

Opening the door to clean power in Toronto

Removing the barriers to combined heat and power and distributed generation

ONTARIO CLEAN AIR ALLIANCE | www.cleanairalliance.org

The City has set ambitious — but very appropriate — greenhouse gas (GHG) reduction goals in its *Climate Change, Clean Air and Sustainable Energy Action Plan*. The City has identified the phase-out of coal-fired electricity as a major element of its plans to reach these targets and is prioritizing actions that will help to support this phase out.

One of the best ways for the City to support a coal phase-out is to encourage the development of highly efficient combined heat and power (CHP) systems in office buildings, municipal buildings, hospitals, high rises, and factories.

Combined heat and power systems will allow these facilities to use the natural gas that is already being consumed for space and water heating to provide electricity as well with little additional fuel input. CHP systems have a number of significant advantages over traditional electricity generation:

- **Much higher efficiency level:** CHP systems can have efficiencies of 80-90% compared to the 33% efficiency of coal-fired generators and nuclear reactors.
- **Lower greenhouse gas emissions:** The greenhouse gas emission rate per kWh of electricity of a CHP plant is 80% lower than that of a coal-fired power plant.
- **Greatly reduced transmission system losses:** Transmission and distribution system losses for conventional generators that have to send power hundreds of kilometres to load centres like cities average around 7.5% in Ontario. These losses are much higher in periods of peak system demand. Because CHP systems are located very close to where the power is actually being used, line losses are negligible.
- **Much greater reliability:** Ontario has experienced numerous unexpected breakdowns with its aging fleet of nuclear reactors. When a nuclear reactor has an unscheduled shutdown, it can destabilize the entire electricity supply system. Because a system built around extensive use of CHP gets power from many small sources, a shutdown of any one unit will cause little disruption. CHP systems also use simple, straightforward technology with proven reliability.



Co-generation systems provide two services — heat and electricity — using about the same amount of gas as would be used to provide heat alone.

CHP provides a good bridging and back-up technology for renewable sources and will be much more complimentary to the City's vision of a smart energy system than large centralized nuclear power plants.

- **Greater security:** Toronto currently generates very little of its own electricity, relying instead on power delivered by two high-voltage transmission paths from distant generating stations. This makes the City very vulnerable to a weather, major equipment failure or sabotage event that takes out one or both of these lines or a provincial or North American blackout. On-site CHP capacity would lessen these risks by providing independent power at the demand point.
- **Reduced transmission load:** The electricity transmission and distribution grid in Toronto is running close to capacity in peak periods. Greater use of local CHP would be a more efficient way of meeting our electricity needs than expanding the grid with an expensive and disruptive third major transmission line through East Toronto.
- **More jobs and revenue for local businesses:** Implementation of CHP and distributed energy systems will be much more jobs intensive than the construction of a handful of large new generating plants. These locally owned assets also have the potential to save local businesses money or even provide new revenues through the sale of excess power.

While the City has set a target for moving aggressively to secure more renewable energy, its staff acknowledge that it will be challenging to meet these targets due to growing competition for renewable power (components and capital) and the current pace of renewable power development. CHP provides a good bridging and back-up technology for renewable sources and will be much more complimentary to the City's vision of a smart energy system than large centralized nuclear power plants.

The City is rightly concerned about a heavy reliance on natural gas from Western Canada and the emission impacts of burning this gas. However, Toronto can simultaneously promote CHP and reduce its total natural gas consumption for the following reasons. First, virtually every home and building in Toronto uses natural gas to provide just one service, namely, heat. It is much more efficient to use these same molecules of natural gas to simultaneously produce two services, namely, heat and power.

Second, combined heat and power plants, which can have an overall energy efficiency of 80 to 90%, are the most energy-efficient gas technology for electricity generation. New CHP plants can help to reduce the need for less efficient natural gas-fired power plants (e.g., the Portlands Energy Centre, which has an energy efficiency of approximately 56% and the proposed Northern York Region peaker plant which will have an energy efficiency of only 36%).

Third, the installation of new CHP plants in Toronto can and should be combined with aggressive Enbridge Gas Distribution energy conservation programs to ensure that Toronto's total natural gas consumption declines as its number of small-scale super-efficient CHP plants increases.

Why isn't CHP lighting up Toronto?

Currently there are three major interrelated obstacles to the widespread adoption of renewable and CHP systems in Toronto.

The first is the lack of a clear financial incentive for the adoption of these technologies due to Ontario's historic practice of subsidizing conventional sources of electricity generation. Specifically, Ontario subsidizes the financial costs of nuclear generation and does not include the costs of air pollution and climate change in the price of coal-fired electricity generation.

To its credit, the provincial government is attempting to address this issue in part with its standard offer program for renewable electricity (RESOP) and its proposed Clean Energy Standard Offer Program (CESOP) for CHP. Properly configured, these programs can go a long way to overcoming the financial hurdles to the development of more sustainable power systems. In fact, the province's renewable power standard offer program has been so successful that, in its first year, it attracted power commitments equal to what the Ontario Power Authority (OPA) predicted would be available over a 10-year period.

Unfortunately, this is where the second major obstacle comes into play. Citing transmission system limitations, the OPA is not allowing program participation in downtown Toronto. This means that one of the largest potential CHP pools in the province will not be eligible for participation in the CESOP and Toronto will not get the full benefit from a program that could spur significant growth and investment in clean energy solutions.

Specifically, according to the OPA, new CHP projects cannot be connected to the grid until the short circuit constraints in downtown and central Toronto have been eliminated.

While there is a need for Hydro One's transmission system to be refurbished and upgraded to address the short circuit constraints and other reliability issues, this fact does not mean that all CHP projects in downtown Toronto must be excluded from the CESOP program. In fact, there are a couple of circumstances under which projects can participate now or can begin preparing for participation as soon as the current technical limitations are rectified.

1. The "short circuit" constraints with respect to load-displacement CHP projects can be resolved prior to the transmission system refurbishment and upgrades being completed. That is, CHP projects that produce electricity solely for internal use and do not export power to the Toronto Hydro or Hydro One grids should be eligible for immediate participation in CESOP.

2. With respect to new bi-directional CHP projects that will export power to the grid, the OPA can sign contracts today to purchase their power as soon as the short circuit constraints are eliminated. By signing contracts today, the OPA will make it possible for developers to start designing, financing and building CHP projects that will be able to come on line as soon as the short circuit constraints are eliminated.

Needless to say, there is an urgent need for the short circuit constraints and other

The OPA is not allowing program participation in downtown Toronto. This means that one of the largest potential CHP pools in the province will not be eligible for participation in the CESOP and Toronto will not get any benefit from a program that could spur significant growth and investment in clean energy solutions.

The third barrier to distributed generation in our City is Toronto Hydro's policy that renewable and CHP projects must pay all the costs of connecting their systems to the Toronto Hydro distribution grid.

reliability issues to be addressed as soon as technically possible. Unfortunately, OPA and Hydro One are currently moving at a very deliberate pace on this issue. Specifically, Hydro One is proposing to only carry out project development work in 2009 and 2010 with respect to identifying the feasibility and scope of the work required to upgrade the short circuit ratings of its Hearn, Leaside and Manby Transformer Stations, meaning it is not planning to actually eliminate the short circuit constraints until 2011 at the earliest.

Clearly, there is need for strong leadership from Toronto City Council and Ontario's Energy Minister George Smitherman to overcome these institutional barriers to CHP in downtown Toronto. As a consequence, the Ontario Clean Air Alliance recommends that:

1. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to develop a strategy to eliminate the short circuit constraints to permit the installation of up to 300 megawatts of renewable and CHP generation in downtown and central Toronto as soon as technically possible (preferably by the beginning of 2011 at the latest).
2. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to provide the City within the next three months with its workplan and time lines for eliminating the short circuit constraints in downtown and central Toronto.
3. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to allow load-displacement CHP projects in downtown Toronto to participate in its CESOP now with appropriate technical safeguards.
4. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to commence signing contracts now for bi-directional CHP projects in downtown Toronto that will provide power to the grid as soon as the short circuit constraints are eliminated.

Grid Connection Costs

The third barrier to distributed generation in our City is Toronto Hydro's policy that renewable and CHP projects must pay all the costs of connecting their systems to the Toronto Hydro distribution grid.

There is a clear double standard in place for energy generation projects in Ontario. Large centralized generators, such as Bruce Power, are not required to pay the costs of building high-voltage transmission lines to transmit their power. All electricity consumers contribute to the cost of these projects through their electricity rates. Currently, for example, Hydro One is planning to spend more than \$600 million to build a new transmission line to bring power from the Bruce Nuclear Generating Station to the GTA.

The cost of this transmission line will be paid for by all Ontario customers.

Meanwhile, CHP project developers in Toronto must pay the full costs of connecting their projects to the local distribution grid. Connection is necessary – and useful – to allow power to flow from these projects to the grid or to allow power to flow from the grid to these customers if they have additional power needs. These projects also have many public benefits: they reduce polluting emissions from large fossil fuel-fired generating stations; they are much less costly than new nuclear plants; they increase reliability and power quality within the local area; and they are key to development of a more sustainable electricity system in Ontario.

However, if Toronto Hydro does not recover these costs from project developers, its profits will be reduced. Furthermore, load displacement CHP projects will also reduce its distribution revenues and profits. Fortunately, there is a straightforward solution to these problems.

The City of Toronto should direct Toronto Hydro to ask the Ontario Energy Board (OEB) to establish a deferral account to record all its costs and lost revenues due to hooking up new distributed generation (renewable and CHP) customers. If this request is supported by the City of Toronto, it is virtually certain that the OEB will approve it. The deferral account will allow Toronto Hydro to recover its distribution grid hook up costs and lost revenues from all of its retail customers when its distribution rates are re-set at the time of its next rate hearing.

In other words, connection costs and lost revenues can and should be recovered from all of Toronto Hydro customers since they all benefit from distributed generation in terms of reduced air pollution, reduced greenhouse gas emissions and increased security of supply.



A combined heat and power system was recently installed on the roof of Toronto Housing's David A. Croll apartments.

Other actions the City can take to advance clean power

There are a number of other actions the City can take to promote the use of clean power systems, whether these systems use natural gas, biogas, or waste heat.

1. As part of its Green Development Standard, the City should require all new commercial or institutional buildings that require emergency back-up power systems to install natural gas-fired CHP systems rather than conventional diesel stand-by generators. (Institutional by 2010 and commercial by 2012.)

Combined Heat and Emergency Power Systems have many advantages over conventional diesel systems, including:

Diesel systems are usually designed to cover essential power needs during a brief building evacuation period (usually two hours), which makes them much less useful during extended power outages. Continuously fuelled CHP systems, on the other hand, can keep a building fully livable during a blackout since the natural gas distribution system is powered independently from the provincial power grid.

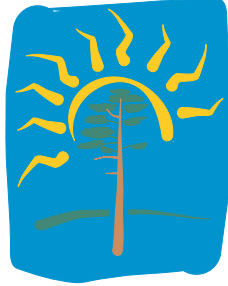
Poorly managed diesel fuel for emergency generators can result in reliability problems (e.g., fuel degradation) and diesel systems without additional emissions controls will have larger air polluting emissions.

The insurance industry is starting to recognize the increased risk of on-site diesel fuel storage and the difficulty of refueling during a widespread blackout, and is adjusting rates accordingly.

2. Institute a requirement that all health-sector facilities within the City install CHP systems. Health facilities are ideally suited to CHP due to their high hot water and heating loads. CHP systems also give these facilities much greater protection against blackouts than current emergency power systems that may support only vital life-support systems. Natural gas-fired CHP systems can permit our hospitals and extended care facilities to operate at *full capacity* during an extended blackout.
3. As part of the Green Development Standard, the City should set targets for connecting new and existing developments to small-scale district energy systems to ensure the most efficient possible use of non-renewable resources or to facilitate expansion of green options, such as deep-lake water cooling or geothermal energy.

Summary of Recommendations

1. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to develop a strategy to eliminate the short circuit constraints in downtown and central Toronto to permit the installation of up to 300 megawatts of renewable and CHP generation in downtown Toronto as soon as technically possible (preferably by the beginning of 2011 at the latest). The Minister should also require the OPA to produce a plan for this work within three months.
2. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to allow load-displacement CHP projects in downtown Toronto to participate in its CESOP now with appropriate technical safeguards.
3. Toronto City Council should ask Energy Minister Smitherman to direct the OPA to commence signing contracts now for bi-directional CHP projects in downtown Toronto that will provide power to the grid as soon as the short circuit constraints have been eliminated.
4. The City should direct Toronto Hydro to ask the Ontario Energy Board to establish a deferral account to: a) record all of Toronto Hydro's costs and lost revenues associated with hooking up renewable and CHP projects to its distribution grid; and b) allow Toronto Hydro to recover these costs from all of its customers when its distribution rates are re-set.
5. As part of its Green Development Standard, the City should require that new commercial buildings or institutional buildings that require emergency back-up power supplies install gas-fired CHP systems rather than conventional diesel stand-by generators, with a deadline of 2012 for commercial buildings and a deadline of 2010 for institutional buildings.
6. Require that all health sector facilities within the City install CHP systems. Health facilities are ideally suited to CHP due to their high hot water and heating loads. Natural gas-fired CHP systems can permit hospitals and extended care facilities to operate at full capacity during a blackout, whereas current emergency power systems may only support vital life-support systems.
7. As part of the Green Development Standard, the City should set targets for connecting new and existing developments to small-scale district energy systems to ensure the most efficient possible use of non-renewable resources or to facilitate expansion of green options, such as deep-lake water cooling or geothermal energy.
8. The City should ask Enbridge Gas Distribution to implement aggressive energy conservation programs that will ensure that the City's total natural gas consumption declines as its use of natural gas-fired CHP systems for electricity generation increases.
9. The City should request that the Province amend the City of Toronto Act to give it the authority to implement stronger energy efficiency standards for buildings. Such authority would help the City reduce electricity demand growth and make the installation of self-generation systems more attractive, thereby reducing pressure on the City's electricity distribution system. As the largest economic centre in the province, the city's adoption of more advanced standards would also help to drive improvements across the province.
10. Toronto Hydro should be encouraged to invest in distributed generation systems through its Toronto Hydro Energy Services subsidiary.
11. Toronto Hydro should be requested to produce a plan by 2010 for introducing smart grid technology for the local distribution system, including the potential development of smart micro-grids as an interim step.



ONTARIO
CLEAN AIR
ALLIANCE

www.cleanairalliance.org
contact@cleanairalliance.org
Suite 402, 625 Church St.
Toronto, ON
M4Y 2G1

For more information,
please contact:
Jack Gibbons, Chair
jack@cleanairalliance.org
416-926-1907 x240