Ontario Power Authority
Toronto, Ontario

Northern York Region Electricity Supply Study
Submission to the Ontario Energy Board
September 30, 2005

Exhibit E
Generation Options
Northern York Region

Hatch Acres
September 26, 2005

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1 GENERATION

1.1 Planning Principles

Generation either local or remote is the only supply option that is capable of alleviating the supply bottleneck in York Region. Generation must be capable of supplying the present load and also the new and growing load.

The Province of Ontario is in the process of acquiring new generation resources. While the scope of the problem here has been limited to Northern York Region it must take into consideration the provincial context. Because generation is required to meet the provincial demand and is already being developed elsewhere in the province, the real cost of providing local generation to address Northern York Region's supply problem is the incremental cost of locating generators in the region instead of somewhere else. It is possible that generation elsewhere may be less expensive to build or operate, but that generation will place demands on the provincial transmission grid, increase losses on the transmission system and require transmission lines to be built or reinforced within York region. All of those factors must be considered in evaluating the two available supply options.

To understand the contribution generation can offer it is important to understand the characteristics of generators as a potential solution to area supply problems. Generation provides energy, capacity and voltage support for the power system. Different types of generation and different generator locations each provide those three forms in different ways.

1.1.1 Energy

Energy is supplied by all generators since it is simply the product of the megawatt output and time. Some generators are however more suitable than others for producing energy and they are usually referred to as belonging to "base" or "intermediate" generation. These are nuclear, hydroelectric, combined cycle gas and others that either have low operating costs or use fuel very efficiently. These generators are selected by system operators to run most of the time to supply most of the power system load on an ongoing basis.

1.1.2 Capacity

Capacity is also supplied by all generators as that is simply the ability of the generator to supply its megawatt capacity of power at an instant in time to meet that same amount of load on the power system. As electricity cannot easily be stored the capacity of all of the generators on the power system must equal the demand. As all transmission systems have limited capabilities, it is necessary to place generators geographically close to the load wherever possible. The required generator capacity on the power system is therefore a matter of matching the total system demand, and of ensuring that the generation is situated in geographic locations that respect the limitations of the transmission system.

If a geographic area of the power system is deficient in generating capacity, it will likely manifest itself as a problem during periods of peak load demand. This peak demand is generally less than about 20% of the time and usually on summer or winter weekdays. Given that the problem may not exist 80% of the time, less efficient more flexible generators commonly referred to as "peakers" are often used. These might for example be oil or natural gas fired simple cycle generators.

If the location is suitable and if there is a provincial need for generating capacity, more efficient base or intermediate generating plants also fill the local need. When planning to serve new or growing loads the choice will be between building local generation or building remote generation with transmission system reinforcements. In local situations the generating plant must contribute to local reliability and diversity of supply. This dictates that generators must have a minimum "firm capacity" available at critical times, and that the generators be connected to the power system in a way that enhances reliability and diversity of local area supply.

1.1.3 Voltage Support

Voltage support is also provided by all generators as all generators produce an output voltage as well as an output current to produce power. The megawatt output is the product of the in phase component of that voltage and current and is called the "real" power. Real power is the force that ultimately turns motors and lights light bulbs. All generators also produce "megavars" commonly called "imaginary power". This is another way of describing "voltage support". The power system requires the presence of voltage to transport the power. Together all of the generators produce that voltage.

Unfortunately the voltage declines along the transmission lines to the loads on the power system, and that decline becomes severe with a risk of "voltage collapse" as the transmission lines become heavily loaded. When the voltage collapses power can no longer be transmitted and local blackouts will occur. There are three common solutions to this problem. The transmission system can be reinforced to reduce the voltage decline, capacitor banks can be connected near the load to help support the voltage, or local generation can be provided to inject "imaginary power" as well as real power. Local generation is by far the best technical solution as generators have "voltage regulators" that help to stabilize the voltage on the local system. When planning a power system and locating generation voltage support is an important consideration.

1.2 Overview of Request for Expressions of Interest (RFI)

Recognizing that generation could provide a solution to the supply problem in Northern York Region the OPA issued a Request for Expressions of Interest (RFI) for New Electricity Generation Facilities in Northeastern York Region on May 2, 2005.

1.2.1 Minimum Firm Capacity Requirements

Given the nature of the problem in the region, the RFI required that generation be firm capacity to ensure it is available at peak periods when it is most needed. Firm capacity is defined as the capacity of a generator with the single largest generating unit unavailable.

For generators connected to the 44 kV distribution network, the requirement was 60 MW of firm capacity and for those on the 230 kV transmission network, it was 140 MW. The intention is that the generator would derive the majority of its revenues from the IESO-administered market.

1.2.2 Maximum Generator Sizes

No maximum generation station size was specified in the RFI for either a 44kV or 230kV connection. This was to facilitate the consideration of generating stations that would have the required economies of scale to participate successfully in the IESO administered market. Sophisticated proponents are familiar with the Ontario power system and will in any case be required to demonstrate to the IESO and Hydro One that their project will be supportive of the power system and not cause problems. The RFI process did not pre judge the outcome of a proponents assessment of the size of plant to build, or the outcome of the IESO System Impact Assessment or other studies.

1.2.3 Generator Connection Requirements

Required geographic connection points were specified in the RFI. For 44kV connected generators the RFI required that they be connected within the Armitage TS distribution system, and a map was provided showing the geographic area. As well, the nature of the 44kV connection was specified to ensure that the distribution system connection did not undermine the reliability of the 60MW firm capacity required. For 230kV connected generators the map showed the portions of the 230kV lines in northern York Region where generators could be connected. It is not necessary for a generating station to be adjacent to the transmission lines as it is the location of the "injection point" on the lines that is critical. The RFI allowed for up to 15kM of 230kV line between a generating station and the injection point on the existing lines. This offered a generous geographic area for possible plant locations and again specified the nature of the connection to ensure that the 140MW of firm generation was available with either transmission line out of service.

1.2.4 Heat Rate Requirements

No heat rate or other indication of required efficiency was specified in the RFI. That was to leave the door open to both simple cycle and combined cycle proponents. Both are capable of meeting Northern York Region needs, but they would participate differently in the IESO administered market. Simple Cycle plants would be called upon to run fewer hours and would expect to participate in the "Operating Reserve" market while idle. Combined Cycle plants would run most of the time and participate in the energy market. In either case they would be "constrained on" whenever Northern York Region demand exceeded the capability of a single transmission line.

1.2.5 Fuel Requirements

The only specification with regard to fuel type was that it must not be coal. That said, other requirements would have eliminated certain fuel types. For instance, wind cannot provide firm capacity without a storage mechanism since there is no guarantee of having wind power available at peak times.

1.2.6 Preferred In-Service Date

There was a preference indicated in the RFI for generation that could be in-service by December 1, 2006 or sooner. That requirement was important for a stand alone generation solution. As generation will be included in an integrated plan where other plan elements can relieve the immediate pressure on Northern York Region this preference has become less significant. On the other hand, the province is deficient in generation and earlier in service dates are more desirable.

1.2.7 Response to the OPA RFI

There was a healthy response to the RFI. A number of companies with proven track records in generation responded to the RFI with proposals. There were sufficient responses of good quality to provide assurance that there is interest in building generation in the affected area.

1.2.8 Confidentiality

Individual responses to an RFI, along with any information that could prejudice potential RFI respondents are commercially sensitive and therefore confidential. In order to ensure that this report to the OEB is made public in its entirety, it is necessary to omit any specific discussion of the RFI responses. The underlying OPA analysis of the supply situation does take into consideration the actual responses to RFI, even though they cannot be shared here.

1.2.9 Surrogate Market Analysis

As it was not possible to do a preliminary or complete assessment based on the RFI responses a surrogate approach was taken, blending the information provided by respondents to the RFI and other expert advice. The objective was to characterize the RFI feedback in the form of surrogate proposals, to evaluate those proposals relative to provincial and local needs, and to relate them to other options available. This approach was taken to ensure that generation would be a credible option for Northern York Region, and as a prerequisite to engaging generator proponents in an RFP process. The market analysis focused on simple cycle and combined cycle gas generation.

1.2.10 Working Group and Public Reaction

There was considerable disappointment among working group members and observers that the outcome of the RFI could not be shared, and that specific generation proposals could not be analyzed in detail. The primary areas of interest were size of generating station, geographic location, running hours per year and efficiency. Generic information on simple and combined cycle plant, limited information regarding the RFI response, unsolicited information from one proponent, and a presentation by the Association of Power Producers of Ontario were all shared with the working group and observers. On the surface it appeared that local generation faced less opposition than transmission lines but that was not determined with certainty.

1.3 Technical Aspects of Generation Options

1.3.1 Types of Power Generation

As part of the generation mix for an area, three types of generation are needed:

1. Base load generation to run continuously to supply the minimum requirements of the area.

2. Intermediate generation to ramp up early in the day and shut down in the evening to supply daytime loads.

3. Peaking generation to start rapidly to meet the few peak hours of a peak day or, to provide immediate support in the event of a contingency on the system.

There are two technical reasons for these categories. The first is a generator's ability to "maneuver" and the other is its "efficiency". A generator can "maneuver" if it can run at a wide range of output power levels, and can change output power levels quickly.

Many generators are not maneuverable at all. These include run of the river hydroelectric plants and nuclear plants where in both cases the output of the generator is constrained by the fuel. This type of generator should be set to an output power level where they are most efficient and then left to run providing Base Load generation.

Coal fired generators and Combined Cycle generators are much more maneuverable and can start and ramp up to full load in an hour or two, and run at a variety of output power levels. For maximum efficiency however all generators should run at their most efficient power level. Combined Cycle plants derive their good efficiency by using complex interlocked thermal processes that need to be in synchronism with each other to make best use of the fuel. Combined Cycle plants can provide peaking and base load generation but are most useful as Intermediate generation.

Simple Cycle generators, some hydroelectric generators, and, to a lesser extent coal fired generators are very maneuverable and are ideally suited as peaking generation. Simple Cycle generators can start in minutes and run comfortably at a wide range of output power levels. They are very useful for tracking system loads to facilitate frequency control or to help maintain appropriate power flows on portions of the transmission system. Simple Cycle generators provide operating flexibility, but run a limited number of hours because of their limited efficiency. They are ideal as peaking generation.

1.4 Suitable Local Generator Types

For a geographic area such as Northern York Region the suitable types of generation will be determined by the following factors:

- Ability to meet local capacity requirements
- Ability to contribute to provincial energy and capacity requirements

- Availability of fuel
- Availability of suitable sites
- Proximity to cooling water
- Consistency with land use policies
- Economies of scale constraints.

The two technologies that will likely meet all of these requirements are simple cycle gas and combined cycle gas. Some of the more detailed requirements that influence a choice between these technologies are as follows:

- Either type of generator must be already running when daily peak loads that exceed the capability of a single transmission line occur and must continue to run until that peak load subsides, generally for several hours each day. Because "voltage collapse" is an instantaneous event it is too late to start any type of generator after the first transmission line fails, even if that failure is momentary.

- Either type of generator must earn most of its revenues meeting provincial energy and capacity requirements, and must therefore be economic during most or all of the time periods for local "constrained on" periods, or provide economic reserve capacity when not running.

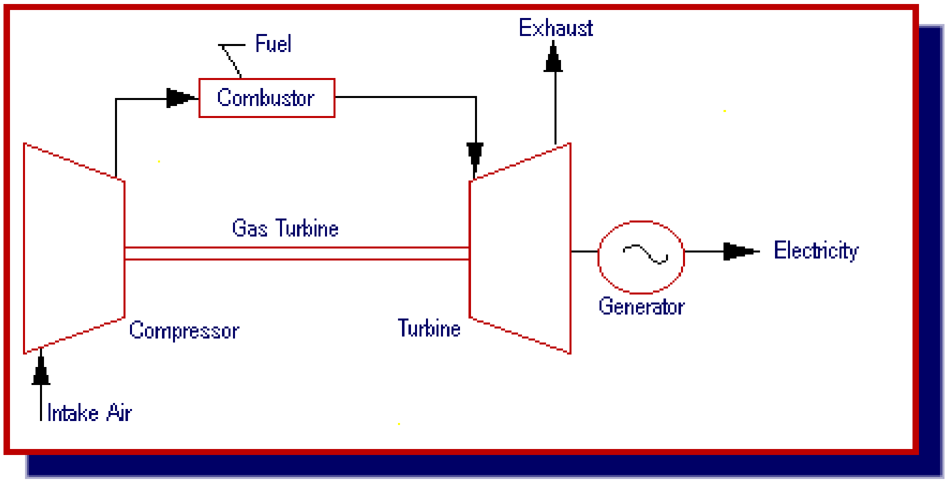
Those technologies and the ability of such plants to meet local and provincial requirements are described in the following sections.

1.4.1 Simple Cycle Generators

Simple cycle generators use a Brayton Cycle. This is a generator driven by a Gas Turbine, also referred to as Combustion Turbine. Heat from the gas turbine exhaust gases is not utilized to produce useful energy.

In a gas turbine, large volumes of air are compressed to high pressure in a multistage compressor for distribution to one or more combustion chambers. High pressure/ temperature combustion gases power an axial turbine that drives both the compressor and the generator before exhausting to the atmosphere.

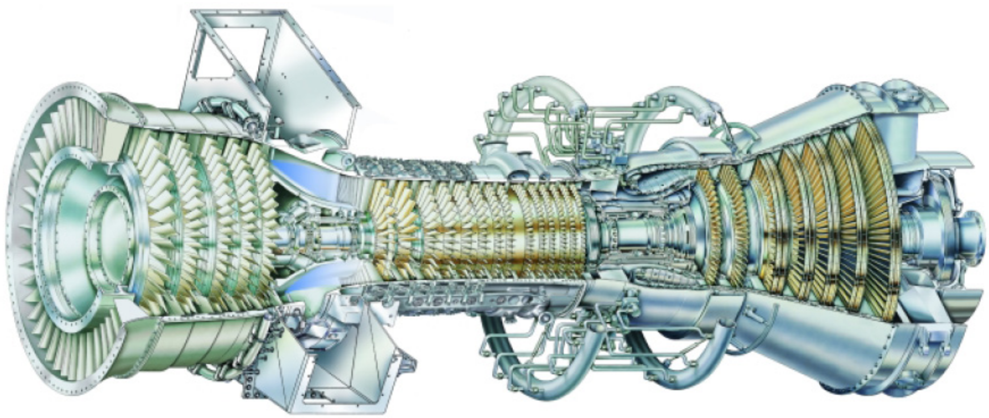
Simple Cycle Process Diagram



Simple cycle generators commonly use Aero-derivative Turbines. The characteristics are as follows

- Aero-derivative gas turbines for stationary power applications are adapted from their jet and turbo-shaft aircraft engine counterparts.
- These turbines are lightweight and thermally efficient.
- Rapid loading capability – 10 minutes from start to full power.
- Aero-derivative turbines available range in outputs from 3 MW to approximately 45 MW in capacity.
- Many aero-derivative gas turbines for stationary use operate with compression ratios in the range of 30:1 (relative to ambient pressure), requiring a high-pressure external fuel gas compressor.
- Aero-derivatives are approaching 45% simple-cycle efficiencies.

GE LM6000PD Aero-Derivative



Simple Cycle Plant Applications are typically

- Temporary power
- Peaking capacity
- System power factor correction and voltage support.

Typical Simple Cycle Plant (120 MW Simple Cycle – 3 X GTG)

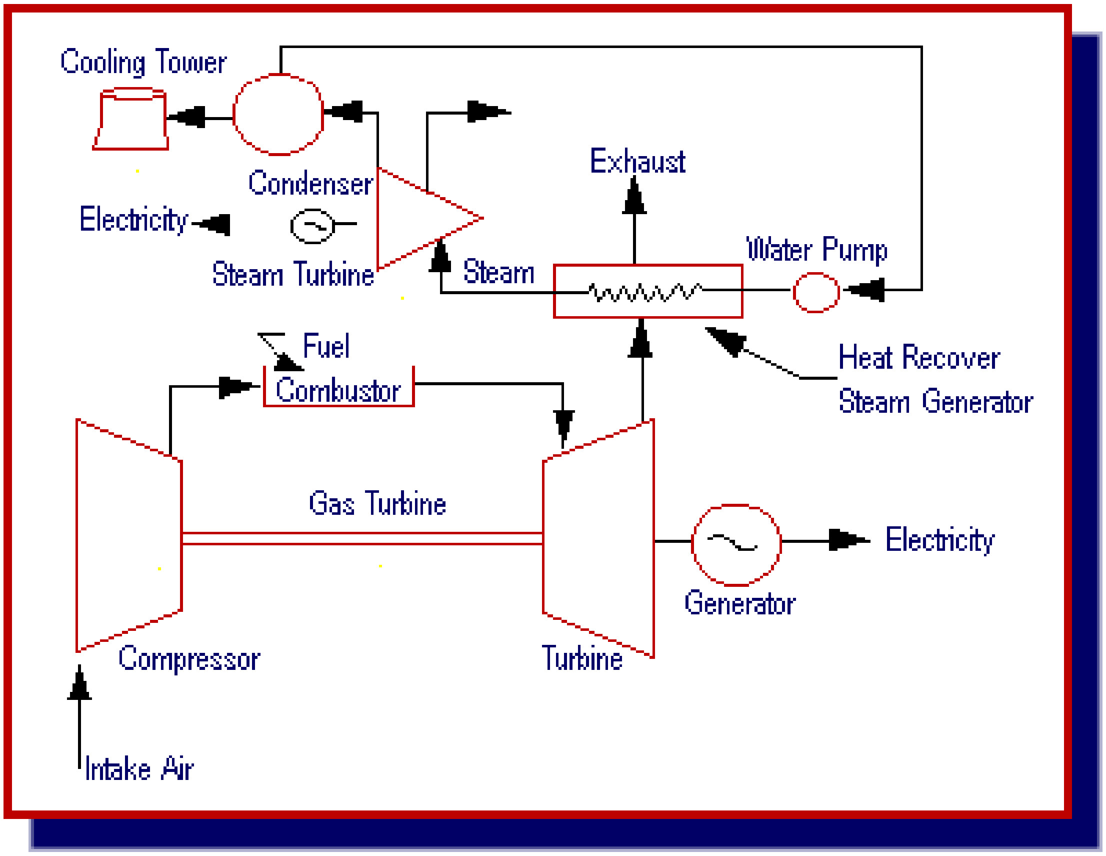
1.4.2 Combined Cycle Generators

Combined Cycle Refers to power plants based on the use of two thermodynamic cycles: the Brayton Cycle defined previously for simple cycle and the Rankine Cycle.

Rankine Cycle uses steam/water as the working fluid. Waste heat from the gas turbine exhaust is used as the thermal energy input to the Rankine cycle. In the Rankine cycle high pressure/temperature steam is expanded in a steam turbine to a lower pressure. Useful work is extracted from this expansion process and converted to mechanical power within the steam turbine. The steam turbine is connected to a generator where mechanical power is converted to electric power.

Combined-cycle units are made up of one or more gas turbines, each with a waste heat steam generator arranged to supply steam to a single steam turbine, thus forming a combined-cycle unit or block.

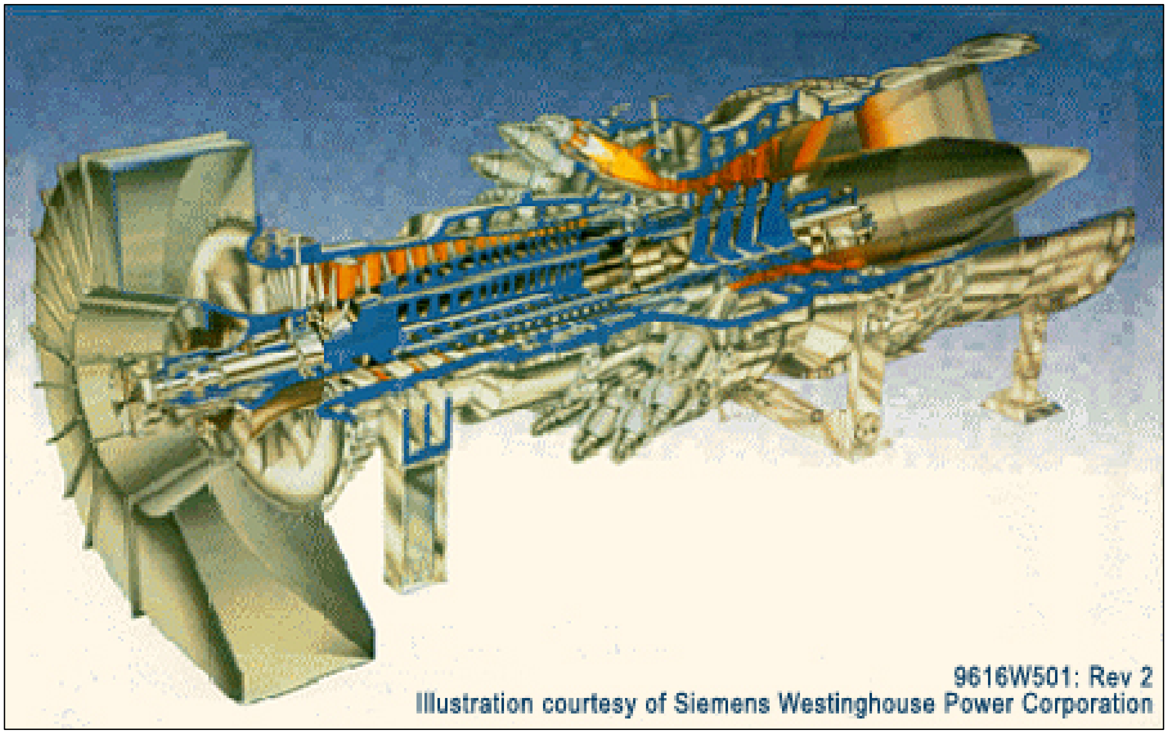
Combined Cycle Process Diagram



Industrial Gas Turbines are commonly but not always used in combined cycle plants. Their characteristics are as follows:

- Industrial or frame gas turbines were developed exclusively for stationary power generation.
- They are available in the 1 to 250 MW capacity range.
- They are generally less expensive than aero-derivatives, more rugged, can operate longer between overhauls, and are best suited to continuous base-load operation.
- They are less efficient and much heavier than aero-derivatives.
- Industrial gas turbines generally have more modest compression ratios (up to 16:1) and often do not require an external fuel gas compressor.
- Industrial gas turbines are approaching simple-cycle efficiencies of approximately 40%.

Typical Industrial Turbine (Siemens W501F Power: 170 MW)

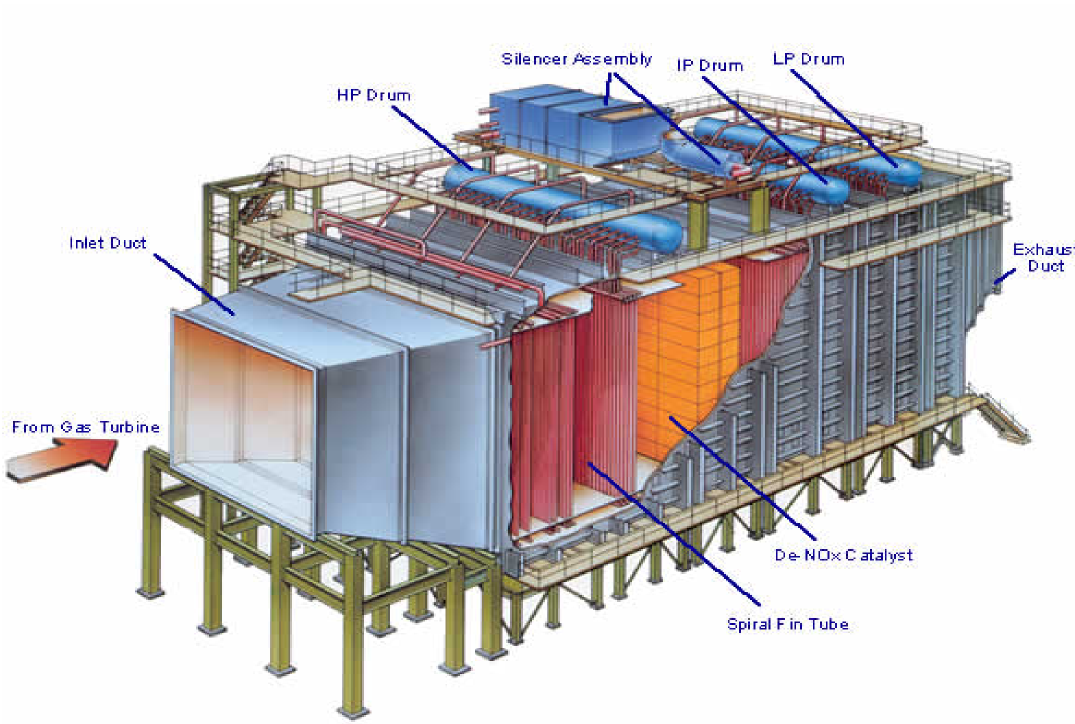


Combined Cycle plants contain equipment for heat recovery not found in Simple Cycle Plants. The major Equipment associated with Combined Cycle Power plants is as follows:

- Gas Turbine Generator(s)
- Heat Recovery Steam Generator(s)
- Steam Turbine Generator
- Condenser (for steam exhausted from steam turbine)
- Heat Rejection System (Cooling Towers or once through cooling system using lake or river water)
- Step-up Transformers
- HV Switchyard.

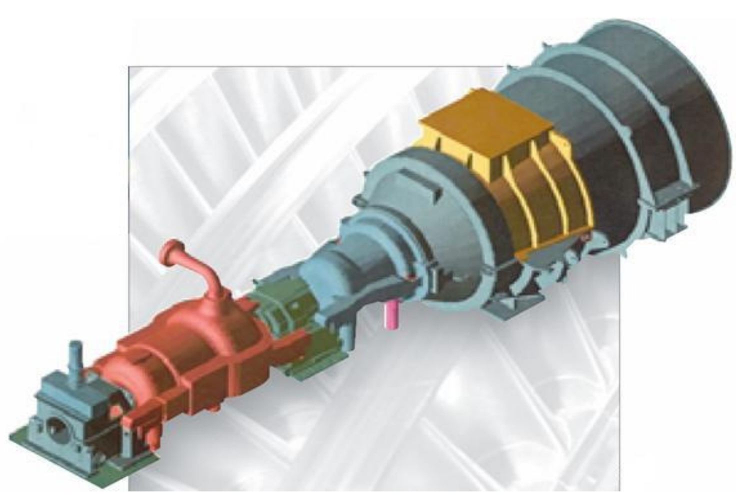
Heat Recovery Steam Generator

Function: Captures waste heat in the exhaust stream of the gas turbine to generate steam.



Steam Turbine

Function: Converts steam energy to mechanical energy (shaft power) to drive an electric generator.



Cooling Tower

Function: Rejection of heat from the Steam Turbine Condenser

Typical Combined Cycle Plant
(640 MW Combined Cycle – 2 X GTG, 1XSTG)

1.5 Comparison of Generator Options

Financial analysis does not appear in this Exhibit, however, a study performed by London Economics for the OPA , and included as Exhibit G, has shown that there is a need in Ontario for both intermediate and peaking generation. The need for peaking generation has come about for two relatively new reasons:

- The phase out of coal fired generation has significantly reduced the available peaking capacity in the Ontario system

- Wind generation presently being added to the Ontario system is highly variable increasing the need for "companion" peaking generation to quickly and completely augment wind generation during periods of low wind.

This document provides input to the financial analysis. The technical factors affecting financial analysis include:

- Attributes of Simple Cycle and Combined Cycle Generators
- Economies of Scale Considerations

1.5.1 Attributes of Simple Cycle and Combined Cycle Generation

Generally speaking, combined cycle gas generation is considered intermediate while simple cycle is peaking. Combined cycle generation typically has a higher capital cost but a lower operating cost than simple cycle. As a result, it tends to run more often than simple cycle, but is more efficient when running. Consequently, a combined cycle generator produces more emissions in absolute terms, but fewer emissions per megawatt hour. The suitability of either type depends entirely on the situation. In the Northern York Region case both the provincial and local needs have to be considered. As Ontario is deficient in all forms of generation including peaking, the York Region decision can be made on the basis of local conditions. The minimum local requirements can be met by either Simple or Combined Cycle generation and ultimately the decision is based on the practicality of each in providing a solution.

1.5.2 Practical Generating Station Size

The OPA has "Minimum Requirements" that must be met to achieve a local solution. For a 44kV connected generation the "Minimum Firm Capability" is 60MW and that must be met with the largest generator unavailable for service. For a 230kV connected generator that same requirement is 140MW. Those requirements will have to be met by either a Simple Cycle or Combined Cycle Plant.

As there could be a premium to pay for generation in the local area because of gas supply, or other local factors, the OPA will set limits on the size of generating station that it will contract for. Finally the transmission and distribution system in the area will have a maximum ability to absorb generation. These put upper limits on the size of plant that can be built in Northern York Region.

Generation is only an option if it is economic for electricity ratepayers, and profitable for the owners of the plant. In general larger plants are more economic for owner operators because much of the infrastructure and operating costs are common to large and small plants. Larger plants produce more power per dollar of investment than small plants do. Accordingly plants should be large enough to be financially efficient. In the case of Combined Cycle plants larger size is a requirement because more machinery is required to extract power using both the Brayton and Rankine Cycles.

This section looks at economies of scale from a developer's point of view given the physical constraints applied by the specific application in Northern York Region.

Combined Cycle Plants

A Combined Cycle plant consists of one or more gas turbine generators, each producing electricity, and each contributing exhaust heat to produce steam for (usually) one steam turbine. The steam turbine drives a generator producing electricity from the waste heat. Combined cycle plants are described as "one on one", "two on one" or "three on one" depending on the number of gas turbines providing waste heat for the one steam turbine.

To meet Northern York Region minimum requirements a combined cycle plant would have to produce the "Minimum Firm Capacity" with its largest generator unavailable. This excludes the possibility of the "one on one" arrangement commonly used for 300MW sized plants because failure of the one gas turbine disables the one steam turbine resulting in zero output. A "two on one" plant can sustain the failure of either gas turbine or the steam turbine and still produce an output. If either gas turbine is unavailable the steam turbine is denied one-half of its required steam so the total plant output will be somewhat less than one-half. To meet a 140MW minimum firm capacity a "two on one" Combined Cycle plant would need a maximum capacity of at least 300MW. A "three on one" plant would improve this situation slightly but at the price of complexity, higher capital costs and a probable need to build an even bigger plant to recoup the capital costs.

Lastly the Combined Cycle Plant would have to use commercially available technology to be financially efficient. Commercially available gas and steam turbines come in certain sizes which would have to add up to the required solution for Northern York Region. The following analysis looks at a hypothetical 300MW Combined Cycle plant to see if such a plant could efficiently meet the stated "Minimum Requirements"

Combined Cycle Plant Analysis:

Assumptions:
300MW maximum plant output and 140MW firm minimum plant output (n-1 output)

The 300MW was based on a hypothetical "right sized" plant. The 140MW was based on the required load meeting capability during "constrained on" periods with the assumption that the largest generator is unavailable

Based on the above criteria the combined cycle configurations that could meet the OPA requirements are 2 x 1 configurations as a minimum. In addition the plant would have to be equipped with bypass stacks to allow operation with the Steam Turbine Generator (STG) out or service. 1 x 1 will not meet the reliability requirements. Based on the minimum/maximum output criteria the combined cycle configurations that are available are limited to the following:

Gas Turbine	# GTG X # STG (per block)	# of Blocks	Plant Net Output	N-1 Output	Efficiency
LM6000PD	2 x 1	2	240 MW	180 MW	51.5%
Trent 60	2 x 1	2	260 MW	195 MW	52%
Alstom GT11N2	2 x1	1	348 MW	174 MW	51%

As can be seen from the above table, a combined cycle plant that exactly meets the OPA criteria is not available in the marketplace with modern, efficient and proven gas turbines.

It should be noted that the output of the Trent or LM6000 (aero-derivative) based plants could be increased by supplementary firing thereby increasing the output from the steam turbine generators but this additional output comes with penalties on heat rate. Water injected versions of the Trent and LM6000PD can achieve slightly higher plant outputs.

The capital costs of the aero-derivative gas turbine based multi block plants will be considerably higher than the cost of the Altsom GT11N2 based plant.

The conclusion is that an economic and practical Combined Cycle Plant would have to be larger than 300MW to meet the minimum requirements of northern York Region, much larger than would be required to provide a local solution.

Simple Cycle Plants:

A Simple Cycle plant consists of one or more gas turbines, each independently producing electricity, and each discharging unused exhaust heat. To meet Northern York Region minimum requirements a Simple Cycle plant would have to produce the “Minimum Firm Capacity” with its largest generator unavailable. To meet a 140MW minimum firm capacity a Simple Cycle plant could have a wide range of maximum capacity depending on the number and size of the individual generators.

A Simple Cycle Plant would have to use commercially available technology to be financially efficient. Commercially available gas turbines come in certain sizes which would have to add up to the required solution for northern York Region. The following analysis looks at a hypothetical 300MW Simple Cycle plant to see if such a plant could efficiently meet the stated “Minimum Requirements”

The OPA requires approximate performance for typical simple cycle plants to be used in the evaluation of proposals from proponents during future planned RFP’s for the addition of new generation for the Region of York. The criteria given for the operating envelope of the plants were as follows:

1. *All configurations should achieve 140MW firm capacity during "constrained on" periods with the assumption that one (the largest) generator is unavailable.*

2. *The maximum power output is 300MW.*

3. *Simple cycle plant data was also requested for a second scenario which involved a smaller plant connected to the 44 kV system. Under this scenario the plant should achieve 60 MW firm capacity during "constrained on" periods with the assumption that one generator is unavailable.*

Assumptions

The performance data provided is based on new and clean performance for the gas turbine generator sets and is based on OEM published data. Guaranteed site specific performance will likely contain margins. Plant auxiliary loads and transformer losses are estimated. Fuel gas compression is assumed to be required for each plant configuration.

Aero-derivative Simple Cycle Plant - 230 kV Connection

5 x LM6000PD Sprint

Performance:

	Summer Design (90F)	***ISO Conditions (59F)***
Net Plant Output (MW)	*39 X 5 =**195***	*46 X 5 = **230***
n-1 Net Plant Output (MW)	*39 x 4 = **156***	*46 X 4 = **184***
Efficiency (%)	*37%*	*40.5%*
Heat Rate (Btu/kWh-LHV)	*9,230*	*8,414*

Assessment:

Plant meets design criteria.

4 x Trent 60

Performance:

4 x Trent60	***Summer Design (90F)***	***ISO Conditions (59F)***
Net Plant Output (MW)	*45 X 4 =**180***	*56.3 X 4 = **225***
n-1 Net Plant Output (MW)	*45 x 3 = **135***	*56.3 X 3 = **169***
Efficiency (%)	*37%*	*39.7%*
Heat Rate (Btu/kWh-LHV)	*9,246*	*8,587*

Assessment:

Plant does not meet the 140 MW target for n-1 generation in summer design case.

Industrial Gas Turbine Simple Cycle Plant - 230 kV Connection

3 x GE PG6111FA

Performance:

	Summer Design (90F)	***ISO (59F)***
Net Plant Output (MW)	*64.5 X 3 = 201*	*73.3 X 3 = 220*
N-1 Net Plant Output (MW)	*64.5 X 2= 129**	*73.3 X 2 = 146.5*
Efficiency (%)	*32.4*	*33.8*
Heat Rate (Btu/kWh-LHV)	*10,549*	*10,090*

**Note: Inlet fogging can be employed to increase output.*

Assessment:
Plant does not meet the 140 MW target for n-1 generation in summer design case. Shortfall is approximately 11 MW. Some, or possibly all, of the generation shortfall could be made up with inlet cooling systems for the gas turbines.

2 x GE PG7241FA

Performance:

	Summer Design (90F)	***ISO (59F)***
Net Plant Output (MW)	*148.5 x 2 = 297*	*167 X 2 = 334*
N-1 Net Plant Output (MW)	*148.5 X 1= 148.5*	*167 X 1 = 167*
Efficiency (%)	*34.4*	*35.5*
Heat Rate (Btu/kWh-LHV)	*9,928*	*9,624*

Assessment:
Plant exceeds the maximum generation target of 300 MW whenever the ambient temperature is less than approx. 85 F (i.e. most of the year).

Aero-derivative Simple Cycle Plant - 44 kV Connection

3 x LM6000PD Sprint

Performance:

	Summer Design (90F)	***ISO Conditions (59F)***
Net Plant Output (MW)	*39 X 3 =**117***	*46 X 3 = **138***
n-1 Net Plant Output (MW)	*39 x 2 = **78***	*46 X 2 = **92***
Efficiency (%)	*37%*	*40.5%*
Heat Rate (Btu/kWh-LHV)	*9,230*	*8,414*

Assessment:
Plant meets design criteria.

The conclusion is that Simple Cycle plants can meet both the "Minimum Requirements", and reasonable maximum size limits. Generator sizes of less than 50MW have advantages in reducing total plant size because the loss of one generator is less significant.

1.5.3 Preferred Generation for York Region

From a technical standpoint, a 230kV connected Simple Cycle plant with a maximum size of 200MW to 250MW would be a practical solution to meeting the minimum requirements of Northern York Region. Such a plant should be connected to both 230kV lines feeding northern York Region such that all running generation is available should one 230kV line be forced out of service.

A Combined Cycle generating station would also meet local minimum requirements but would have to be in the 350MW range to be practical. Such a generating station would provide the additional benefit of providing greater supply diversity for Northern York Region. If the transmission lines feeding Armitage TS were reconfigured such that the limited supply from the north (approximately 150MW) could be combined with the output of a 350MW generating station the two together could supply all the area load in the event of a failure of the lines from the south.

Although 44kV connected generation would be a useful contributor to an overall solution, it is unlikely that it could be a complete solution, as it could not provide the range of benefits that a 230kV connected generating station would. Further to this 44kV generation with an installed capacity of about 150MW would have to be located in close proximity to transformer stations where physical space is limited. In addition this generation would have to displace load from the transformers to be effective and therefore have to be associated with the most heavily loaded transformer stations. Armitage TS is the logical choice from this standpoint but has egress problems that would make connection of significant generation very difficult. 44kV connected generation should be seen only as a contributor to a generation solution.

These technical conclusions were developed to contribute to the financial analysis performed for the generation option that will include additional non technical factors.