

March 8, 2004

## MANITOBA HYDRO/NCN

EXHIBIT #  
WUSKWATIM GENERATION  
& TRANSMISSION PROJECTClean Environment Commission Hearings to  
Review the Wuskwatim Generation and Transmission Projects

CLEAN ENVIRONMENT COMMISSION

## Response to Undertaking from Transcript Page 789 (Volume 3)

---

**Provided by: David Cormie and Ed Wojczynski**

---

Regarding the undertaking on Page 789 of Volume 3 of the transcripts which reads as follows; – “Provide any documentation available related to a comparison of the "run-of-the-river" mode with respect to the three fixed blade turbines vs. the use of the Kaplan turbine.”

A summary table from a report documenting the energy capabilities and the associated water level changes for several alternative plant configurations that were assessed as part of screening studies undertaken in 1998 and 1999 is submitted as requested. The full report is currently being printed and will be submitted on Tuesday, March 9, 2004.

It should be noted that in the table, the run-of-river mode is actually referred to as ‘base-loaded’ and is distinguished from the shaping and peaking mode of operations. The Kaplan turbine was investigated in all three modes of operation, base loaded or run-of-river, shaping and peaking.

The summary table provides additional documentation describing among other things the maximum daily water level variations (under open water conditions) at Opegano Lake and the energy that could be produced.

# Wuskwatim G.S. Screening Studies

## Estimated Monthly Energy, Stage Variations at Opegano and Index of Routing Files

Mode of Operation	Wuskwatim Configuration						Average Annual Energy			Stage Variations at Opegano		Notes	Hydraulic Routing File Used to Estimate Annual Energy and Stage Variations				
	Plant Configurations					Outages		On Peak Energy	Off Peak Energy	Total	Expected (50 %ile)		Maximum (100 %ile)	File Name	Worksheet		
	Nominal Plant Capacity (Open Water) (MW)	Forebay (m)	Number of Units	Type of Units	Discharge Capacity (cms)	Unit Outage (assumed)	System Outage (1977-88)	(GWh/yr)	(GWh/yr)	(GWh/yr)	(m)		(m)				
Base Loaded	200	235	2	PROP	1050	3.85%	3.70%			1516							
Shaping	200	235	2	PROP	1050	3.85%	3.70%			1533	0.16	0.68			ROR model v4.xls		
Peaking	200	235	2	PROP	1050	3.85%	3.70%	778	745	1523	0.20	1.10	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_stg_var_v25.xls	2	
															wusk_weekly_v3c.xls	2	
Base Loaded	200	235	2	KAP	1050	7.69%	7.70%			1490					ROR model v4.xls		
Shaping	200	235	2	KAP	1050	7.69%	7.70%	1024	457	1481	0.01	1.00	7 by 16 'Shaping'		wusk_stg_var_v25.xls	5	
Peaking	200	235	2	KAP	1050	7.69%	7.70%	756	718	1474	0.22	1.50	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3a.xls	3	
Base Loaded	200	235	3	PROP	1050	3.85%	3.70%			1537					ROR model v4.xls		
Shaping	200	235	3	PROP	1050	3.85%	3.70%			1556	0.14	0.49			wusk_stg_var_v25b.xls	6	
Peaking	200	235	3	PROP	1050	3.85%	3.70%	789	749	1537	0.26	1.48	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3c.xls	3	
Base Loaded	200	235	3	KAP	1050	7.69%	7.70%			1510					ROR model v4.xls		
Shaping	200	235	3	KAP	1050	7.69%	7.70%	1038	461	1499	0.01	1.17	7 by 16 'Shaping'		wusk_stg_var_v25.xls	7	
Peaking	200	235	3	KAP	1050	7.69%	7.70%	764	729	1493	0.22	1.78	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3c.xls	4	
Base Loaded	210	235	3	PROP	1100	3.85%	3.70%			1550					ROR model v4.xls		
Shaping	210	235	3	PROP	1100	3.85%	3.70%			1581	0.14	0.51			wusk_stg_var_v25.xls	8	
Peaking	210	235	3	PROP	1100	3.85%	3.70%	818	735	1553	0.52	1.52	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3e.xls	2	
Base Loaded	225	235	3	PROP	1200	3.85%	3.70%			1529					ROR model v4.xls		
Shaping	225	235	3	PROP	1200	3.85%	3.70%			1604	0.38	0.55			wusk_stg_var_v25.xls	3	
Peaking	225	235	3	PROP	1200	3.85%	3.70%	869	688	1557	0.76	1.59	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3d.xls	2	
Base Loaded	225	235	3	KAP	1200	7.69%	7.70%			1571					ROR model v4.xls		
Shaping	225	235	3	KAP	1200	7.69%	7.70%	1132	412	1544	0.53	1.25	7 by 16 'Shaping'		wusk_stg_var_v25.xls	9	
Peaking	225	235	3	KAP	1200	7.69%	7.70%	845	686	1530	0.68	1.84	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3a.xls	6	
Base Loaded	260	235	4	PROP	1400	3.85%	3.70%			1586					ROR model v4.xls		
Shaping	260	235	4	PROP	1400	3.85%	3.70%			1624	0.84	0.88			wusk_stg_var_v25.xls	4	
Peaking	260	235	4	PROP	1400	3.85%	3.70%	982	580	1563	1.22	1.99	5 by 16 Peaking (Minimum 1 Unit BG)		wusk_weekly_v3f.xls	2	
Base Loaded	190	234	2	PROP	1050	3.85%	3.70%			1450	0.00	0.00	234 m Forebay		ROR model v5.xls		
Shaping	190	234	2	PROP	1050	3.85%	3.70%			1465	0.16	0.68	234 m Forebay		wusk_stg_var_v25c.xls	3	
Peaking	190	234	2	PROP	1050	3.85%	3.70%	743	712	1455	0.20	1.10	234 m Forebay, 5 by 16 Peaking (Min 1 Unit BG)		wusk_weekly_v4c.xls	4	
Base Loaded	200	234	3	PROP	1100	3.85%	3.70%			1482	0.00	0.00	234 m Forebay		ROR model v5.xls		
Shaping	200	234	3	PROP	1100	3.85%	3.70%			1512	0.14	0.51	234 m Forebay		wusk_stg_var_v25c.xls	2	
Peaking	200	234	3	PROP	1100	3.85%	3.70%	781	703	1484	0.52	1.52	234 m Forebay, 5 by 16 Peaking (Min 1 Unit BG)		wusk_weekly_v4c.xls	2	

Column No.: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Notes	
Data Sources:	BH
Flow File	KDG models
Energy and Stage Variations	RRW analysis, ACRES cost points
Cost Estimates	CRW with input from JDH
Unit Efficiency	HEO and ACRES
Hydraulics	Historic Records
Maintenance Outage	