

Undertaking MH-69: Confirm the number of tonnes that Wuskwatim will result in a reduction of greenhouse gases in the United States (April 13 - transcripts page 4519)

On April 13, as part of the EIS panel cross examination by CASIL, Counsel requested that hydro check the number of tonnes of CO_{2e} that will be displaced by Wuskwatim through exporting power to the U.S.

The reference was to EIS Volume 4 Section 10 regarding the discussion of how much CO₂ will be displaced by Wuskwatim. The intended comparison was the output of CO₂ from Wuskwatim to the amount displaced by Wuskwatim based on the information in the Pembina Lifecycle study and the material in section 2.4.2.2 on GHG.

The analysis was incorrect as the transcripts show that the comparison was for the lifecycle output of Wuskwatim for CO₂ to the figures for the annual displacement of CO₂ by exporting Wuskwatim power to U.S. customers.

The Pembina study calculated that over its 100 year life Wuskwatim would produce 520,000 tonnes of CO₂. The EIS stated that the annual CO₂ displaced by Wuskwatim was over 750,000 tonnes. In CASIL's cross exam of the EIS panel, there was an attempt to net the two figures on an annual basis to make the point that the net gain from displacing thermal generation was not that great. However, the figure for the output of Wuskwatim on an annual basis was out by a factor of 100 if you average the lifetime output. (Note that the majority of CO₂ attributable to Wuskwatim is during the construction phase, when the plant is operational the actual annual output may be less than the average annual figure.)

The following calculations provide clarification as requested in undertaking MH-69.

As per table 2.4-1 of the Wuskwatim Generating Station EIS (Volume 4, section 2, page 2-15), the difference between the (less GHG intensive) combined cycle natural gas generation and the Wuskwatim hydro option is 505.2 tonnes CO_{2e} per GWh on an annual basis (509 t/GWh minus 3.8 t/GWh). With a capacity factor varying from 0.85 to 0.87 (the Pembina Institute report uses 0.87 as a capacity factor), the reduction in total annual emissions resulting from using Wuskwatim in place of CCNG generation are indicated in Table 1 below.

The statement that "Wuskwatim will produce approximately 520,000 tonnes of CO₂ equivalents" is correct as per table 3.1 in the Pembina Institute report. With the expected 137,160 GWh of delivered energy (i.e. after 10% transmissions losses) over a 100-year lifespan combined with an (lifecycle) emission rate of 3.8 tonnes/GWh, the total emission for the life of the Wuskwatim project is 521,284 tonnes. Table 2 indicates both the annual and total project life (100 years) emissions from Wuskwatim as well as from two other supply options (coal and CCNG). The table also provides the ratio of displaced emissions to Wuskwatim emissions. (e.g. Wuskwatim will displace 133 times more tonnes of CO_{2e} than it will produce on an annual and project life basis when compared to CCNG.)

In summary, there are two main points that invalidate the comparison suggested by CASIL. The 520,000 tonnes of CO_{2e} output is for the lifetime of the Wuskwatim project, i.e. the total emissions over 100 years, whereas the 750,000-770,000 (depending on capacity factor as indicated above) tonnes that will be displaced as a result of Wuskwatim is an annual amount. As well, the 520,000 number refers to emissions on delivered energy (i.e. after losses) while the 750,000-770,000 refers to emissions from generation before losses.

Table 1

Plant Capacity (GW)	Capacity Factor	Hours/Year	Emission reduction (tonnes/GWh)	Total Annual Emission reduction before losses (tonnes)	Total Annual Emission reduction after 10% losses (tonnes)
0.2	0.85	8760	505.2	752,344	677,109
0.2	0.86	8760	505.2	761,195	685,075
0.2	0.87	8760	505.2	770,046	693,041

Table 2

Electricity Supply Option	Lifecycle GHG per unit (tonnes CO ₂ e/GWh)	Total Annual Emissions ¹ before losses (tonnes)	Total Annual Emissions ² after 10% transm losses (tonnes)	Total Lifecycle Emissions (tonnes emitted over 100 year life) before losses	Total Lifecycle Emissions (tonnes emitted over 100 year life) after losses	Ratio of displaced supply option to Wuskwatim Hydro
Wuskwatim Hydro (WH)	3.8	5,792	5,213	579,211	521,284	
Pulverized Coal (PC)	1108	1,688,858	1,519,954	168,885,792	151,995,440	291
PC - WH (displaced emissions)		1,683,066	1,514,742	168,306,581	151,474,156	
NG Combined Cycle (NGCC)	509	775,838	698,246	77,583,816	69,824,620	133
NGCC - WH (displaced emissions)		770,046	693,033	77,004,605	69,303,336	

¹ assuming capacity factor of 0.87 with associated annual energy generation of 1524 GWh

² assuming capacity factor of 0.87 with associated annual delivered energy of 1372 GWh