



*Science & Technology Foresight Directorate*  
**Office of the National Science Advisor**  
**Privy Council Office,**  
**Government of Canada**

**Canada**

**Industrial Bio-Products Future  
Scenarios Workshop:  
Proceedings**

**A Report from the  
Science & Technology Foresight Directorate**

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*Industrial Bio-Products Future Scenarios Workshop: Proceedings*

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## 1.0 Foreword

This research report is part of a series of reports that have been produced by the Science and Technology Foresight Directorate (STFD) of the Office of the National Science Advisor (ONSA) for the benefit of sponsors, participants and professionals interested in how emerging and prospective developments in global science and technology might impact Canada's future.

The STFD operates as a collaboratively structured partnership activity within the Canadian Government undertaking projects with multiple partners and stakeholders that have included Federal science-based departments and agencies, Provincial ministries and agencies as well as universities and private partners. These partnerships are developed around specific themes or projects. They are designed to explore the application of foresight tools to help stimulate longer term thinking and build shared R&D awareness and capacity for engaging broad and horizontal challenges for which the Canadian S&T and policy communities should be better prepared.

These research reports are the property of those who participated in the processes they describe, and consequently, they reflect the combined views of the participants, and the best wisdom and creative thinking that we could stimulate with the tools of foresight.

They do not represent an official view of any one organization who contributed to the research. Although this work is undertaken under the leadership of the Government of Canada it does not signify endorsement by its Departments and or Agencies, unless so indicated.

It is useful to recall the definition of S&T Foresight that is used to define the scope and focus for the research:

***S&T Foresight involves systematic attempts to look into the longer-term future of science and technology, and their potential impacts on society, with a view to identifying the emerging change factors, and the source areas of scientific research and technological development likely to influence change and yield the greatest economic, environmental and social benefits during the next 5-25 years.***

S&T Foresight is necessarily speculative, creative and analytical because it must rely both on the interpretation of S&T change drivers and on how, if and when these could become significant factors in Canada's prospective social economic and political realities. Since these are highly uncertain, foresight is inherently about attempting to understand, dimension and reduce or at least prepare for significant risks.

Because of this context of inherent uncertainty, foresight participants and stakeholders should not regard these reports as fact or prediction. They represent collaborative research that was conducted primarily for learning purposes, with the understanding that if a consensus emerged regarding possible application of these insights, then one or more of the domains studied might eventually warrant a further, more detailed examination in that context. This is the nature of foresight - creating a range of plausible future scenarios that in their diversity should alert readers to the kinds of issues and perspectives they may not have initially considered in longer term research planning and contingency thinking.

In foresight each player, sponsor or participant takes away some collaborative learning and experience that is tacit and more deeply resonant than the descriptive or analytical accounts contained in the reports. These indicate how various foresight approaches and tools can be applied to help readers become better prepared or at least more capable of contingent planning and action in these turbulent times.

***Jack Smith, Director, Science and Technology Foresight,  
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## 2.0 Welcome, Meeting Format, Participant Introductions

Facilitator **Ken Andrews** welcomed participants and described the format the workshop would take over the ensuing day and a half, highlighting the following elements:

- Thursday - Orientation on the Foresight process  
- Challenge Questions: scenario development
- Friday - Back casting: implications today  
- Next steps in the process
- Parallel processing: small group brainstorming & plenary reporting
- Creative forward thinking, not solutions for today's issues
- Consensus is not required or expected: it's OK to agree to disagree
- What's brainstormed here ...stays here

Participants were then asked to introduce themselves briefly. See [Appendix 1](#) for a complete list of registered participants.

## 3.0 Introduction to the Foresight Process

**Jack Smith**, Director of Technology Foresight for the Office of the National Science Advisor, welcomed participants on behalf of Dr. Carty, the Prime Minister's National Science Advisor.

He then introduced the concept of Foresighting, noting that the future is usually precarious – sometimes we can be confident about it, sometimes it appears difficult, challenging, but it is always contingent. The future cannot be predicted, yet we believe we can prepare for it, through multiple, plausible, contingent thinking and the creation of multiple scenarios and possibilities. These scenarios comprise plausible situations, technical developments, social changes, pressures and drivers of change. They are contingent in that we try to boundary the uncertainties we may have to contend with. We look at risk, complexity, technology change, social factors – in effect, the ecology of an evolving society amidst uncertainty in a global context.

He went on more specifically to note that the bio-economy today is one in which there are many uncertainties. We hope that it will lead to a more sustainable ecology of relationships with respect to the production and consumption of energy in the future, substitution of chemicals with biological products, and new and innovative applications of bio- and related technologies.

He stressed that the scenarios under discussion would not necessarily be entirely positive, but would challenge participants to think about how we can deal with negative situations we may have to contend with. Part of the methodology to be applied in the workshop is to push the boundaries of those challenges, then back cast from there to see how we might have arrived at such a scenario in 2020. Then we will think about what we might have to do, or avoid, or to arrive at the future scenario we have envisioned.

## 4.0 Objectives of the Exercise

**Sally Rutherford**, Executive Director of BioProducts Canada, was called on to provide some background and context for the partnership between the Technology Foresight initiative and her organization, and to describe the objectives of the Foresight process.

She began by describing that what her organization wished to achieve through this process, primarily the opportunity to think ‘outside the box’ about the policies and programs that would be needed to develop the bio-based economy in general and, more specifically, to better understand the drivers for the development of industrial bioproducts in Canada. The objective of the two day session itself is to take the outputs that are generated from the workshop and capture them in a form that can be conveyed to key decision makers in government. Sally concluded her introductory remarks by stating that if we are serious about incorporating bio-products and processes into the existing economy, then we have to figure out what changes are required to make this transformation happen, how we are going to make the required changes and how we can help to enable governments to facilitate these changes to occur.

There are many reasons for doing this including:

- Economic development – not just the chemical value chain, but in Northern communities, for example, or agricultural communities, where alternate uses of changing resources have to be found
- Interest from the environmental side – looking for alternative feedstock sources that are environmentally friendly
- Interest from the health community to find substitutes for products and processes that will improve air and water quality

We need to figure out what to do to make these changes happen, and that’s the kind of thing that we intend to address today with this Foresight process. We understand that it won’t be easy; it’s not obvious. There is a good deal of knowledge around this, but we currently lack a consistency of messaging, and that is part of our goal in this workshop.

Our larger goal is to work through the outputs from this workshop over the summer, both within and outside government and, by fall, to have a package that we can take to governments – federal and provincial – to let them know specifically what our requirements are. It is the level of specificity that we can achieve and the concrete recommendations for successful implementation that will enable us to be successful over the longer term.

Sally concluded her remarks by drawing attention to the broad range of interests represented by the participants and underlined how vital this was for the process, given the multidimensional nature of the issue.

***Objective of the Bio-products Foresight Initiative***

***The development of a way to talk about Bio-Products and Bio-Processes so that the subject can be inserted into government thinking, and into the public discourse, resulting in mechanisms that allow a positive contribution to be made to environmental and economic issues.***

## 5.0 Scenarios

The facilitator then described in detail the basics of the Foresight process and its strengths, as follows:

*A set of tools for anticipating the future . . .*

- Considers multiple, plausible future scenarios
- 5-25 year time horizon (today we're in 2020)
- Accommodates uncertainty and diversity
- Highlights emerging opportunities & threats

*Foresight is not a forecast or prediction*

## *Why is Foresight a Powerful Tool?*

***"Better decisions ...  
more robust policy"***

***Activates:  
early-warning  
radar***

***Engages:  
multiple  
stakeholders***

***Identifies:  
critical S&T***

***Removes:  
current  
constraints***

***Prepares:  
for change***

***Educates:  
leaders &  
public***

The scenarios to be worked with were then briefly described:

1. **“Still Hewers of Wood and Drawers of Water”:** Canada diversifies its markets without first making its economy more innovative. This scenario addresses issues related to Canada’s relationship with the U.S., China, and Canadian sovereignty over our natural resources, the state of the environment, and research & innovation.
2. **“The 21<sup>st</sup> Century is Canada’s Century – Laurier Redux”:** Successful environmental action and an innovative economy. This scenario draws attention to productivity, social cohesion, research and innovation, reorganization of government, and resource management.
3. **“From One Frying Pan into Another”:** An innovative economy but unsuccessful environmental action. This scenario highlights the critical importance of water and the impacts on the rural community in a transition of a greater dependency on an industrial bio-based economy.
4. **“What’s Mine is Mine and What’s Yours is Mine”:** High energy prices and a threatened economy. This scenario raises the issues of foreign ownership and sovereignty, the impacts on the environment of high energy prices, and the outcomes of innovation.

Complete text of the scenarios, which were not read until the break-out sessions began, are included in [Appendix 2](#).

## 6.0 Challenge Questions

“Challenge questions” are a part of the Foresight process meant to enrich scenario building. Challenge questions

- provide context to scenario frameworks
- encourage thinking outside the box
- get people to the heart of the matter quickly
- are present-biased

In this Foresight workshop, the challenge question methodology had been chosen as most appropriate to fleshing out scenarios that had been developed in outline in preliminary phases of the exercise. Workshop participants were asked to break out into brainstorming groups that would spend the remainder of the first day addressing seven challenge questions in relation to each of the four scenarios.

The questions to be addressed were as follows:

1. What **technologies** support or impact this scenario? What drives technology innovation and investment?
2. Describe the state of the Canadian **economy** in this scenario. What is supporting its growth or decline? How are investment decisions made?

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3. If a public opinion poll were taken at the time of this scenario, what would it reveal about the state of Canadian **society**? For example: social cohesion, values, healthcare, government, & media.
4. How are Canadian **natural resources** being managed/conserved in this scenario? Describe the health of the Canadian environment (e.g. water & air quality).
5. What is the role and influence of **industry** in this scenario? What impact does ownership (foreign or Canadian) have?
6. In what ways does Canada's **education** system support the research and business requirements of this scenario (K-12, post-secondary, workplace training)?
7. What style and sources of **leadership** are required by or support this scenario? How do governments, industry and other stakeholders communicate and interact?

**Randal Goodfellow** assigned participants to seven teams, which then decamped to their respective break-out rooms.

### **7.0 Team Presentations Day 1**

The seven teams had been asked to designate a spokesperson to deliver a brief encapsulation of where their teams had arrived at by the end of day 1 in developing the four scenarios. Ken Andrews re-capped each scenario and characterized the general direction in which the economy, the environment and society were moving in each:

#### **7.01 "What's Mine is Mine and What's Yours is Mine"**

- Jeb Bush is president of the US
- Canada no longer has control of its natural resources
- There has been a continental resource management bill passed in the US, which provides proportional resources for all from the North American resource bank
- Canada is the world leader in alternative energy
- Major Canadian companies are owned by multinationals
- China is flexing its economic muscle
- Oil has reached \$150/barrel; cars are powered by hydrogen

Economy → Environment → Society →

#### ***Team M1***

- Multinationals now own all the technology we have developed
- The economy experiences rapid and turbulent change with energy rich provinces increasingly becoming the 'have' provinces in Canada
- Local and regional regions have increasingly polar economies with extreme wealth and extreme poverty existing side by side.

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- All of our energy has been siphoned off; money coming back into Alberta from oil export, creating regional disparity on a grand scale – Toronto has been left to the raccoons, everyone wants to move to Alberta
- All levels of government feel an increasing level of strain
- Federal government has become weaker; an Alberta Benevolent Society (ABS), which is representative of the a number of such organizations that would emerge in energy ‘have’ provinces based on increasing energy revenues, begins to move into the breach
- Canadians have three primary reactions to the demands of this new economy:
  - Because Alberta is exporting all of our energy, we cannot heat our homes – we become a world leader in conservation, sustainability and alternative bio-energy
  - Bio-processing plants have sprung up next to where food is being grown; Canada consists of tiny, local, self-sustaining communities
  - Canadians view fast-growing multinational corporations as a phenomenon that will grow itself out, leaving behind the slower-growing, more sustainable SMEs

### *Team M2*

- Bush electoral slogan was “proportional resources for all”, which we interpreted as everything going down south
- Multinational have taken over
- Federal government is a puppet government, its strings pulled by the multinationals
- There is less consideration for the environment and bio-diversity is waning
- Industry has been able to close the loop on the waste side, but still sapping our resources
- The US legislation implies that the world will be split into blocks and Canada is merely part of the American block; our sovereignty is eroded
- Even though our resources are being eroded, we lack the power to turn off the taps
- 2050 – the death of Canada occurs. We have lost all political, economic sovereignty

### **7.02 “From One Frying Pan into Another”**

- Fossil fuels replaced by bio-products
- Water shortages affecting the food supply
- Canada’s natural resources are being consumed rapidly
- There is a negative impact on our environment and social conscience
- Research community is stagnant
- Commercial success is seen to be at the expense of Canadians’ health and welfare

Economy ↑    Environment ↓    Society ↓

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### *Team P1*

- First impression of the scenario seems a positive one, looked like Ralph Klein had been in office continuously up 'til 2020
- Biomass being used up in all its forms leading to innovation, wealth, trade, jobs
- We've captured the bio-economy, using all the OMICs (Genomics, proteomics, metabolomics) including informatics
- But, we saw that the impacts on society were highly negative, with everyone out for themselves
- There is a rural apocalypse, collapsing the rural infrastructure
- Management of natural resources completely unsustainable, resulting in drought water shortages, and environmental degradation (air and water pollution)
- We developed technology so quickly that we were unable to keep up from a regulatory perspective, resulting in failed stewardship of resources
- Main educational issue is that we have concentrated so heavily on technological depth, to the detriment of breadth, that we lack the ability to participate in the democratic process; citizens are unable to make informed choices
- Leadership profit-driven, short-term decision making

### *Team P2*

- We have a very aggressive trade economy; we've gone overboard on bio without life-cycle analysis or concern over negative externalities
- We've devoted all our university capacity to working with industry to develop bio-technologies; close alliance exists between universities and industry
- Government is also closely allied with industry and has abdicated its social and environmental responsibilities
- Focus is on wealth generation; social and environmental concerns are marginalized, as are the NGOs concerned with these issues
- Resources depleting very fast, especially water, but we are not paying attention
- End result is the desertification of the landscape

## **7.05 "The 21<sup>st</sup> Century is Canada' Century – Laurier Redux"**

- 21<sup>st</sup> Century is Canada's century
- Canada has the most productive and innovative economy, based on bio-products and bio-energy
- Canadians have a very strong sense of pride in their success
- Quality of the environment has gone up
- Renewed focus on innovation and commercialization
- Government departments have been horizontally integrated to oversee renewable resources and innovation
- However, there are world shortages in critical resources

Economy ↑ Environment ↑ Society ↑

**Team L1**

- Team L1 has had THE ideal scenario to deal with
- We tried to see what the linkages are between the economy, the environment, and society under such a positive scenario
- We saw that a shift had to have occurred in the piecemeal approach to progress we have had in the past, where the various societal elements – government, industry, universities, NGOs – looked at and dealt with the issue of technology in a not well-integrated or linked fashion
- We envisioned what we have called a “Fifth Way”, that incorporates all of these elements, plus the broader society which has expectations of being delivered some of the benefits of a positive future
- We saw this Fifth Way as being facilitated by better interconnectivity, such as we already have through the Internet, as well as through better knowledge networks that will be permitted to flourish because of technological advancements
- We saw the concept of value chains being replaced by the notion of a “value cycle” of products, innovation, best practices within business, governments, universities and NGOs, and interaction among the parts.
- Our conversation stressed such vocabulary as collaboration, integration, networking, multi-disciplinary and clustering, dynamic systems and fluidity

**7.06 “Still Hewers of Wood and Drawers of Water”**

- Renewal of Canada-China preferred trading agreement to supply raw materials to support China’s dominance of global manufacturing
- Ends Canada’s reliance on the US for trade
- Canada continues to place low priority on innovation and research
- Critics warn of negative environmental consequences
- Much closer ties between Canadian and Chinese universities
- Loosening of foreign ownership restrictions in Canada

Economy → Environment ↓ Society ↓

**Team H1**

- Canada’s expertise has remained in the arts, social sciences, oil and fossil fuels extraction
- Canada’s situation was seen as analogous to the frog being gradually brought to a boil
- At first, the team could see few opportunities for bio-product development under this scenario
- As the Challenge Questions were explored, they began to see some light at the end of the tunnel (although that light might be the train heading our way to run us down)
- A majority of team members imagined their only option would be moving to China in this scenario

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- Probably the only opportunity for bio-product development in Canada, under this scenario, is in energy – perhaps in gasification expertise or extraction technologies

### ***Team H2***

- We are true-blue Canadians because we have accepted our limitations as a third-level country of influence; we've had significant success competing globally with value-added products
- We've turned our creativity toward new ways of leveraging assets of being an APEC country, a successful multicultural country and a resource-based economy
- We've been creative in building a strong relationship with the Chinese, and have concentrated on being able to operate resource-base industries to attract investment and influential leaders from abroad
- The success of this scenario has been to produce a reasonable level of happiness for the greatest number of Canadians and nurture an environment of bovine contentment, while making an economic contribution globally
- We expect this scenario to be sustainable for 50-100 years, *unless* we are derailed by massive global climate change
- *Our* frog analogy shows the amphibian simmering contentedly over a fire stoked gently by the business hand – Canadians are happy!

## **8.0 Back-casting from 2020**

On Day 2 participants were asked to imagine themselves in their future scenario in 2020, and then to “back cast” on how we got to that world from 2005. Teams were asked to infer the technology, policy and other contributing factors that were necessary for that evolutionary path. Templates were provided to assist in the back-casting activity; these asked participants to consider events in the following categories:

Policy & Government  
Industry & Trade

Technology & Research  
Natural Resources & Environment

**8.01 M1 “What’s Mine is Mine and What’s Yours is Mine”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Continental Energy Pact</li> <li>• Community response to National Energy Program II threat</li> <li>• Oil rises to \$150</li> <li>• Accelerated bio-innovation, government incentives/policy</li> <li>• Major business, social dislocations</li> <li>• Middle class house sales/SUV squeeze</li> <li>• Global impacts on employment</li> <li>• In Canada, Alberta calls the shots</li> <li>• Alberta resists then supports alternatives to retain revenues</li> <li>• Ontario/Quebec/Atlantic provinces pressure for NEP II</li> <li>• Alberta opens negotiations with U.S.</li> <li>• Issue of recirculating % of oil revenues within Canada</li> <li>• Issue of mechanisms: Alberta invests in next-generation energy technology (bio, H2, solar) Alberta derives more security of wealth from item above</li> <li>• Volatile fed/prov electorate</li> <li>• Federal electorate supports alternatives to oil dependency, leading to negotiations between oil companies and Alberta</li> <li>• Provincial support for hybrid fuels, vehicles</li> <li>• Nuke-H2 link renewed 2010</li> <li>• Energy conservation/distributed generation grows rapidly w. public/private investment (Ont., Atlantic)</li> <li>• Gas hydrates accelerated for commercial production – intensifies shift from oil, H2</li> <li>• Oil use profile changes from fuel &amp; power to materials after 2020</li> <li>• 2013 new federal government following CE Pact, huge demand for Canadian oil to replace declining sources from abroad</li> <li>• new government institutes new activities and alternatives – comprehensive fed/prov/municipal programs to capture rents and reinvest in sustainable power</li> <li>• “Alberta Benevolent Society” /Solution established</li> <li>• Alberta government mandates water treatment market incentives</li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D push on alternative fuels</li> <li>• H2 vehicle infrastructure developed</li> <li>• Canadian Solar created 2010-2013</li> </ul> <p>2010 (run-up to CEP)</p> <ul style="list-style-type: none"> <li>• Alberta wealth pressured to re-invest in alternative energy</li> <li>• Provinces pressured to invest in off-shore oil technologies</li> <li>• Small/hybrid vehicles</li> <li>• H2 demonstrations 2008-2010</li> <li>• More efficient oil extraction/distribution</li> <li>• Bio-diesel niche-market success in agriculture</li> <li>• Public transit technologies – fuel cells, electric, hybrid auto management</li> <li>• Co-generation, district heating, biomass methane</li> <li>• Building codes and housing practices revised</li> <li>• Water/sewage technology, inventions for conservation and re-use</li> </ul> <p>2013-2015</p> <ul style="list-style-type: none"> <li>• Rapid progress to commercialize inventions from 05-13</li> <li>• Power grid decentralized</li> <li>• Oil companies start to buy alternative energy firms</li> </ul> <p>2015-2020</p> <ul style="list-style-type: none"> <li>• Eco-systems (incorporating nano/bio/info) innovations progressing</li> <li>• ABS a key investor</li> <li>• MNEs (oil&amp;gas) buy up Canadian S&amp;T innovations but fail to commercialize</li> </ul>

<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<p>2005-2010</p> <ul style="list-style-type: none"> <li>• Canadian energy startups struggle</li> </ul> <p>2010-2013</p> <ul style="list-style-type: none"> <li>• Canadian ownership diminishes</li> <li>• MNEs buy Canadian bio-firms</li> <li>• Developing choices in global energy (nuke/H2/gas from coal/bio/tar sands oil)</li> </ul> <p>2013-2020</p> <ul style="list-style-type: none"> <li>• Producing provinces reinvest oil revenues in Canadian alternative energy firms</li> <li>• CE Pact 2013 changes dynamics</li> <li>• Globally intense energy competition fueled by high oil prices</li> <li>• High energy prices stimulate a range of responses, not just bio-based solutions and methodologies</li> </ul>	<ul style="list-style-type: none"> <li>• Water shortage crisis begins</li> <li>• Home heating costs (oil&amp;gas) average \$5K/yr</li> <li>• Relentless depletion of resources and environment across time period</li> </ul> <p>2005-2010</p> <ul style="list-style-type: none"> <li>• Relative inaction on Kyoto</li> <li>• R&amp;D on “clean” coal intensified</li> <li>• Air and water quality worsens until 2015</li> <li>• Bio-diversity muddles along; modest measures</li> </ul> <p>2010-2013</p> <ul style="list-style-type: none"> <li>• Kyoto 1 evaluated as failure, but more need seen</li> <li>• High oil price accelerates shift away from oil resulting in cleaner environment</li> <li>• Coal a challenger as alternative to oil (cleaner coal being developed)</li> </ul> <p>2013-2020</p> <ul style="list-style-type: none"> <li>• Rising pressure for strict Kyoto</li> <li>• 2015-2020 – clean environment improvements</li> <li>• Pressure on Canadian water as mandated under CE Pact</li> <li>• Water and air quality improvements from aligned fed-prov actions</li> </ul>

**8.02 M2 “What’s Mine is Mine and What’s Yours is Mine”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Treaty signing</li> <li>• Allowance of foreign ownership</li> <li>• Lack of sponsorship of internal capitalization, commercialization</li> <li>• Support for R&amp;D, both direct and tax incentives</li> <li>• Change in federation with provinces on the ascendance, the federal in decline</li> <li>• Change in focus from sustainable development to extraction for foreign markets</li> <li>• Loss of Canadian sovereignty as globalization continues. North America looks like EU</li> <li>• Focus on non-biorenewables</li> <li>• Regulatory system mandates R&amp;D \$\$ for closing waste loop</li> <li>• Corporate-friendly tax regime tipping point for energy pricing</li> </ul>	<ul style="list-style-type: none"> <li>• Carbohydrate to H2 economy</li> <li>• More \$\$ for R&amp;D in industry and government</li> <li>• More university R&amp;D in partnership with feds and industry; R&amp;D more applied, less basic</li> <li>• Flow of R&amp;D \$\$ South to North with transparent tax benefits</li> </ul>

<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• Fortress North America – free trade in all energy goods and resources, human resources</li> <li>• Global trade restricted by treaty</li> <li>• EU-like relationship                             <ul style="list-style-type: none"> <li>○ US provides finished goods, security</li> <li>○ Canada provides raw materials</li> </ul> </li> <li>• Innovation focused, not commodity focused</li> <li>• Bio-products substituting for high-energy products such as steel, concrete</li> <li>• World is in “blocks”; increased demand for oil from rest of the world</li> </ul>	<ul style="list-style-type: none"> <li>• Focus is on short-term profit, not sustainability</li> <li>• Biomass resources fully/over-subscribed for food, products and energy</li> <li>• Loss of control – carbon credits</li> <li>• Shift in focus on sustainability towards issues like clean air and away from sustainability, biodiversity and similar issues</li> <li>• Excess demand for goods and energy around the world</li> </ul>

**8.03 P1 “From One Frying Pan into Another”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• No longer have endangered species; all are extinct. Act is redundant</li> <li>• Government driven by short-term horizons: job creation, wealth creation, dominate political agenda. Industry Canada rules.</li> <li>• Carbon credit trading well established; Canada becomes a net buyer of credits</li> <li>• Smart regulations still being discussed, but no new ones implemented</li> <li>• Environment Canada increasingly marginalized</li> <li>• Continued inability of key federal departments to recruit the best and brightest</li> <li>• No deliberate engagement of the public</li> <li>• Favourable climate for the protection and production of Intellectual Property</li> </ul>	<ul style="list-style-type: none"> <li>• Second generation processing</li> <li>• Collection and delivery mechanisms optimized</li> <li>• Supply chain optimized</li> <li>• 2010: Bio-products business model/case firmly established</li> <li>• 2007: massive infusion of cash from the energy sector drives construction of bio-processes, which in turn drives interest in OMICs research (genomics, proteomics, etc)</li> <li>• Accelerated commercialization; success with pilot processes</li> </ul>
<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• 2020: oil is \$100/barrel and rising</li> <li>• Increased demand for technical personnel</li> <li>• Increasing vertical and horizontal integration</li> <li>• 2010: oil is \$80/barrel and rising; energy and bio-products exports surpass forestry exports</li> <li>• Efforts to restrict export of water</li> <li>• 2007: oil economy invests heavily in bio-economy</li> <li>• 2005: oil hits \$60/barrel, yet demand is increasing</li> </ul>	<ul style="list-style-type: none"> <li>• Alien species rampant</li> <li>• Demand for environmental technologies increases</li> <li>• Lack of emission controls on bio-processes</li> <li>• Continued intensification of land use and water</li> <li>• Ongoing shift to industrial crops</li> </ul>

**8.04 P2 “From One Frying Pan into Another”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Sale and diversion of water to U.S.; massive irrigation projects</li> <li>• Power transfer to municipalities</li> <li>• Policy to accelerate development of bio-economy</li> <li>• International crisis prompts government to take action to generate our own energy</li> <li>• Government withdraws investment in R&amp;D; industry steps in</li> <li>• Aggressive North American trading block develops; Canada develops its own biotechnology niche</li> <li>• Loose competitiveness in food production prompts switch to bio-products not “capped” by cheap food policies</li> <li>• Subsidies to bio-products</li> <li>• Infrastructure program</li> <li>• Social policy to save rural areas by investing in bio-business</li> <li>• Government stops listening to environmental NGOs altogether (not just extreme voices)</li> <li>• Push for community development initiatives</li> <li>• Attempts to meet Kyoto abandoned; last ditch attempt prompts investment in bio-products</li> <li>• Privatization of universities as they turn increasingly to industry money</li> <li>• New IP policies allow rapid and non-exclusive licenses for technology commercialization</li> <li>• Environmental review processes dropped</li> <li>• Selective “high-tech” immigration</li> </ul>	<ul style="list-style-type: none"> <li>• New cheap nitrogen technology and other cropping input technologies</li> <li>• Commercialization improves dramatically</li> <li>• Plant/microbes, etc. (GMOs) are widely developed and used</li> <li>• Integrated technologies (CHP); industrial clusters</li> <li>• Salaries, grants and profit sharing make R&amp;D an attractive career</li> <li>• No Life Cycle Analysis research funded; no sustainability/ environmental studies</li> </ul>

<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• North American trading block for water and oil</li> <li>• Market demand “pull” for bio-products</li> <li>• Small, collaborating companies co-exist with large companies</li> <li>• Highly paid workforce</li> <li>• Trade infrastructure, soft and hard</li> </ul>	<ul style="list-style-type: none"> <li>• Several major diversions to the US; remaining water in Canada is protected as a “reserve” and not available</li> <li>• Soil nutrients depleted</li> <li>• Marginal lands used for industry</li> <li>• Wildlife is rare</li> </ul>

**8.05 L1 “The 21<sup>st</sup> Century is Canada’ Century – Laurier Redux”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Bio-economy the policy focus of dedicated science and business councils</li> <li>• Government puts in place processes and incentives to empower individual innovation and action on bio-sciences</li> <li>• Governments commit to long-term planning in a short term (electoral) environment – frameworks put in place to permit long-term planning</li> <li>• Parliament public service re-vitalized</li> <li>• 2010: opportunity to revitalize Public Service seized as massive retirement occurs</li> <li>• 2005-2010: Government and industry successfully complete mind and memory projects to institutionalize continuity of corporate knowledge</li> <li>• Horizontal coordination between governments and departments in planning and delivery of the bio-economy</li> <li>• Flattening of hierarchical structures involved in the delivery of the bio-economy</li> <li>• Policies in place to facilitate movement of individuals around the bio-economy, e.g. portable pensions, expense deductions</li> <li>• CFO appointed</li> </ul>	<ul style="list-style-type: none"> <li>• Chief Science Officer/ Science Brains Trust established with secure funding and tenure</li> <li>• Bio-economy vision, targets, road map established and implemented</li> <li>• 2007 – innovation and commercialization system in place with and emphasis on demonstration and first user support</li> <li>• 2005 – bio-economy targeted as a priority for research and commercialization</li> <li>• Education re-focused to promote whole-brain learning and creative functioning</li> </ul>

<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• 2007: National Council on the Bio-economy established</li> <li>• “Fifth Way” recognition of the role of knowledge workers outside the traditional mix of university, business and government, working together with other key players (cooperative alignment of business, government, universities and civil society) provides effective framework for moving forward – creating consensus on vision, targets, roadmap for bio-economy</li> <li>• Establishment of micro-stock exchanges permits massive infusion of capital into SMEs</li> <li>• Value chain becomes “value cycle”</li> <li>• Industry networks become the norm</li> </ul>	<ul style="list-style-type: none"> <li>• 2005: treaties on patent rights and genetic manipulation of the environment are negotiated</li> <li>• Suite of integrated benchmarks and reporting for natural capital management institutionalized</li> <li>• Pricing mechanisms for air, water and land use established</li> <li>• Stats Can removes charges for data</li> <li>• Coordination of activities around natural resources and strategies for sustainability is established among Ag. Can, NRCan, fisheries, Env. Can., justice, the provinces and municipalities</li> </ul>

**8.06 H1 “Still Hewers of Wood and Drawers of Water”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Economic imperative to have CCPTA (China-Canada Preferred Trading Agreement)</li> <li>• Federalism caves in - Canada still exists, but greatly altered; dilution of federal role</li> <li>• Greater tension among Federal/Provincial/Territorial governments and even municipalities</li> <li>• US is more protectionist; Can/US relations decline</li> <li>• Conservative majority government dumps Kyoto; influence of oil and gas rises</li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D not creating anything new</li> <li>• R&amp;D activity aimed at maintaining economic health</li> <li>• R&amp;D \$\$ spread very thin</li> <li>• R&amp;D \$\$ focused on traditional strengths, i.e. natural resources, but to meet foreign needs</li> <li>• Lack of vision</li> <li>• No national framework for a bio-economy</li> <li>• Push for R&amp;D return in 3-5 years; no opportunity for long-term progress</li> </ul>
<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• Natural resources are our major assets and major short-term driver</li> <li>• CCPTA</li> <li>• Trade with China replaces trade with US</li> <li>• China invests in Canadian manufacturing; relationship builds between two countries</li> <li>• Big industry walks away from bio-economy</li> <li>• No major success for bio-products and processes</li> <li>• Farmers walk away from biotechnology</li> <li>• Manufacturing declines</li> </ul>	<ul style="list-style-type: none"> <li>• Natural resources are our major assets</li> <li>• Canada maintains status quo on environmental regulations</li> <li>• No value added strategy</li> <li>• Sustainability falls off the table</li> <li>• Focus on natural resources as commodities, not assets contributes to strong economy</li> </ul>

**8.07 H2 “Still Hewers of Wood and Drawers of Water”**

<p style="text-align: center;"><b>LENS (A)</b> <b>(Policy and Government)</b></p>	<p style="text-align: center;"><b>LENS (B)</b> <b>(Technology &amp; Research)</b></p>
<ul style="list-style-type: none"> <li>• Export deal on H<sub>2</sub>O</li> <li>• No credible third party challenge from universities, media, think tanks</li> <li>• Turned to China in crisis mode brought on by decline of US economy; bad trade deals as a result</li> <li>• Signals of US decline missed</li> <li>• No leadership from Government of Canada</li> <li>• Individuals seen as consumers, not citizens</li> <li>• No Canadian innovation agenda</li> <li>• No limitations on foreign ownership</li> <li>• Social policy and programming all but abandoned as focus becomes further commercialization</li> <li>• Provinces focus on job creation; long-term policy and planning sidelined</li> <li>• Incentives to bio-economy frozen; redirected to primary resource extraction sector</li> <li>• Limited science content knowledge at senior levels of government contributes to lack of progress on science related economic issues</li> </ul>	<ul style="list-style-type: none"> <li>• Opted out of Knowledge-based Economy</li> <li>• Waste conversion technology adopted</li> <li>• Education and research on efficient commodity/resource sector operations and manufacturing efficiency</li> <li>• Focus on resource commodity research and technology; focus on value added element declines</li> <li>• SMEs not supported; innovation agenda collapses</li> <li>• Window-dressing support for knowledge-based, value-added economy</li> <li>• Reduced funding for education</li> <li>• Technologies to extract from oils sands advances significantly</li> <li>• University and government research increasingly commercialized</li> </ul>

<p style="text-align: center;"><b>LENS (C)</b> <b>(Industry &amp; Trade)</b></p>	<p style="text-align: center;"><b>LENS (D)</b> <b>(Natural Resources &amp; Environment)</b></p>
<ul style="list-style-type: none"> <li>• Whereas Industry and trade become further integrated within North America the US is in decline so Canada switches trade focus to China and other APEC customers</li> <li>• Trade of natural resources focused principally on Chinese market and an ever increasing portion of our trade is in natural resources as value added export products from various sectors are in decline</li> <li>• Canada follows trade rules; other nations do not leaving Canada on the short end of the stick</li> <li>• Markets are totally resource focused</li> <li>• Free movement of labour between Canada, the US and China, because of aging demographic</li> </ul>	<ul style="list-style-type: none"> <li>• We recognize the high value of our resources and the global demand for our oil and water</li> <li>• Traditional strengths in natural resources continue to drives investment, policy and trade</li> <li>• China is the new high-paying customer</li> <li>• Strategies on climate change were developed and communicated, but never implemented</li> <li>• Depletion of our natural resources now having a serious impact on our environment in an irreversible way</li> </ul>

## **9.0 Team Presentations: Advice to First Ministers**

Teams were asked to prepare a five-point series of recommendations on the future of the bio-economy for presentation to a fictional meeting of federal/provincial/territorial first ministers being held in 2005. The recommendations were to be based on the teams' brainstorming throughout the previous day and a half, particularly reflecting the fleshed-out scenarios arrived at on Thursday afternoon and the back-casting exercises of Friday morning.

In order of presentation, these were:

### **9.01 M2 "What's Mine is Mine and What's Yours is Mine"**

1. Make changes to the tax system to provide an incentive for extracting more value out of our crops and for maintaining Canadian control of both crops and the value chain.
2. Maintain and improve regulatory standards for resource exploitation and management – the regulator needs to work with industry from the beginning of the process of commercialization to ensure better environmental outcomes as well as greater certainty for business.
3. Adopt an innovation strategy that would encompass such tactics as green product procurement, a federal energy star program (like Ontario's) where energy-efficient purchases would be exempt from GST, the streamlining of federal-university R&D support and facilitation of the commercialization process, and improved education through incentives to life-long learning.
4. Go beyond the One Tonne Challenge – get municipal/provincial success stories out, ensure that industry best management practices are widely demonstrated, implement incentives for appropriate choices, switching from non-renewables, include changes to consumption taxes.
5. Adopt annual reviews of standardized, measured environmental parameters if we are to avoid the "boiled frog" scenario. Present results of annual review to first Ministers so that progress or lack thereof, can be seen.

### **9.02 M1 "What's Mine is Mine and What's Yours is Mine"**

1. It is essential to find new mechanisms that will:
  - recirculate the "petro-dollars" rents within Canada
  - meet the spirit of equalization.
2. Substantial investments will be required to:
  - restructure significant parts of current Canadian industries,
  - replace the employment lost to higher energy prices through the development of new industries that will thrive in an era of high cost oil such as next generation alternate fuels, conservation and environmental technologies.

3. Optimizing the potential of these new technological opportunities will require structural changes in how energy is produced and made available with a greater focus in local distributed generation combined with the sale of the local surplus.
4. Create a joint Federal, Provincial, and Territorial Commission with a mandate to make recommendations on ways and means that a new FPT partnership mechanisms which would allow part or all of energy rents to be used to finance the economic restructuring that has been precipitated by the high energy prices.
5. Consideration should be given to:
  - a concept known as the Alberta Benevolent Society (ABS) under which oil rents would be invested in productive Canadian research and production across the country to restructure the economy of the nation. Depending on whether the investments were debt or equity the ABS could own the resulting assets and generate returns for the ABS; will lead to greater possibility that Canadian technologies will be developed, commercialized and owned in Canada.
  - restructuring equalization payments to reflect the new realities of the implications of resource rents and federal fiscal capacity
  - mobilizing community leadership to explore the potential local development and/or application of the next generation technologies
  - changes to federal and provincial policies and regulatory regimes that will enable and accelerate development of cost effective energy and water alternatives (e.g. bio-fuels, bio-products, clean coal / gasification, nano-solar electricity, hydrogen / fuel cells, energy and water conservation systems) and the creation of local distributed energy generation and its sale into the national energy grid.

### **9.03 P2 “From One Frying Pan into Another”**

1. The development of a bio-based economy is an excellent policy for Canada, provided that resource stewardship is enforced.
2. It is necessary to ensure the development of appropriate community and social support, as well as infrastructure, to avoid any negative consequences of an unchecked (entirely deregulated) development of the bio-economy
3. Major investment is needed in science, technology and training focused on the bio-based economy and including sustainable development principles.
4. Sovereignty needs to be maintained in trade agreements (particularly as it relates to water use).
5. Improve commercialization mechanisms, access to IP; ensure broad stakeholder engagement; good coordination required within and between governments

#### **9.04 P1 “From One Frying Pan into Another”**

1. The Bio-products sector is poised to explode and will re-shape industry in the 21<sup>st</sup> century in terms of jobs and wealth creation.
2. Investment is the key to grasping this opportunity; governments must create a positive climate for foreign, public and private investment; strategic investments are required in R&D, technology transfer, education and technical training; need appropriate protection for intellectual property.
3. Predictability, transparency, stability in the policy and regulatory environments are key enablers.
4. There are real problems with the bureaucratic separation of pharmaceuticals, nutraceuticals and medical devices from other biotechnologies. The only really feasible bioproduction model is one based on a bio-refinery model.
5. We need to move beyond a model of a single commodity and think instead about the full utilization of a resource. It is critical to understand and organize companies around both products and platforms.
6. Governments must champion the embedding of environmental protection and sustainability into decision making to avoid over-exploitation of bio-resources, to preserve and enhance the quality of life.
7. Society must be engaged in the debate, to ensure transparent communications in policy development and to both educate and inform the public.

#### **9.05 L1 “The 21<sup>st</sup> Century is Canada’ Century – Laurier Redux”**

1. Establish a Canada-wide, broadly representative Council on the Bio-economy that is independent of short-term political and industry agendas. The Council would provide leadership and credibility in establishing vision, targets and a roadmap for the bio-economy; government’s role would be to support the Council.
2. Appoint a Chief Science Officer/ Science Brains Trust-type office with secure tenure and funding. CSO would chair the Council on the Bio-economy (see above). His/her Office would encourage the application of broader science relevant to the bio-economy and ensure that such science is carried out in the service of society.
3. Establish a suite of integrated benchmarks and reporting mechanisms for natural capital management, with an emphasis on developing the bio-economy. This is seen as complimentary to the mission of the Council on the Bio-economy and will give the Council tools for strategic planning, as well as progress indicators.
4. Adopt policies to enable and fund SMEs to develop products and processes for the bio-economy. Such policies should be directed at increasing the number of SMEs, fostering creativity at this level, allowing SMEs to become the engines of delivery for the bio-economy, developing markets and networks, and encouraging private-sector funding.
5. Adopt policies to enable linkages of federal and provincial programs to facilitate funding and deliver an effective innovation and commercialization system for bio-products.

### **9.06 H1 “Still Hewers of Wood and Drawers of Water”**

1. Create a national bio-economy strategy built on an accurate understanding of our existing natural resource base, industrial complex and R&D capacity.
2. Address the reality that the bio-based economy is not yet market-driven and will need the incentives that were / are given to other energy related segments of the economy.
3. Move to the value end of the new economy within Canada, rather than allowing this to occur in other countries, such as China.
4. Foster commercialization continuum through investment; build related technology and innovation platforms, direct support to R&D and products that come out of commodities.
5. Promote sustainable economic activity through the bio-economy

### **9.07 H2 “Still Hewers of Wood and Drawers of Water”**

1. We need to politically recognize, and continually articulate that our renewable resources and water are not only our traditional but also our future strength. We need to appreciate and protect them and then create a strategy to add further value to these natural resources.
2. We need to understand and broadly appreciate that Canada’s current and future prosperity is at risk and that if we do not create a culture of commercialization and a supply chain of innovation our economy will decline; the “problematique” of the culture of commercialization and supply chain of innovation must be fully defined and fully understood and articulated. This is especially critical as it pertains to our renewable natural resource base and water.
3. Its all about making the conditions right for having strong companies as it is only companies that create products that replace ones that are more environmental damaging and that create the economic benefits and jobs.
4. Models established by provinces such as Ontario and Alberta, to address the above objectives with respect to R&D, capital investment, market development, human resource development and infrastructure creation need to be emulated at the Federal level as well as in other provinces.
5. We need mechanisms to benchmark our current situation and then measure our progress towards articulated goals that will be reported on by the federal and provincial first ministers.

## **10.0 Closing Comments and Next Steps**

**Jack Smith** spoke briefly about the next steps in the Bio-products Foresight, which will begin with the core team examining the results of the workshop and tightening up the outputs into a framework for policy discussion. The team will then begin to engage policy officials in the stakeholder departments and agencies in policy discussions, probably running into mid-fall.

## ***Industrial Bio-Products Future Scenarios Workshop: Proceedings***

The structure and rigour of the follow-up process will build on the creativity of the workshop outputs, using those outputs to elucidate policy challenges and follow-up arguments that need to be made to advance the file.

The Advice to First Ministers presentations arising from the brainstorming sessions of the workshop are particularly useful as a rehearsal for what might in fact be said to Ministers around generating alternatives for the future.

Jack thanked participants and advised them that the partners would be keeping in touch with the group, first of all with a report on the workshop.

**Sally Rutherford** added her thanks to Jack's and remarked on how struck she had been by the fact that, no matter how outlandish some of the scenarios might have seemed, the discussions around them never failed to clarify current issues already being faced. The discussion was also useful with respect to how politicians and policy managers can be engaged by identifying solutions and directions that can be a win for them as well as everyone else.

Sally reaffirmed Jack's undertaking to keep in contact with the participants, providing updates as the process advanced, in addition to the report on the workshop itself.

## Appendix 1 Registered Participants

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## *Industrial Bio-Products Future Scenarios Workshop: Proceedings*

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## Appendix 2 Full Scenarios

### Scenario 1: Still Hewers of Wood and Drawers of Water (H1, 2)

#### *Canada diversifies its markets without making its economy more innovative*

*A news story in the South China Morning Post, the morning of May 26, 2020*

Today the South China Morning Post is happy to announce the renewal of the China-Canada Preferred Trading Agreement. It is easy, in retrospect, to see the immense benefits of this arrangement for both countries. For China, it has ensured access to the raw materials that are needed for its' continued dominance in global manufacturing sector. From the raw or semi-processed goods that flow to its' shores from Canada, China fashions the high value goods that ensure that its' economy remains the dominant global economy.

For Canada, the agreement has signalled the **end of its reliance on the United States** as the primary market for their goods. The agreement, in addition to their similar arrangements with India and Brazil, has meant that the Canadian economy has not been locked into the death spiral that has encompassed the United States as its' growing international debt and the exodus of its so-called 'creative class' to cleaner and more tolerant shores has left this once mighty giant a shell of its former self.

As with any agreement of this type, the CCPTA has not been without its critics. Protestors in Canada continue to question the value of this trade agreement and argue instead for a heavier investment of government resources in health and education. In reality, however, Canada is too far behind in so many technical fields that it is much better off specializing in the areas where it has a competitive advantage, like mining, forestry and growing wheat and other important agricultural commodities. Undoubtedly, this is a reflection of the **low priority placed by the Canadian government on innovation and research** in the early parts of this century. Although the government at that time in Canada expressed a strong commitment to developing a world-leading innovative economy, too many years of political instability and infighting de-railed these ambitions pushing Canadian companies to focus solely in their areas of traditional strength. The agreement has been critical to China's well being as without Canadian wheat and other agricultural goods China would not be able to support its booming post-industrial manufacturing economy and population.

Critics in both China and Canada continue to argue that the CCPTA has had **terrible consequences for the environment**. The general consensus among experts, however, is that the loss of clean water, old-growth forests and pristine wilderness is more than compensated for by economic growth in China. The economic loss of these assets is more than offset by the value of the value of the economic activity of processing the waste materials that are shipped annually from China to Northern British Columbia for processing.

The agreement has also undoubtedly led to closer ties between Canadian and Chinese institutions of higher learning. Although much of the engineering and scientific expertise that our economy relies on is now imported from India and South Africa, Canadian universities are noted none the less for their expertise in areas such as the extraction of oil and other fossil fuels and in the arts and social sciences.

Finally, it should be noted that the success of Canadian resource companies is also a success for China. Since the **loosening of foreign ownership restrictions** by the Canadian government, Chinese companies have a controlling interest in more than half of all resource sector companies in Canada.

**Scenario 2: The 21st Century is Canada's Century - Laurier Redux (L1)**  
*Successful Environmental Action and an Innovative Economy*

*A speech by the Prime Minister of Canada on July 1<sup>st</sup>, 2020*

Welcome to one and all on what can only be considered as Canada's finest day. Today, we celebrate twin accomplishments – Canada's return to the number one ranking as the top country in which to live in the world and our debut as the country with the **most productive and innovative economy**. Perhaps it is useful on the momentous occasion to look back at the factors that have allowed us to achieve all that we have achieved.

Undoubtedly the single greatest factor in our success was the choice that was taken in the early parts of this century to move the Canadian economy away from traditional natural resource extraction focused activities to value-added activities across the entire spectrum activities. Where once the fleets of the British Empire were built of Canadian timber, now automobiles the world over are powered by the BioDiesel that is extracted from our renewable timber resources, fuel cells that are powered by world leading Canadian technologies, solar farms that are providing green electricity, and BioEthanol that is made from the parts of plants that were once considered waste.

As Canadians, we can have a justifiable **sense of pride** in our success as a country. We have created more high paying, highly skilled and interesting jobs, while renewing our rural communities through the developed of value-added bio-industries that are located in the heartlands of our great country.

**Our environment has improved** since the dark days earlier this century when we questioned the environmental and economic sustainability of the very fundamentals of the old way of doing business. Our focus on developing environmental technologies and sustainable communities has enabled our economy to grow while shrinking our environmental footprint on the future. Fully realizing that we all live in a global village our world leading Canadian technologies are also being exported abroad so that Canadians no longer have to suffer the consequences of the pollution from other continents and in other nations.

Since our renewed focus on innovation and commercialization, Canada has continued to attract the first class minds and new knowledge that is necessary to continue our amazing growth. We have become the "New Athens of the North" leading to what is now being referred to as the "Canadian Enlightenment". Canadians are not just leaders in developing new scientific knowledge; we also lead the way in social and political innovation. Our regulatory system is a world leader both flexible and fair, with the strongest provisions in the world to protect our communities in conjunction with our unique support mechanisms that enable companies to swiftly and sufficiently develop and get approved the new technologies on which our economy thrives. Our **government departments have been horizontally integrated** to over see renewable resources, commercial development and scientific excellence.

Canadian corporations continue to grow and develop with global behemoths emerging from our successful small and medium sized companies. These small organizations, the life blood of our economy, that once would have been swallowed up by larger multinational companies now have the support they need to grow in Canada into world leaders.

To conclude, it is critical that we not rest on our laurels. World shortages in critical resources threaten our continued success. Our ongoing negotiations with the United States over access to our fresh water and fossil fuels continues to be the single most pressing issue that faces our country other than the growing impact of accelerating global climate change, which of course as we know are so closely linked. Yes, there are challenges on the horizon, but by continuing our focus on adding value to all aspects of our and the global economy and society, Canada can continue to lead the way.

### **Scenario 3: From One Frying Pan into Another (P1, 2)**

#### ***Unsuccessful Environmental Action but an Innovative Economy***

*The head of the Canadian Environmental Action Network is interviewed on the CBC, June 10, 2020.*

Thank you for that kind introduction. Canada is at a crossroads. Our economy, which, as your other esteemed guest indicated, has, by some indicators, has never been better, but the activities that make up these limited measures of success are what is threatening the very health of our people and the survival of our country. **The notion that it is possible to replace all fossil fuels with bio-products while still growing enough food for Canadians is, frankly, absurd.**

Look what is happening in Southern Saskatchewan and Southern Alberta. Critical **shortages of water** combined with record prices for agricultural products are leading to an ecological Armageddon. Even the stalks of plants that once would have been left in the fields to enrich the soil are being consumed by the voracious bio-economy or bio-industrial monster. Given the continued expansion of the oil sands project in Northern Alberta and the explosion of so called bio-based industries in the South, it is a miracle that there is a single drop of water left to drink in the entire province.

Canada, once one of the world's largest exporters of agricultural products is now importing food just to feed our population! It just isn't right. Not only are we consuming our own natural resources at a rate that is entirely non-sustainable we are now forcing other countries to adopt similar measures in order to enjoy the fruits of our technological expertise. Although it is true that Canada is developing and commercializing technologies at a rate that far exceeds our historical average, this acceleration of our technical wizardry has come at the **cost of our environmental and social conscience.**

Look at Canada's rural areas, once thriving rural towns have now been replaced by huge bio-industrial complexes that poison the air and pollute the groundwater. These monstrosities are destroying our landscapes and our very way of life. The demand for marine biomass has fueled an ever-increasing need for commercial fish farms and loose federal and provincial regulation has led to the escape of industrial fish species that are destroying our marine ecosystems.

Our research community is an international disgrace. Where once stood proud faculties of higher learning now stand cold technical institutions that churn out engineers and scientists who lack even the most rudimentary skills to understand or analyze the social, environmental and, yes, even moral implications of their actions. Is this the research community that we want for our country?

Without a doubt, one of the most pernicious impacts of our new economy is the terrible cost that it imposes on our governments, cities and communities. **Our companies are internalizing their profits while socializing the environmental costs of their actions.** Canadians are paying for the cost of our economic success with their health and with their happiness. Don't believe for a second the tripe about how our improved economy and emerging companies will help to pay the costs of these social and environmental burdens. As costs go up, these companies will move on to new countries to exploit, while all of the costs are borne by our communities and our environment.

We once thought that we could divorce our economy for our ecology, history is teaching us the consequences of our arrogance.

**Scenario 4: What's Mine is Mine and What's Yours is Mine (M1, 2)**  
*High Energy Prices and a Threatened Economy*

*An old man reminisces to his granddaughter in the summer of 2020*

You know when I was your age, all of our cars used to be powered by gasoline. Back then gasoline was cheap and we thought that it would last forever. Even earlier this century there were huge companies all over the world that did nothing but extract oil from the ground and sell it to heat our homes and power our cars.

Back when oil was cheap, we used to think of ourselves here in Canada as an independent country. Up until Jeb Bush became president **we used to have control of our own natural resources**. Canada had the largest reserves of fresh water in the world and the second largest reserves of oil. In your history class at school you probably heard of his slogan when he ran for president “proportional resources for all”, that became the basis for the Continental Resource Management Bill of 2013. I don’t know how much longer we can continue to use our natural resources at the rate that we are right now, but the Americans will never let us turn off the taps. So much water has been diverted from the Athabaska River that both Calgary and Edmonton were on **water rations** all of last summer.

It hasn’t been all bad for us here in Canada though. Back in 2005 we began to diversify our economy and think of ways to become **less reliant on traditional energy sources**. It may sound incredible to you, but back then nobody had heard of Canada Solar and there wasn’t a single hydrogen vehicle on the roads. Now **Canadian companies are world leaders in the provision of alternative energy**. Well, maybe it isn’t entirely honest to call these companies ‘Canadian’ when they are **owned by Multinationals** from the U.S., Europe and hell, even from China. But the technologies were grown here in Canada and they’ll stay here as long as we have the resources that they need.

Not that anyone can say how long our resources are going to last us, what with us extracting as much oil as we can as fast as we can and burning through our renewable and non-renewable fuels at a rate that would make even an oil company blush – remember, I told you earlier in the conversation they used to be companies that sold nothing but oil – pay attention. Now where was I ...?

Oh yes, energy. I can’t say as how I blame the government for focusing on energy. When oil hit \$150 a barrel who could afford to invest in any other types of research and technology? By goodness what I wouldn’t give for the good old days when things didn’t cost what they do now. Who knew that the cost of heating our homes would quadruple in 5 years? I never guessed, not in a million years. It was pretty funny though to see those rich yuppies selling off their monster homes and SUVs and move into apartments. Makes me wish I had bought a condo back when they were in fashion.

Anyway, you’re probably tired of hearing me reminisce. You don’t want to hear about how Royal Shell Solar and Royal Shell Ethanol ... no you probably don’t. I just hope that these rumblings that I hear about China wanting a bigger piece of our energy resources aren’t true. We should tell them all what’s what, but you can bet that the Americans won’t stand for any of that nonsense from us.