Resource Costs

Technical Working Group Meeting 8

July 28, 2026

dunsky Energy + Climate

IESO NOVA SCOTIA

Agenda

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Today:

- **Storage:**
  - Updated Costs
  - LT2 Comparison
  - Battery Degradation
- **Gas & Biomass:**
  - Updated Gas Costs
  - PLEXOS Gas Modelling
  - Biomass Costs
  - Lead Times

Storage: Updates since Assumption Set 1

Basis for changes

1. Stakeholder feedback and industry engagement
2. New NS-specific information
3. IESO LT2 results

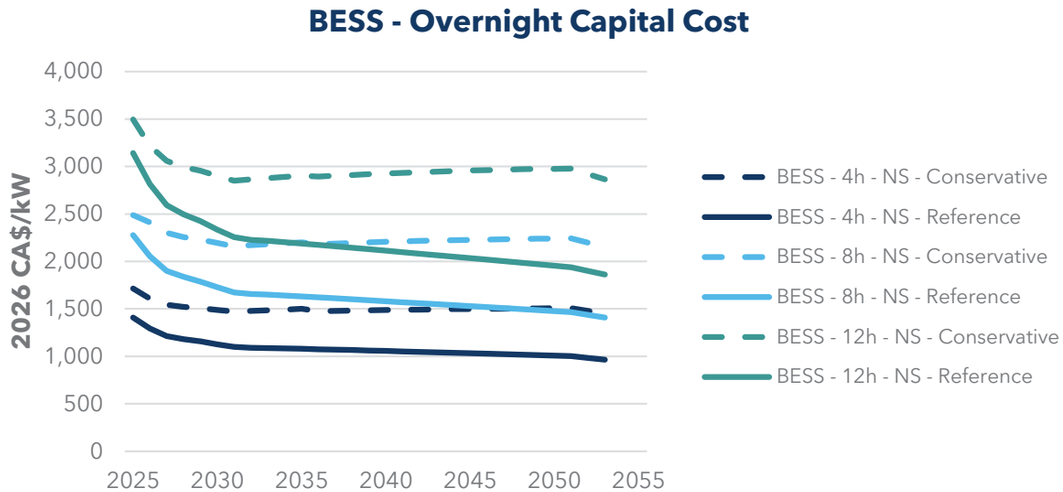
Summary of updates

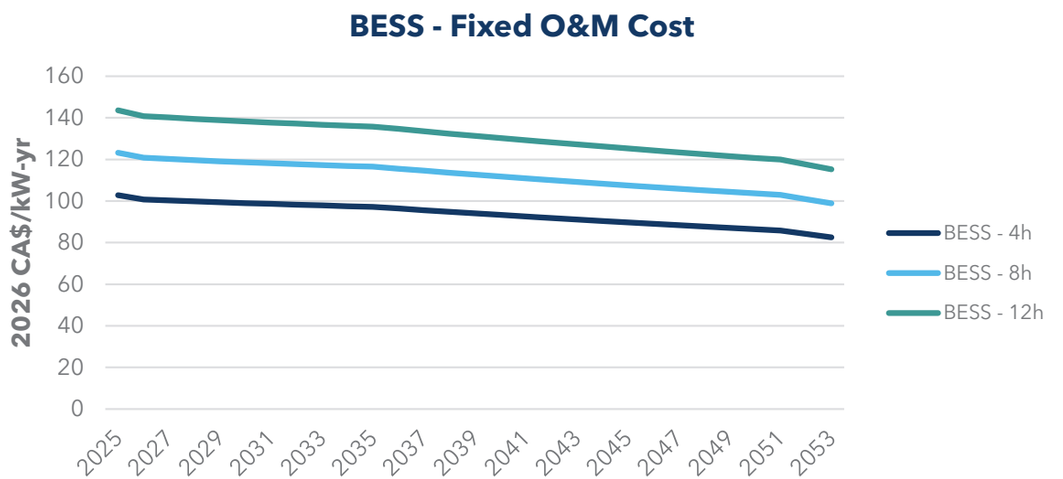
- **Resource Costs:** Updated based on Nova Scotia-specific CAPEX and O&M info and LT2 procurement results
  - Values exclude augmentation costs (consistent with IESO LT2)
  - Dunsky's high and low learning curves applied for future projections
  - 12-hr storage CAPEX and O&M extrapolated from values provided for 4-hr and 8-hr
- **Financing:** Adjusted economic life of storage assets from 15 to 20 years

Storage: Updated Costs

Observations

- **OCC declines through 2031, driven by continued cost reductions across storage durations**
- **Reference:** cost decline continuously through 2053
  - 4h: $1,296/kW → $965/kW
  - 8h: $2,055/kW → $1,409/kW
  - 12h: $2,815/kW → $1,862/kW
- **Conservative:** costs through around 2031, rise gradually through 2051, then decline through 2053
  - 4h: $1,609 → $1,472 (2031) → $1,508 (2051) → $1,449 (2053)
  - 8h: $2,413 → $2,160 (2031) → $2,242 (2051) → $2,155 (2053)
  - 12h: $3,217 → $2,850 (2031) → $2,979 (2051) → $2,863 (2053)
- **Fixed O&M gradually decreases:**
  - 4h: $103/kW-yr to $83/kW-yr
  - 8h: $123/kw-yr to $99/kW-yr
  - 12h: $144/kw-yr to $115/kW-yr

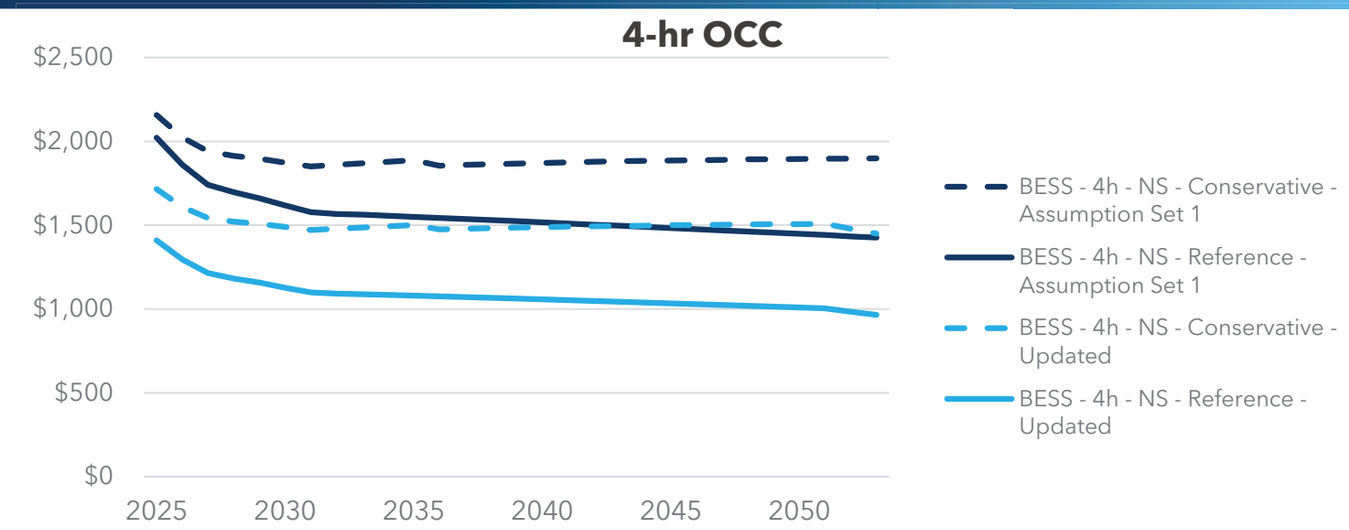


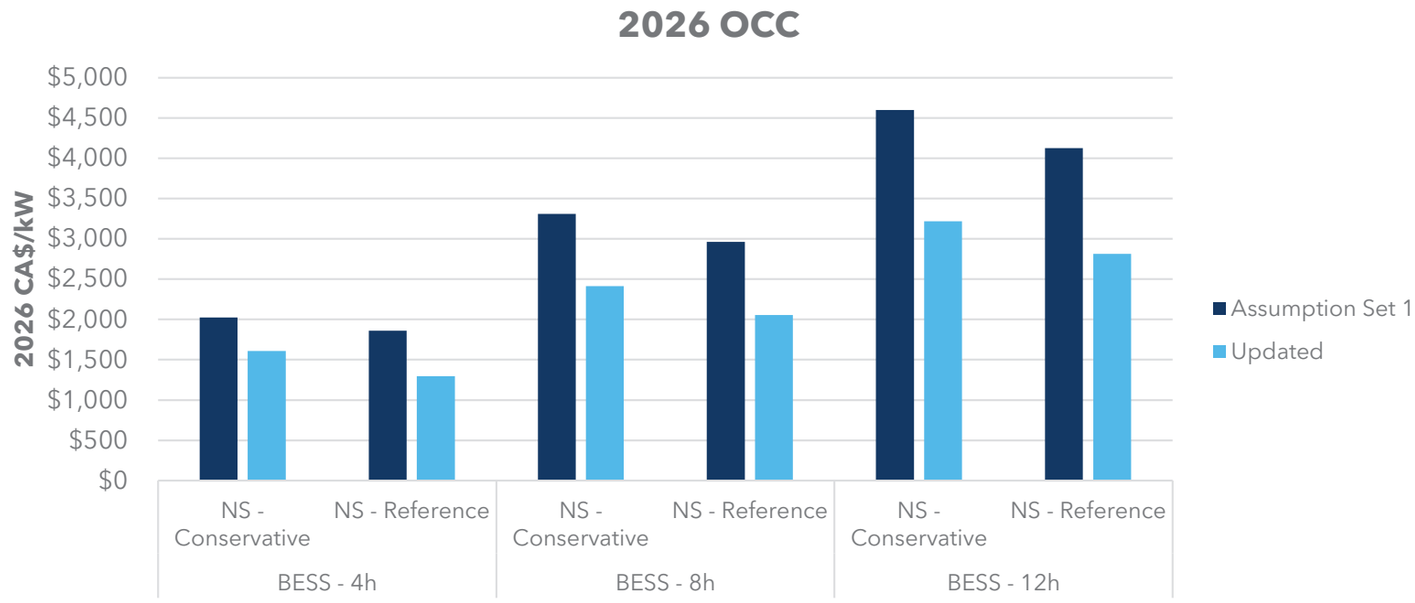


Comparison

Observations

- Updated *Conservative* scenario aligns closely with original *Reference* scenario
- Spread between scenarios is roughly the same
- Approximately 30% decrease in OCC across all durations (4, 8, and 12-hr) and scenarios because of updates





LT2 Comparison

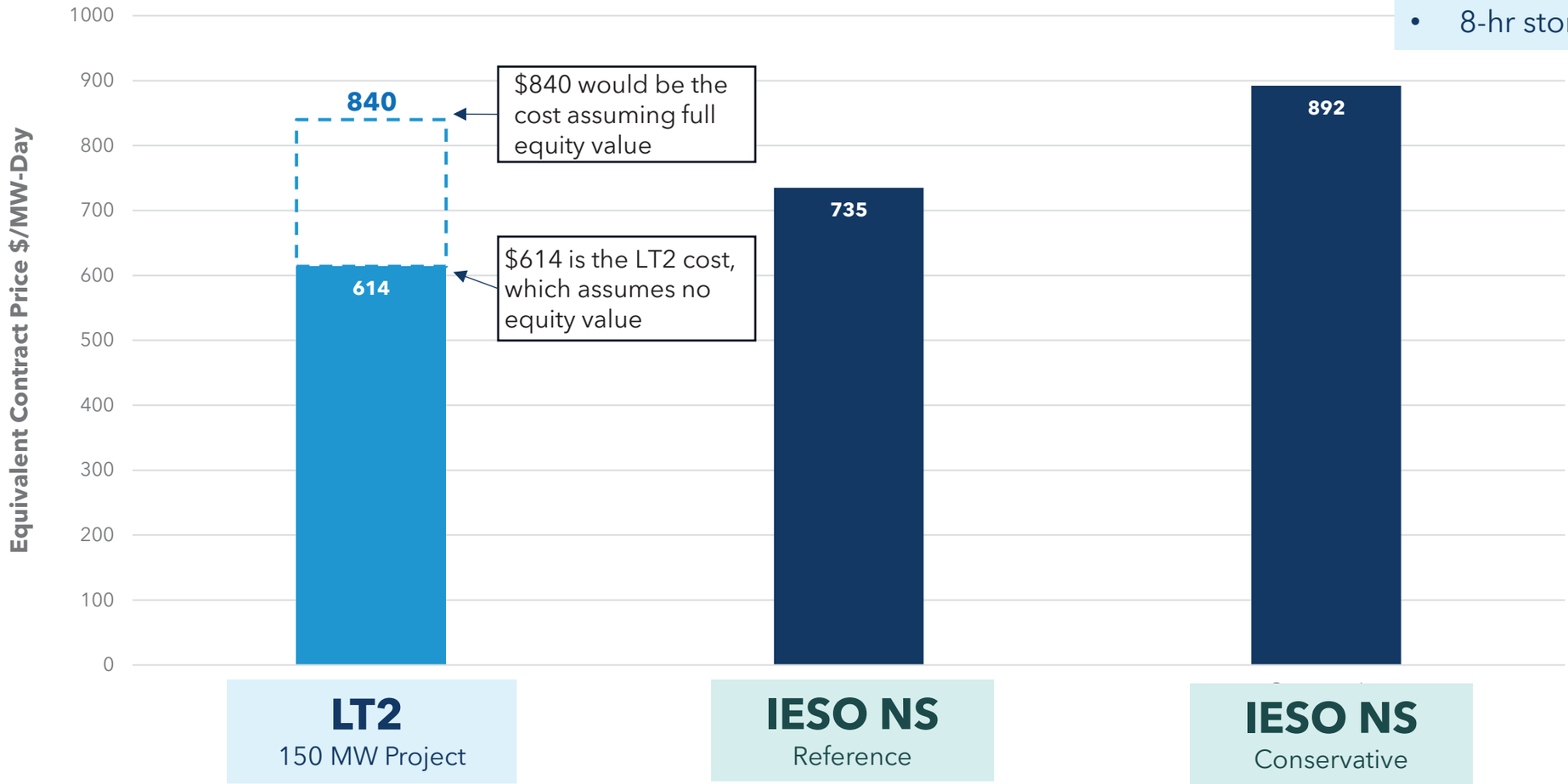
- Contract equivalent pricing represents:
  - Storage assets can earn incremental revenue throughout the contract period and potentially earn further incremental revenue in the market after the 20-year contract period
  - LT2 contracts are a risk mitigation mechanism developed to encourage long-term capacity in the IESO market aligned with the project life
- Benchmarking against LT2 requires framing the result relative to the full cost of the resource; we assume:
  - The LT2 price aligns with the debt portion of a 75/25 debt-to-equity ratio project; equity and return on equity are driven by additional market revenues.
  - General pricing is compared with debt at 6% and a target return on equity at 15%
  - The $614/MW-day bid for the smaller 150 MW project is the most relevant benchmark for Nova Scotia

LT2 Comparison

The figure below compares IESO NS's equivalent contract price with LT2 results, using the same financing assumptions

Assumptions:

- 75/25 debt-to-equity ratio
- 2030 install year
- 8-hr storage duration



Battery Degradation Assumption

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Recommended assumption: 1.5% per year

Discussion
Is 1.5% per year a reasonable assumption for battery degradation in Nova Scotia?

Rationale:

- Ontario's LT2 process allows storage assets to reduce contracted output by 7% at up to three points over the 20-year contract term, with payments reduced proportionally each time.
- Averaged across the term, this stepwise schedule works out to ~1.5% degradation per year, assuming battery projects overbuild contracted capacity by 5.4%. This assumption is consistent with Ontario precedent – the overbuild is what lets a project absorb the 7% step-cuts without falling short of its contracted MWh in the interim years.
- This 1.5%/year figure was also validated against battery OEM input in NS.
- *Note: the LT2 mechanism technically degrades contracted MWh, not MW capacity; however, it is often expressed in capacity terms for simplicity.*

Gas: Updated Costs

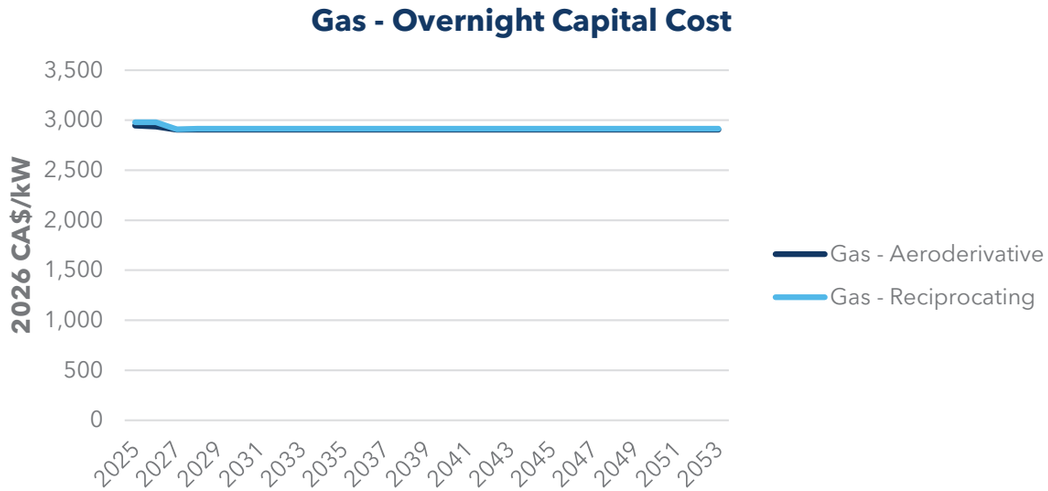
Changes from Assumption Set 1:

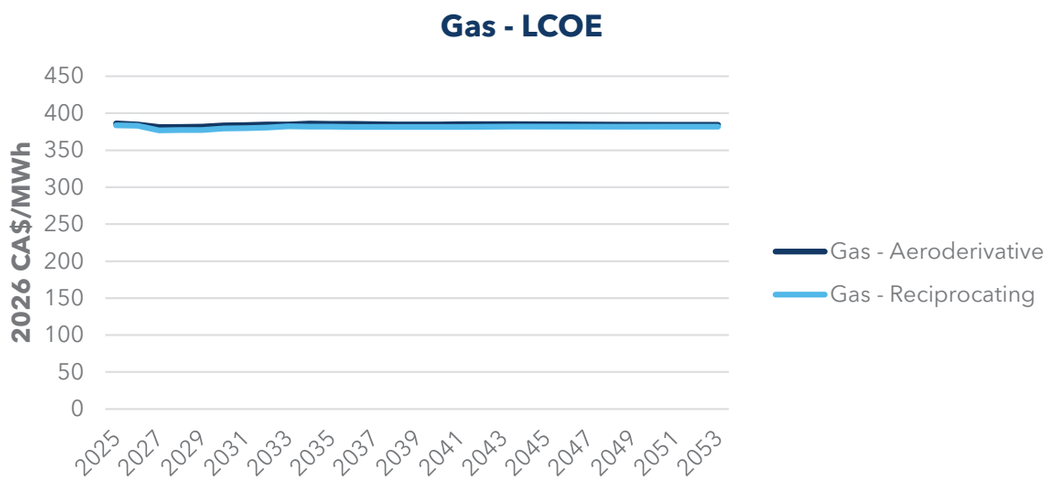
- Revised natural gas fuel cost forecast to better reflect delivered NG costs in Nova Scotia
  - **Impact**: Increases LCOE; does not impact OCC
- Based on volume of stakeholder feedback on gas resource capital costs, we conducted additional research and benchmarking to validate and refine underlying cost estimates
  - **Impact**: Refined reciprocating engine cost estimates using other IRP sources; as a result, reciprocating engine costs have increased and are now more comparable to aeroderivative CTs
  - No adjustments made to the heat rate, as there is insufficient evidence to support a Nova Scotia–specific adjustment

Gas: Updated Costs

Observations

- OCC for both Aeroderivative CT and Reciprocating Engines remains relatively flat around $2,910, and $2,980, respectively, consistent with other recent IRPs reviewed
- Only one scenario for gas given increased technological maturity
- **Fixed O&M:** Aero: $32/kW-yr; Recip: $34/kW-yr
- **Variable O&M:** Aero: $9/MWh; Recip: $14/MWh





Gas: PLEXOS Modelling Discussion

Given the relative cost parity between the two gas resources, should only one representative gas technology be modelled in PLEXOS?

- Represent as “gas peaker”, otherwise technology-agnostic

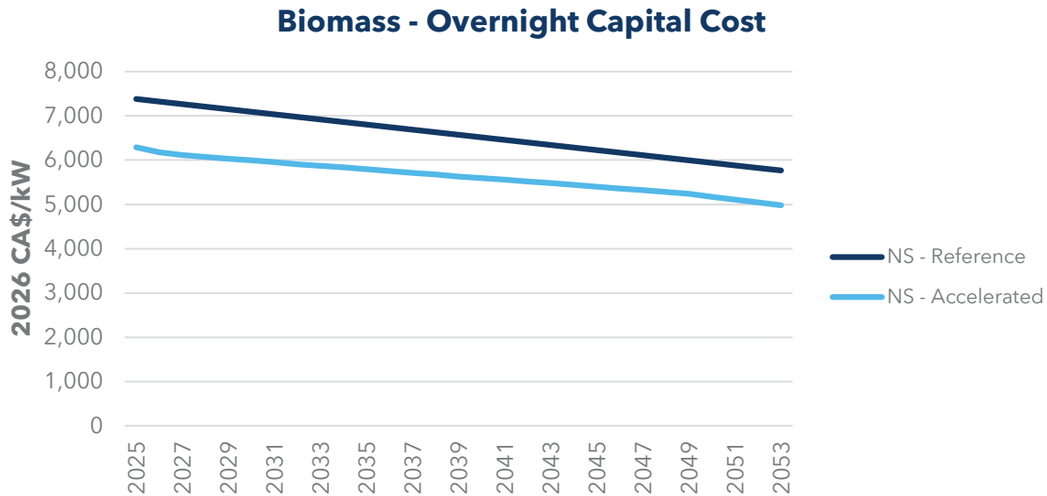
Biomass

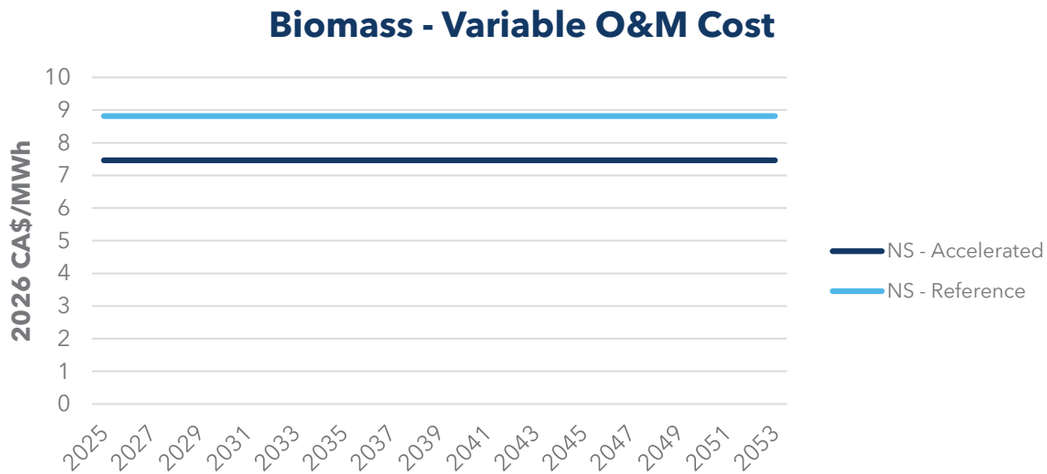
Observations

- **OCC:**
  - High -> Based on MB IRP and IESO APO
  - Low -> NREL ATB (from EIA)
- **Var. OPEX (non-fuel):**
  - Low: $7.5/MWh
  - High: $8.8/MWh

Benchmarking

- Assuming a feedstock cost of $100/MWh, results are relatively in line with NB Power 2023 IRP (294 $CAD2022 /MWh)





Lead Times

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Metrics

1. **Development Timeline:** Total time from project initiation to in-service date.
2. **Construction Timeline:** Subset of the development timeline representing the period of capital deployment and construction activity.
3. **Date of First Availability:** Earliest year a resource can be selected and enter service in the model

Lead Times: Gas and Biomass

Assumptions

- For gas, a 2030 first availability date reflects projects that could come online through the IESO Nova Scotia's active procurement process (up to 600 MW).
- Beyond this active procurement, we recommend a 2033 date of first availability, reflecting a development timeline of 7 years

	Construction Timeline	Development Timeline	Date of First Availability
Gas	2 years	7 years	2030 * / 2033
Biomass	4 years	7 years	2033

** active procurement only, up to 600 MW*

Discussion

Is 2033 a reasonable date of first availability for gas (beyond the 600 MW active procurement) and biomass?

Questions?