**MANITOBA HYDRO**

**2012/13 & 2013/14 ELECTRIC GENERAL RATE APPLICATION**

**UNDERTAKING PROVIDED BY: D. CORMIE**

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**Manitoba Hydro Undertaking #26**

Manitoba Hydro to provide the approximate capital cost of a 250 MW CCCT versus the capital cost of a 250 MW SCCCT. Manitoba Hydro to indicate how scaleable these are in terms of upsizing the turbine.

**Response:**

As capital cost information specific to a 250 MW unit size is not publically available, Manitoba Hydro is providing indicative capital cost information.

Single-unit simple cycle generating stations range in sizes from less than a megawatt to 470 MW, while combined cycle gas turbines are available in capacities ranging from less than 10 MW to over 1000 MW. The determination of whether to select a simple cycle versus a combined cycle is largely based on the expected utilization of the plant – with combined cycle operation selected for higher utilizations, and simple cycle arrangements selected for lower utilizations such as for peaking operations.

The estimated range of capital costs for a simple cycle industrial gas turbine plant constructed in the US Midwest is currently US$800/kW to $1000/kW. This range is for a single, industrial frame type, gas turbine of a 150 MW size, and would be scalable for multiple units, and/ or for larger sized units.

The estimated range of capital cost for a combined cycle industrial gas turbine plant constructed in the US Midwest is currently US$1000/kW to $1300/kW. This range is for a combined cycle generating plant of a 550 MW size, and would be scalable for multiple plants, and/ or for larger sized units.

Although price ranges provided are considered typical, publicly available data on three recent Canadian combined cycle plant projects each utilizing two Mitsubishi's M501G

gas turbines, each rated 260 MW, coupled to a single steam generator/ turbine demonstrates large price variability, even exceeding the range of capital costs for a typical combined cycle project previously noted.

| Project | Capacity (MW) | Project cost (millions) | Project cost per kW |
|---|---|---|---|
| Southdown ON | 800 | $1020 | $1275/kW |
| Shepard AB | 800 | $1410 | $1764/kW |
| Sundance 7 AB | 800 | $1500 | $1875/kW |

In general terms, one would expect larger plants to be less expensive on a per kilowatt basis than smaller ones. However for large industrial gas turbines the relationship between price and capacity is weak as other site specific factors can significantly impact capital costs of an individual project. These factors can include the proximity and availability of an adequate natural gas supply, plant arrangement and design efficiency, the degree of air emission controls required at a specific location, water treatment and supply costs, and the availability of skilled trades and labour at the time of construction.