

DG2 To DG3

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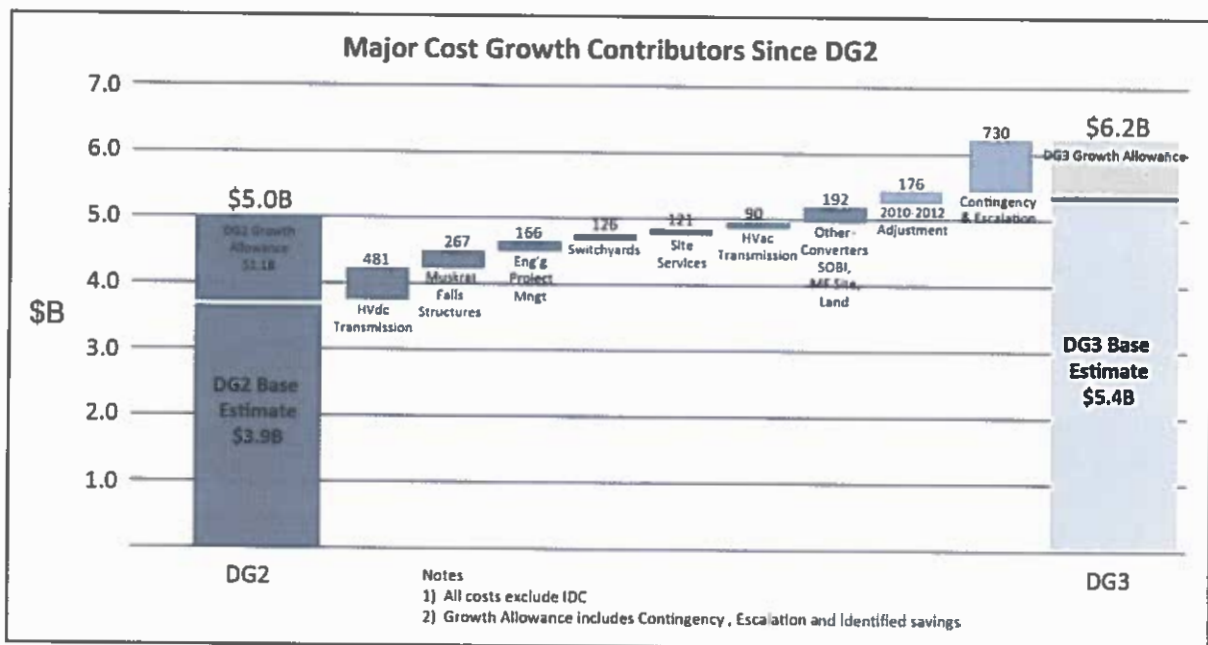
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# backgrounder

## Key Changes Affecting Project Estimate

Since Decision Gate 2 (DG2), enhanced operational, reliability and construction-driven changes were made to the generating station and transmission assets. These changes refined the anticipated project cost, as seen at Decision Gate 3 (DG3).



### High Voltage direct current (HVdc) Overland - \$481 million

- Design of transmission line for severe ice and wind loadings and optimized voltage, resulting in more robust design with heavier towers and less line losses, and increasing the quantity of steel and installation person hours required
- Access to very remote areas resulted in costlier helicopter construction and caused increased person-hours

### Muskrat Falls Structures - \$261 million

- Reorientation of structures to maximize energy output, which resulted in more excavation and more concrete
- Addressed intake structure stability and potential dam/spillway erosion issues, resulting in more excavation and concrete
- Changed intake gate structure design to improve spillway reliability, which resulted in more structural steel and concrete
- Reservoir clearing – resulted in more roads than initially planned
- Construction period ice management for increased safety purposes– resulted in additional cofferdam on South side, which caused increased person hours and resulted in higher overall labour costs

**Engineering and Project Management - \$166 million**

- All engineering work completed in the province – premium to relocate external workforce
- Strong competition for experienced engineering and project management personnel
- Environmental Assessment release was delayed, resulting in additional carrying costs for two years

**Switchyards - \$126 million**

- More detailed design work resulted in larger Churchill Falls switchyard extension than initially planned, leading to more civil work and greater cost
- Muskrat Falls switchyard extension to allow future Happy Valley-Goose Bay connection, to facilitate potential economic growth in the region
- Geotechnical site investigation identified additional excavation and fill needed
- Additional camp required at Churchill Falls to accommodate more people
- Increased logistic/transportation costs
- These factors caused increased person-hours, resulting in higher overall labour costs as well as additional material costs

**Site Services - \$121 million**

- Primarily driven by increased person hours, as described above, and associated increased operating costs.
- Increased costs of services including ground transportation, drug and alcohol testing, pre-employment medical screening, road maintenance and vehicles.

**High Voltage alternating current (HVac) Overland Transmission - \$90 million**

- Design of transmission line for severe ice and wind loadings resulted in more robust design and heavier towers
- Detailed line routing and construction methods finalized with quantified right-of-way clearing scope
- These factors resulted in more clearing scope, more steel than estimated at DG2, and increased installation person hours
- Requirement for increased marshalling yards, catering, camp, medical and other support services
- Actual bids now received for tower steel and transmission equipment

**Converters, Strait of Belle Isle, Muskrat Falls Site and Land - \$192 million**

- Operating voltage optimization resulted in costlier HVdc converter stations
- Strait of Belle Isle cable size increased to accommodate the optimized voltage, resulting in cost increases for the three cables
- Studies following DG2 identified the need to protect from salt contamination at overland to sub-sea transition points, requiring additional buildings, structures and cable burying
- Reliability requirements resulted in additional cable switching equipment to allow for remote switching of spare Strait of Belle Isle cable
- Muskrat Falls site - construction power demand increased, telecommunications cost increased, camp relocated
- Land - transmission line route finalized, whereas costs were previously unknown.