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IS THE SITE C PROJECT WORTH ITS GROWING PRICE TAG?

British Columbia's Site C hydroelectric project is under scrutiny, yet again. The provincial NDP government, long sceptical of the project, has been re-elected. In its previous term, the NDP government was tepid in its support for Site C (approved by a previous Liberal government) but did grant the project a budget increase. However, new issues are likely to increase costs even further. Our analysis shows that completion of Site C now only makes sense if Alberta and British Columbia 1) cooperate on new interprovincial transmission and 2) set ambitious decarbonization goals.

In 2018, following significant scrutiny, the Site C project received a budget increase from $8.8B to $10.7B to account for unanticipated cost pressures. Soon after, in late 2019 and early 2020, project engineers identified additional unanticipated geological issues which will require unplanned foundation enhancements to ensure sufficient stability for the dam and related components. These additional required enhancements are expected to further inflate the project budget, although an exact cost estimate has yet to be produced. This has prompted the BC Government to appoint a new advisor to review the project and to provide advice on its continuation.

In this brief we share the results of a recent working paper, which models the potential net present value of Site C, to help explain why that decision is not straightforward and requires careful thought about Alberta and BC's future electricity policy decisions.

Our basic metric for evaluating Site C is the Net Present Value: total direct financial benefit less total direct financial cost. While there are estimates of the cost of the Site C project, the benefits depend significantly on how ambitious western Canada is in its decarbonization efforts, and whether BC and Alberta cooperate on new interprovincial transmission.

There are two cost measures relevant to Site C: The "Total Cost" of the project, and the net costs that can be avoided if the project is cancelled ("Avoidable Cost"). If benefits exceed total cost, the project had justifiable economics from the start. But if benefits are less than the avoidable costs, the province will lose less value by cancelling the project than by completing it.

As of March 2020, BC Hydro had spent $5.1B on Site C. Given the current $10.7B budget, this sunk cost implies a "go-forward" cost of at least $5.6B, plus any additional expenditure associated with the newly identified geological issues (BC Hydro 2020). A 2017 report identified cancellation costs of approximately $1.2B (Deloitte 2017), which means BC Hydro could avoid approximately $4.4B in expenditure by cancelling Site C ($5.6B less $1.2B in cancellation costs).

Figure 1 - Benefits and Costs of Site C in Different Scenarios

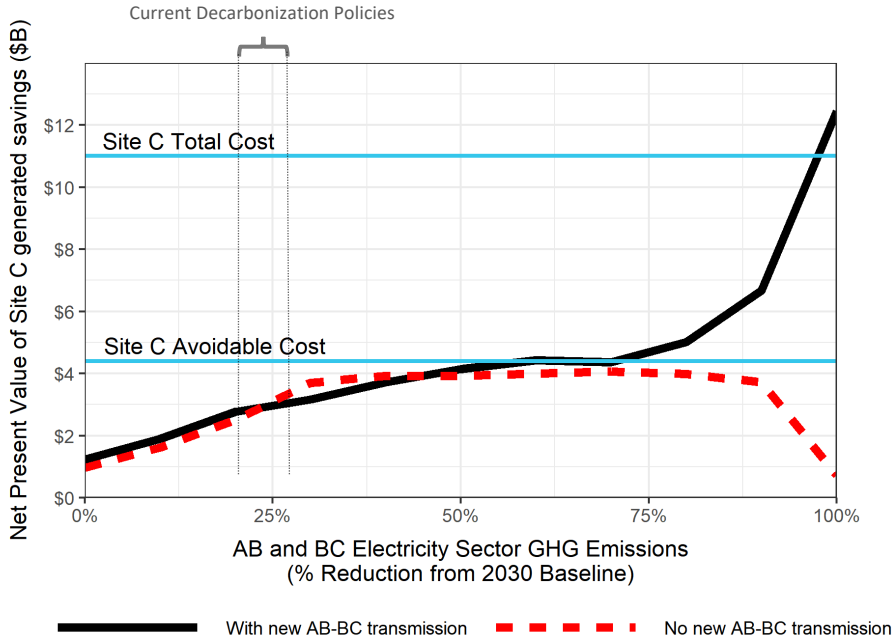

Figure 1 shows the present value over 70 years of Site C benefits to the Alberta and BC electricity systems, along with the two cost measures. The benefit measure comes from a purpose-built capacity expansion and dispatch model as detailed in our recent working paper (Dolter et. al.). We calculate the annual benefit in 2030 and assume the value of that benefit grows at 1.52%/year over the estimated 70-year life of the facility. We then discount the stream of benefits to its present value at a discount rate of 5%.

As indicated, the net benefits of Site C depend on the ambition of decarbonization efforts as well as the degree of inter-provincial transmission cooperation between Alberta and British Columbia. Our greenhouse gas (GHG) emissions baseline

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includes only the phase-out of coal-fired power plants in Alberta. The value of Site C increases as aggregate Alberta and British Columbia GHG emissions are reduced below these baseline levels. Policies such as a $50/tonne carbon price and BC's Clean Energy Act will achieve a further GHG emissions reduction of approximately 21% relative to our baseline (see "Current Decarbonization Policies" in Figure 1). At this level of decarbonization, Site C is uneconomic and should not be completed. Only when decarbonization efforts increase to 80% and beyond does completing Site C deliver an economic benefit greater than the avoidable cost, and in that case, only when new transmission links can be built between Alberta and BC.

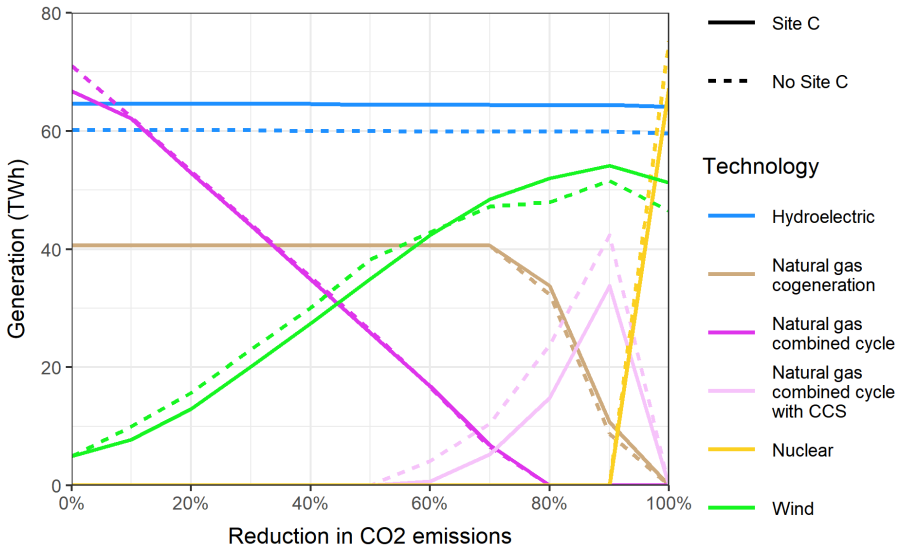
The value of Site C depends on what it is displacing. At low levels of decarbonization (less than 20%, below the no-policy baseline), Site C displaces natural gas combined cycle generation. At decarbonization levels between 20% and 70%, Site C displaces some wind generation, whereas at higher levels of decarbonization (reducing emission by 60% or more from the non-policy baseline) Site C enables greater levels of wind generation (see Figure 2). With ambitious decarbonization and new transmission between Alberta and BC, Site C has higher value because it displaces expensive natural gas combined cycle CCS plants and nuclear plants.

Our results add nuance to the Site C debate. Existing studies have focused largely on comparing the "Levelized cost of Electricity" (LCOE) produced by Site C (eg: Goulding & Kiragu, 2020). LCOE is a measure of the average cost per MWh generated over the life of a generating asset like a wind turbine, hydroelectric project or other power plant. Site C is not competitive based on the LCOE metric; only coal and nuclear have higher costs as measured by LCOE. However, the levelized cost of electricity misses the key contribution that different generation technologies play in terms of their dispatchability (and other important characteristics). Site C is both low emissions and "dispatchable" meaning that operators can decide when it should generate electricity. This allows it to balance the variability of renewable energy generation sources such as wind, which becomes more important at high levels of decarbonisation.

Given the newly identified geological risk and the implied additional construction work, the Site C budget will almost certainly need to expand if the project is to be completed, so the total capital costs will increase from the projection summarized in Figure 1. Avoidable costs will likely increase as well, though this will depend on the degree to which cancellation costs have increased since the 2017 Deloitte estimates. In any case, part of the BC government's deliberations on the future of Site C should include a conversation with Alberta on the ability to coordinate interprovincial transmission and decarbonization of the electricity sector.

There is still a chance the project makes sense on a go-forward basis, but only if these western provinces can coordinate future electricity plans. Otherwise policy makers should stop throwing money at a project that is likely to end up under water.

Figure 2 Generation by technology across decarbonization scenarios (with new AB-BC transmission)



For a longer discussion of the modelling behind this work, interested readers are directed to the Dolter et. al. working paper (link in the references below).

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Dolter, Fellows, Rivers (Working Paper) "*The economics of the Site C hydroelectric project in British Columbia.*" http://ssrn.com/abstract=3742136.

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