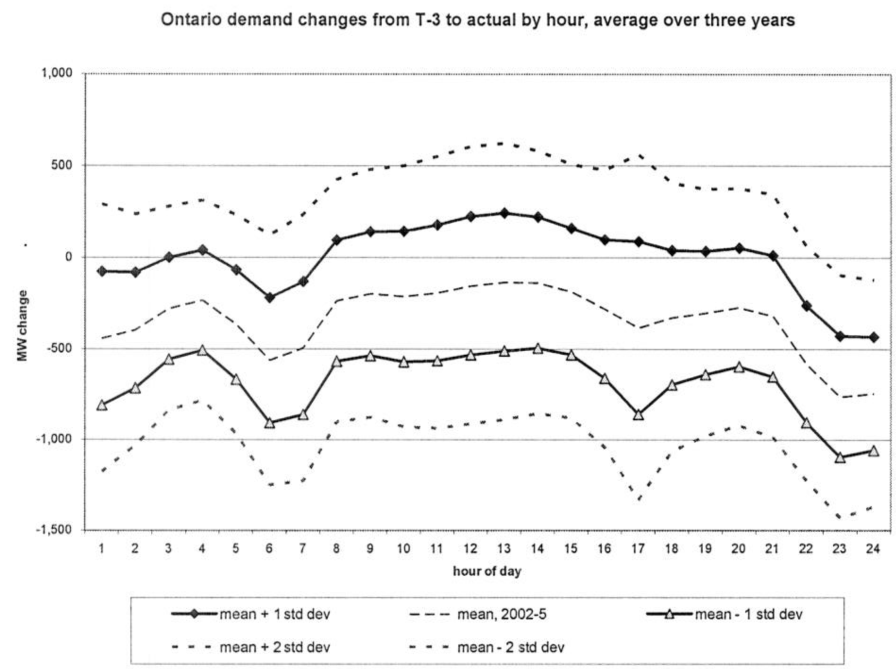
Figure 1



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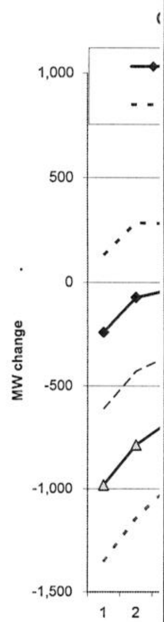

The results of the statistical analysis are summarised in Table 1:

Table 1: Variability in System Demand
(see footnote 1 for data definitions)

	Day-ahead to T-3	T-3 to actual	Day-ahead to actual
Mean hourly change	- 191 MW	- 342 MW	- 532 MW
Std. deviation in hourly change	598 MW	389 MW	698 MW
Std. deviation in hourly gas demand relative to forecast[2]	4,800 GJ/hr	3,100 GJ/hr	5,600 GJ/hr
Mean daily change	- 4,590 MWh	- 8,200 MWh	- 12,790 MWh
Std. deviation in daily change	11,250 MWh	3,990 MWh	12,230 MWh
Std. deviation in daily gas demand relative to forecast[3]	90,000 GJ	31,900 GJ	97,800 GJ

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The changes shown in Table 1 arise from the demand forecasting alone.

This analysis indicates that maintenance of system reliability in the face of load forecast variation requires significant hourly flexibility in generation response (quantified by the standard deviation around the mean three-hour-ahead forecast error) regardless of individual generator considerations and the other compounding factors discussed below. In order to accommodate this

[2] Gas demand is calculated at an assumed 8 GJ/MWh to account for some inefficiency of variable operation.
[3] Assumes that gas is the marginal energy resource over the whole day.

variability 95% of the time, the gas system needs to provide the flexibility for generators to alter gas deliveries +/- two times the standard deviation, or +/- 6,200 GJ/hr. This flexibility is needed at all times in order to maintain electricity system reliability. While other technologies may accommodate some of this variability, the consistent pattern of variability throughout the day makes it likely that the maximum flexibility for gas-fired generation will be required for at least some of the time during the day.

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This basic analysis shows that on a daily basis, the standard deviation in the short term change represents a total of 32,000 GJ/day. The provincial gas system would need to be able to accommodate some +/- 64,000 GJ/day of short notice (three hours) changes to gas deliveries, equivalent to the hourly variation sustained for ten hours.[4]

(ii) Variation of actual wind and hydroelectric generation from forecast

Given the recent addition of wind power to Ontario's resource mix, data is not yet available on the actual Ontario variability of total wind-generated output. However, if one assumes the potential for 2700 MW of wind generation, and an estimated variability of at least 25%, this would result in 675 MW of additional variability. At best this additional variability would not be correlated with load forecast variance. At worst, a drop in wind could cause both an increase in air conditioning load and a reduction in wind generation, with a significant compounding impact on the need for gas-fired generation to respond.

Hydroelectric generation in Ontario has limited storage capability. The operation of these plants is therefore dependant on the flow characteristics of water moving down the particular river. This can result in significant variability between day ahead forecasts and actual production levels for hydroelectric production.

(iii) Changes in import and export schedules, and failures of import and export transactions

The firmness of imports and exports becomes finally apparent to the IESO only as late as the two-hour-ahead pre-dispatch. This can materially impact the total market demand in a manner likely unrelated to variations in the Ontario demand and the wind generation output which are discussed above. This could impact the dispatch of generating facilities. The DACP that will operate this

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[4] The unpredictable change required between day ahead and real time is two to three times the change arising in the last three hours, on both an hourly and daily basis.

(50,000 GJ = 3125 GJ * 16 hours) expected to be delivered from 6 p.m. Tuesday to 10 a.m. Wednesday can either be sent to storage, sold to a third party or diverted to another location. However, the 25,000 GJ for the first 8 hours of the gas day will be deemed to have flowed and will incur significant balancing penalties. For example, if gas is priced at $10/GJ, the lowest spot price on that day, the cost of the effective imbalance cash-out penalty with Enbridge would be $122,500 [25,000 GJ*(1.0-0.02)*($10/GJ*(1.0-0.5))]. With more nomination windows available, a generator would have had an opportunity to reduce the 25,000 GJ imbalance.

(b) Supply Overrun: At 10 a.m. on Tuesday, the IESO, responding to increased demands on the power system, issues revised dispatch instructions to the facility that will require it to increase its hourly consumption of gas over the day to 4,167 GJ/hr, from 10:00 a.m. Tuesday to 10:00 a.m. Wednesday. The facility uses the Intra-day 1 window (Tuesday 11 a.m.) to increase its nominations from 75,000 GJ/day to 100,000 GJ/day. The additional volumes will only be available on an interruptible basis. If approval to increase the nomination is not granted, the plant will effectively draw 25,000 GJ of gas from the system that it did not deliver. The facility likely would face overrun charges at the end of that gas day. If gas is priced at $10/GJ, the highest spot price on that day, the cost of the effective cash out penalty would be $122,000 [25,000 GJ*(1.0-0.02)*$10/GJ*(1.5-1.0))].

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What these examples illustrate is that in order to meet their operational needs, dispatchable gas-fired generators require gas transportation services that enable them to adjust, frequently and in a timely manner, their calls on transportation services so that the generators (i) can respond to IESO dispatch instructions and (ii) end the gas day with minimal or no imbalances. To achieve this result, enhanced transportation services need to contain two key features:

(a) more nomination windows during each gas day in order to reduce the need to rely on balancing services to eliminate end-of-day imbalances; and

(b) more flexible balancing services, including storage deliverability, that permit generators to manage delivery/receipt imbalances on short notice.

The more flexible the gas transportation and balancing services offered by Ontario's gas utilities are, the easier it will be for the IESO, through its dispatch of generators, to maintain the reliability of the Ontario power grid.