



Presentation to the NZ Conference

Future BioPathways



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Natural Resources
Canada

Ressources naturelles
Canada

Canada 

Outline of Presentation



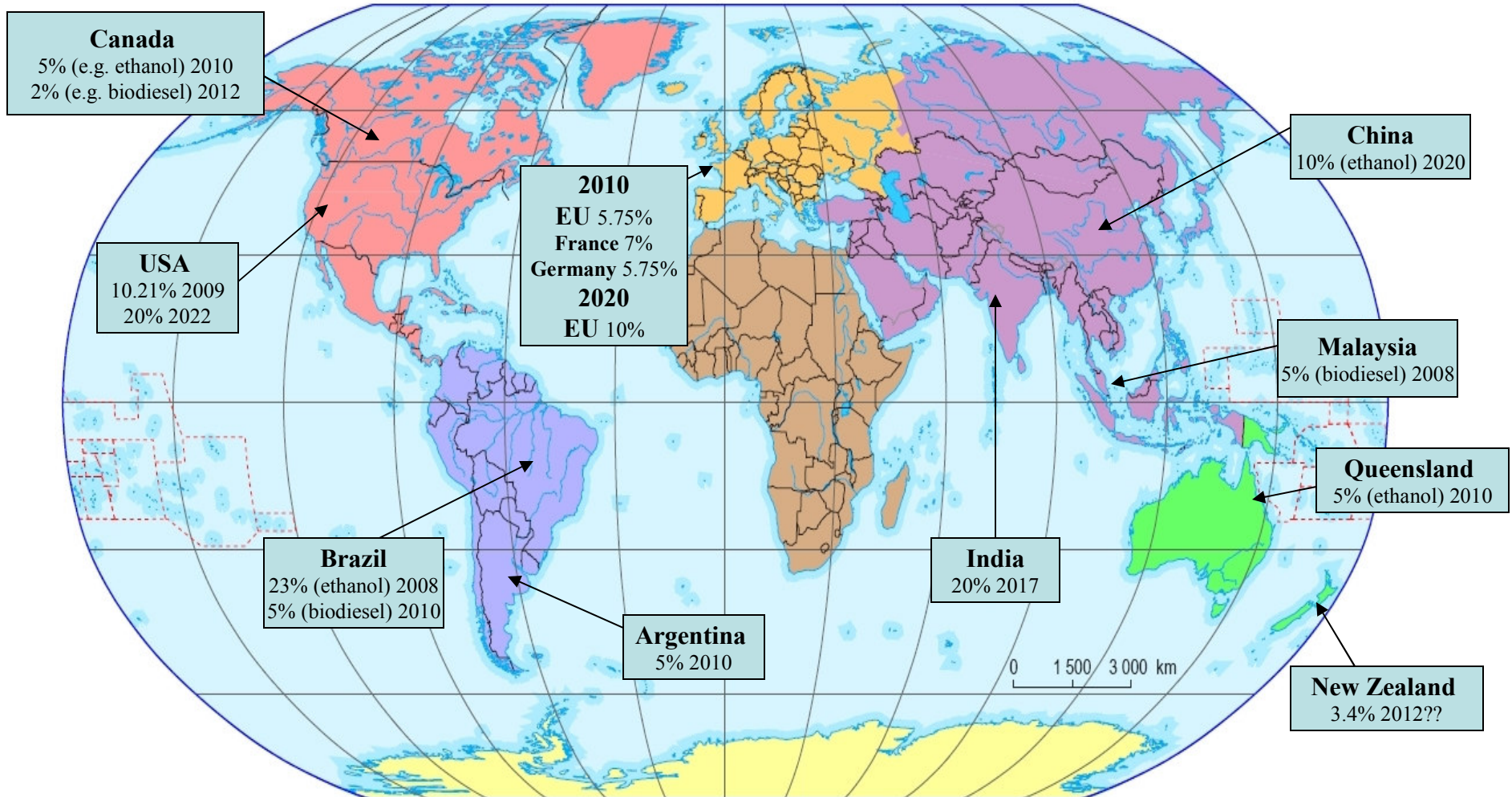
- Context
- Background – who/what/why/how
- Results
- Take-home messages
- Policy Implications
- Canadian Federal Support
- Next Steps

What are the major economic and social drivers for next-gen bioenergy?



- Financial and Economic Drivers
 - Energy security through energy diversification
 - Development of innovative Canadian technology
 - Forest Sector Economics – revitalization!
- Environmental Drivers
 - Climate change
 - Improved air quality
 - Food vs. Fuel
- Socio-economic Drivers
 - Rural economic development
 - Economic diversification
 - Job creation
 - Sustainable communities

Countries/regions have established or intended biofuels mandates...



Canadian Forest Sector Snapshot



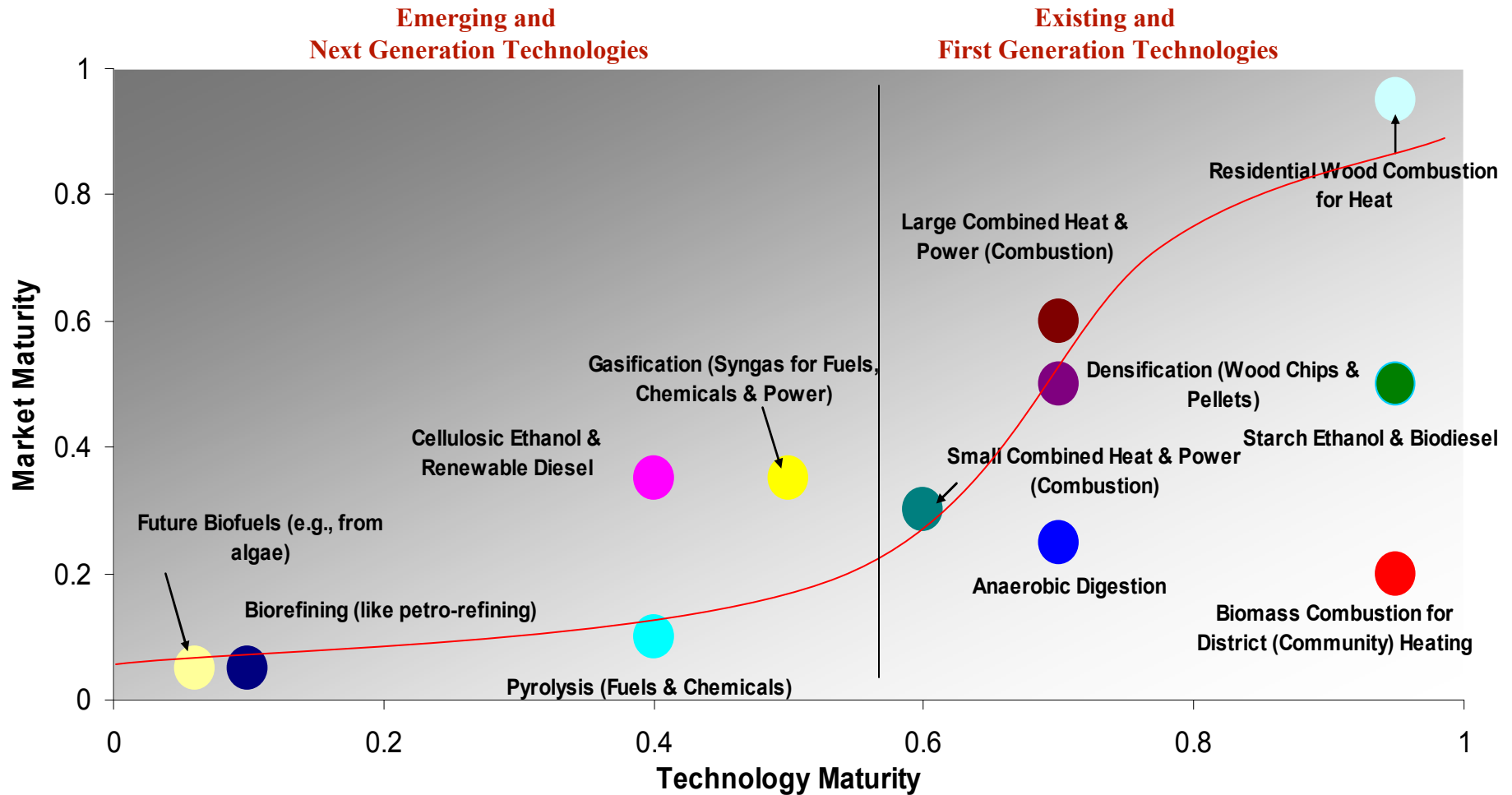
- Economic challenges in sector – both cyclical and structural:
 - Employment: 267,300 jobs in Aug 2010
 - 136,000 jobs have been lost since 2003
 - (34% decline)
 - Economy: \$24 B contribution to GDP in 2008 (in 2002 \$)
 - down from \$31 B in 2005 (in constant 2002 \$)
 - Bankruptcy of Canadian firms
 - Exports: \$30.1 B in exports in 2008 (current \$)
 - down from \$37 B in 2003 (current \$)
 - 60% decline in North American newsprint consumption since 1999, eliminating 840,000 tonnes/yr

Drivers for Transformation in the Forest Sector



- Need for a new business model
- Shift to green energy and products happening globally, nationally, regional (climate change, energy security, etc.)
 - Foreign subsidies and mandates have major impacts
- High interest in Canada in forest bioenergy ...but decisions are being made with little information
 - Harvesting licenses for biomass removal for bioenergy
 - Long-term contracts for pellet plants, to ship pellets to Europe
- Many technologies being developed and promoted
 - Need to separate fact from fiction
 - What are the best options for the sector and communities?

Bioenergy technologies are at different stages of development



Adapted concept from: OECD/ IEA 2008 report: *Deploying Renewables: Principles for Effective Policies* (Paris), p. 25 and based on NRCan expertise.

BioPathways Project



- What are the real opportunities for new technologies and emerging products from wood fibre?
- Will these new products and technologies have similar financial and socio-economic contributions compared to traditional forest products?
- How might public policies and programs help support the forest sector in this transformation?



How: Six Lines of Inquiry



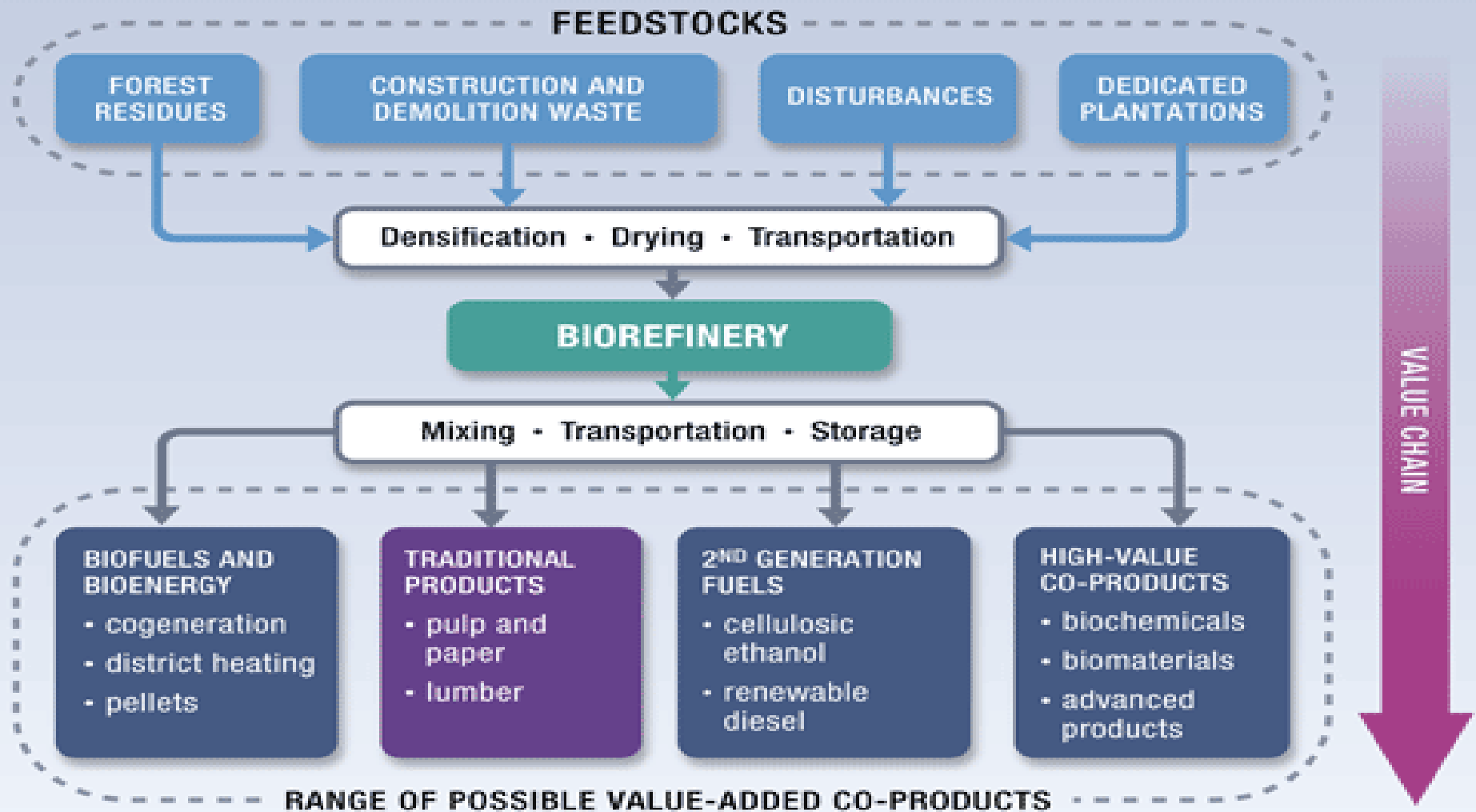
1. Assess the “market readiness” of the emerging technologies.
2. Quantify key economic, social and environmental metrics associated with the main existing and emerging bio-products;
3. Analyze economic fibre supply;
4. Examine the market potential of emerging bio-products;
5. Explore new approaches to managing the value chain and development of partnerships; and,
6. Build capacity to manage innovation in the Canadian forest products sector.

Who: Collaborative Process



- Steering Committee
 - Leadership of FPI, NRCan (CFS, Energy, CANMET), BCMF, OMNR/OMNDMF, MRNQ, Ivey Foundation and FPAC.
- Project Team
 - Co-chaired by CFS and FPAC
 - FPIinnovations
 - NRCan
 - FPAC
 - Don Roberts (CIBC)
- Selected bioenergy companies
- Large network of experts

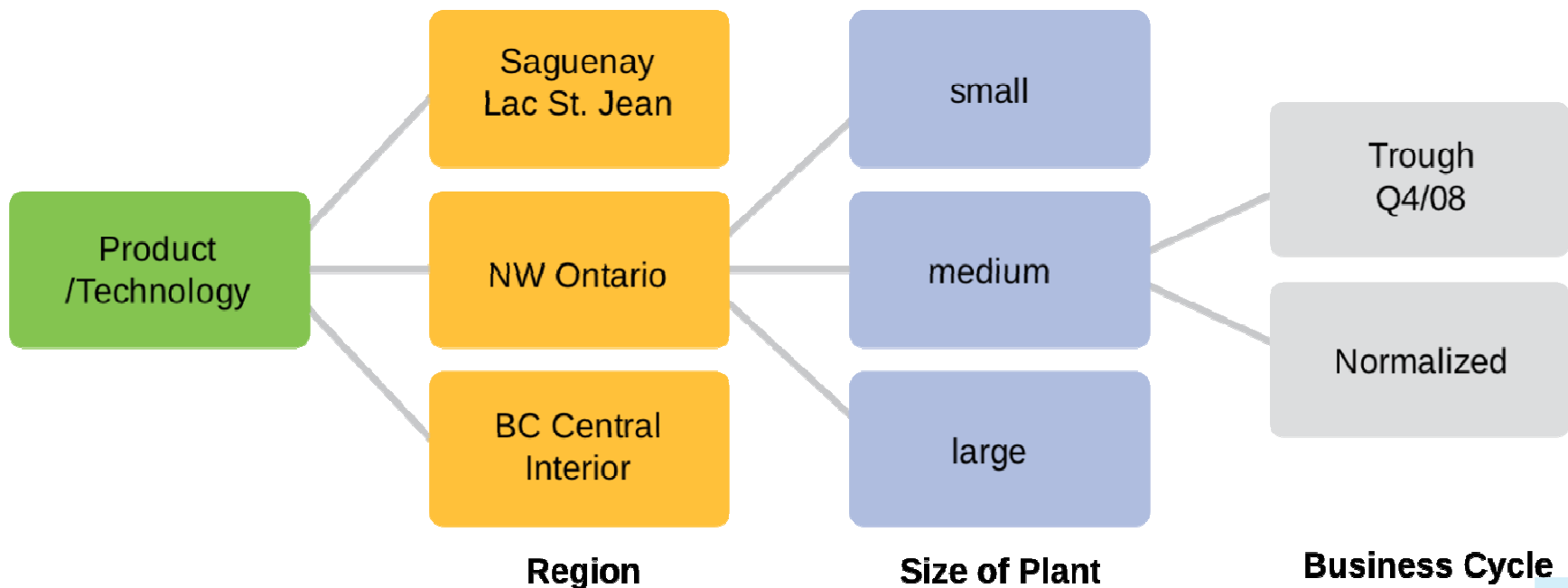
What: The Forest Biorefinery



How: Sensitivity analysis using case studies



27 Products/technologies were originally examined in the 1st Phase of the Project – 16 traditional and 11 emerging



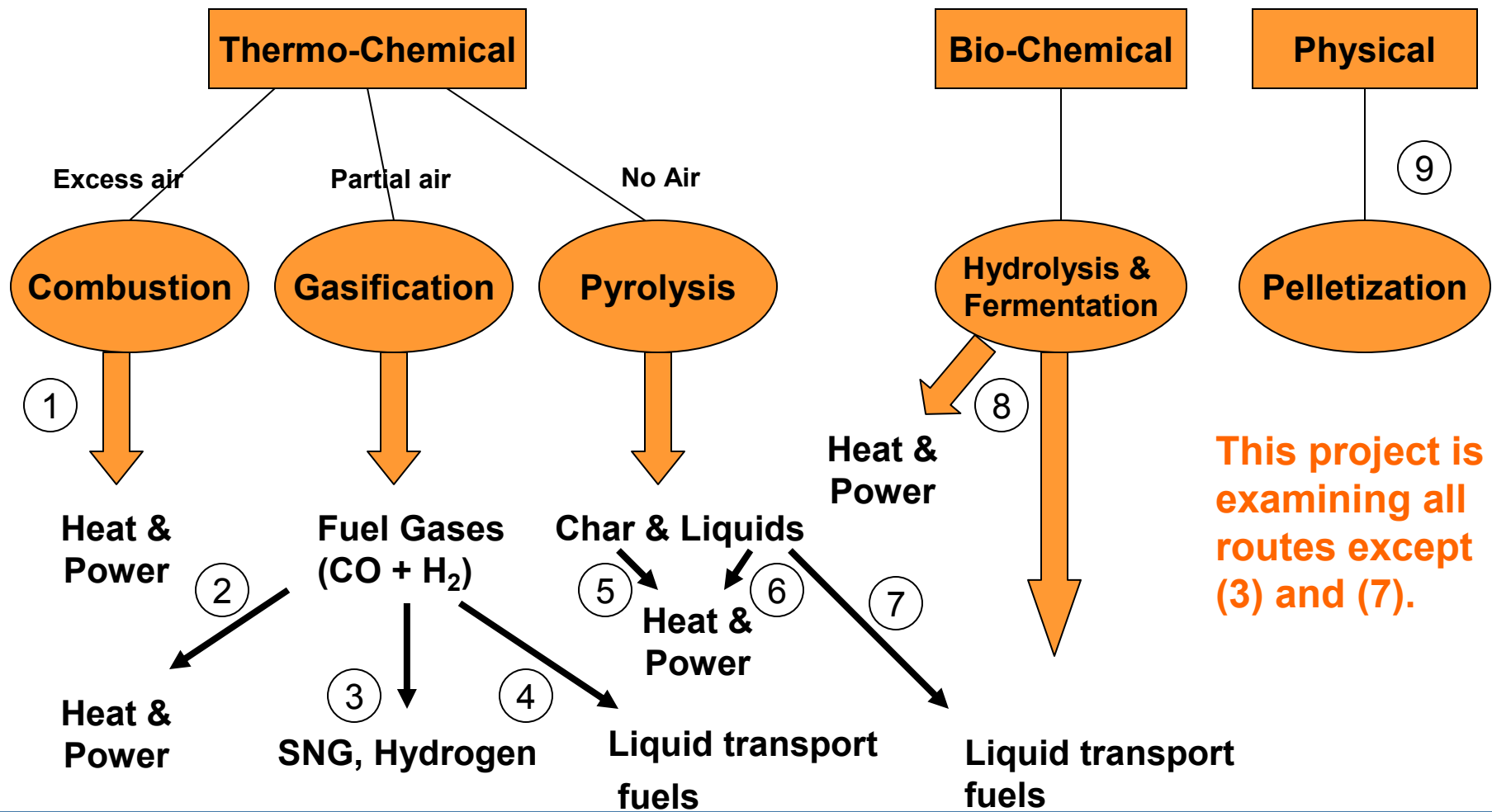
How: Metrics Analyzed



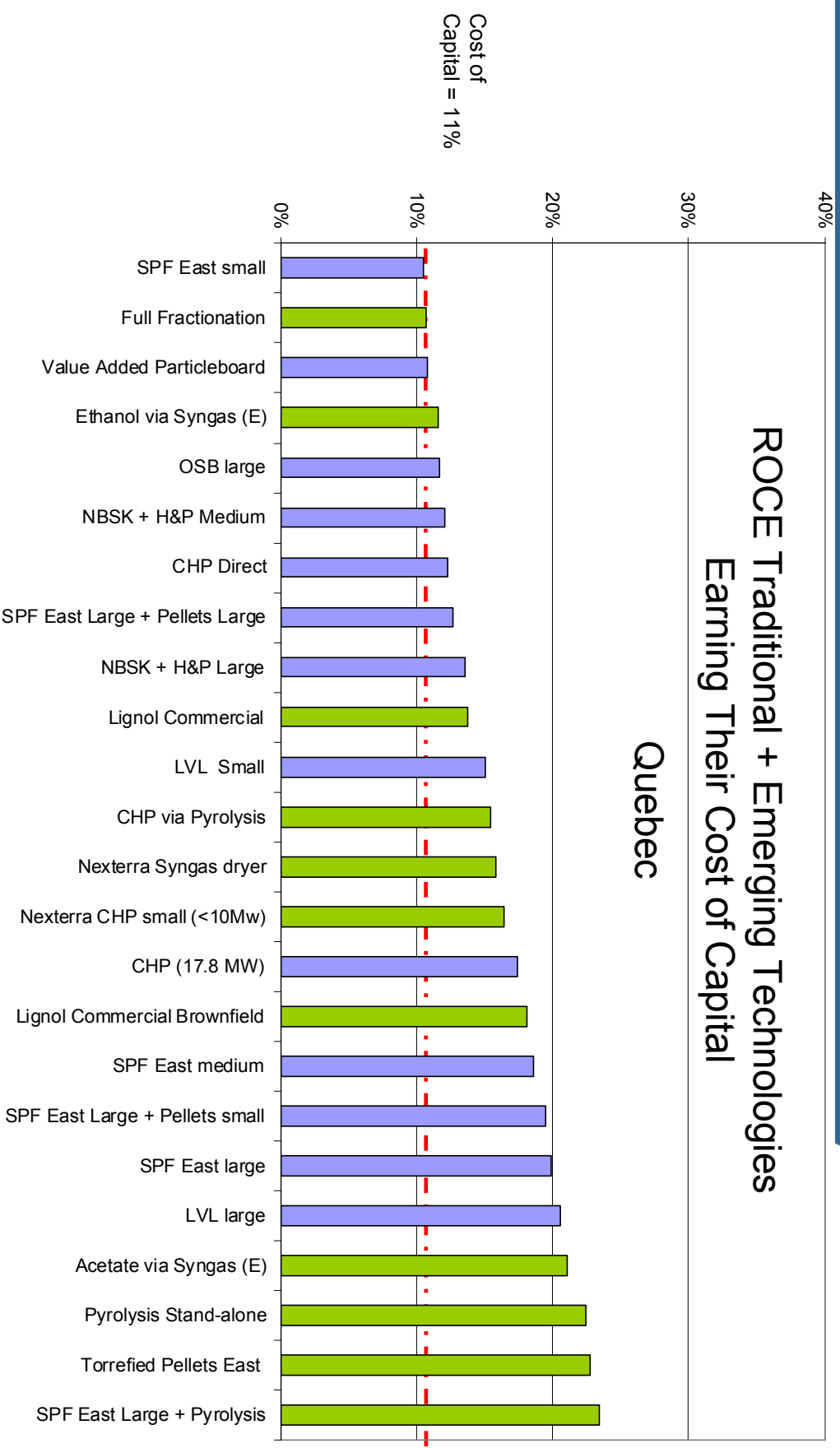
| Financial | Social | Environmental |
|-------------------|--------------------------|---|
| Revenue/ODMT | GDP Multiplier | Carbon Footprint <i>(In process)</i> |
| EBITDA/ODMT | Employment Multiplier | <i>Others to follow (LCA)</i> |
| Return on Capital | | |



How: Bioenergy Pathways Analyzed



Results: What is the best from both worlds?

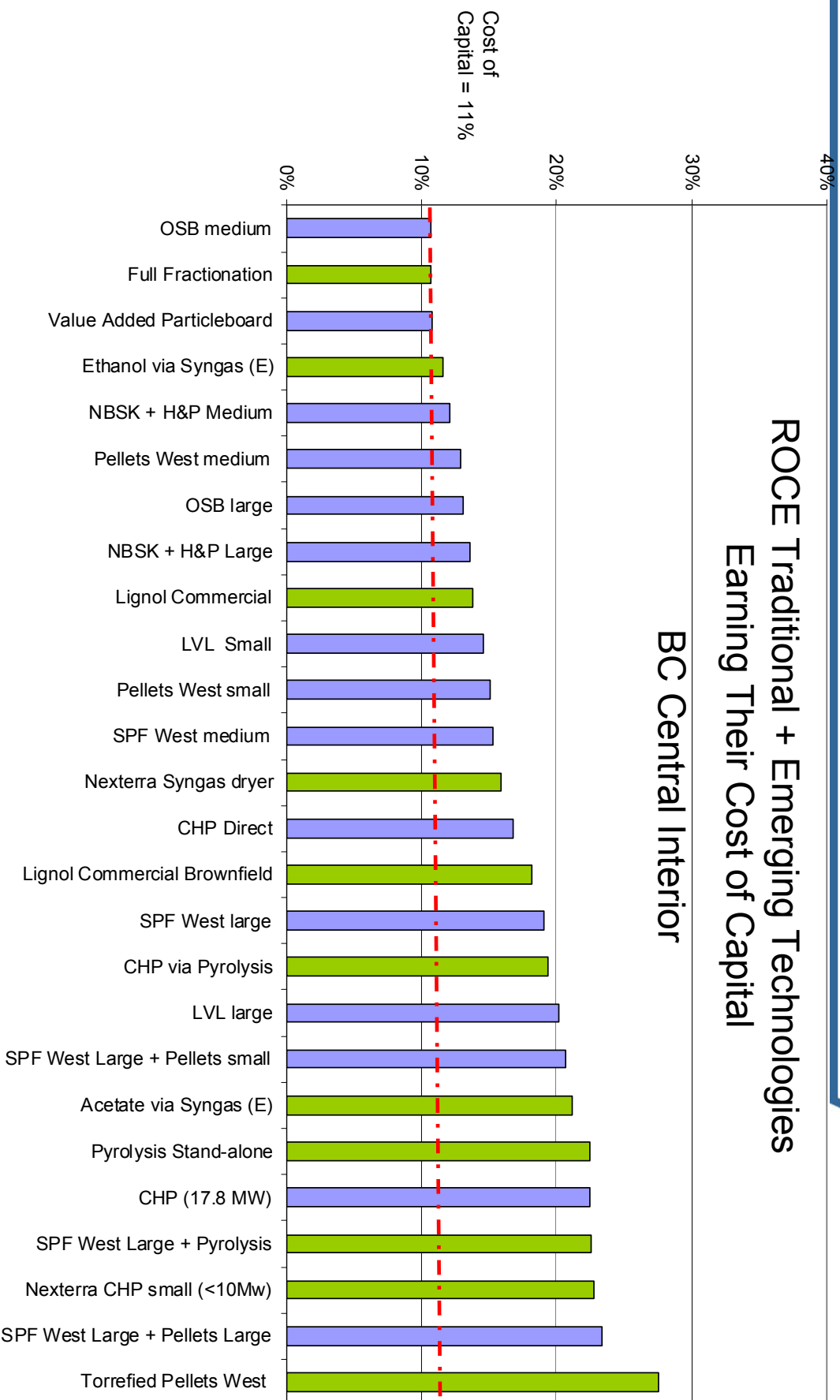


What is the best from both worlds?

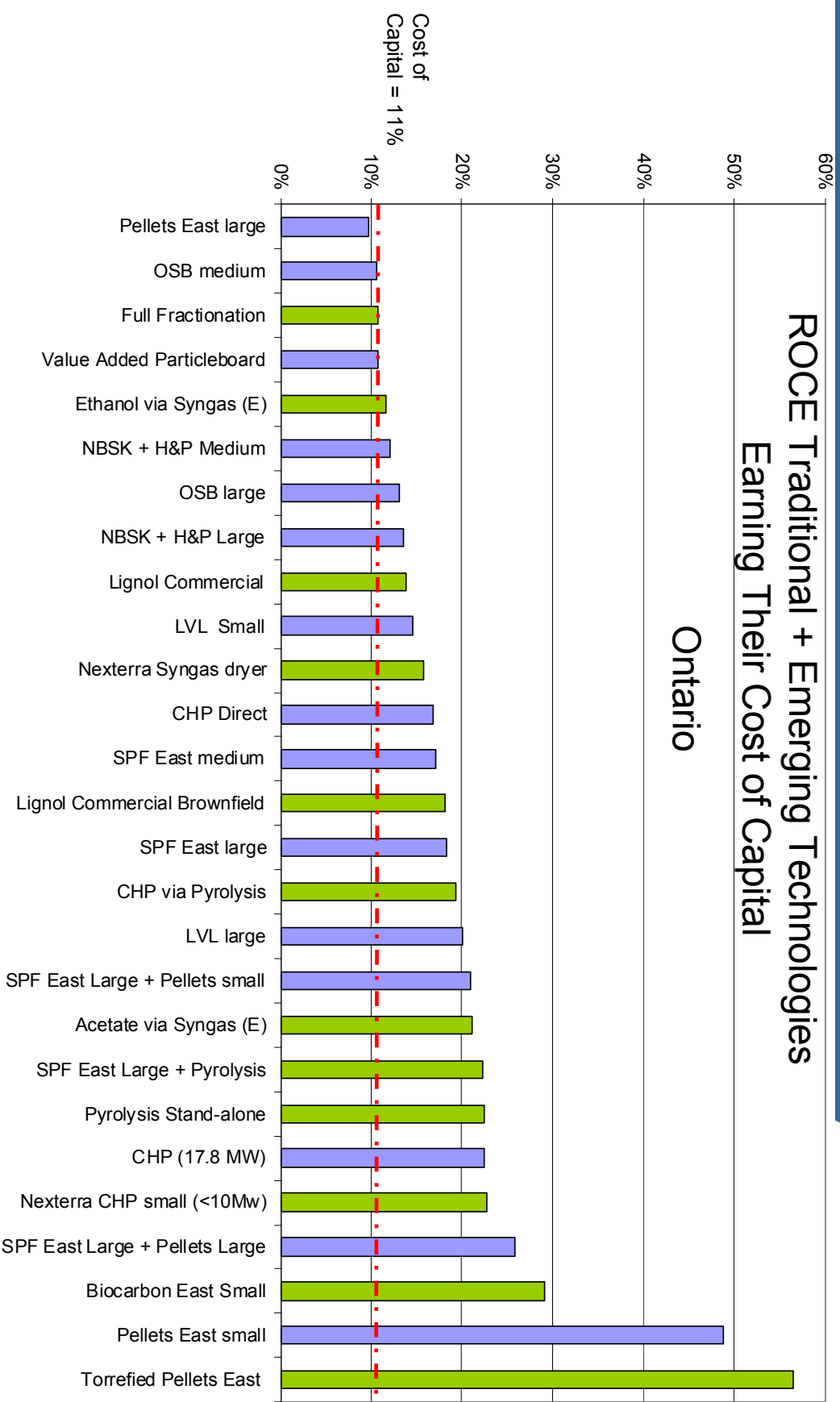


ROCE Traditional + Emerging Technologies Earning Their Cost of Capital

BC Central Interior



What is the best from both worlds?



What is the best from both worlds?



- Some of the emerging products are better, but we have to be selective.
 - E.g., Small-scale gasification and pyrolysis oil for power looks attractive, while the pure production of ethanol via the bio-chemical process does not.
- The most promising future involves:
 - solid wood mills integrated with bioenergy at the back-end
 - pulp mills evolved into biorefineries, which produce a range of pulp/bioenergy/biochemical products
- Moving to the production of commodity bioenergy products is a necessary step in the forest industry transformation
 - Commodity bioenergy should be part of the biorefinery platform (i.e. integrated facility producing a range of products)
- Increased emphasis on those higher valued bio-chemical markets in future

Standalone or Integrate?



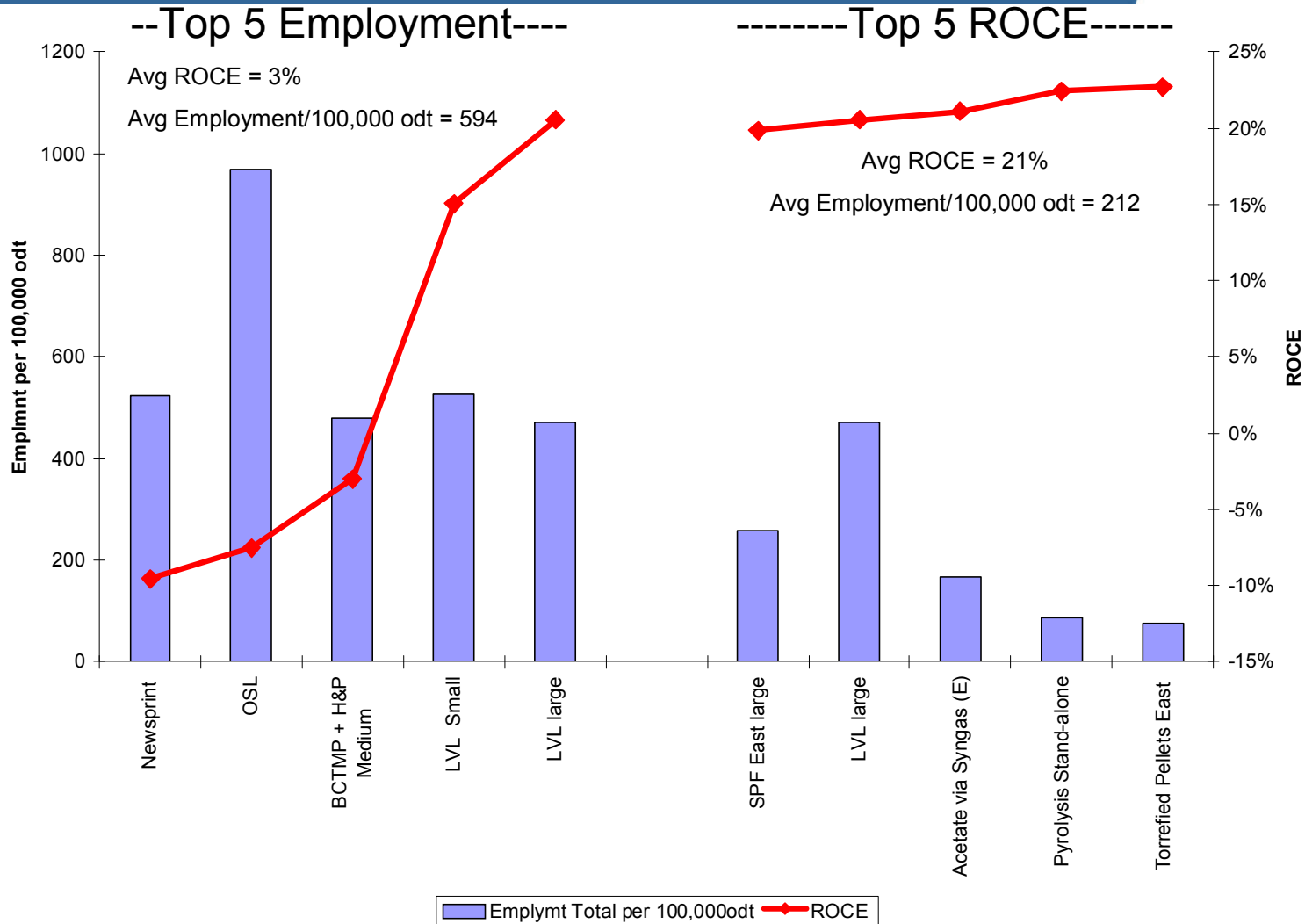
- Although there are a few exceptions, the emphasis should be on integration.
- Integration generally provides:
 - Higher ROCE
 - Higher employment base
 - More secure and lower cost supply of fibre (key issue in the capital markets.)
- Results underscores integration of new into traditional production facilities is far better for the production of both the traditional and emerging product.
- There is a compelling financial case for both the established and potential new entrant to co-operate.

General Bio-energy Strategy?



- Simply selling bioenergy is generally not good enough in the long-run.
- However, selling bioenergy may still make sense in the long-term if:
 - If it is one of a series of products that are jointly produced in a bio-refinery.
 - You are operating in a special environment characterized by:
 - Low delivered cost of biomass
 - High price for electricity.
- The best value will be created if you can exploit bio-energy's “battery-pack” and “optionality.”
- The threat is that the competitiveness of bio-energy relative to other sources of renewable energy is expected to deteriorate over time.

Is There a Trade-off Between Financial Returns and Employment?



Carbon Analysis



- Purpose
 - Provide mill-level analysis for investment decisions
 - Provide product-level analysis for comparison with current products (e.g., fuels, power, structural products)

- Methodology
 - Direct
 - NG, Oil, other fossil fuels
 - Conversion carbon emissions (e.g., lime kilns, enzymes)
 - Indirect
 - Electricity – varies by province
 - Fibre supply model – harvest, transportation
 - Other – LCA, carbon multiplier, sensitivity analysis

Biopathways: Key Take Home Messages



- The future of the industry lies in integrating new technology into the existing sector rather than replacing it
- New and emerging technologies offer some promising opportunities but no silver bullets
- Bioenergy is only part of the story – with higher-value co-products being more promising & sustainable over the longer term
- The long -term viability of some traditional products in Canada is surprisingly strong
- A functioning, healthy solid wood sector is key...turning low-cost waste residues into diverse higher valued product streams
- There are tradeoffs in financial vs. socio-economic benefits and environmental indicators of different products/technologies

Implications for Public Policy



- Sector renewal will require a new business model as well as technological innovation on the part of the industry
 - Programs and policies should encourage new partnerships between the forest sector and energy, chemical and technology firms.
- Future of the industry likely lies with a mix of traditional and emerging products
 - Maintaining a viable lumber sector key
- Support for particular technologies or products can have unintended consequences on environmental and regional development objectives
 - Choosing winners and losers is a risky business (technologies, jobs)
- Investors will require sustainability of fibre supply...
 - Need to ensure environmental sustainability if we increase removals from forest
 - May require broadening of definition of forest sector

Canadian Federal Support for Forest-sector Transformation



- Transformative Technologies – Pilot-scale demonstration (TT-PSD: Can\$40M)
 - Support development of technologies at the pilot stage
- Investments in Forest Industry Transformation (IFIT: Can\$100M)
 - Support for demo to pre-commercial technologies and partnerships with non-traditional industries
- Pulp and Paper Green Transformation Program (PPGTP: Can\$1B)
 - Supports “green” investments, including energy efficiency, renewable energy, etc.

Next Steps - Lines of Inquiry 4-6



4. Examine the market potential of emerging bio-products;
 - Levelised cost of energy vs. other renewables
 - Foreign markets and competition

5. Explore new approaches to managing the value chain and development of partnerships; and
 - Cost reduction and logistics optimization

6. Build capacity to manage innovation in the Canadian forest products sector.

Thank you



Questions/Comments?

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