

What is Built in Canada: Capital, Risk, and the Forest-Based Bioeconomy

By

**Don Roberts,
CEO, Nawitka Capital Advisors Ltd.**

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Five Questions

- 1** What are the “good” forest product businesses?
- 2** What drives investment?
- 3** What is the process for Project Finance?
- 4** How confident are you in your Cap Ex estimates?
- 5** Canadian Investment Summit Deal Book: How do the forest sector projects score?

So What?



QUESTION 1:

WHAT ARE THE “GOOD” FOREST PRODUCT BUSINESSES?



The Business Fundamentals

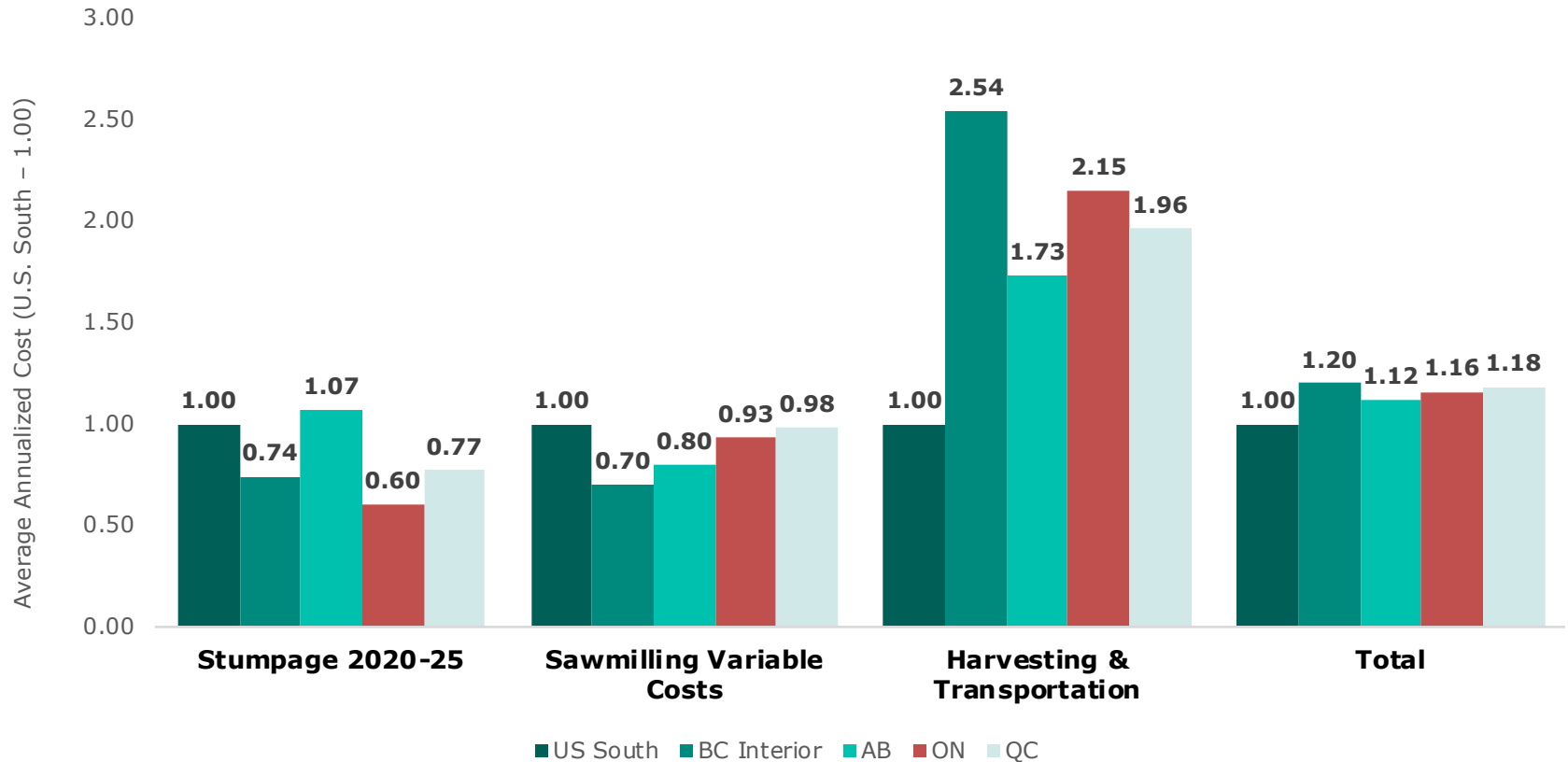
- **Lumber** remains a fundamentally viable long-term business due to a significant structural deficit in housing, but relative cost is critical.
- **Communications paper** is in terminal decline, but demand for **packaging & tissue** continues to grow. However, global markets remain plagued by over-capacity in almost all grades of paper.
- **NBSK Market pulp** is becoming a niche product.....and **BCTMP** is even more challenged. Expect a lot more mill closures unless additional revenue streams can be generated.
- **Bio-based Alternatives to Fossil-based commodities**.....only competitive if we can monetize the value of renewable carbon. Public policy is critical, but mixed signals are being sent.
 - BioPower
 - Liquid transportation fuels
 - Bio-Chemicals
 - Biomaterials (eg., biochar)
 - BECCS

We need serious innovation in the Canadian forest sector in a number of dimensions.

The status quo is a dismal option.



Exhibit 1: Average Regional Sawmill Costs (2020-2025)

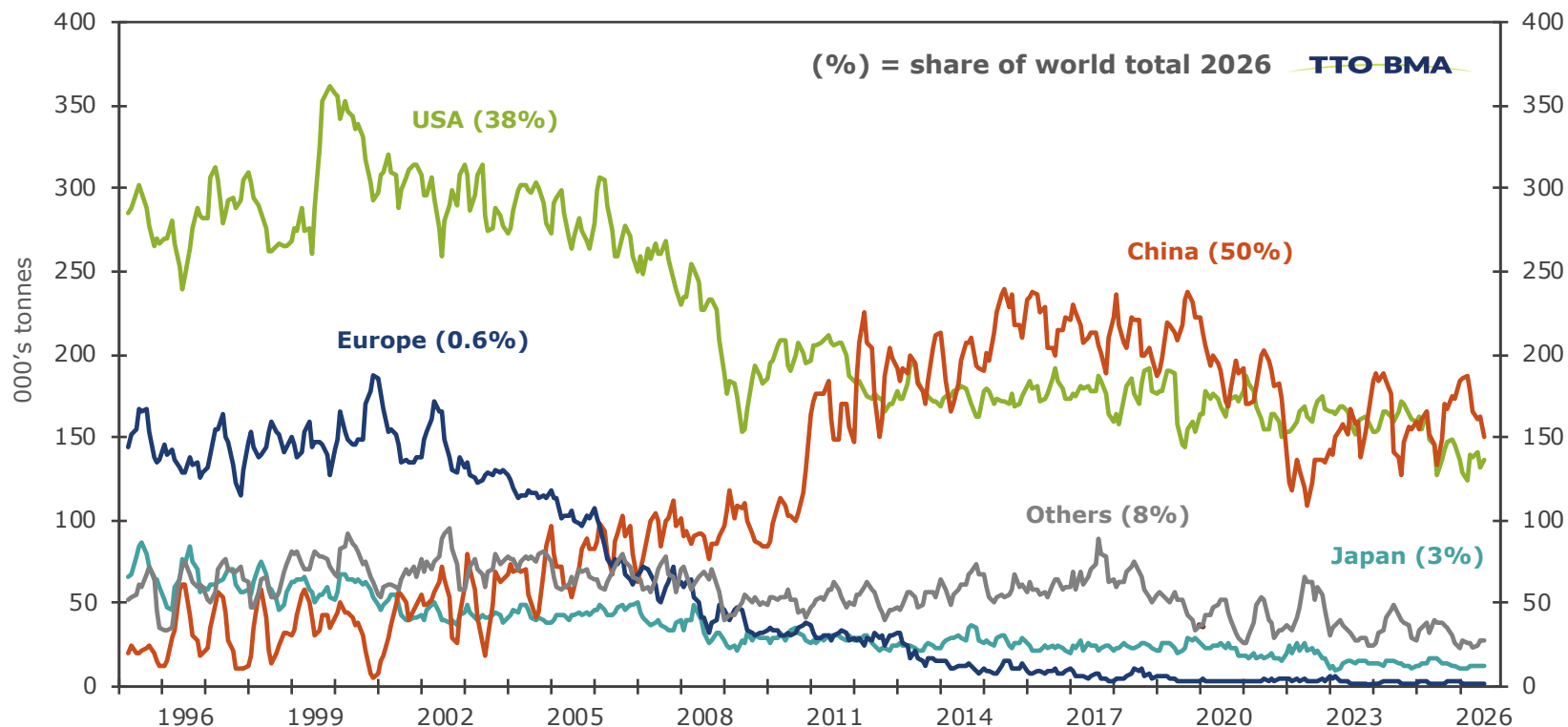


- Canada's cost of producing lumber is too high.
- B.C. Interior is the worst, with harvesting & transportation costs >2.5x those in the U.S. South.



Source: Canadian Forest Sector Transformation Task Force, 2026

Exhibit 2: Canada's Monthly NBSK Exports by Destination



- Decreased Canadian exports of NBSK largely reflect competition from South American and Asian pulp, and improved cooking, washing, fractionation & fibre refining in China which decreases the need for NBSK.
- Could we see Canadian NBSK exports to China return to their levels in the late 1990s? If so, it has significant implications for the whole Canadian forest sector.



Source: TTO BMA.

Data Centres

The single “hot-spot” in the forest sector for investors? Data Centres.

What are Hyperscalers* looking for?

Sites with existing infrastructure that accelerates time to power generation, at scale

- Quick power ramp of 50+MW (within 12-36 months), with phased additional build-out to 100MW?/500MW?/1GW? potential over time.
- Land - Hundreds of acres in rural locations, room to scale; often adjacent parcels nearby.
- Water – Industrial water rights secured and permitted; often surface water.
- Grid interconnection - existing grid ties for speed to power.
- Zoning & permits – industrial entitlements in place today.
- Fibre Optics – reasonable proximity to fibre infrastructure.
- Community – located near communities that are receptive.

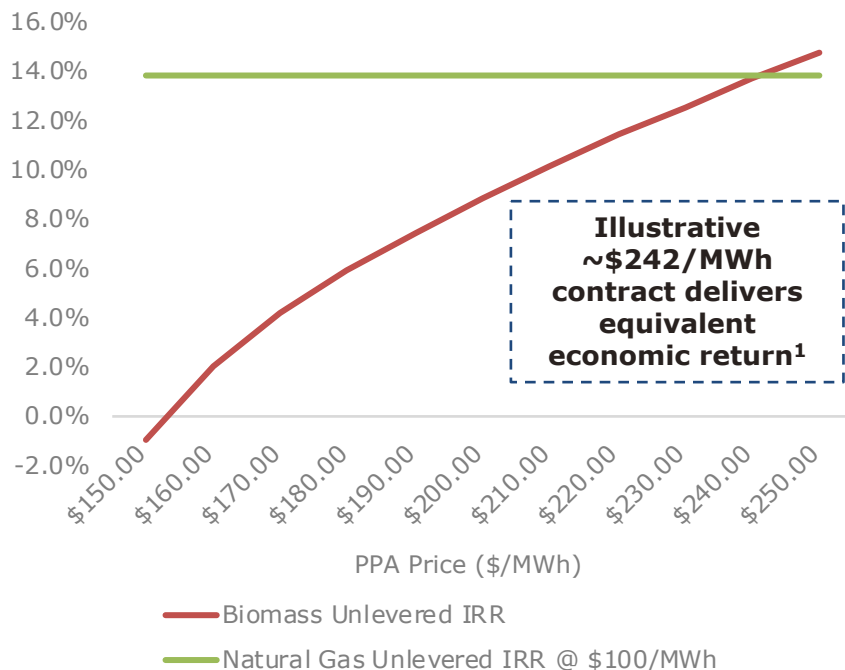


Pulp mills are quite unique – they meet most of these criteria.

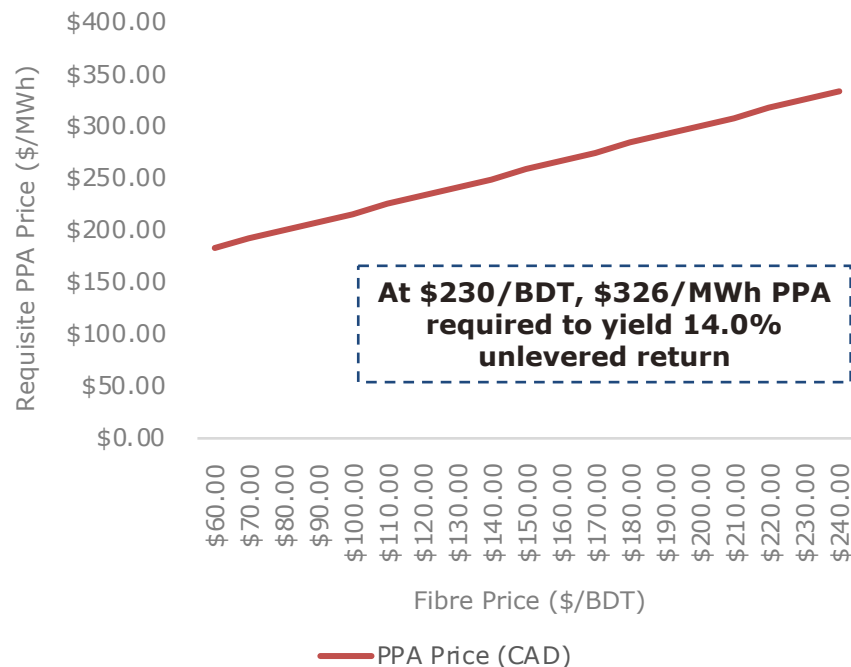
* The big 5 hyperscalers are Amazon, Microsoft, Google, Meta and Oracle

Exhibit 3: Revenue Requirements for New Biomass Power Projects

Biomass PPA Pricing to Yield Equivalent Economic Return vs. Natural Gas Generation (50 MW)



Biomass PPA Pricing Relative to Fibre Pricing to Yield 14.0% Unlevered IRR



Note: All figures in Canadian Dollars. Revenue and cost items assumed to escalate at 3% inflation over a 30-year asset life.

Natural gas modeled at \$2.25/MMBtu + \$0.26 transport differential for illustrative Alberta project. Fibre modeled at \$130/BDT. Natural gas case contemplates Alberta TIER carbon penalty of approximately \$20/MWh. Biomass projects exclude incremental revenue from RECs or TIER.



Source: C0280

Data Centres: Biopower vs Natural Gas

Economics of Biopower CHP vs Natural Gas CHP?*

- Delivered cost of \$110-\$150/BDT drives a Levelized Cost of Electricity (LCOE) of \$311-364/MWh vs \$136-\$143 /MWh for natural gas, with a delivered cost of \$2.00-\$2.50/MMBtu +\$0.26 transport.
- Midpoint unlevered IRR of ~4% for biopower is 1000 bps below the ~14% hurdle rate for alternative power (eg., natural gas)
- To deliver the same unlevered IRR as a Natural Gas CHP:
 - Given a delivered biomass cost of \$130/BDT, a PPA of ~\$242 /MWh is needed (excluding RECs).
 - Given a current delivered wood pellet price of ~\$230/BDT, a PPA of \$326/MWh (excluding RECs) is needed.

Biopower cannot compete if not supported.....and pellets will likely be one of the last forms of biomass to be used.



*Source: CO280

QUESTION 2:
WHAT DRIVES INVESTMENT?

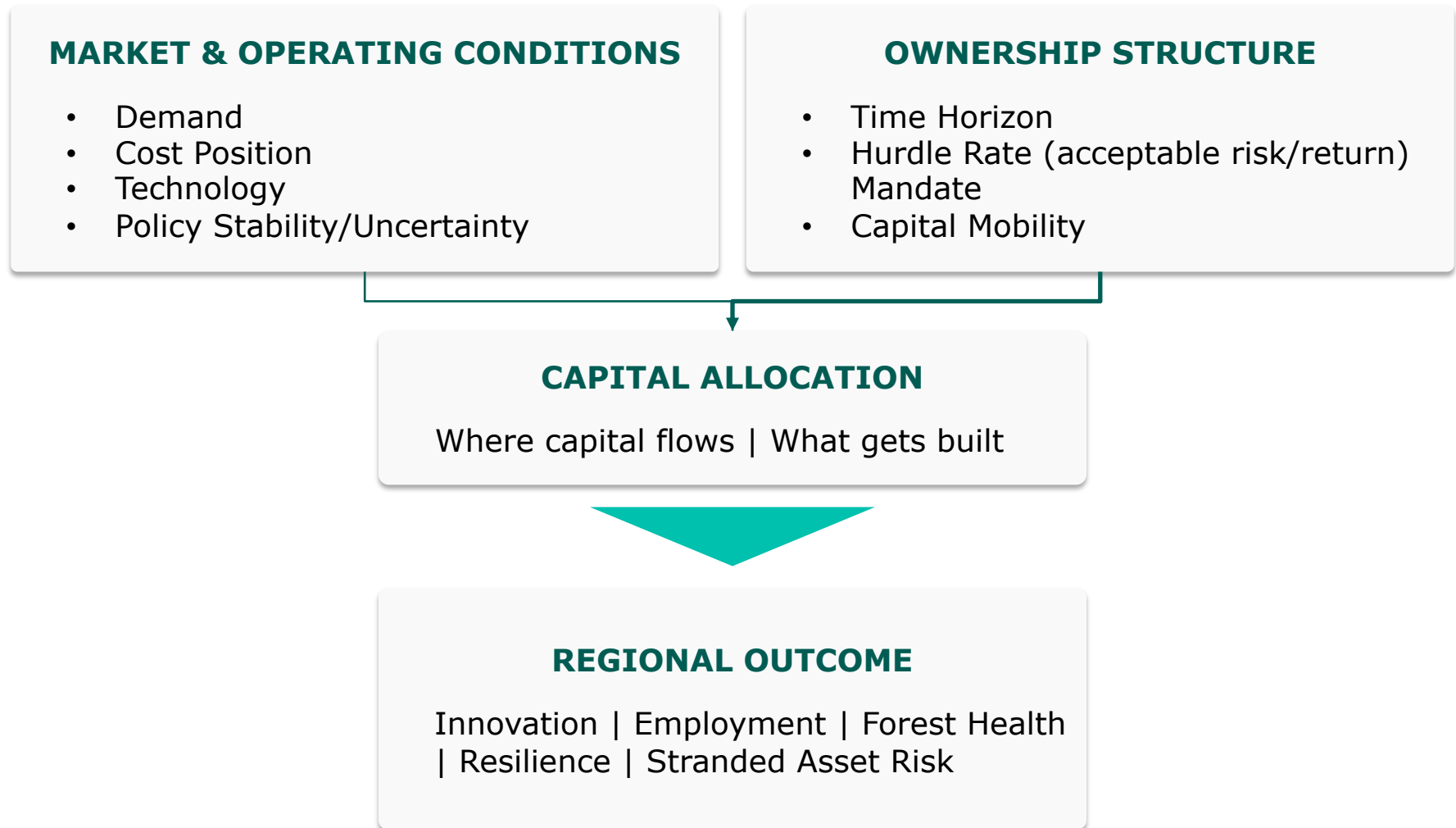


What Drives Investment?

- 1 Solid business case
- 2 Strength of balance sheets
- 3 Cost of capital
- 4 Execution strength of management
- 5 Ownership



Exhibit 4: Investment is Influenced by Many Factors



Market forces determine which projects are economically viable. Ownership structure influences where capital is deployed when viable opportunities exist. Together, they drive capital allocation & regional outcomes.

Thought Process

- Capital allocation is an important driver of regional innovation outcomes.
- Ownership structure influences the mandate, time horizon, capital mobility, and hurdle rate of investors. All four factors influence the allocation of capital over time.



Bottom Line:

The argument is not that ownership overrides economics —it is that ownership influences how economics are acted upon.

Ownership is especially relevant when there is a need for innovative (and riskier) investments.



Types of Forest Owners

Aside from Canada, the three major countries with essentially all of their forest land under government ownership are **Russia, China and Indonesia.**

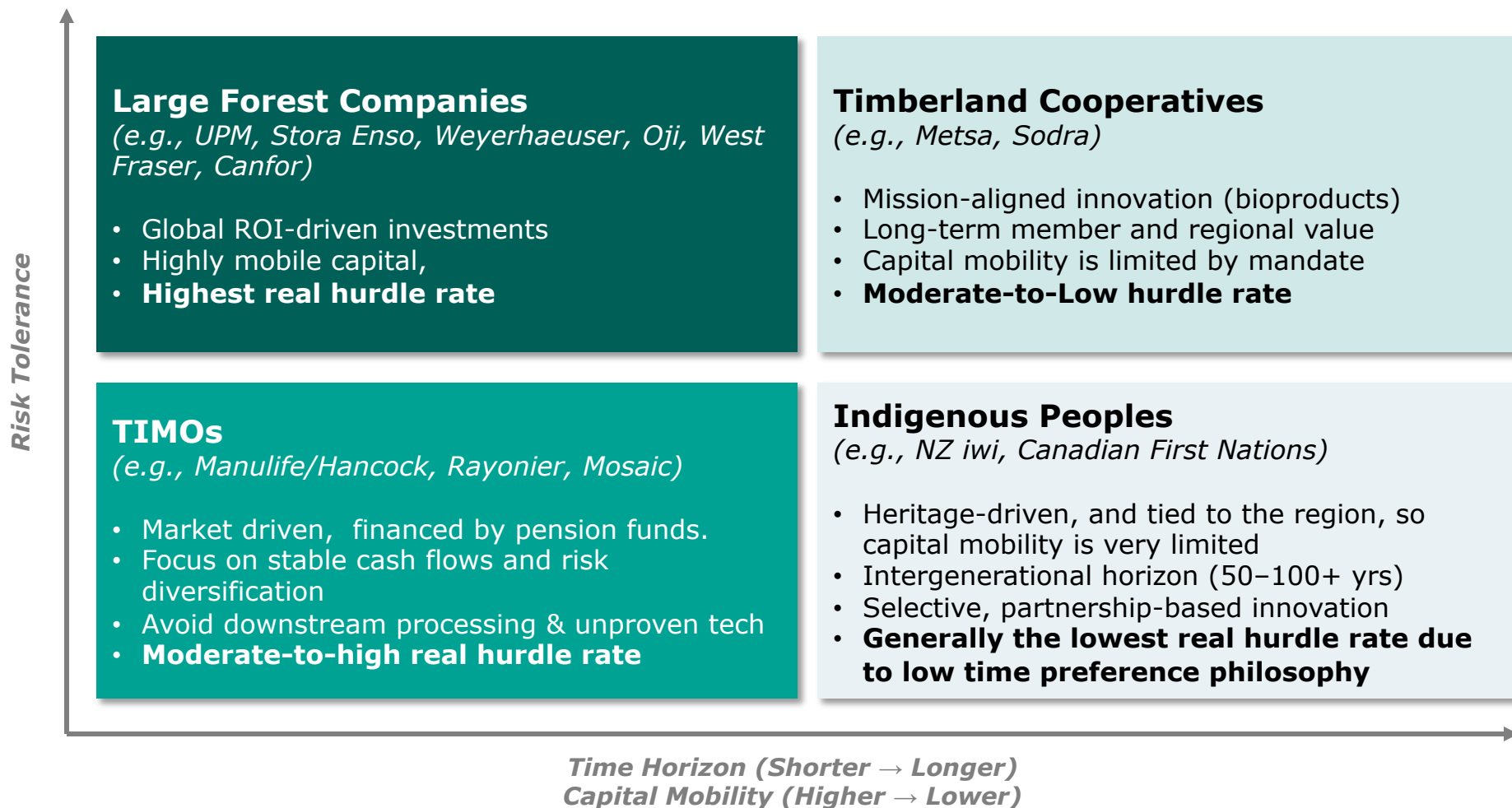
- Forest management in all four is below average.

Lessons to be learned from outside Canada? Consider four other types of forest owners:

- 1 Large publicly traded companies
- 2 Timberland Investment Mgmt. Organizations (TIMOs)
- 3 Timberland Cooperatives
- 4 Indigenous Peoples/Local Communities



Exhibit 5: Investment Behavior Matrix - Timberland Ownership Types



Moving from bottom-left to top-right, actors integrate both innovation capacity and the long-term sustainability of the local forest economy.



Case Study:

Investment Behavior of Scandinavian Companies

- Some large publicly traded forest companies are developing innovative & high-value-added projects. However, like their counterparts in Canada, they are **still focusing mainly on their traditional commodity products and shifting to lower-cost regions**. For UPM:
 - Invested ~US\$3.5B in new pulp mill & plantations in Uruguay
 - Continuing to sell its timberland in Scandinavia.
- Large Cooperative Timberland Owners are acting differently.
 - **To maintain demand for their wood in response to changes in global markets, they are incentivized to make innovative investments in local downstream processing**
 - **Far higher % of total capex is invested locally** Metsa invested ~US\$7B in Scandinavia since 2015, including ~US\$4.5B on two innovative pulp mill/biorefinery complexes in Finland.
 - Such investment options may not meet the risk/return criteria of the publicly traded companies, but it **helps stop their forests from becoming stranded assets**.



Canadian Context: An Institutional Design Problem

Under the current model, **asset ownership and downstream profitability are institutionally separated.**

- Government ownership tends to accommodate the **broad scope of stakeholder interests** in the Province and has multiple objectives which shift over time.
- Although they own the forest asset, they do not bear the industrial downside directly. They also **don't generally see the forest as an "asset"**.
- **The problem is not incompetence. It is institutional design.** Governments are asset regulators, not industrial capital allocators. The design problem is structural, not political.
- Even if overregulation can be reduced for a period, **there is built-in pressure for the pendulum to shift back.**
- **Changes in the governance & control of the forest asset is recommended to better align incentives for investment in the local forest economy.**



QUESTION 3:

WHAT IS THE PROCESS FOR PROJECT FINANCE?



The FID Roadmap & Timeline

Months 1–12: Feasibility & Pre-Development

- Conduct Pre-FEED engineering, initiate site selection, launch Environmental & Social Impact Assessments (ESIAs), and formulate core commercial framework/offtake MOUs.
- Engagement with local First Nations should be initiated in this initial stage.

Months 12–24: Detailed Engineering & Structuring

- Finalize Front-End Engineering Design (FEED) to narrow asset cost estimates, tender/negotiate fixed-price turnkey EPC contracts, and launch the bank Information Memorandum (IM).

Months 24–36: Due Diligence & Final Board Approval

- Engage lenders to trigger independent audits (Technical, Legal, Environmental). Secure formal credit approvals, finalize loan docs, and submit proposal to the Board for the final FID vote.



Equity & Debt Sourcing Timeline

Equity Providers (Strategic & Financial Investors):

- Engage 12 to 18 months before target FID.
- Rationale: External equity partners require early seats at the table to shape the EPC framework, technology choices, and long-term offtake strategy.

Senior Debt Providers (Commercial Banks & DFIs):

- Engage 9 to 12 months before target FID.
- Rationale: Requires stable project architecture (FEED finalized, advanced offtake term sheets) to initiate a rigorous 6-to-9-month independent due diligence cycle.

Key Strategic Balance:

- Approaching financiers too early wastes resources on an unrefined project package;
- Approaching them too late introduces significant delays to the construction timeline.



The Financial Architecture of FID

Ring-Fenced Project Cash Flows:

- Senior lenders focus on downstream cash flow predictability and debt service capability, rather than relying on the sponsor's corporate balance sheet strength.

Debt Sizing Metrics:

- Lenders evaluate Debt Service Coverage Ratio (DSCR) to establish cash cushions during operations, and Loan Life Coverage Ratio (LLCR) to ensure long-term coverage over the loan duration.

Comprehensive Security Package:

- Requires a first-priority lien on all physical plant assets, land tenure rights, project bank accounts, and a direct, clean assignment of all Offtake and Feedstock contracts to the lender syndicate.



Bankability Metrics: Traditional vs Emerging Technologies

Leverage (Debt/Equity Gearing Ratio):

- Traditional forest products leverage ranges from 65/35 to 75/25.
- Advanced biomaterials/biofuels drop to 40/60 or 55/45 due to technology and performance risks requiring heavier equity cushions.

Target Operational Debt Service Coverage Ratio (DSCR):

- Traditional projects require a lean 1.25x – 1.35x.
- Advanced bio-refineries demand a strict 1.50x – 1.75x+ for contracted revenue, escalating past 2.00x for any uncontracted merchant or spot market exposure.

Debt Tenor & Revenue Certainty:

- Traditional debt tenors run 10–15 years, matching long asset lifecycles under liquid spot markets.
- Advanced bio-debt is limited to 7–10 years and often bounded by 10+ year 'Take-or-Pay' offtake contracts.



The Due Diligence Gatekeepers

The Independent Engineer (IE) Report:

- A lender-appointed expert firm audits your FEED study, CapEx contingency allocations, and scale-up timelines. A clean, un-qualified IE report represents an absolute Condition Precedent (CP) to closing.

Independent Biomass Catchment Study:

- Third-party foresters verify absolute physical feedstock volumes, local competition, and hauling economics. Bankability requires a sustainable regional 'Buffer Ratio' of 2x to 3x the plant's annual consumption.
- BDO Zone ratings can summarize a wide range of relevant variables.

Independent Market & Regulatory Audit:

- Validates structural long-term supply/demand curves and the stability of green compliance credit compliance values (e.g., SAF mandates, LCFS, CFR). Lenders heavily haircut uncontracted revenues.



Bridging the Advanced Project Financing Gap

Government Debt Support:

- Utilize state-backed platforms (e.g., EDC, Canada Infrastructure Bank, Canada Growth Fund) to absorb early-stage process technology or shifting regulatory policy risks, restoring commercial banking appetite.
- Investment Tax Credits (eg., Federal 30% for Clean Technologies & 50% for BECCS) play an important role.

Strategic Off-taker Equity Alliances:

- Bring in creditworthy downstream corporate buyers (e.g., airlines for SAF, industrial chemical majors) as equity co-investors to signal commercial alignment and guarantee long-term revenue streams.

Technology Performance Wraps:

- Secure specialized process technology insurance or comprehensive balance-sheet guarantees from Tier-1 engineering vendors to isolate scale-up performance risk during early operations.



The Technical Checklist for FID

Engineering Data Baseline:

- FEED Study finalized to a Class 2/3 cost estimate providing +/- 10% to 15% budget accuracy. Technology Readiness Assessment (TRA) supported by pilot/demonstration data proving scalability.

Wrapped Construction & Inputs:

- EPC contract fully negotiated as a fixed-price, turnkey wrapped structure with robust liquidated damages. Feedstock catchment study proving a minimum 2x sustainable volume buffer.

Environmental & Clearance Audits:

- All critical path permits executed.
- Environmental & Social Impact Assessment (ESIA) completed and verified as fully compliant with international Equator Principles and IFC Performance Standards.



QUESTION 4:

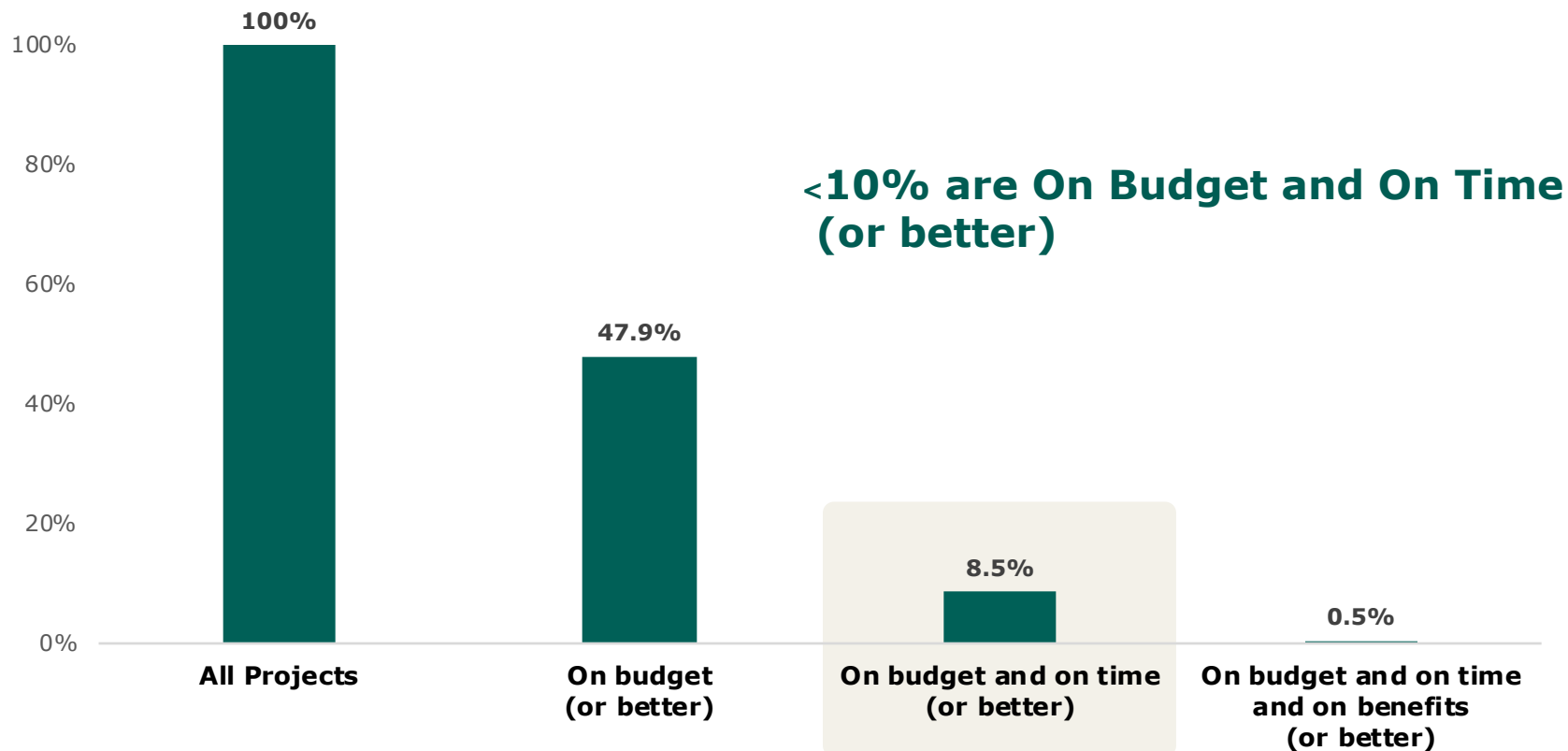
**HOW CONFIDENT ARE YOU IN YOUR CAPITAL EXPENDITURE
ESTIMATE?**



Exhibit 6: Track-Record of Cap Ex Estimates?

The Iron Law of Project Management:

"Over Budget, Over Time, Under Benefits, Over and Over Again"



Postmortem done on 16,000+ projects in 136 countries by Flyvbjerg's team at Oxford University. Reflects cap ex estimate at FID and expressed in real dollars.



Source: How Big Things Get Done, by Bent Flyvbjerg and Dan Gardner, 2023

Exhibit 7: Cap Ex Overruns Are the Norm

Project Type	Mean Cost Overrun (%)	% of Projects in Tail (>50% Overrun)	Mean Overrun of Projects in Tail (%)
Hydro Dams	75	37	186
Nuclear Power	120	55	204
Oil & Gas	34	19	121
Solar	1	2	50

- Flyvbjerg's Team broke the 16,000+ projects into 25 categories, with 4 representative categories summarized above.
- Represents base rates for cost risk in project management, and there is great variation across categories; **more “fat-tailed” distributions in cap ex estimates than we acknowledge – especially for emerging technologies.**
- Eg., if you’re planning an oil & gas refinery (which is your best reference for a bio-refinery), **your base rate (expected value) for cost overrun is ~35%, with a ~20% chance of ending up in the tail with an expected cost over run of ~120%.**

– Can you afford this escalation? How can you reduce the risk?



Source: How Big Things Get Done, by Bent Flyvbjerg and Dan Gardner, 2023

QUESTION 5:

**HOW DO THE FOREST SECTOR PROJECTS SCORE IN THE
CANADIAN INVESTMENT SUMMIT DEAL BOOK?**



Exhibit 8: Canadian Investment Summit Prospectus: A Report Card

Tier A

plausible FID candidates / relatively de-risked

Tier B

credible projects, but with a major commercial or financing hurdle remaining

Tier C

potentially important projects, but with substantial technology-integration and/or project-development risk

Tier D

still essentially development propositions

Of the over 160 projects, how many are related to the forest sector, and how do they “score”?

4 BECCS projects:

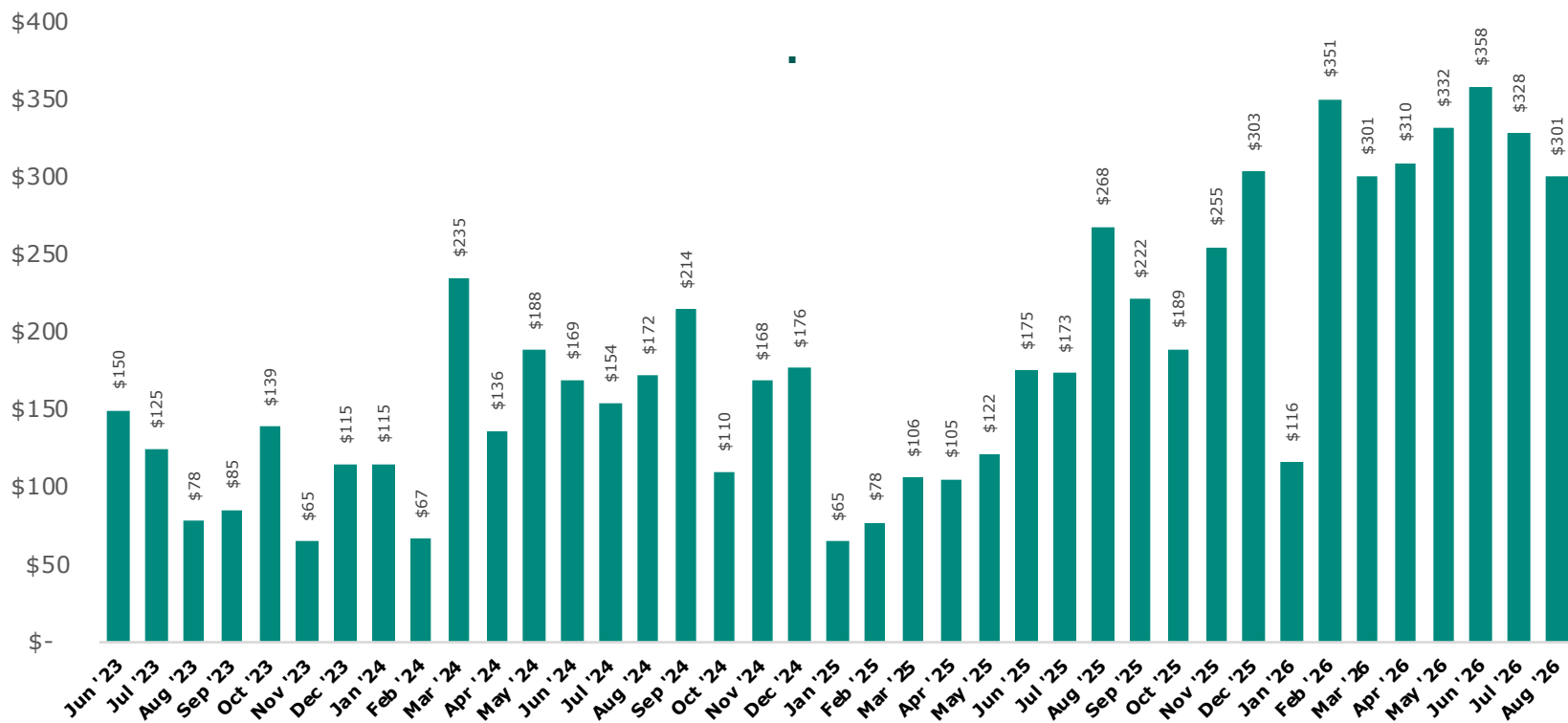
None are in Tier A; 4 are in either Tier B or C.

13 Advanced Biofuels Projects (most focus on SAF):

4 in Tier A; 4 in Tier B, 2 in Tier C and 3 in Tier D.



Exhibit 9: Canadian Fuel Regulation (CFR) Credit Prices



- The **CFR credit market is one of the country's most valuable carbon pricing mechanisms** to support the commercial viability of low carbon projects. Currently used to support the production of low carbon biofuels for transportation and heating.
- CCS tied to the fossil fuel supply chain is integrated into the CFR, but **Carbon Dioxide Removal (CDR)** technologies—such as Bioenergy with Carbon Capture and Storage (BECCS)—that actively pull carbon from the atmosphere rather than a fossil fuel stream **are excluded from generating CFR credits**. Should the scope of the CFR be expanded to include CDR technologies? Impact on credit prices?



Source: ECCC Data Catalogue

So What?

What do we need to do if we want to create a commercially viable forest sector in Canada?

1. Significantly reduce harvesting & transportation costs so our Delivered Wood Costs become internationally competitive.
2. Institute public policies that correct the private markets' failure to price the externalities caused by using carbon. Investors must be able to monetize the social value of using renewable carbon.
3. Recognize the technical, market and policy risks associated with the deployment of emerging bio-based products at scale, and systematically mitigate them.

Given the quality of the projects related to the forest sector in the Summit “Deal Book”, we need to “up our game” wrt developing projects for FID.

There is no easy solution to the challenges facing the Canadian forest industry.....and it has no God-given right to survive.



THANK YOU

