guarantee policies that provide incentives for long-term research and development and support initial capital investments to drive conversion.
3. Enable a cost-effective supply of renewably sourced feed stocks
 - Implement policies that reward rural infrastructure development and job creation.
4. Help create transformative technology
 - Move to larger scale risk-sharing to "jump start" emerging new technologies.
5. Patience

-
- Ensure that policy is consistent through more than one administration.
We will need patience to allow these emerging technologies to evolve: example - Sorona fibre product took 12 years to get to market – it is a replacement for nylon in carpet that is actually a better input as it allows for better fibre and carpet product attributes.

Panellist: Stephanie Clendennen, Biotechnology Program Leader, Eastman Chemical Company

For Eastman Chemical last year, bio-based feedstocks accounted for 7% of inputs and accounted for 27% of revenue.

Eastman is making bioindustrial products because it makes economic sense (feedstock price stability, allows for incremental expansion of production without huge capital investment).

Biotech providers/tech developers are making a huge shift from focusing on biofuels to biochemical opportunities.

Partnership between equals can be easier to foster: The Alberta petrochemical industry is the same size as the Alberta forestry/agricultural industries and is actively looking to diversify.

An important step of the strategy will be to identify which bio-based chemicals can be easily and economically brought to market.

Dr. Clendennen commented on the Alberta over-emphasis on thermal technology (pyrolysis etc.) for making products, when the need is for fermentation technologies to convert simple sugars into the basic building blocks of chemicals.

Comments after panellist presentations

The thoughts on pursuing the opportunity of focusing on the oil and gas sector were:

- This is a good short term strategy and in the long term it is better to diversify outside that sector.
- Alberta's strengths are that it has a long term, stable supply of feedstock and it has the infrastructure (capital, experience w/ shipping out of Alberta, cheap power)
- Two pieces are missing from this strategy: a clear path to market (need partnerships and to convince Alberta or international partners to play); and fermentation conversion is missing (too much emphasis on thermal fuel conversion to fuel).

If we are processing wood material to harvest sugars then there will be left over lignin which has value in power generation.

We need a clear line to markets: Alberta's focus has been on large shipments of resources.

- Alberta does have great knowledge of how much it costs to ship bulk products to international markets.

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- We need to look at the supply and value chains together to understand where the opportunity is and to what extent processing/value adding should be completed.

Partnerships are an important part of any bioindustrial strategy as they show that connections and relationships are being made across stakeholder groups.

We need to understand what are the key success factors and elements to make projects/technologies succeed:

- i. What expertise does your organization bring
- ii. Who might have the skills you don't have and need
- iii. Create partnerships with those that will bring what's missing for success

Alberta seems good at the early stage of the value chain. Medium sized biochemical companies are a chance to develop a sector that is further up the value chain.

The growth of Alberta's petrochemical industry was actually a government strategy and support for this strategy was seen as a way to get more value added from existing Alberta resources.

Based on interviews, leaders of power producing companies and petrochemical companies seemed surprisingly conservative, especially when considering long term development of bio industrial opportunities.

CEOs (Chief Executive Officers) are generally not the innovators – it's usually some maverick within the organization. CEOs have a responsibility to shareholders to make profits now. The innovative thinking can't really come from them as that's not their responsibility. Maybe there is value in asking the maverick people about bioindustrial opportunities and you might get a different story.

Bioindustry opportunities can also include the best monitoring or integrated management system tools.

Metagenomics in oil sands is a long term technology right now, but with the right support and development it could be a huge market opportunity. (Metagenomics is the study of metagenomes, genetic material recovered directly from environmental samples. The broad field may also be referred to as environmental genomics, ecogenomics or community genomics. While traditional microbiology and microbial genome sequencing and genomics rely upon cultivated clonal cultures, early environmental gene sequencing cloned specific genes (often the 16S rRNA gene) to produce a profile of diversity in a natural sample. Such work revealed that the vast majority of microbial biodiversity had been missed by cultivation-based methods.)

Other opportunities could be in green hydraulic fracturing ("fracking") products and in biological gasification combined with utilization of huge coal reserves.

Weyerhaeuser has done intercropping of agricultural fuel crops with their managed forests in Southern US and Latin America.

DuPont's sustainable positioning has made the company a more compelling employer and it has become an employer of choice for high quality people.

11. Environmental Entrepreneurship - Panel

Presentation Paul Clark, President, VisionGain Consulting Inc.

Sustainable Chemistry Alliance (SCA) has a vision to see Canada become a top 3 bioindustrial nation. It has committed \$4.4M to 12 projects with significant leveraging of \$136.5M.

SCA successes:

1. BioAmber recently announced it will build a 17,000t succinic acid plant in Sarnia using waste biomass – this will provide important precursor feed to Lanxess, a local butyl rubber plant.
2. Ecosynthetix, a producer of natural based binders just went public with an IPO (Initial Public Offering) of over \$100M. SCA has an investment position in the company along with direct funding.

SCA has had excellent early success and it hopes to raise another \$80M in funding.

SCA is based in Ontario but interested in collaborating with companies outside Ontario.

Synergies appear possible between the Climate Change Emission Management Corporation (CCEMC) and Alberta Innovates. CCEMC has been very successful with leveraging funds in their core investment areas of green energy production, carbon storage and sequestration, improving energy efficiency and adaptation.

SCA is planning for a bio-related expression of interest in 2012 as part of an open innovation prize. SCA is looking to create a prize for anyone who can capture 1Gigatonne of greenhouse gases from the air directly.

At the National Research Council a major transformation has been initiated to move it from an institute to a program oriented organization. There will be four areas of interest, three of which will have a bio focus - industrial biomaterials, algae carbon conversation and wheat improvement.

Don't assume willingness to pay a premium.

There is a need for more dialogue between sectors and between jurisdictions in Canada.

Other than dialogue the key things to building this industry are:

- i. Develop vision –this is not clear yet and there needs to be more forward thinking about what successes look like.
- ii. Money/funding are key - how can we leverage it and get enough resources? Win win situations are key.

India plays a prominent role in world agriculture. It is still an agrarian nation and there are opportunities in the ag bio area. There may be an opportunity to continue to license agriculture biotechnology for application in India.

Panellists

Panellist: Kirk Andries, *Managing Director, CCEMC*

Environmental services - does demand for environmental integrity create opportunities? Yes.

The four “pillars” of the Alberta economy (energy, agriculture, forestry and tourism) all have growth mandates and this growth is all expected to occur on the same land base. Alberta often allocates resources independently of each pillar. Each pillar has rights to access the resource on the surface. This can create business to business conflicts.

E.g. Alpac had 10,000 well sites in its FMA (Forest Management Agreement). This means that more wood is harvested for oil and gas production than for forestry. These two industries have two different regulatory requirements with no integration. One has a requirement to rebuild the forest while the other has the requirement to prevent erosion, which they do with clover or grasses (not replanting trees).

There is an opportunity to master the challenge of cumulative effects management through bioindustrial opportunities given the fear of losing social license to operate. Crisis stimulates change.

We have a new land use policy that is intended to deal with cumulative effects and make tough choices - value choices. In that business there are winners and losers.

Regarding environmental thresholds, we need decision support tools that allow this type of management.

As an example of footprint reduction, can we do seismic surveys with no footprint at all?

Panellist: James Chepyha, *Vice President of Investments Alberta, Chrysalix Energy Venture Capital*

There are three focus points globally - energy shortages, environmental degradation of the atmosphere and the economy.

In Alberta today we are expending a lot more energy to get energy out. Globally we are faced with population growth and energy consumption is rising.

A carbon price will be very hard to implement globally in an equitable manner. This won't happen until there is a legitimate alternative to fossil fuels.

Clean technology must be sustainable on its own financially.

From a venture capital firm's perspective, here are some of the issues in terms of investing into bioindustrial technologies/opportunities:

- The value chain has huge holes in it. Bioindustry must be able to see how development of a company will lead to access to a market. Some companies must actually build an entire value chain to get to market. This is a big issue and a place for government to help build the infrastructure. Government helped initially develop this for the natural gas industry in Alberta.
- Obsolescence is another huge issue. If you are making sugars there are now other sources of sugars and they are cheaper. Can you sustain your market?
- In looking at algae investments there are large sustainability risks that must be addressed.

There is a capital investment challenge with getting companies through the valley of death.

From a venture capitalist's perspective taking 12 years to get a technology to market is too long as it makes the Return on Investment too low.

Panellist: Annette Hester, Fellow, Center of Strategic and International Studies

Waste Management is an area we were leading already so we should make that a focus in Alberta and expand the capacity in the province.

We need to align ourselves with people outside of the usual suspects.

Alberta is on the verge of losing its social license to operate oil sands in the eyes of international markets.

Comments after panellist presentations

There is a distinction between the opportunity around solving environmental issues/challenges associated with the energy sector via biological solutions where there is a green focus versus a bioindustrial solution which is not necessarily green, but simply biologically sourced. The latter would require a certification to ensure it was "green".

Oil and gas has a regulatory responsibility for some things that they have no expertise in and for this they outsource. The bio-based sector could provide the expertise that is needed in certain areas.

Environmental services are a good economic opportunity, but how are they connected to the biomass supply in this province?

- Inputs could flow from bioindustrial/biomass to the environmental services e.g. providing biodiesel or providing raw materials for bioremediation.

Monitoring system requirements for oil sands are going to be arms length from companies, and government, so does this create opportunity for new services and companies?

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- It is a key driver and opportunity that can open doors for companies and technology providers.
 - The Alberta Biodiversity Monitoring Institute is a hidden gem for overall coordination and for reviewing monitoring systems and data to ensure it is credible, scientific and rigorous.

Certification is linked to social license to operate e.g. forest certification process.

How do you see the environmental services that could be developed in Alberta playing in the international marketplace?

- Action on our challenges can be leveraged through international development bank opportunities.

Newfoundland's marine services development and growth is a good example of where the technology was supported and developed through a combination of licensed and internally developed technologies.

In Newfoundland, aquatic research/consulting services were sold to local oil and gas companies, but not as much as you would think. They really grew because of international demand for services.

In Alberta why would you set up a company when you have the option of going and taking a job with an oil and gas company? The innovation infrastructure is not here in Alberta. The way to create innovation in Alberta is to provide funding - and then leverage it - but it's hard to explain and sell this politically in Alberta.

12. Final Comments from Participants

Health/life sciences have a place in the bioindustrial strategy. There are lots of medical companies that have very real challenges and issues that are blocking their opportunities to innovate and bring problem solving technologies to the market.

We can't forget to include the petrochemical sector as part of Alberta's jurisdictional advantage.

The players that can help bring the bioindustrial opportunity to the oil and gas sector are the medium sized companies in the EPC (Engineering, Procurement, and Construction) and manufacturing sector, as well as the petrochemical companies. Those companies are not engaged in the bioindustrial strategy so far.

Sustainability certification schemes are missing, and this may provide opportunities across different bioindustrial activities. It is important to keep other cross-cutting opportunities in mind (e.g. Pan Western Canadian Initiative).

We need to determine who the champions will be within government and outside government to drive these strategies.

This process needs to allow divergence to draw in as many ideas as possible then, using established and agreed upon criteria, then converge/filter projects to drive towards specific project implementation.

Government investment in facilities and capital investment is an important aspect in this process.

Michigan Biotech Institute is a great model for innovation approach.

We need to make it explicit that there's an international market goal.

Make sure that we define various terms, such as culture, so that everyone can understand what we are talking about.

The four "buckets" within the bioindustrial sector (bioenergy, biochemicals, biomaterials, and environmental services) are unique enough that they need their own strategies.

There may be a need to stage actions so that other opportunities don't get left behind, but will be addressed in later stages.

What, exactly, is the problem that we are trying to solve?

We need a statement of intent (*what we're going to do*). Be realistic based on funding availability.

What investment position does Alberta want to take (i.e. government owns, company owns, license from others etc)? Know you're intended role first before developing a vision.

We need to synthesize the SWOT (strengths, weaknesses, opportunities, threats) section to something tighter.

Strategy needs to consider market 'back' and not resource 'out.' Be sure the customer is there.

What's really needed to answer is whether what we're offering is unique? We must make sure, and if it is not, we need to partner with those already more experienced. If yes, we need to make sure development focuses on what's unique.

Think long term "generational thinking".

Are we following a "keep it simple" principle here? It seems rather complicated e.g. Austin, Texas successfully kept it focused to one thing.

Do the 5 whys test: keep asking why for 5 levels i.e. Why are we doing this? Why are we doing it that way? Why is this way going to work?

We need to create an impact achievability grid to identify the area where we can have an impact and achieve it. Don't spread out the butter evenly across everything. Focus!

Alberta is in a good situation given its oil and gas industry (Germany has no gas or oil and the last coal mine is closing).

Alberta needs to define where it is in the global bioindustrial market which will make it obvious who we need to partner with.

Collaboration focus should start with reviewing and working with the oil and gas and petrochemical industries.

Find the people within organizations who are playing to win to be our partners and champions. We need that attitude because we need to hit above our weight class in this global marketplace.

Make sure the bioindustrial strategy aligns with what the Alberta Government administration wants to accomplish.

Alberta Innovates Bio Solutions will look to continue being the “Sherpa” on this work.

13. Questions from Participants

1. Where does Alberta sit in terms of biomass production, accessibility and technology relative to other jurisdictions?
2. What percentage of existing biomass will be/should be used for the bioeconomy and what will be/should be left for environment, watershed, food and other uses?
3. Has a lifecycle analysis of the process been completed (large transportation costs, etc)?
4. How can we build the relationship with the oil and gas sector?
5. Is there intent for ARIA (Alberta Research and Innovation Authority) and AEDA (Alberta Economic Development Authority) to work more closely together in future?
6. What are some examples of bioindustrial products that get higher market value?
7. What examples are there of government policy that drives industry action?
8. Investment opportunity lies with technology/companies that can answer how are we going to get our energy and how are we going to create it sustainably?
9. In the strategy, how do you manage short-term opportunity within sectors that are currently part of the long term goals of strategy (e.g. agricultural opportunities)?
10. How do you change culture of competition and distrust between SMEs (small and medium enterprises)?

* To view all PowerPoint presentations, visit www.bio.albertainnovates.ca/stratthemes/bioecoadvance/bioe-initiative/thought-leaders-forum/