MANITOBA HYDRO

2012/13 & 2013/14 ELECTRIC GENERAL RATE APPLICATION

UNDERTAKING PROVIDED BY: V.WARDEN

Manitoba Hydro Undertaking # 47

Manitoba Hydro to provide an explanation of the escalation in construction costs for Wuskwatim from the initial estimate to the final actual costs.

Response:

Wuskwatim capital costs (including transmission) increased from the initial estimate of $988 million in CEF03 to $1.771 billion in CEF12. Overall, the response to CAC/MH I-73(c) indicated that the Wuskwatim project experienced cost increases which were driven to a large degree by the impact of massive international investment in infrastructure which placed increased demand on commodities such as steel, copper, fuel and cement, as well as on heavy machinery and equipment manufacturers, engineering consultants, construction contractors and construction workers. In addition, the in-service date was deferred 3 years from September 2009 to June 2012 resulting in increased costs associated with the extended regulatory and studies and investigation and construction periods as well as increased interest and escalation.

The following table provides a cost breakdown of the increases to the Wuskwatim project:

Cost Breakdown	Increase	Explanation for change
Pre-construction 2003 to 2006	$224 million	*Extended duration of federal and provincial approvals as well as PDA and NCN ratification resulting in the deferral of the construction start date, extended duration of construction, and the 3-year in-service date deferral.*
General civil contract	$178 million	*Lower trade labour productivity, higher*

		labour rates, increased bedrock overbreak, and increased engineering.
Turbines & generators	$19 million	*Higher labor rates, extra work, claims due to schedule delays.*
Site preparation	$32 million	*Increased quantities (primarily rock) due to unknown site conditions, increased camp accommodations and operation and maintenance costs.*
Catering	$22 million	*Higher camp occupancy and higher offsets required for work performed through a direct negotiated contract.*
Electrical & Mechanical	$38 million	*Additions to scope of work and engineering, and contractor cost claims due to schedule and access delays.*
Gates, Guides & Hoists	$20 million	*Extra work and contractor cost claims due to schedule delays.*
Staffhouse	$30 million	*Addition of staffhouse to meet staffing requirements*
Transmission	$109 million	*Increases in market costs experienced for labour, materials and contracts partially offset by reductions in contingency, project management and contract costs nearing construction completion.*
Other	$47 million	*Actual escalation in excess of original estimated inflation and other cost increases*
Interest allocated to construction capital	$64 million	*Due to increases in costs and deferral of in-service date partially offset by lower interest rates*
Total increase	$783 million	

Further descriptions of the increases or decreases from forecast-to-forecast can be found in the responses to CAC/MH I-51(d), MIPUG/MH I- 28(b), and PUB/MH II-66 from the current GRA, as well as PUB/MH I-65 from the 2010 GRA.

Manitoba Hydro undertook regular process reviews during the pre-construction and construction phases of the Wuskwatim Project. The outcomes from these reviews were used to adapt the planning and construction processes for the Wuskwatim Project to control project scope, schedule and budget. The process reviews continue to be applied to the Keeyask and Conawapa Projects' planning, construction and cost estimating processes to realize the same type of benefits.

a. Pre-Construction Phase

Two of the most significant differences from the period in which the last hydro project was developed (Limestone Generating Station) to the period in which the Wuskwatim Generating Station was developed were:

- the Wuskwatim Project is the first project in which Manitoba Hydro has engaged in a partnership framework, and
- The significant increase in the degree of rigour required environmentally as compared to the past, under *The Canadian Environmental Assessment Act* and *The Environment Act* (Manitoba) both of which came into existence after the Limestone Generating Station. A related effect was that, as new legislation, there was no experience by the federal and provincial regulators in Manitoba, which added another dimension to project scheduling.

The new broad tasks related to pre-construction and the partnership framework were integrated into Manitoba Hydro's previous planning/regulatory approval/construction process so that the project could be implemented successfully. Manitoba Hydro adapted its organizational structure to fit the new requirements and applied best project management practices where possible.

Some of the notable observations from the pre-construction project review processes are as follows:

- Significantly more engineering and environmental information is required earlier in the pre-construction process in order to support process and informational needs for both the partnership framework and for the pre-construction activities.
- Early inputs from and engagement with stakeholders (regulators and affected communities) is critical to ensure the project scope is well defined, understood and agreed to by the relevant parties.
- Preparation and endorsement of agreements to define development arrangements and adverse effects are time consuming and difficult to schedule, taking much longer than anticipated. Timing needs to be managed carefully with engineering, regulatory and procurement processes.
- Moving supporting infrastructure design and construction activities (such as those for access roads and camps) out of the generation project and into separate earlier projects. The primary reason for doing this was to avoid difficulties experienced on the Wuskwatim Project with a First Nation joint venture partner. Advancing infrastructure work ahead of the generating station provides benefits to First Nations, such as increased and advanced employment, training and capacity-building opportunities, as well as reducing financial risks to the First Nation joint venture partners. In addition there are benefits to the generation project by advancing the in-service date and reducing construction delay risks.
- The complexity of the pre-construction work, including the partnership framework, requires many of the project management processes and mechanisms utilized as standard practice for the construction phase of large hydro projects.

b. <u>Construction Phase</u>

Experience gained from the construction phase of the Wuskwatim project are also being implemented for the benefit of the Keeyask and Conawapa projects:

- Craft labour and heavy construction market research is undertaken. The findings are utilized in improving the recruitment and retention of craft labour workers to major northern project sites and in customizing contracting strategies for particular work packages associated with the projects,
- New approaches to contract frameworks (for example, “target price” contracts) are utilized to improve alignment with prevailing market

conditions, and to manage risks associated with certain aspects of the major projects, attract contractor interest, and provide incentives for contractor performance,

- The design and construction of camps have evolved significantly to provide craft workers with remote site living conditions that are on par with those of other major project sites across Canada, improving craft labour recruitment, retention and productivity.
- Strategies for management of final designs include early input from contractors to maximize opportunities for optimization of design cost-effectiveness and constructability.
- Key staff from the Wuskwatim project continue to be transitioned to leadership and other roles on other major projects, including Keeyask and Conawapa.

c. Keeyask & Conawapa Estimates

It was recognized that several of the underlying drivers for the increase in the estimate for the Wuskwatim project during construction may continue throughout much of the period during which Keeyask and Conawapa will be constructed, and that the rate of construction cost escalation will likely exceed the rate of increase in the CPI.

The recent updates to the Keeyask & Conawapa total project costs are the result of re-estimates that incorporate experiences from the Wuskwatim project. This includes updates to labour, material and equipment rates as well as updates to the assumed labour productivity.

Additionally, management reserve funds have been included in the current estimates for Keeyask and Conawapa. Management reserve is intended to address major risk items not addressed through the normal scope of contingency. In the case of Keeyask and Conawapa the increased risks related to labour productivity and escalation are addressed through use of management reserve funds due to the magnitude of the cost variation they may cause. The labour reserve represents potential additional costs associated with labour productivity and cumulative impacts. The escalation reserve represents potential additional costs to the project associated with cost escalation greater than Canadian CPI.