

OPG's Strategy to Meet on a Forecast Basis the 2009 CO₂ Emission Target

The 2009 CO₂ Emission Target

The Ontario Government's Shareholder Resolution dated May 16, 2008 directs OPG to develop an Implementation Strategy (the "Strategy") 'to meet on a forecast basis CO₂ emissions, arising from the use of coal at its coal-fired generating stations, for the calendar 2009 year of not more than 19.6 million metric tonnes' (the "Target"). The Strategy will be filed with the Ministry of Energy by November 30, 2008. This document describes the measures OPG will take to meet the Target on a forecast basis.

OPG's Strategy to Meet the 2009 Target on a Forecast Basis

OPG's Strategy to meet on a forecast basis the emission target for 2009 is derived from procedures used in operating an energy-limited resource. There are four major elements to OPG's Strategy.

- **Planned Outage Strategy:** designating certain of the planned outages required by the coal fleet as CO₂ outages associated with the Shareholder's Declaration and Resolution, thereby ensuring the Implementation Strategy is not exposed to the risk that major outages are cancelled.
- **Operating Strategy:** determining the number of available units from the coal-fired fleet that will be offered into the IESO-administered market at any point in time while managing fleet reliability and emission rates.
- **Offer Strategy:** applying a uniform emission adder to the offers made for all units in all hours of the emission-limited period, calendar year 2009.
- **Fuel Strategy:** purchasing coal on contract to meet the emission target on a forecast basis, and on the spot market to provide flexibility to adjust production capability if requirements exceed forecast.

Outage Plans to Accommodate the CO₂ Initiative

Certain of the planned outages of OPG's coal units will be designated "CO₂ Outages" to assist OPG in managing the reliability of its coal fleet as part of the overall Implementation Strategy. These outages will be identified by OPG before the start of calendar year 2009 using the existing planned outage process. No CO₂ Outages will be scheduled in January, July or August.

The IESO shall treat unit CO₂ Outages as similar to a regulatory requirement, which means the risk of moving these outages or recalling them will be limited to only those situations where system reliability issues exist and the IESO is unable to resolve the problem with other available actions. The CO₂ emissions associated with IESO-directed operation will not count toward OPG's actuals which are monitored against the target.

Operating Strategy for the Coal Fleet in 2009

Operating costs for a coal-fired unit increase with the number of starts the unit makes per year. In the context of the emission target, it may not be cost effective to offer all available units into the market, as that may increase

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the total number of starts for these units. OPG used to have to offer all its available units into the market at all times. However, as a result of the Minister's Directive (dated May 21, 2008) to the OEB to change OPG's license, OPG now has the flexibility to reduce the number of coal-fired units it offers into the IESO market. The units that are Not Offered into the market, But are Available if needed, are referred to as NOBA units. These units can be offered into the market as per market rules with IESO approval and started if an operating coal-fired unit is forced out of service, or if the IESO requires additional capacity for reliability purposes.

- If a coal-fired unit is forced out of service the coal fleet reliability can be improved if the NOBA unit can be started in less time than it takes to repair and return the forced unit to service. Further, OPG can reduce the costs of repair of the forced out unit by not having to rush to return the unit to service.
- If the IESO directs a NOBA unit to operate for reliability reasons using the authorities under its amended License, the resulting emissions will not be included as part of OPG's actual emissions being monitored against the Target.

The 2009 Implementation Strategy makes the following use of NOBA units.

- Only Lambton GS and Nanticoke GS units will be candidates for operating as NOBA generation.
- OPG expects to utilize 78 unit-weeks of NOBA generation from these stations in 2009. These unit weeks will occur in all months of the year except the peak demand months of January, July and August.
- NOBA units are in addition to any planned outages for the coal-fired fleet.
- To be considered a NOBA unit, the unit is expected to be 'in the money' (ie, on a forecast basis its offer is expected to be accepted). As the Lambton GS units 1 and 2 have the highest priced offers in the coal fleet, there may be instances when they are available and offered, but not operating because their offers are not 'in the money'. Under such circumstances, these units are not considered to be NOBA units.
- The particular units that are NOBA will vary throughout the year. When a coal-fired unit is forced off, OPG will offer a NOBA unit to replace it and start it once it has IESO approval. After the forced-out unit is repaired, it may then become a NOBA unit. It is possible that 2 or more units could be forced off during the same period, so that NOBA units may not always be able to quickly replace generators that are forced off. Nonetheless, OPG expects both fleet unreliability and the number of unit starts to be reduced through the use of NOBA generation.

The use of NOBA units is a new feature of OPG's operating strategy for its coal-fleet. Optimizing this new operating regime will likely take some time. For instance, it may be appropriate to have fewer NOBA units during the week and more on weekends. OPG will provide sufficient notice of its NOBA strategy to the IESO so that the IESO may incorporate this information in its planned outage approval and reliability assessment processes.

Offer Strategy for the Emission-limited Coal Fleet in 2009

When a group of units is energy-limited, it is standard practice to apply a uniform adder (\$/MWh) to the offers for the energy limited resources in order to price these resources out of the market enough of the time so that their total production does not exceed the target. The uniform adder approach results in the energy-limited resources running in the hours which are most valuable to the market.

Given the Shareholder Resolution, the coal-fired fleet is emission-limited, but the way to achieve the emission limit may be analyzed in a similar manner. The distinction is that the emission adder is expressed in \$/tonne. To determine the size of the emission adder required to achieve the target on a forecast basis, OPG runs its inter-connected market simulation model, progressively increasing the offer adder on the coal-fired units until it finds the uniform adder that will yield the desired emission target. In each hour, the emission adder in \$/tonne is

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translated into the appropriate \$/MWh adder on the simulated offer using the CO₂ emission rate curve for each of the coal-fired units. (The CO₂ emission rate curve gives the emission rate of the unit at any level of its output. For instance, a 500 MW unit operating at the 100 MW output level is less efficient and therefore produces more CO₂ per MWh than when it operates at the 400 MW level.)

Given the number of unit-weeks of NOBA generation indicated above and the market assumptions OPG has used in developing its 2009 Corporate Business Plan, OPG estimates that a CO₂ emission adder of \$C 7.50 / tonne will yield annual CO₂ emissions that meet the 2009 target on a forecast basis.

Fuel Strategy for the Coal Fleet in 2009

OPG will contract for sufficient quantities of fuel to permit production of the coal-fired energy associated with the target emissions of 19.6 Mt of CO₂ (approximately equivalent to 20 TWh). Were it to become clear that additional fuel may be required in 2009, OPG will attempt to purchase the required amount on an incremental or spot basis.

Adjusting the Implementation Strategy as Year-end Forecasts Change

Risks to Meeting the 2009 Target

The estimate of the emission adder required to limit the coal-fired fleet to the targeted emissions on a forecast basis is subject to a high degree of uncertainty. In particular, it depends on the demand for power in Ontario and the demand for power exports from Ontario to its interconnected markets. The competitiveness of OPG's coal-fired fleet in export markets is driven by the spread between Western and Eastern coal prices and the spread between these coal prices and the natural gas price. The levels of demand and fuel prices are always uncertain, but are particularly so at this point in time. In addition, the underlying demand for energy from the coal fleet depends on the output of the baseload generators: nuclear, hydro and wind.

Apart from issues with the forecasts of the market drivers and the baseload production assumptions used in the simulation model, the model and its market information may prove not to be precise in simulating the impact of the estimated adder on coal-fired emissions. This is something that can only be learned by experience.

Monitoring Actual Emissions vs. the Forecast Profile for 2009

The Ministry of Energy has asked OPG to provide periodic emission tracking reports on the progress toward achieving the target. Preliminary CO₂ emission measurements from the coal-fired stations will be available within one month following a month's end, and final emission results will be available within two months following a month's end. OPG will provide the year-to-date actuals and updated forecasts of year-end emissions to the Ministry each month starting in March 2009.

OPG will establish a range around the target that recognizes the volatility of the marketplace. OPG will endeavour to manage its CO₂ emissions within this range. Should the updated year-end CO₂ emission forecast move outside the range, OPG will adjust its implementation strategy.

Adjusting the 2009 Implementation Strategy

If, on a forecast basis, the 2009 year-end coal-fired CO₂ emissions are expected to fall outside the established range, OPG will adjust the Implementation Strategy to line up with a forecast for year-end CO₂ emissions that meets the target. OPG will either adjust the number of NOBA unit-weeks or the CO₂ emission adder or both. OPG will include changes to the number of NOBA-weeks in monthly updates of the NOBA profile to the IESO. Any revisions to the CO₂ emission adder will be posted publicly and will take effect with one week's notice.