Distributed Generation in Toronto:

A Stakeholder Survey of Barriers and Benefits

Prepared for
World Wildlife Fund Canada
by Joslyn Higginson
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This report was prepared for WWF-Canada by Joslyn Higginson
of Manifesto Sustainability Communications.

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for our work on reducing greenhouse gases by maximizing the potential contribution
from high-efficiency co-generation power projects.

PREFACE

Distributed Generation and Green Energy Act

WWF commissioned this study on Distributed Generation (DG) with the goal of documenting and assessing stakeholder perceptions of the barriers to DG and cogeneration in Ontario, and Toronto specifically. Our goal was to identify common ground on which to advance a strategic framework for widespread implementation of DG, and provide a vehicle for communicating the experiences of those working most closely with DG projects and policies.

Toronto is facing numerous short-, medium- and long-term supply and capacity challenges. To many, DG is an obvious solution to meet those challenges, and also to meet many of the City's and the Province's environmental, energy and social goals. It therefore made sense to focus on Toronto as a starting point from which to advance a Roadmap that might then be applicable to Ontario more broadly, with some modifications.

While many respondents expressed frustration with the lack of progress in advancing DG, virtually all were enthusiastic about its potential, and offer valuable insights into its many benefits, ways to eradicate existing barriers and to move forward with DG in Toronto.

Ontario's *Green Energy and Green Economy Act*, tabled just as this study was concluded, promises to be an important catalyst to more widespread implementation of DG, provided the right measures are taken and amendments made. WWF commends the Government of Ontario and the Minister of Energy and Infrastructure for this bold legislation, which has the potential to be a world-leading framework for advancing green energy, and positioning Ontario to reap the economic, technology and employment benefits of the global shift to renewables.

As this Preface is being written, the Ontario Power Authority has released the proposed rates for the Feed-in-tarrifs, announced in the legislation. As this study states, the prices will ultimately determine the viability of DG projects, and the prices put forward by the OPA look promising. More needs to be done, though, particularly if we are to encourage more widespread cogeneration or CHP in Toronto and Ontario.

WWF acknowledges and thanks the Ontario Trillium Foundation for its generous support of this work to investigate and promote Distributed Generation and Cogeneration in Ontario. WWF would also like to thank the Ontario Power Authority for its assistance in providing information, analysis and data for this study.

Keith Stewart
Manager, Climate and Energy Solutions
WWF-Canada
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Executive Summary

1. This study looks at stakeholder views on Distributed Generation (DG) in Toronto. It is based upon 41 in-depth interviews and a literature review. The principal objective is to identify key barriers and opportunities for DG in Toronto.
2. Escalating interest in DG over the past 10-15 years has been driven by various factors: technological innovations; increasing system-capacity needs; changing economic and regulatory environments; and, shifting environmental and social priorities. The International Energy Agency (IEA) (2002) specifies five major factors contributing to this evolution: developments in DG technologies; constraints on the construction of new transmission lines; increased customer demand for highly reliable electricity; the liberalization of electricity markets; and, concerns about climate change[1].
3. DG is growing quickly: as of 2005, 25% of new electricity generation installed globally came from distributed resources, compared with only 13% in 2002.[2] In Europe, decentralized energy systems and distributed generation are growing in demand, as they are seen to meet the twin challenges of energy security and climate change. Countries like Denmark, Finland and the Netherlands demonstrate that it is possible to make much greater use of DG and district energy opportunities. In Denmark, approximately 57% of electrical capacity comes from CHP and 31% from renewables – achieved primarily through the introduction of a feed-in tariff to promote renewables and CHP[3], and heat planning legislation to promote CHP and district heating.
4. In contrast to the traditional, centralized system, DG is "a system in which electricity is produced by small to medium-sized generators connected to distribution systems."[4] This study will define DG as electricity production that is on-site or close to a load center, either interconnected to the utility distribution system or, less commonly, stand-alone. These generators can range from a few kW to approximately 20MW. Widespread uptake of DG will require a paradigm shift from the centralized power generation model Ontario was built on. This definition includes such technologies as photovoltaics; small wind; small biomass; small combined heat and power (CHP) or small cogeneration; small combined cooling, heat and power (CCHP); small non-CHP systems; and gas fired CHeP systems.
5. While larger cogeneration does not technically fit this definition, it is included in the scope of this survey. Cogeneration is defined as electricity and heat production that is on-site or close to the load center that could be interconnected at distribution, subtransmission, or transmission system voltages, combining heat and power and recycling heat and gases. These systems can range from several kWs to hundreds of MWs in size.
6. Downtown Toronto faces significant medium and long-term reliability and capacity challenges. A new supply source is being actively explored and development work is being initialized. Until development and uprating work can be done through to 2011, implementation of DG in downtown Toronto will totally constrained, with the exception of micro-solar installation.

1 International Energy Agency (2002). Distributed Generation in Liberalized Markets. Accessed at **http://www.iea.org/textbase/nppdf/free/2000/distributed2002.pdf**
2 WADE, World Survey of Decentralized Energy 2006. Accessed at: **www.localpower.org**.
3 UK DTI Ofgem Study on Decentralized Generation. 2007
4 Ontario Electricity Market Primer, Revised August 2007, Electricity Distributors Association. Accessed October 2008 at **http://www.eda-on.ca/eda/edaweb.nsf/0/3B81CCABE37213958525734D00460E37**.

7. However, these constraints do not explain the lack of progress in addressing the myriad other barriers that DG projects face across the board. Nor does it explain why DG penetration remains low in other areas of Ontario that could benefit from it, and which do not face the same issues as the Downtown Toronto grid.

8. DG penetration in Toronto and Ontario remains exceedingly low. Currently[5], Toronto Hydro identifies the amount of embedded generation within their service territory to be 88 MW of installed capacity spread out over 77 projects. Much of this embedded generation is used for purely back up purposes and is not used for grid generation purposes. Of the 88 MW, only roughly 0.1 MW or 100 kW is contracted through the Renewable Energy Standard Offer Program (RESOP). Currently, the RESOP program has 6.7 MW in-service through 50 existing contracts in the Toronto Zone. Of that 6.7MW, there is a single contract for 5.6 MW.

9. The City of Toronto, meanwhile, has taken significant measures to address barriers and incentives within its jurisdiction, with an aim to accelerate DG uptake in Toronto as a means of meeting its climate and air quality targets through renewable energy.

The Survey

10. The majority of respondents – 69% – expressed personal support for DG and the need to increase and facilitate implementation to in order to reap the benefits and assist in alleviating current energy challenges in Toronto.

11. The benefits of DG are widely acknowledged by respondents and in the literature. A number of jurisdictions have well-established DG systems and policies, while others are moving aggressively to accelerate the implementation of DG through policy and incentive measures. Challenges still remain in quantifying DG's benefits and in factoring these into overall costs and rewards. Ontario is pursuing this quantification work, though it lags behind other leading jurisdictions.[6]

12. Benefits as identified by respondents, fell into four main categories: system benefits; environmental benefits; social benefits; and economic benefits. The system benefits of DG – as a category – were the most often identified and recognized by respondents, followed by environmental benefits, then social and finally economic benefits.

13. The top 5 single benefits cited by respondents (unprompted to an open-ended question) are:
    a. Reduction in line losses and efficiency gains, cited by 67% of respondents;
    b. Reduction in carbon footprint/GHG emissions, cited by 52% of respondents;
    c. Delayed or avoided infrastructure investments, cited by 52 % of respondents;
    d. Reliability, security, stability of supply, cited by 48% of respondents; and,
    e. Increase in clean energy, cited by 45% of respondents.

14. The benefits of DG are well understood and appreciated amongst stakeholders, evidenced also by the strong personal support expressed by the majority of respondents at the top of and throughout the interviews. The wide range of benefits to be derived from DG have not, in themselves, been sufficient to catalyze any large or widespread implementation of DG, as evidenced by the very low penetration of DG in Toronto or Ontario.

5 Provided by the Ontario Power Authority in response to an email request, dated January 13, 2009.
6 EES Consulting for the Ontario Energy Board (2007). Discussion Paper on Distributed Generation (DG) and Rate Treatment of DG. Page 10.

15. In Toronto and Ontario, widespread implementation of DG will be critical to "turbo-charging" green energy deployment, as envisioned in the Green Energy Act. "The implications for DG development for renewable energy may well be the most significant environmental benefit conferred by DG."[7] The system change facilitated by a greater move to DG favours greater clean energy deployment, eradicating some of the system bias and comparative costs over time. This will build momentum for DG as barriers come down.

16. These benefits also align closely with many of the Province's goals in respect of climate change, energy, sustainability and community development. At present, these values are not reflected in either the pricing or incentives for DG and cogeneration projects. The playing field is skewed toward central generation and discriminates against smaller, local generation.

Barriers

17. The lack of adequate financial incentive, or a functioning Clean Energy Standard Offer Program (CESOP), was the top barrier identified by 25 of the 42 respondents as impeding the uptake of DG. Notwithstanding the establishment of a mechanism, being the CESOP or the newly-announced feed-in-tariffs, the actual price will be a critical determinant of the uptake of DG, particularly for much-needed CHP projects.

18. Barriers were grouped into four categories: system barriers; financial barriers; technical barriers; and social barriers. System barriers were the most frequently cited category or type of barrier, a total of 115 times. These barriers tend to be systemic and reflect the system's design to serve the needs of large central generators and extensive transmission and distribution infrastructure.

19. After system barriers, financial barriers were the category of barrier most frequently cited by respondents. Financial barriers include the lack of financial incentive, such as the CESOP – or "C-STOP" as one respondent referred to it. CESOP and RESOP were repeatedly characterized as being inadequate, or not working as intended (in the case of RESOP).

20. Almost half of respondents identified a lack of vision and mandate – 19 out of 42 or 45% – as a real impediment to more concerted implementation of DG. The same percentage identified a lack of coordination and strategy across the system as a major barrier to individual projects. Respondents felt that DG was being approached across the system in a piecemeal fashion, with little coordination between the parts of the system, resulting in a lack of harmony between stated goals and actual implementation. There is no target, much less a path, for DG in either Ontario or Toronto – nothwithstanding recent information from the OPA that they will be looking for up to 400MW of DG in Downtown Toronto beginning in 2011.

21. The barriers to DG are consistently – and significantly – outweighing the benefits. Ultimately, regulators and policymakers must set appropriate principles, policy goals and regulations so that implemented DG results in more benefits than costs to project developers. In other words, we must level the playing field for DG, and eradicate the system bias that is preventing its uptake, as so many other jurisdictions have done or are in the process of doing.

7 Canadian Renewable Energy Alliance (2006). Alex Doukas. Distributed Generation in Canada – Maximizing the benefits of renewable resources.

22. Ontario needs a Roadmap for DG, starting with Downtown Toronto. A Roadmap is proposed in Chapter 9. As the details of the Green Energy Act are worked through and regulations established, such a Roadmap can set Toronto and Ontario on the path to more decentralized energy and increased community energy planning and control. Key elements of the proposed Roadmap are:
    a. A Vision for meeting 30% of Toronto's total peak demand with DG and cogeneration by 2020;
    b. A five-point strategy for achieving the 2020 Vision;
    c. The most important measures to undertake through the strategy, based on this survey;
    d. The most immediate opportunities to be seized in the short-term for increasing DG and cogeneration in Toronto.

1. Introduction: A Global Trend

Interest in Distributed Generation (DG) has been growing in recent years, in Ontario and around the world. While a number of jurisdictions have established policy and regime measures to enable the smooth and enhanced integration of DG, and still others are moving aggressively to address remaining barriers and 'level the playing field,' progress has been decidedly slower – if not outright mired – in Ontario.

As Toronto faces very real capacity and infrastructure issues alongside growing demand, DG is emerging as an attractive solution for the central and downtown area. Beyond electricity supply considerations, DG has the potential to advance broader municipal and provincial environmental and social goals.

And yet, DG penetration in Toronto and Ontario remains extremely low. DG proponents claim that the myriad barriers faced from municipal and provincial regulators and local distribution companies (LDCs), as well as the costs, and the inherent system bias, culminate to make realizing DG projects far too difficult, costly and cumbersome. If Ontario is to exploit the benefits of DG, it must eradicate these barriers and establish a mandate and a framework for facilitating and even expediting DG. The timing, with a door opened by the new *Green Energy and Green Economy Act 2009*, is opportune.

Stakeholders throughout the system have first-hand experience with these barriers, and an examination of their perspectives on the benefits, barriers and opportunities for DG can be a useful contribution to evolving a framework for advancing DG.

1.1 Context: A New Power System Paradigm

The vast majority of Ontario's energy is generated by large-scale, centralized power plants using fossil fuels, hydropower or nuclear power. This energy is transported significant distances over high voltage transmission lines and more local distribution lines to end-users. In this paradigm, power flows in one direction from the central power station to the network then to the consumer. For much of the past century, this system has provided Ontario's industries and citizens with reliable, abundant and affordable power, achieving important economies of scale and contributing immeasurably to the growth of Ontario's economy and society. It is a paradigm repeated across most of the industrialized world.

Today, at the beginning of the 21st century, this traditional power system paradigm is being brought increasingly into question. As we enter "a twilight period where the full costs of our fossil fuel addiction is beginning to act as a drag on the world economy,"[8] there is a growing dissonance between the attributes of the centralized power system and deeper environmental, social and even economic aspirations. Broadly speaking, the current disadvantages of the centralized system include: the environmental impact of greenhouse gases and other pollutants in light of the intensifying climate imperative; toxic waste; transmission losses and inefficiency; growing security of supply concerns; system sustainability; over-consumption; and, the high cost of ongoing upgrades and replacement of transmission and distribution infrastructure.

8 Rifkin, Jeremy, "Leading the Way to the Third Industrial Revolution and a New Distributed Social Vision for the World in the 21st Century." 2008 speech. Accessed at **http://www.foet.org/packet/Global.pdf**

In the past 10-15 years, technological innovations, changing economic and regulatory environments and shifting environmental and social priorities have spurred renewed interest in DG. The IEA (2002) identifies five major factors contributing to this evolution: developments in DG technologies, constraints on the construction of new transmission lines, increased customer demand for highly reliable electricity, the electricity market liberalization and concerns about climate change[9].

In Europe, at the EU level and in many member states, decentralized energy systems and distributed generation are growing in demand, as they are seen to meet the energy challenges of the 21st century and so the shifting environmental, social and economic criteria of policymakers.

Countries like Denmark, Finland and the Netherlands have demonstrated that it is possible to make much greater use of DG and district or decentralized energy opportunities. In Denmark, approximately 57% of electrical capacity comes from combined heat and power (CHP) and 31% from renewables. This has been achieved primarily through the introduction of heat planning legislation to promote CHP and district heating, and a feed-in tariff to promote renewables and CHP[10].

Typically, successful implementation of DG schemes has been the result of local ownership and involvement. In much of Europe, local and provincial/state governments have been major owners of electricity and district heating companies. In the EU, "[t]echnological developments and EU targets for penetration of renewable energy sources (RES) and greenhouse gas reductions are decentralizing electricity infrastructure and services.[11]"

A 2003 survey undertaken by ENIRDGnet[12] (the Energy Research Centre of the Netherlands) identified the most important forces driving demand for DG in European countries as:

- Environmental concerns;
- Deregulation of the electricity market;
- Diversification of energy sources/energy autonomy; and,
- Energy efficiency.

9 International Energy Agency (2002). Distributed Generation in Liberalized Markets. Accessed at **http://www.iea.org/textbase/nppdf/free/2000/distributed2002.pdf**

10 UK DTI Ofgem Study on Decentralized Generation. 2007

11 Scheepers, M.J.J., van Sambek, E.J.W. "Regulation of Distributed Generation. A European Policy Paper on the Integration of Distributed Generation in the Internal Electricity Market." June 2004. SUSTELNET – Policy and Regulatory Roadmaps for the Integration of Distributed Generation and the Development of Sustainable Electricity Networks.

12 Scheepers, M.J.J.; Timpe, C. *A look into the future. Scenarios for distributed generation in Europe* ECN-C–04-012; December, 2003. **http://www.ecn.nl/publications/**.

These drivers have translated into a range of EU-wide policy directives, country-specific incentives and tax policies to encourage the uptake of DG, because it is seen as a means of advancing climate policy and energy security goals. Indeed, a 2007 UK government review of DG summarized the rationale for additional government intervention – above and beyond significant measures already undertaken in that country – as follows:

> *DG has the potential to offer benefits to the country. The current framework was established to meet the needs of large centralised generation and aspects of the system disadvantage smaller distributed generators. There is a clear case for ensuring that there are no barriers to the expansion of DG: we need to ensure that any cost-effective carbon reduction opportunities can be taken up. A number of Government policies and recent Ofgem changes to market arrangements will act to level the playing field for DG. To complement this work, we have developed a package of additional measures that will go further to address the barriers to the greater take up of DG and enable it to compete freely and effectively with larger- scale, centralised generation.* [13]

At the European Union level, a broader system change away from centralized generation (CG) is envisioned and mapping is well underway[14]. A 2003 European Commission Paper, "New ERA for electricity in Europe" described the future of DG in the European power system as follows:

> *What is known as Distributed Generation is a new model for the power system. It is based on the integration into electricity networks of small and medium sized generators based on new and renewable energy technologies. It may create a new era, where thousands or millions of users will own their generators, becoming both producers and consumers of electricity. All these generators will be interconnected through a fully interactive intelligent electricity network. This revolution will require sophisticated control and communications technologies…*[15]

In North America, jurisdictions like California and New York – among others – have been driven by supply, environmental and land-use concerns, to introduce policy and regulatory interventions as well as market incentives to level the playing field for DG. Additionally, federal government studies on the benefits of DG identify homeland security and security from terrorist attacks as additional drivers[16] for facilitating and expanding DG.

13 Review of Distributed Generation. A Joint Government/Ofgem Report, May 2007. Department of Trade and Industry. United Kingdom.

14 Scheepers, M.J.J., van Sambek, E.J.W. SUSTELNET Research Project. *The main objective of the SUSTELNET project was to develop regulatory road maps for the transition to an electricity market and network structure that creates a level playing field between centralized and decentralized generation and network development. The regulatory roadmaps are intended to facilitate the integration of RES, within the framework of the liberalization of the EU electricity market.* Accessed at: **http://www.ecn.nl/en/ps/research-programme/energy-supply/sustelnet/**

15 NEW ERA FOR ELECTRICITY IN EUROPE. Distributed Generation: Key Issues, Challenges and Proposed Solutions. European Commission, Community Research. 2003.

16 As an example: The Potential Benefits Of Distributed Generation And Rate-Related Issues That May Impede Its Expansion. A Study Pursuant To Section 1817 of The Energy Policy Act Of 2005. U.S. Department of Energy. June 2007.

New York has made considerable progress in addressing barriers to distributed generation beginning in 1999, and has implemented a comprehensive plan for the integration of DG resources. California has invested significant time and resources into developing a vision, a policy roadmap and a graduated strategy for integrating DG and CHP. Part of California's vision, as articulated by Commissioner James Boyd of the California Energy Commission in a recent speech is as follows:

> *Ideally, an automated 21st century distribution grid incorporating distributed renewable energy, combined heat and power and demand response would allow operators to manage the grid in real time, provide for rapid two-way information exchange between utilities and customers, and provide a seamless integration of the full spectrum of 21st century technologies.*[17]

The California Energy Commission and Public Utilities Commission jointly adopted a preferred "loading order," which calls for utilities to meet their electricity needs first through cost-effective energy efficiency investments; second from renewable energy and distributed generation sources; and finally, from all other energy sources. At the municipal level in the United States, DG is increasingly seen as integral to urban revitalization in cities like San Francisco, Chicago and Austin[18].

Many see DG as complementary to existing centralized power systems. Certainly, a number of survey respondents expressed that view. Others envisioned a larger system transformation over time. A growing number of international policymakers and thinkers see the emergence of distributed energy resources as the beginning of a new era. Jeremy Rifkin, for example, talks about the dawn of a new 'distributed social vision:'

> *A new Distributed Social Vision flows directly from the coming together of distributed communication and information technology and distributed renewable energies. We are on the cusp of a new energy era and a new economic paradigm that will literally "empower" hundreds of millions of human beings to create their own energy and share their surpluses with neighbours across regions, nations and continents. The democratization of energy gives rise to a new Distributed Social Vision in the 21st Century that will change our economic, cultural and political institutions as dramatically as the Enlightenment vision that accompanied the first industrial revolution two centuries ago.*[19]

Indeed, as of 2005, fully 25% of new electricity generation installed globally came from distributed resources, compared with only 13% in 2002.[20]

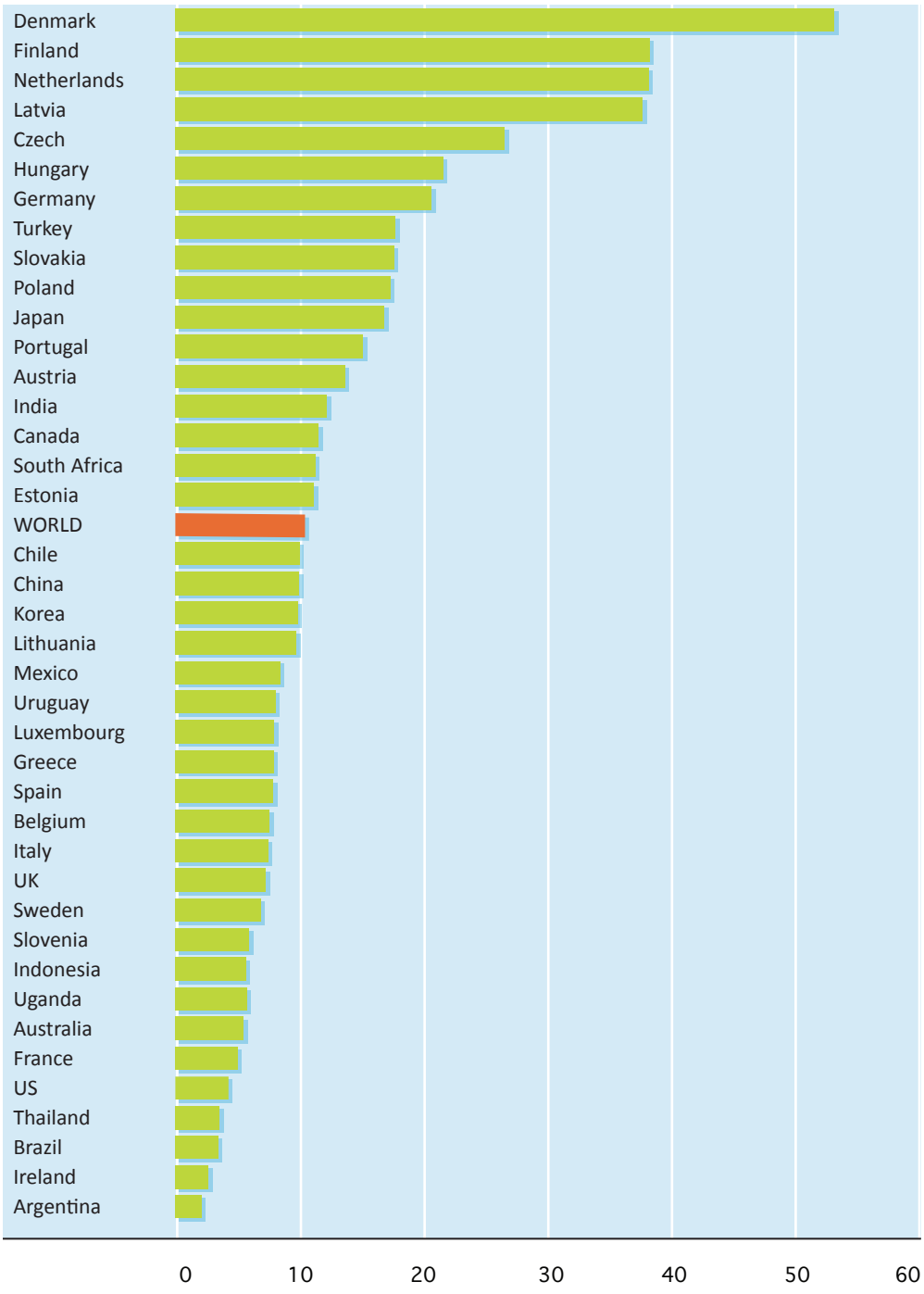
17 Remarks by Commissioner James D. Boyd, Vice Chair, California Energy Commission. "Distributed Energy Resources: A State Policy Perspective." January 31, 2008, CADER Conference in La Jolla.

18 Perlman, Jeff. "Environment: Rethinking the Grid; Distributed Generation and Urban Development." Next American City Online. Accessed September 2008 at: http://americancity.org/magazine/article/environment-rethinking-the-grid-perlman/

19 Rifkin, Jeremy, "Leading the Way to the Third Industrial Revolution and a New Distributed Social Vision for the World in the 21st Century." 2008 speech. Accessed at http://www.foet.org/packet/Global.pdf.

20 WADE, World Survey of Decentralized Energy 2006. Accessed at: **www.localpower.org**.

Proportion of Total Power Generation from Decentralized Capacity (WADE)



The Graph above depicts the penetration of Decentralized Energy in countries around the world (from WADE World Survey of Decentralized Energy, 2006[21]).

21 WADE, World Survey of Decentralized Energy 2006. Accessed at: **www.localpower.org**.

> *Although they represent a small share of the electricity market, distributed-generation technologies already play a key role: for applications in which reliability is crucial, as a source of emergency capacity, and as an alternative to expansion of a local network. In some markets, they are actually displacing more costly grid electricity. Worldwide, more DG capacity was ordered in 2000 than for new nuclear power. Government policies favouring combined heat and power (CHP) generation, and renewable energy and technological development should assure growth of distributed generation. This kind of generation has the potential to alter fundamentally the structure and organization of our electric power system. Yet market conditions in some countries pose serious challenges to some generators, particularly those producing combined heat and power.*
>
> International Energy Agency, Distributed Generation in Liberalized Electricity Markets, 2002

1.2 Ontario

Like most industrialized jurisdictions, Ontario faces two overarching long-term energy challenges:

- Reducing carbon emissions to stem the worst impacts of global warming, and,
- Ensuring reliable, clean, secure and affordable energy to fuel homes and businesses.

In addition to these long-term imperatives, Ontario also faces more near-term, specific concerns:

- The Province must invest over $40 billion to upgrade ageing power system infrastructure, facilities and capacity in the coming years. [22]
- Ontario is working to meet its climate targets and phase out coal-fired generation by 2014.
- Ontario also faces a looming electricity gap over the next decade – estimated to be as high as 3,500 MW between 2014 and 2019[23], when coal goes offline and before new nuclear could come online.
- Additionally, the Ontario Power Authority (OPA) has been directed to 1) find 300 MW of demand side management and/or demand response initiatives in Toronto by 2010[24] and, 2) review the proposed IPSP to find greater opportunities for green energy and conservation, including DG.

These are the issues currently framing decisions around DG and the broader context in which DG is being considered in Ontario and particularly Toronto[25] at present. Some of the specific constraints on expanded DG in Toronto are examined more closely in Chapter 3.

22 Perlman, Jeff. "Environment: Rethinking the Grid; Distributed Generation and Urban Development." Next American City Online. Accessed September 2008 at: http://americancity.org/magazine/article/environment-rethinking-the-grid-perlman/

23 Renewable is Doable. The Pembina Institute, WWF Canada, The David Suzuki Foundation, Greenpeace, Canadian Environmental Law Association, Sierra Club Ontario. 2008. Accessed online at **http://www.renewableisdoable.com/electricity-gap**

24 A December 2008 response to a Pollution Probe Interrogatory indicates that Hydro Ones' transmission system will not be capable of accepting 300MW of new generation in downtown Toronto by December 2010. December 23, 2008, EB-2008-0272, Exhibit 1, Tab 5, Schedule 3.

25 The Ontario Power Authority and Toronto Hydro have commissioned a study to identify the most constrained parts of the Toronto distribution system that would benefit most from DG load displacement. The results of this study will not be available until later in 2009.

1.3 Defining Distributed Generation

In the course of surveying stakeholders it became clear that there are varying conceptions and definitions of Distributed Generation, and different stakeholders include and exclude different technologies and services in their respective definitions. This further clouds meaningful discussion of the issues surrounding DG. It is therefore helpful to establish a common definition in the Ontario context.

In contrast to the traditional, centralized system, DG is "a system in which electricity is produced by small to medium-sized generators connected to distribution systems."[26] This study will define DG as electricity production that is on-site or close to a load center, either interconnected to the utility distribution system or, less common, stand-alone. These generators can range from a few kW to approximately 20MW (a 2007 study by EES for the Ontario Energy Board defines DG as up to 25MW[27]).

The Ontario Power Authority (OPA) is currently defining DG as projects less than 10MW. This may be due to the constraints in Downtown Toronto. (Amounts of generation larger than 10MW downtown would need to be distributed through the distribution system. The voltage level of the main distribution system is 13.8kV and the load supplied by 13.8 kV distribution feeders is typically limited to about 10MW. Individual generators connected to these feeders will likely be limited to 10MW or less.)

This definition includes such technologies as photovoltaics; small wind; small biomass; small combined heat and power (CHP) or small cogeneration; small combined cooling, heat and power (CCHP); small non-CHP systems; and gas fired CHeP systems (but not conventional diesel-only back-up generators as demand-response, given their low efficiency and high pollution.)

While larger cogeneration does not technically fit this definition, it is included in the scope of this survey. Cogeneration is defined as electricity and heat production that is on-site or close to the load center that could be interconnected at distribution, sub-transmission, or transmission system voltages, combining heat and power and recycling heat and gases. These systems can range from several kilowatts (kW) to hundreds of MWs in size.

26 Ontario Electricity Market Primer, Revised August 2007, Electricity Distributors Association. Accessed October 2008 at **http://www.eda-on.ca/eda/edaweb.nsf/0/3B81CCABE37213958525734D00460E37**.

27 EES Consulting for the Ontario Energy Board (2007). Discussion Paper on Distributed Generation (DG) and Rate Treatment of DG. Page 10.

2. Objectives, Methodology and Scope of Survey

2.1 Objectives

The fundamental purpose of this survey was to assess the prospects for advancing Distributed Generation (DG) as one solution to the capacity and reliability needs that have been identified in Toronto's downtown core. The study was guided by four primary objectives:

1. Document and analyze a broad range of stakeholder perceptions and experiences around DG in Toronto, and to some extent, Ontario more broadly;
2. Gauge support among these stakeholders for facilitating increased DG implementation in Toronto;
3. Identify and characterize stakeholder perceptions of the benefits and particularly the barriers to implementing DG projects in Toronto and Ontario more broadly; and,
4. Identify what stakeholders consider the most critical policy and technical measures necessary to facilitate greater DG implementation in Toronto.

More generally, this research seeks to identify common ground among stakeholders for advancing a solutions-oriented vision and strategy for Distributed Generation in Toronto. It will also help to further shape WWF's policy and advocacy position on Distributed Generation in Toronto and Ontario. Finally, it is hoped that this survey will contribute to the broader discussion of the evolution of Ontario's power system in the context of accelerating climate, economic, environmental and social imperatives.

2.2 Methodology

The research was conducted in two simultaneous phases:

1) Stakeholder Survey: A total of forty-two (42) individuals participated in in-depth interviews and discussions, following a pre-determined set of questions (questionnaire can be found in Appendix C) which sought to solicit the perspectives and experiences of individuals and organizations involved with the development of DG in Toronto and Ontario. Specific questions focused on the perceived benefits of DG, the nature and resolution of specific barriers experienced and observed, with emphasis on economic issues for DG project.

Of the forty-two interviews, forty were oral – conducted either in-person or via telephone and ranging from 20 minutes to over 3 hours in length. Two interviews were completed via email exchanges. All of the interviews took place between October 2008 and January 2009 inclusive. (See Appendix D)

The forty-two respondents represent a broad range of stakeholders across the power sector, including the Government of Ontario, the Government of Canada, City of Toronto officials, the local distribution company (LDC), issue experts, project developers, regulators, industry associations, actual and prospective proponents/hosts, NGOs and think-tanks.

All interviews were strictly confidential. In order to ensure that interviewees spoke freely, their anonymity was guaranteed, particularly when referencing specific responses in this report.

2) **Literature Review:** A review of existing literature was conducted simultaneously with the Stakeholder Survey. Literature focused on Distributed Generation generally, the benefits of DG, the barriers to DG, the policy and technical measures to overcome these barriers. The research focused on several jurisdictions, including but not limited to: Ontario; Canada; British Columbia; The United States; California; New York; The European Union; Germany; Denmark, Netherlands.

The Survey questionnaire contained qualitative, open-ended questions only. These responses were documented, and are reported and analyzed in this report. Notwithstanding the qualitative nature of the survey, most of the questions lent themselves to some quantification, and help to determine which perceptions are held by a majority, or large segments, of this stakeholder sample. The literature review attempts to elaborate and support the experiences and perspectives put forward by the respondents, as well as underscoring the similarity of issues associated with DG across jurisdictions, notwithstanding the differences between the mostly liberalized electricity markets and Ontario's hybrid system.

2.3 Scope of the Study

The scope of this study extends to the exploration of selected stakeholder perceptions of the benefits and barriers to DG in Toronto, stakeholder support for DG, stakeholder opinions regarding the most critical policy and technical measures necessary to advance the implementation of DG in Toronto. The study elaborates on these perceptions, and on some of the issues identified through the literature review. It is not a technical review of DG in the system.

This study's scope is to assess stakeholder opinions, and to elaborate on some of the core issues. Though not a technical or policy study, the report does conclude with a proposed Roadmap for DG and cogeneration in Toronto.

2.4 Structure of the Report

The report is broken into nine chapters, integrating desk and opinion research (survey findings) in the exploration of key issues. The introduction and project overview are followed by a review of Stakeholder Characteristics, reporting and assessing the responses to Questions 1 through 3 of the Questionnaire (Appendix C). The subsequent chapters deal with distinct questions from the survey, namely the benefits of DG, the barriers to DG, the business case for DG, and stakeholder views on addressing these barriers.

The report concludes with a proposed Roadmap for DG in Toronto, suggesting a vision, path, principles and strategy for increased integration of DG in Toronto, which could extend to Ontario more broadly with some slight modifications.

Direct quotes from respondents are used liberally throughout the report, in order to convey perceptions in first-person perspective and language. These quotes are right-justified and italicized. When several quotes are presented in sequence, they are separated by three asterisks. These are not attributed, to preserve anonymity.

3. Distributed Generation in Toronto

The global trend toward increasing uptake of distributed generation, as highlighted in Chapter 1 and in the literature[28], has certainly contributed to growing support for greater integration of DG in Ontario, particularly in the decade following the restructuring of Ontario's electricity market. Beyond these more generic drivers, key challenges and constraints on Downtown Toronto's transmission system have accelerated exploration of and support for DG in Toronto.

3.1 Situation

> *The main barrier is that [Toronto] cannot, at the distribution system level, accept the bi-directional flow right now. There's a problem with the infrastructure currently. The issue in Toronto is that there is not sufficient short circuit capacity for Toronto to accept distributed generation of any great amount. Right now there's a lineup of different projects in the marketplace that would like to hook up to the Toronto Hydro distribution system but there isn't enough short circuit capacity available. Every distribution system has to have a capacity to safely interrupt current. The City of Toronto needs to know that if there's a fault that occurs at a distributed generator, that that fault can be cleared by the circuit breakers that are available. The problem is that all of the capacity for interrupting the fault have been taken up by the existing system, the existing generators, so there isn't enough capacity left to interrupt safely in the event of a fault.*
>
> Survey Respondent

Downtown Toronto faces significant medium and long-term reliability and capacity challenges. A new supply source is being explored, and may be needed even to permit the development work necessary to allow additional generation. These challenges were identified in the proposed Integrated Power Supply Plan (IPSP)[29] in 2007 as follows:

- **Supply Capacity**: While conservation is expected to meet most of forecast demand growth in Downtown Toronto and offset supply capacity needs, some capacity needs could emerge in the 2015-2017 period which could require a new supply source.
- **Infrastructure Renewal**: Much of Downtown Toronto's 115kV transmission system is 40-60 years old, and has remained largely unchanged for almost 20 years, while serving more and more businesses and people. The Hearn, Leaside and Manby transformer stations will require "substantial refurbishment" within five to ten years. This intensive refurbishment work will in turn require outages which could put significant load at risk, interrupting supply to customer load.
- **Vulnerability to High Impact Events**: While the likelihood of a high impact event, ie a loss of one of the supply paths, is low, the potential exists for major interruptions, with significant amounts of load potentially unsupplied for prolonged periods. Existing limited supply paths cannot fully back up all parts of the system.

28 Industry Canada. Unleashing the Potential of On-Grid Photovoltaics in Canada. http://www.ic.gc.ca/eic/site/rei-ier.nsf/eng/nz00023.html

29 Integrated Power Supply Plan OEB Filing. ED-2007-0707, Exhibit E, Tab 5, Schedule 5.

Short circuit capability at Ontario's three- 115kV transmission stations (Leaside, Hearn and Manby) are near capacity and major upgrades or station rebuilds will be required in order to incorporate additional generation. Upgrading these transmission facilities is a highly complex and expensive undertaking: the facilities are old, highly utilized and densely packed.

The amount of generation that can be accommodated in the area is constrained by the local system's short circuit capacity. Large-scale DG – specifically cogeneration – can also collectively affect the short circuit levels on the transmission system. The Independent Electricity System Operator (IESO) conducted an assessment which indicates that with 10 MW of DG connected at six stations, for a total of 60 MW, there were short circuit issues at Leaside and Hearn. Even for 20MW, the short circuit capabilities on the Leaside West subsystem were slightly exceeded. This limits new generation to 70 MW in the Manby area and 20 MW in the Leaside area (which includes Hearn). These limits apply to all new generation with the exception of micro solar (less than 10 kW).[30]

The Ontario Power Authority and Toronto Hydro have begun a study to evaluate the potential of DG as a means of addressing some or all of these needs. The study, due in late Spring 2009, will form the basis of the OPA's plan for DG in Toronto. However, no new generation can be incorporated until development and subsequent work is completed. Thus, the recent CHP II RFP for example, precluded projects in downtown Toronto.

The IPSP filings reveal that Toronto Hydro Energy Services has identified the potential for 300MW of DG in sizes less than 10MW in the combined Manby and Leaside systems, without altering the form and function of the distribution system. "That is, the distribution system, currently designed, built operated and protected as a uni-directional power system would be maintained and the installation of the generation would not impose restrictions on the ability of the distribution system to connect new or serve existing customers."[31] However, individual short circuit capacity at individual stations is a constraint on the amount of DG able to be connected on each distribution susbsystem.

Accordingly, the OPA has confirmed recently[32] that the transmission system will not be capable of accepting 300 MW of new generation in the Downtown by the end of 2010. The development work and uprating will take place through 2009-2010 and it is expected that no new projects – or any measurable integration of DG - will be possible until 2011 at the earliest, when the uprating work is completed.

Notwithstanding these delays, the OPA has indicated recently[33] that significant levels of DG targets are being considered for Downtown Toronto – up to 25% of the subsystem load or 400 MW. OPA officials further explain that there are transmission and distribution system technical considerations to be worked through as part of the development work underway, and that significant planning and integration – notably coordination with the newly-announced feed-in tariff – will be required.

30 Integrated Power Supply Plan OEB Filing. ED-2007-0707, Exhibit E, Tab 5, Schedule 5.
31 Ibid, page 29.
32 Ontario Energy Board IPSP Review (2008-). Pollution Probe (PP) Interrogatory #1-6. List 1, Responses Filed December 23, 2008. EB-2008-0272, Exhibit 1, Schedules 1-4. Accessed at **http://www.hydroonenetworks.com/en/regulatory/oeb_applications/EB-2008-0272/Exhibit_I/Tab_5_Pollution_Probe.pdf**
33 Ontario Power Authority Stakeholder Workshop, "Distributed Generation in Toronto." Held February 2009, Toronto.

3.2 Penetration of Distributed Generation in Ontario and Toronto

Based on a review of the IPSP filing evidence, total pre-filed generation of existing generators less than 20 MW in Ontario amounts to 541 MW. A further breakdown shows that 52 MWs come from early RESOP contracts and the remaining 489 MW is existing non-RESOP generators. The following table shows the breakdown by fuel type of the non-RESOP generators across Ontario.

Breakdown by Fuel Type of Non-RESOP Generators in Ontario

FUEL TYPE	CAPACITY (MW)	COMMENTS
Water	340 MW	Almost all of this is located in the North
Bio	39 MW	28 MW (74%) located in the North
Gas	58 MW	39 MW (67%) located in the North
Oil	52 MW	42 MW (81%) located at major generating stations

Some of the facilities totaled in these amounts could be transmission-connected generators, especially those located in the North.

To put some of these numbers into perspective, the load in the GTA is about 10,500 MW, the City of Toronto is about 4,800 MW, and the central and downtown Toronto area is about 2,000 MW.

> *Toronto has an issue with bottle-necking of energy supplies getting into the downtown core. Planning policies would encourage densification and bringing the community into a central location rather than sprawled. So getting energy into the downtown core is difficult. The power plants are located strategically as far away from population as possible and that was part of the development process for Ontario Power Generation many years ago. Now you're looking at a situation where there are no more corridors for bringing transmission in, or indeed, cooling or heating in any other form. So decentralized energy, I think, would be, not just convenient, but almost an essential way of dealing with growth in the downtown core.*

In 2007, according to the IPSP filing, the level of DG penetration in Downtown Toronto was "quite low," with estimated installed capacity of DG at less than 15 MW[34]. This estimate includes solar, biogas/biomass, reciprocating gas and microturbine gas generators. Enbridge Gas estimated at that time, that there was an additional 500 MW (approximately) of installed capacity of emergency and backup generators in Toronto, the vast majority being diesel-fuelled and used for emergency purposes only.

Operation of these generators is very limited because of their low-hour industrial rating, limited connected loads and on-fuel storage, unsophisticated switch-gear and existing environmental permits limiting their operation to emergency situations only. Obviously, they present air emissions/pollution problems that would be counter-productive to the goals and benefits of increased DG. Converting or upgrading these facilities is extremely costly and impractical according to Industry experts; complete replacement or augmentation, wherever

34 Integrated Power Supply Plan OEB Filing. ED-2007-0707, Exhibit E, Tab 5, Schedule 5, pp 28-42.

possible, would be more practical and economical than conversion.[35] It should be noted that a number of respondents address back-up generators as DG options in their responses.

Currently[36], Toronto Hydro identifies the amount of embedded generation within their service territory to be currently at 88 MW of installed capacity spread out over 77 projects. However, it should be noted that much of this embedded generation is used for purely back up purposes and is not used for grid generation purposes. Of the 88 MW, only roughly 0.1 MW or 100 kW is contracted through RESOP.

Currently the RESOP program has 6.7 MW in-service through 50 existing contracts in the Toronto Zone (which represents roughly the GTA). Of that 6.7MW, there is a single contract for 5.6 MW.

Toronto Hydro Energy Services has estimated that it will be possible to incorporate 300 MW of DG in Downtown Toronto. The detailed estimates for this work, and the MWs that will be enabled will be prepared as part of the development work in 2009 and 2010. The Ontario Power Authority and Toronto Hydro study is currently underway to determine the need and potential for DG in Toronto, based on customer profiles.

The Ontario Power Authority has indicated in early 2009 that significant levels of DG penetration are being considered in Downtown Toronto – up to 25% of the subsystem load or 400 MW. It is not clear at this stage what timeframe that target would pertain to. In a letter to Councillor Paula Fletcher dated July 2007, Toronto Hydro President David O'Brien states that,

> *Toronto Hydro is first and foremost committed to seeking demand side management and distributed generation solutions to the supply concerns that all parties recognize must be addressed. This is consistent with public statements from the Minister and Ontario Power Authority.*[37]

Chapter 5 will look at the host of barriers to DG in Toronto. For now, it is clear that there are very real technical and system limitations to integrating widespread DG in the Central and Downtown zone. These issues, as indicated above, are in the very early stages of being addressed. In the meantime, other barriers can be tackled to lay the groundwork for a concerted strategy and implementation mandate for DG and cogeneration. Many steps can be taken in 2009-2010 that would enable rapid deployment of DG beginning in 2011. To do that, it is helpful to understand the current situation, the present levels of DG and the measures the City has taken to date in order to accelerate uptake and implementation of DG.

35 Integrated Power Supply Plan OEB Filing. ED-2007-0707, Exhibit E, Tab 5, Schedule 5, pp 28-29.
36 Provided by the Ontario Power Authority in response to an email request, dated January 13, 2009.
37 Letter dated July 13, 2007 from Toronto Hydro President & CEO David O'Brien to Councilor Paula Fletcher regarding the "Third Line."

3.3 City of Toronto Measures to Accelerate Penetration of DG in Toronto

> *The City's position is that DG will become, we believe, or should become a significant contributor to the reliability of the system, not just the distribution system, but the transmission system that feeds Toronto.*
>
> *DG should also play a role in the broader public safety issues because when you have distributed generation all over the city, then the likelihood of a catastrophic failure diminishes quite a bit. So it's important for us to look, not just at the fact that we're pumping more electricity into the system, but the fact that there are co-benefits that are very meaningful and significant.*
>
> *The third thing is that DG is something that, again, is consistent with City of Toronto objectives, creates a fair bit of job creation and, in many cases, not just temporary jobs when you start the overall project, but ongoing permanent jobs are also a result of DG.*
>
> *DG can significantly aid in reducing any kind of electricity constraint problems at the distribution and transmission level and clearly, then, it would also minimize any potential down the road for the OPA or the IESO to start having congestion charges locally. Congestion charges address the issues around, if you're congested, then you've got to pay more and that would just further encumber businesses and residents in the City of Toronto.*

While DG penetration remains exceedingly low, the City of Toronto has launched a course to pursue DG in Toronto, through its Climate Change, Clean Air and Sustainability Energy Action Plan. In order to do so, it has had to address numerous barriers at the municipal level. Many barriers remain beyond the municipal powers to address, resting with the Province, its agencies and Toronto Hydro. Yet, the City of Toronto has made important progress in removing those within its control.

Synopsis of Specific Measures Taken by City of Toronto to Overcome Barriers to DG

- Energy planning and vision is tied to the City Climate Plan: Climate Change, Clean Air and Sustainability Energy Action Plan. This is one of the few integrated municipal climate and energy plans in Canada, and takes a holistic approach to climate & energy planning and solutions;
- The City has established a goal of "Becoming the Renewable Energy Capital of Canada;"
- $20 million Green Energy Fund to support renewable energy installations in Toronto; Introduction of additional financial incentives through low or no interest loans;
- The Development of a special zoning 'omnibus' bylaw for DG removed a series of antiquated bylaws restrictive to DG developments;
- The requirement to join a district energy system, in Waterfront redevelopment projects for example, to address the lack of a market heat generated by CHP plants;
- The City entered an encroachment agreement to allow for geothermal pipes on city property to overcome the barrier of a lack for space for a renewable energy project;

- Zoning height bylaws were reviewed and amended to remove the restriction on building heights which were prohibiting the installation of solar systems on rooftops;
- Excessive building permit fees were eliminated by issuing a special designation for solar thermal houses;
- Allowance for on-site metering for a PV system removed a former requirement to meter at the transformer station;
- Development of skills training program addressing lack of knowledge in the DG sector, and laying the groundwork for a local industry
- Dedicated staff to promote DG, through the Energy Efficiency Office and the Better Buildings program and to work with project developers.

> *Our main role is in promoting distributed generation, particularly if it's a renewable source. We deal with a lot developers that we're encouraging to include energy generation in their development plans. We're working on community energy plans where we're encouraging district energy, relatively small district energy systems and we think of things like the Regent Park development that's putting in district energy. Also up at Lawrence Heights, Toronto Community Housing is redeveloping that site and we hope that we'll have district energy there. With the redevelopment of Downsview, again, we want to see district energy there, and in campus locations like York University. They're doing a lot of development planning there and we'd like to see district energy there.*
>
> City respondent

The City of Toronto has made considerable progress in addressing many of the barriers to DG development that existed within its own jurisdiction. One major step, cited by a few respondents, was the integrated approach to climate and energy planning taken in its "Climate Change, Clean Air and Sustainability Energy Action Plan"[38] – this is significant because it takes a holistic view of the challenges of climate change, air quality and sustainable energy, and to the formulation of solutions. The City determined that the only way to meet its climate target of 80% GHG reduction by 2050 as set out in the Action Plan, was through the deployment of renewable energy. Limited as to the amount of renewable capacity that it would be able to integrate onto the grid, it set out to "replace grid energy with distributed generation," as one respondent explained.

> *We have the greenhouse gas reduction target set out in the Climate Change, Clean Air and Sustainable Energy Report – 80% reduction by 2050. The only way we're going to achieve those goals is through use of renewables, and there's only going to be so much we can do to get renewables onto the grid. That means that we have to replace grid energy with distributed generation. For instance we have, right now, a pilot program for solar-thermal for 300 homes in the Riverdale area in Toronto with the intention that we will go through that program, get it in on 300 homes and then be able to roll out a full scale program throughout the city. That will reduce our greenhouse gas emissions.*

38 City of Toronto. Climate Change, Clean Air and Sustainability Energy Action Plan: Moving from Framework to Action, Phase 1. Toronto Energy Efficiency Office, June 2007. Accessed October 2008 at **http://www.toronto.ca/changeisintheair/pdf/clean_air_action_plan.pdf**

Additionally, Toronto had numerous out-dated and restrictive bylaws that were prohibiting the development of DG, including one restrictive to industrial projects of any kind in residential neighbourhoods. City Council passed a special zoning law[39], effectively replacing this suite of long-standing and prohibitive by-laws. In previous zoning bylaws, as several respondents noted, a home that had a grid-connected PV system was categorized as a generator, and was prohibited from being zoned residential, even if that residence was a net importer of electricity from the grid. In August 2008, the City of Toronto issued variances to by-law 76-2003 which restricted the height of a proposed on which solar panels could be installed.[40]

The City has also taken steps to deal with another real and physical limitation to DG in the urban centre: limited space for infrastructure. As one respondent explained, a downtown hotel building could not facilitate the size of a geothermal plant onsite. The City therefore granted an "encroachment agreement" to allow construction of geothermal pipes on city property (right-of-way).[41] When discussing barriers, a number of respondents talked about the limited space for the infrastructure necessary to transfer heat and steam for example in the case of CHP development where the proponent did not have an on-site application for these.

In addition to by-law reform, Toronto has taken measures to overcome permitting and fee barriers. Developers seeking to participate in the development of Toronto's Waterfront district must join the district energy system in order to acquire building permits. Developments proposed in the Regent Park area of Toronto are similarly required to join district energy systems, as mentioned by the respondent above. Given that one of the barriers cited by respondents, and noted in the literature and case studies, is the need to have a host for the heat or steam from CHP projects, this policy encourages DG and particularly cogeneration in that district, improving the economics by guaranteeing a paid use for the waste heat. This requirement also encourages large-scale CHP projects.

Meanwhile, a City pilot program to implement solar thermal in 300 homes in Riverdale, also referenced in the respondent citation above, was slowed by excessive fees and building permits. The City established a special designation for fees at the municipal level to address the classification of solar collectors as "designated structures" in Ontario, allowing the project to proceed. The cost of building permit fees for these systems in Toronto has now been reduced to $ 94.00,[42] from several hundred for the smallest solar heating systems. After this pilot, the City intends to roll the program out across the City, demonstrating that as barriers fall, momentum for DG development can be built and encouraged.

In the case of the PV installation at Exhibition Place, metering posed a barrier because its installation predated the RESOP and the distance between the installation and the transformer made it unfeasible. The City secured a special exemption to allow metering onsite

39 City of Toronto, By-law 218-2008. *A by-law to permit the production and distribution of energy from specific renewable devices and cogeneration devices.* March 5, 2008. Available at **www.toronto.ca/legdocs/bylaws/2008/law0218.pdf**. Accessed October 20, 2008.

40 Ontario Municipal Board, PL071081, August 1st 2008, **www.omb.gov.on.ca/e-decisions/p1071081-Aug-01-2008.pdf**

41 City of Toronto. Installation and maintenance of geothermal heating/cooling system within the City laneway – 357 College Street – "Planet Traveller." Staff Report, June 24, 2008. Available at **www.toronto.ca/legdocs/mmis/2008/te/bgrd/backgroundfile-14511.pdf**. Accessed October 20, 2008.

42 Solar Neighbourhoods. Frequently asked questions. Available at **www.solarneighbourhoods.ca/faq/php#permits**.

rather than at the transformer station, as normally required by RESOP. This situation is also an example of the City working in partnership with proponents to overcome barriers.

These measures and examples demonstrate that the City of Toronto is working creatively to address the barriers to DG that are within its control, in order to accelerate the uptake of DG throughout the City.

> *So what we're trying to do is find out ourselves exactly what the barriers are and what we can do to overcome them. One of the major ones is the cost of putting it in. Distributed generation has high up-front costs and we have a number of programs in the city, incentive programs, for electricity savings and also interest-free loan programs. So if it's a non-profit organization and they're interested in industry generation, then we can look at providing some funding. That's helpful in that most of these programs, over a period of time, will have a revenue stream, will pay back. So if we can provide some up-front financing, that can overcome some of those barriers. We have a number of programs with our Sustainable Energy Fund that are doing geoexchange, YWCA Building and the Arts Barn, the Witchwood Arts Barn at Christie and Dupont, and the Brickworks. They aren't doing straight generation, per se, they're doing solar. So there's a number of programs we're supporting in trying to overcome that funding barrier.*
>
> City Respondent

The City's actions also demonstrate to some extent the issue raised by many respondents – that each project is a "one-off," and barriers are presently being addressed one by one, as they arise.

3.4 Conclusions

1. Despite years of interest and study, DG penetration in Ontario and Toronto remains exceedingly low.
2. In downtown Toronto, additional DG integration will be limited to under 90MW until 2011, due to the development and uprating work that must be done to accommodate any additional generation.
3. The City of Toronto has a clear policy position and strategy for DG as part of its climate & energy plan, and is moving to remove municipal barriers to DG on the one hand, and to incentivize and promote DG on the other.
4. While implementation in Downtown Toronto is stalled until development and uprating work can be completed, other barriers can be addressed now.
5. A Vision and Roadmap for DG and Cogeneration in Toronto are proposed in Chapter 9, along with most critical steps in achieving the Vision, starting with incentives, reducing barriers and seizing immediate opportunities
6. Pilots in Toronto should be a priority. The Downtown system could handle up to 70 MW while uprating work is carried out, and this capacity should be designated for priority pilots (see Chapter 8).

4. Respondent Characteristics & Profile

In exploring the barriers to DG in Toronto and Ontario, it is important to understand the roles various actors play in the system, and who has a direct role in the advancement or hindrance of DG projects and greater uptake, and who, ultimately is responsible for driving increased DG at a system level. The issue of responsibility would seem more straightforward than it actually is.

In analyzing the survey results, it is also important to understand how respondents see their own role and position vis-a-vis- DG, even on an aggregate level. This is particularly germane given that a perceived lack of overall leadership emerged as a dominant theme in conversations with stakeholders (which is discussed in more detail in chapters 5 and 6).

Accordingly, this section breaks down responses to questions 1-3 in the questionnaire (Appendix C), which attempt to determine perceived roles and influence, whether organizations have fully-formed and active policy positions regarding DG, and whether or not respondents held or offered personal views or insights on DG in Toronto or more generally. The third question probing personal insights was an open-ended one.

4.1 Direct Role in Decisions regarding DG Implementation in Toronto

Respondents themselves identified whether they or their organization plays a direct role in decisions regarding DG in Toronto.

Respondents' Role in Decisions Regarding DG

- More than half of respondents – 55% identified their organization as having a direct role in decisions regarding DG in Toronto or Ontario more broadly.
- 45% said they/their organization did not have a direct role in decisions regarding DG in Toronto.

Originally, this question was designed to identify the decision-making process and ultimate responsibility for advancing DG – who is responsible at the end of the day for making it happen? In the end, seems to indicate that there is a real lack of clarity around who is ultimately responsible for setting and meeting goals for increased DG and cogeneration in Ontario, notwithstanding the fact that many actors and agencies must work together.

It is also interesting to note the number of respondents whose organizations have policy positions regarding DG, and the number of respondents who are personally supportive of DG, combined with the number of respondents having a role of influence. This influence is not advancing DG, as penetration remains low.

4.2 Organizational Policy Positions regarding DG in Toronto

It is interesting that 45% of respondents do not have a policy regarding Distributed Generation. Again, this would seem to speak to the lack of vision and mandate addressed by a number of respondents (see Chapter 5). A policy clear policy or general position regarding DG would seem to be important to any organization playing a role in DG in Toronto or Ontario.

Organizational Policy Position Regarding DG

- 55% of respondents said their organization does have a policy position regarding DG; the formality of these policies varied widely;
- 45% of respondents did not have an organizational policy position regarding DG.

Not all those who have a direct role in decisions regarding DG, have a clear policy position on DG. In all, just over half of the respondents have organizational policies on DG. Of the 23 respondents who have a direct role in decisions regarding DG, only 15 – or 65% – have an organizational policy position; while 8 of the 23 – or 35% – having a direct role do not have a policy position regarding DG. This lack of policy at the organizational level could be a microcosm of – and a contributing factor to – the lack of vision and mandate perceived at the system level.

Eight of the 19 respondents who do not have a direct role in DG – or 42% of these – do have an organizational policy position regarding Distributed Generation.

Policy Positions – Excerpt of Responses

Amongst the 23 respondents whose organization has a policy position regarding Distributed Generation, very few of these positions could be characterized as strong, positive active positions either to advance or pursue DG or to minimize or oppose it. It has not been possible to quantify or verify how many have a written position. A significant number of the positions cited by respondents were vague. The OPA's position is, in effect, the Minister's Directive of September 18, 2008 directing the Authority to find more green energy in the IPSP, specifically including DG. The Province's position – prior to the Green Energy Act – is that various forms of DG, particularly "behind the fence," are regarded as conservation and demand management. Other positions were explained as follows:

> *Yes. Distributed generation is part of a policy. We are trying to be net off the grid neutral by the end of 2010. Our power usage is roughly about 25 megawatt hours of power a year. So we said, "Okay, what we would like to do is, we'd like to take and reduce that down to net zero," i.e., we're not saying we're not on the grid, but with the power we produce, the power we conserve and then the power we use, basically we're trying to get it as close to zero as possible.*

Yes. This comes back to the power planning level, that DG has a host of benefits in terms of distributed generation by definition: greater reliability, better use of distribution and transmission assets, and fundamentally, going to a decentralized system as opposed to just more central, large stations. It has a host of, I think, economic, operational and structural benefits; and quite apart from, I would say, the real potential to do something very tangible, much easier than building new central stations or new transmission upgrades.

Yes. We think that virtually all of Ontario's future electricity supply needs should be met by distributed generation. It's the lowest cost and most reliable option to keep the lights on. It's the cleanest option. Distributed generation, if it's renewable, of course, it's very clean. If it's natural gas fired, it can have an energy efficiency of 80% to 90% versus the 33% efficiency of a nuclear power plant. So it's clearly the way to go: lowest cost, cleanest, most efficient and we're very strong advocates of it.

Yes, all for it. We promote it in our development projects; so far not in Ontario or Toronto, though we've tried. We've done it other provinces.

Our position is to accommodate DG.

Our position is for green energy and distributed generation is an integral part of that because it enables the types of renewable energy and clean energy.

4.3 Personal Insights/Views regarding DG in Toronto

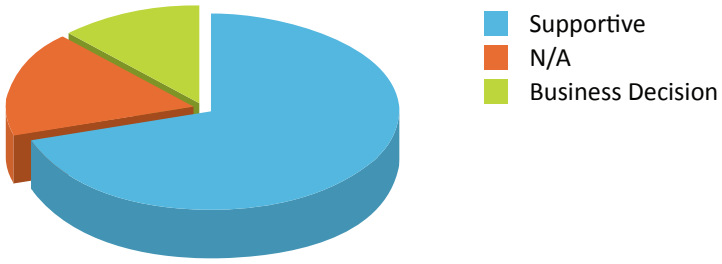
I think there's got to be some coordination between the involved parties. The OPA is trying promote generation and the other areas, being HydroOne or Toronto Hydro, they tend to be roadblocks and there's a clear absence of helping, or wanting projects to work. You know, "You tell me what you want and I'll tell you whether you can do it or not." I don't think there's any coordination or commitment by all the parties. That's been our experience.

A sizeable majority of respondents expressed personal support for DG and increasing its application. Many cited the system, social environmental and other benefits of DG.

Twenty-nine of the 42 respondents – or 69% – stated that they were personally supportive of DG. Seven declined to offer a personal perspective, and five said that the view of DG was decided on a case-by-case or one-off basis taking the strength of the business case into account.

Of those who were personally supportive, a number qualified that support with insights based on experience. Several expressed frustration, others stipulated that there were numerous challenges to be addressed in advancing DG in Toronto and Ontario more broadly, and others offered specific insights and anecdotes.

Respondents' Personal Views on DG



- 69% of respondents offered personal view that were supportive of DG
- 17% declined to offer personal views or insights
- 12% said their views were based on a case-by-case basis, based on the business merits of projects

Personal Insights – Excerpt of Responses

The personal insights expressed in the course of the interviews show that the range of respondents come at DG from some very different perspectives.

> *I think DG introduces major opportunities especially with all the re-capitalization needs, in the energy system in the near future. I think we should look at all options and I'm convinced that distributed generation is a good opportunity both in terms of environmental and economy costs, especially when you think about all the issues with transmission and distribution of electricity. I think with distributed generation, there is a good potential there.*

> *I feel pretty conclusively that DG should be part of the mix because in the energy picture of Canada, I think we can all admit, at least in private, that we have no energy strategy in Canada, or framework. In this picture, there is no silver bullet, and there are a number of technologies that can play a key role in delivering an energy solution for Canada that's a lot less haphazard than what we have now and what it looks like we might have in 25 years*

> *The utilities in the Greater Toronto Area and the Golden Horseshoe area are actually set up to do it, and they' re not doing it. So my own personal view is that they have the ability to do so, they have the authority to do so, they're still learning how to understand to do it in terms of a market advantage, and so at some point, we'll hopefully see it.*

> *And something that's been discussed repeatedly for the City of Toronto, it's been done within Markham and Hamilton, almost all the major cities are looking at doing localized distributed energy generation of one form or another, but those relationships usually between the objectives of Council and a local utility or their utility that they own, don't often coincide. So it's a difficult challenge and still one we have to move toward in terms of rebalancing.*

My view is we need to dramatically reduce electricity consumption, be much more efficient, move to green energy and away from the "energy technocracy that builds bigger and bigger stuff all the time." I will never understand how the best deal, even in dollar terms, for the rate payers in Ontario is another nuclear power plant. It makes no sense to me. We've got all this stranded debt. The whole point of distributed generation is that it's local and yet the local distribution company can't do the work to make it happen.

I'm supportive – I believe it is very, very much more efficient, environmentally friendly technology, and you don't have to spend hundreds of millions of dollars on additional transmission wires to bring the power from a remote location into the urban area.

I'm a big proponent of it. Some of the technologies can be retrofitted to any place that has a steam boiler in their facility. So you could have local generation throughout the Toronto area in any big building that had steam generation. Part of the cost associated with power generation is how do you get the power from where you're going to generate it—because nobody wants a power plant in the middle of the city. How do you get it from point A to point B? One of the biggest parts of the cost is the transmission lines, whereas, if you're doing localized generation, you don't need the transmission lines because you're just generating it into a local grid system which will already use it. Therefore, it should reduce the costs.

I'm supportive, but the provincial government is not supportive. The first directive dealt only with electricity; province-wide, we need to get to local planning. The fundamental questions have not been asked by the Province: there's no motivation and no mandate. Basic, fundamental work is not being done to advance DG. Everything favours centralized generation.

I think the structure probably needs more work if those social goals are to be achieved. Personally, I certainly see this as something that people want and there's definite environmental benefits and so on, so from that point of view, I think I'd rather my company be doing things that are seen as supportive of what society wants as opposed to inhibiting those things..

Well, I've been a proponent personally and it flows out through our corporate mentality. We've always been pro-distributed generation. I think there are a heck of a lot of benefits surrounding DG. Many of those benefits that are, unfortunately, not realized by the folks that actually spend the money to put the resource into play.

I'm personally very supportive of DG; it's the way to go to move away from central generation, away from coal and nuclear.

Where does it make sense? - not just DG for DG's sake, but where it's needed.

To put it in very black and white terms, there's either a centralized system which supports large scale thermal power plants, or there's a distributed system which supports clean distributed energy. I guess one of our policy positions and personal position is that it's difficult to accommodate the latter, all of our infrastructure and investments go into the former.

I think it's a good thing. I think it makes sense for Toronto. I think there's a lot of untapped potential and I think that there are some interesting policies that are going ahead both at a provincial and a municipal level that are going to promote distributed generation. There's a lot more that could be done as well.

Well, distributed generation sounds like a great idea. Taking advantage of all the potential that's not being used or is it only being used locally, it's great. We haven't worked it into the master plan or the fabric of the [organization] to go in that direction because we aren't incentivized to do that. I would suggest that building the potential is a capital investment that then gets us into that dynamic: where does the next dollar go? There's a lot of pressure on every dollar.

My views on DG implementation in our current housing environment has lots of challenges in terms of regulatory regime, technical fit, capital investment and operation/maintenance issues.

It's not working under the current conditions, it's not going anywhere. We have a facility and it's losing money out of the gate. It would be cheaper not to run it. Bottom line.

I've spent several years now working on this and the province doesn't make it easy. If you're talking about alternative fuels, that's always going to be an issue. What are the market-based costs of the fuel that you're using versus the regulated price of the electricity that you can charge? Even if you get into biomass—in Dockside, in Victoria, the problem is: what if we can't get a 20-year contract for inexpensive wood for the biomass plants over the next 20 years and the price of biomass fuel goes up but the price of electricity remains fairly steady because it's regulated by the province? Same issue in Ontario. So that's a big issue.

5. Benefits of Distributed Generation

> *The chief benefits: lower carbon footprint, more efficient use of existing facilities, a more reliable grid because you've got more generators. You can work around congestion by having local generation. You can tilt toward greener opportunities with solar, wind and co-gen. You know, the benefits are legion.*
>
> *Conservation is one of the primary outcomes of DG – in the heating sector and the power sector.*
>
> *"The value of distributed generation lies in its ability to provide generation capacity in a flexible, timely, economical and environmentally attractive manner."*[43]

Escalating interest in DG over the past 10-15 years has been driven by various factors: technological innovations; increasing system-capacity needs; changing economic and regulatory environments; and, shifting environmental and social priorities. The IEA (2002) specifies five major factors contributing to this evolution: developments in DG technologies; constraints on the construction of new transmission lines; increased customer demand for highly reliable electricity; the electricity market liberalization; and, concerns about climate change[44]. As of 2005, 25% of new electricity generation installed globally came from distributed resources, compared with only 13% in 2002.[45]

The benefits of DG are "multiple and symbiotic,"[46] yet these drivers have a common foundation in the recognized need to use primary energy as productively and "efficiently as possible, with the least environmental impact whilst ensuring that energy supply is secure, safe and supplied at an agreed quality…"[47]

The benefits of DG are widely accepted. A number of jurisdictions have well-established DG systems and policies, while others are moving aggressively to accelerate the implementation of DG through policy and incentive measures. Challenges still remain in quantifying DG's benefits and in factoring these into overall costs and rewards. Ontario is pursuing this quantification work, though it lags behind other leading jurisdictions.[48]

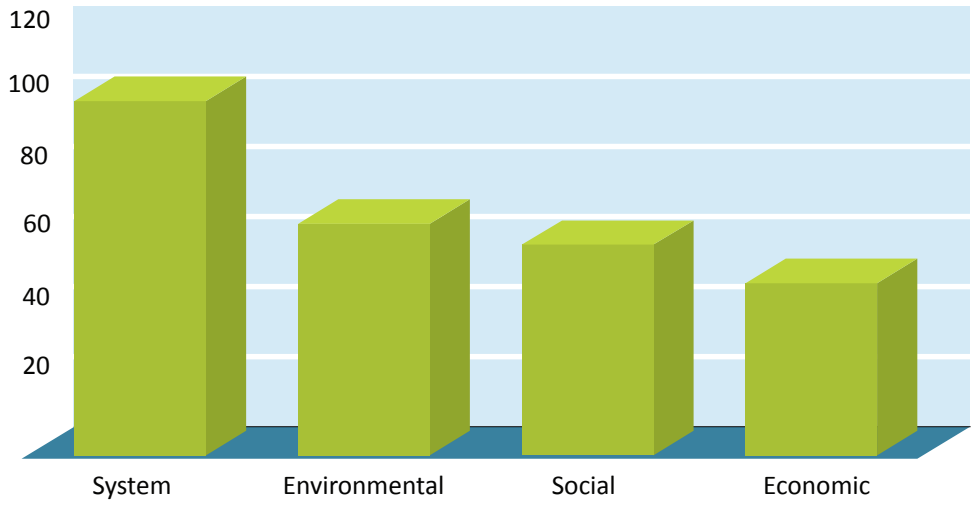
At present, the decision to install DG is ultimately made by the individual customer. It is therefore important to assess the costs and benefits from the perspective of a wide range of stakeholders. Ultimately, the benefits must outweigh the barriers and costs if we are to facilitate more widespread uptake of DG. That is not the case as yet.

43 Ontario Industry Task Force on Distributed Generation (2005), "*Decentralizing Energy Security in Ontario*." Provided by the Association of Power Producers of Ontario.
44 International Energy Agency (2002). Distributed Generation in Liberalized Markets. Accessed at **http://www.iea.org/textbase/nppdf/free/2000/distributed2002.pdf**
45 WADE, World Survey of Decentralized Energy 2006. Accessed at: **www.localpower.org**.
46 European Commission Research. Energy – Key Advantages of Distributed Energy Resources. Accessed at http://ec.europa.eu/research/energy/nn/nn_rt/nn_rt_dg/article_1159_en.htm
47 Ibid.
48 EES Consulting for the Ontario Energy Board (2007). Discussion Paper on Distributed Generation (DG) and Rate Treatment of DG.

5.1 Summary of Key Findings: Benefits

The benefits enumerated by respondents have been grouped into four closely linked categories: System Benefits; Environmental Benefits; Social Benefits; and, Economic Benefits. Generally, DG is seen by respondents to offer wide-ranging tangible and intangible benefits. These are consistent with the benefits identified in other jurisdictions – notwithstanding differences in levels of market liberalization – and in the literature.

Benefits as Identified by Respondents by Category



By far, system benefits were the most frequently identified by respondents, followed by environmental, then social and finally economic benefits.

It should be noted that respondents were asked to identify what they saw as the benefits of DG, in an open-ended question (see Appendix C, question 5). Respondents were not provided a checklist or categories for reference.

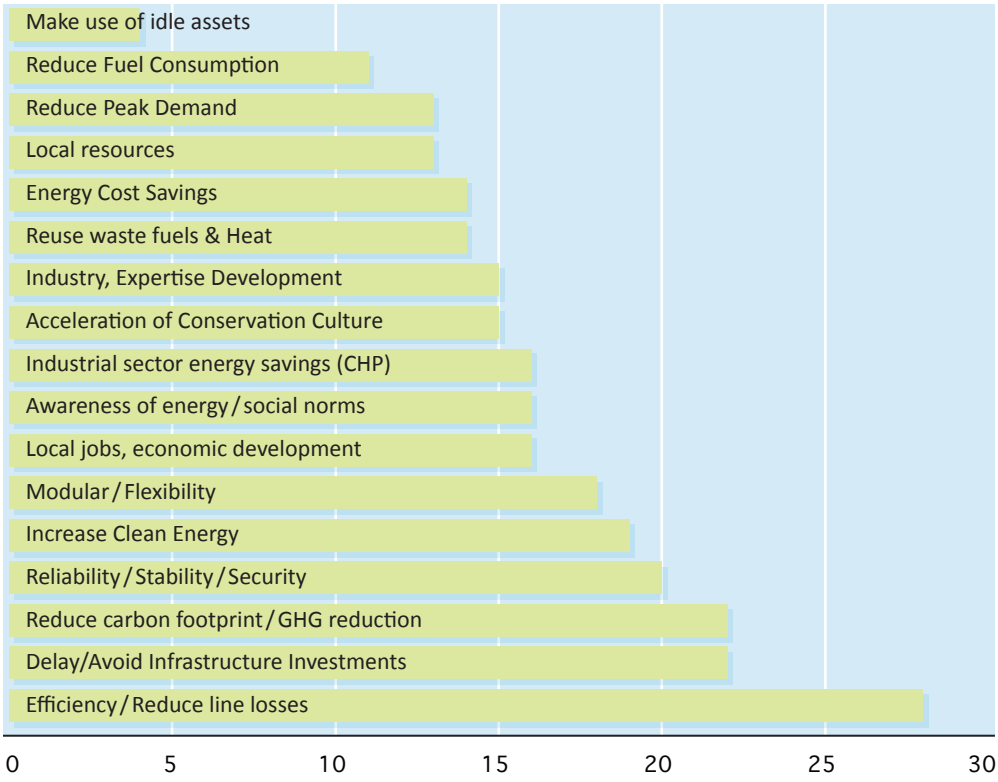
- Overall, system benefits were identified a total of 101 times – more than any other category – by respondents, broken down as follows:
  - System efficiency/reducing line losses was identified by 28 – or 67% of – respondents – more than any other single benefit;
  - Delayed or avoided infrastructure costs and investments were identified by 22 – or 52% of – respondents;
  - System and supply reliability/security/stability was identified by 20 – or 48% of – respondents; and,
  - Reducing peak demand/prices was identified by 13 – or 31% of – respondents.
- Overall, environmental benefits were identified a total of 66 times by respondents, broken down as follows:
  - Reduce Greenhouse Gas emissions was identified by 22 – or 52% of – respondents;
  - Increase in clean energy was identified by 19- or 45% of – respondents;
  - Recycling of waste fuels and heat was identified by 14 – or 33% of – respondents; and,
  - Reduced fuel consumption was identified by 11 – 26% of – respondents.

- Overall, social benefits were identified a total of 60 times by respondents, broken down as follows:
  - Local jobs and development were identified by 16 – or 38% of - respondents;
  - Awareness of energy consumption and demand was also identified by 16 respondents (38%);
  - Fostering of a conservation culture identified by 15 respondents (36%); and,
  - The use of local resources was identified by 13 respondents (31%).
- Overall, economic benefits were identified a total of 49 times, broken down as follows:
  - Industrial sector savings and benefits (through CHP) were identified by 16 – or 38% of - respondents;
  - Economic and industry development were identified by 15 respondents (36%);
  - Energy cost savings was identified by 14 respondents (33%); and,
  - Making use of idle assets was identified by 4 respondents (10%).

5.2 Principal Benefits of DG: Overview

Most respondents felt strongly about the benefits of DG, relating back to the strong level of personal support expressed (Question 3, in Section 4.3 above), and consistent with policy underpinnings in other jurisdictions and with the literature. The specific benefits, by frequency identified, are summarized in the graph below.

Specific Benefits Identified by Respondents



Benefits Identified by Type and Frequency			
IDENTIFIED BENEFIT	TYPE	NO. RESPONDENTS IDENTIFYING	PERCENTAGE OF RESPONDENTS
Efficiency/Reduce line losses	System	28	67%
Reduce carbon footprint/GHG reduction	Environmental	22	52%
Delay/Avoid Infrastructure Investments	System	22	52%
Reliability/Stability/Security	System	20	48%
Increase Clean Energy	Environmental	19	45%
Modular/Flexibility	System	18	43%
Industrial sector energy savings (CHP)	Economic	16	38%
Awareness of energy/social norms	Social	16	38%
Local jobs, economic development	Social	16	38%
Industry, Expertise Development	Economic	15	36%
Acceleration of Conservation Culture	Social	15	36%
Energy Cost Savings	Economic	14	33%
Reuse waste fuels & Heat	Environmental	14	33%
Reduce Peak Demand	System	13	31%
Local resources	Social	13	31%
Reduce Fuel Consumption	Environmental	11	26%
Make use of idle assets	Economic	4	10%

5.3. System Benefits

Generically, there can be a genuine system benefit particularly for those types of generation that follow the load or produce greater power when demand for the power in the system is higher. It can reduce losses on the system. It can reduce loading on particular transformers. So there are a lot of local benefits where certain types of distributed generation can be highly beneficial. In an urban setting, obviously, generation that follows load and can reduce loading on transformers and reduce losses is going to have some real benefit.

5.3.1 Delay or Avoid Infrastructure Investments

- 52% percent of respondents identified the delay or avoided infrastructure investments as a key benefit of DG.

As electricity demand grows, increasing congestion on transmission lines stretched to capacity has resulted in even greater transmission losses[49]. North America's aging centralized power grids are becoming more susceptible to congestion along transmission lines. Respondents felt that when a transmission system is congested, appropriately located DG can reduce the congestion and thus defer the need for an upgrade.

49 U.S. Climate Change Technology Program (2003). Technology options for the near and long term. Retrieved from http://climatetechnology.gov/library/2003/tech-options-1-3-2.pdf.

Furthermore, if a distribution network is operating near capacity or needs to be upgraded to accommodate power flows from the generator, DG installed at a transformer station for example, may allow a distribution company to cope with the problem, delaying the need to upgrade distribution assets.

Given that the distribution and transmission infrastructure costs are estimated to be 30% of total costs of delivered electricity, this could be a very significant benefit as Ontario considers the refurbishment of its power grid.

A number of respondents also felt that this benefit to the system in particular must be better quantified, in order to assess credit to project developers, who bear most of the costs, while many of the benefits are reaped throughout the system.

> *Bringing the generation closer to the load so that you can reduce your infrastructure costs, less transmission and distribution facilities. I mean, those are probably the big, big ones.*

> *You reduce equipment loading so you can use the same equipment for more growth. You can also avoid the equipment breakdowns as a result and defer some grid enhancements.*

> *DG is going to reduce the need for those new distribution or transmission lines coming in. It's going to reduce the need, right away, back to any new major power plant that has to be built. It's going to make the power available as, and when, it's needed so it can be balanced by short-term storage capacity and it's generally managing the energy supply needs of the community.*

5.3.2 Reduce Peak Demand

- 31% of respondents felt that DG could help to alleviate peak demand and peak prices.

Respondents also pointed out that DG also has the benefit of being able to reduce the demand on the transmission and distribution systems during peak hours, and can provide responsive or emergency back-up power during grid outages. The Government of Ontario includes DG in its definition of electricity conservation and demand management activities and programs.

> *DG also helps to reduce the transmission and distribution losses, which are common and unavoidable in big power plants and grid transmission. Especially in downtown Toronto where most of our buildings are located, it assists the LDC power supply problem during summer and winter demand peak.*

5.3.3 Reduce line losses, Increase system efficiency

- System efficiency and the reduction of line losses was the top benefit cited by survey respondents, with 67% identifying it as a principal benefit of DG.

As many respondents explained, system losses are affected by changes in power flows in the distribution network. On-site generation will cut system losses by reducing power demand on the system. If a distributed generator is located near a large load, then its exported power will also tend to cut system losses, whereas power exported to the grid from remote distributed generators may increase these system losses.

According to the International Energy Agency, broad deployment of DG could result in cost savings of nearly 30% total electricity costs by mitigating transmission and distribution losses and displacing expensive infrastructure.[50] One of the benefits of DG is the reduced transmission loss, or a significant reduction of the electricity wasted in the transmission of electric power over long distances. While transmission and distribution losses were estimated at 7.2% of total electricity generation in the United States in 1995[51], and the Ontario Clean Air Alliance estimates overall system losses in Ontario at an average of 7.5%[52], precise data is not readily available. The Ontario Power Authority confirms that the total transmission loss for an Ontario system peak demand of 27,000MW is approximately 3%,[53] but this does not include transmission losses.

Data regarding transmission and distribution system losses in Central Toronto were not available.

> *Well, you reduce the transfers from the grid, so you reduce the losses on the grid.*
>
> • • • • • • • • •
>
> *The upstream benefits are that you can reduce—you have a compounding benefit because upstream you produce electricity at, say, 30% efficiency and then you have all of the distribution losses on the transmission lines as you get it to the market. So if you produce the electricity on site and you're using the hot water as well because you have an end user for it, then you can bump up your efficiency to about eighty-something percent, and you've also eliminated that 10% of line losses from the central generating plant to the market. So, compounding benefits as you go upstream.*

5.3.4 Greater flexibility and control, modularity

- 43% of respondents identified modularity/flexibility/control as a key benefit of DG.

A number of respondents raised the benefit of modularity, particularly in conjunction with the possibilities emerging with smart grid technologies.

50 International Energy Agency (2002). Distributed Generation in Liberalized Markets. Accessed at **http://www.iea.org/textbase/nppdf/free/2000/distributed2002.pdf**

51 U.S Climate Change Technology Program (2003). Technology options for the near and long term. Accessed at **http://climatetechnology.gov/library/2003/tech-options/tech-options-1-3-2.pdf**.

52 Ontario Clean Air Alliance (2009). Opening the Door to Clean Power in Toronto: Removing barriers to combined heat and power and distributed generation. Accessed at **http://www.cleanairalliance.org/files/active/0/cesop-web.pdf**.

53 Information provided by the Ontario Power Authority via email correspondence.

Because it is modular, DG can be implemented much faster to match generation and demand better than new centralized generation. Unlike centralized generation plants, DG systems can closely match changes in projected demand achieved through conservation and efficiency strategies. Modular DG also has lower lead-times than most centralized generation, which can translate to less financial risk and exposure, and in less capital being tied up prior to a plant generating revenue. The smaller scale of DG power plants can also encourage streamlined permitting and planning processes, which means fewer project failures, and less risk to capital investors. There is also much greater flexibility in siting DG than centralized plants.[54]

> *DG is modular: you can add it where it's appropriate in small chunks as needed. So it avoids huge capital investments in acquiring additional supply and defers or obviates transmission and distribution upgrades and associated costs.*
>
> • • • • • • • • •
>
> *You also have modularity. If you put in a central plant, you know, one of these micro central plants, you can update the technology more easily than you can on a massive infrastructure project at a central plant. In other words, you could bring in alternative fuels a lot more easily in the future; it's much more future-adaptive.*

5.3.5 Reliability/Stability/Security

- 48% of respondents identified reliability and stability as a major benefit derived from DG.

As respondents explained, the decentralization of electricity generation can greatly reduce the damage and disturbance caused by system-wide grid failure and major power interruptions through the implementation of smart-grid or micro-grid systems, which can safely provide power from DG to nearby loads during periods of general system failure. When centralized failures do occur, DG can also help in restarting the power system, reducing downtime; as modular units, they tend to be far easier to restart than centralized units that rely on energy-intensive startup procedures.

Two of North America's more recent major blackouts, those in 1996 and 2003, were caused by overloaded lines sagging into trees, resulting in short circuits that precipitated a larger collapse of the electrical grid. The costs of the 2003 North American blackout alone have been estimated variously to be between $4 billion and $10 billion.[55] [56] [57]

> *But not to be overlooked is also the security aspect and reliability. So if you envisioned a grid five, ten years from now which has a much higher percentage of DG in it, the odds of all those units going off-line at the same time are very slim statistically, but the odds of one of these big nuclear power plants is not slim,*

54 Lovins, A.B., Data, K.E., Feiler, T., Rabago, K.R., Swisher, J.N., Lehmann, A. (2002). Small is profitable: The hidden economic benefits of making electric resources the right size. Snowmass: Rocky Mountain Institute. Accessed at **http://www.smallisprofitable.org/207Benefits.html**

55 More power to the GRID. (2005). Oak Ridge National Laboratory Review, 38. 1. Retrieved from **http://www.ornl.gov/info/ornlreview/v38_1_05/article11.shtml**.

56 ICF Consulting. (2003, September 8). The economic cost of the blackout: An issue paper on the northeastern blackout. Retrieved from http://www.icfi.com/markets/energy/doc_files/ blackout-economic-costs.pdf.

57 Parks, B. (2003). Transforming the grid to revolutionize electric power in North America. U.S. Department of Energy, Edison Electric Institute's Fall 2003 Transmission, Distribution and Metering Conference, cited in Electricity Consumers Resource Council. (2004). The Economic Impacts of the August 2003 Blackout. Retrieved from **http://www.elcon.org/Documents/EconomicImpactsOfAugust2003Blackout.pdf**.

and if it does, it affects a huge part of the supply. So, by having a whole bunch of smaller units in the grid, you improve reliability that way, and security.

DG is a more reliable source of supply. With distributed generation, we can keep the lights on even if there's a province-wide or a North American blackout. It's cleaner, much cleaner than coal-fired power plants.

You've got improvements in reliability because your generation's close so you're not at the mercy of the transmission system which, by the way, is very reliable.

The energy security, energy reliability, reduced volatility as well as a range of technical benefits. There are lots of benefits to the system. It is generally agreed that DG can bring many benefits over large conventional centralized generation, with few disadvantages. It is not our view that DG will replace centralized plants, but be complementary.

5.4 Environmental Benefits

Overall, DG is far less environmentally disruptive than central generating stations and far less polluting. The greatest environmental benefits will be derived from pursuing clean DG options and technologies, such as solar PV, etc. Natural gas obviously plays an important role in the development of DG and particularly CHP, and it is much less carbon-intensive than other fossils. Also, DG can result in much greater conservation and efficiency.

Perhaps the most obvious one is the environmental benefit, the reduced emissions. If you're using renewables and even if you're using fossil fuels, you're doubling, or more, your efficiency often. So there are some air quality benefits there, reduced smog. Toronto has problems with air pollution, so that would be a big advantage over the status quo.

5.4.1 Reduce carbon footprint, Lower GHG emissions

- 52% of respondents expressed the view that DG would help to reduce GHG emissions, the second-most identified benefit amongst survey respondents.

Respondents qualified this view with the caveat that this depends on the type of DG. The greatest GHG benefits are reaped through clean energy DG, according to a number of respondents, but most DG, because it creates more efficiency and in the case of CHP recycles waste gases and emissions, will be more climate-friendly.

DG can contribute to reducing greenhouse gas emissions in a number of ways: through greater efficiency, through greater clean renewable energy deployment and through demand management. Over time, it will also facilitate the move away from more centralized and polluting plants to smaller, local generators. CHP at industrial facilities, for example, can play a large role in the overall reduction of GHG emissions in the Province, by reducing demand on coal-fired generation. As such, CHP should be seen as integral to advancing Ontario's climate targets, in addition to its energy supply needs.

DG can reduce emissions compared with older, less efficient fossil fueled generation technologies. DG can reduce the environmental footprint of providing society energy. DG can reduce unhealthy air pollution thus improving quality of life.

5.4.2 Increase the amount of clean energy

- 45% of respondents (19) identified the increase in clean energy associated with broader uptake of DG as a key benefit.

These respondents felt that widespread DG development could also play a very significant role in accelerating the deployment of renewable energy, and achieving green energy targets. This also relates back to the system bias and system change necessary to facilitate a shift to less centralized generation, though this system change was only raised by just over half of the 19 citing this particular benefit. Many did not see widespread system change necessary or resulting from greater uptake of DG. The system change facilitated by a greater move to DG favours greater clean energy deployment, eradicating some of the system bias and comparative costs over time.

Renewable energy forms of DG would help us in meeting our Green Goal faster and better.

If you're using renewables, you will be producing cleaner power, which has environmental and air quality and public health benefits, and responds to social priorities.

5.4.3 Reduced fuel consumption

- 26% of respondents identified reduced fuel consumption as a benefit of DG.

As elaborated earlier, DG creates much greater efficiency, according to many respondents. Some also took the view that, over time, all of the symbiotic benefits will together result in significant reductions in fuel consumption through greater generator and individual control; greater individual and community awareness of consumption and supply; much greater efficiencies across the system; and, greater conservation.

The main benefit of DG is promoting the use of cleaner sources of energy: renewables, natural gas, co-gen, so it's more efficient. So we're going to reduce our greenhouse gas emissions and our fuel consumption. Energy security, people will be able to control their energy to a large extent, so they'll know how much it's going to cost. So if the price of oil skyrockets, and eventually it will, they'll be somewhat insulated from that. That should assist people in Toronto economically.

5.4.4 Reuse and Recycle Waste Fuels and Heat

- 33% of respondents identified the recycling of energy and waste fuels and heat as an important benefit of DG.

Unless harnessed and applied, waste heat and fuels are just that – wasted. In the case of industrial gases for example, these are in many cases flared into the atmosphere, releasing pollutants and blighting the skyline. With CHP, these gases, heat and other waste materials can be harnessed and recycled for on-site electricity and/or electricity that is sold back to the grid. This in turn reduces demand on coal-fired and nuclear generation.

> *Because you're bringing it down to a smaller scale, we're not now talking about collecting all the heat from Pickering or Darlington and trying to use that in the community. We're talking about using the heat from localized generation. Let's take some of the blocks down in the downtown core by Union Station, this whole slew of downtown high rise office towers, all inter-connected with shopping malls and goodness knows what, and localized generation could not only provide the electrical power for that, but the waste heat from that generation—and it will be waste heat because we're not going photovoltaics here, we're going to localized combustion generation. So there is heat available and the heating should be used as it is in some places with EnWave, and what have you, down there to heat the buildings as well as using it for the cooling.*
>
> • • • • • • • • •
>
> *DG presents a valuable business opportunity to otherwise wasted fuels (e.g., sewage, landfill gas, municipal solid waste, commercial, industrial and agricultural wastes). DG can reduce wasted fuel. By increasing investment in DG, efficiency gains can be obtained through thermal efficiency gains and reduced line losses.*

5.5 Social Benefits

When respondents talked about the social benefits of DG, they referred to a range of tangible and some less tangible or immediate consequences. On one level, respondents identified very real local benefits in and for communities – greater use of local resources, jobs and expertise in the community, heightened awareness of and connection to energy needs and consumption, to name a few.

On another, perhaps less concrete level, respondents talked about the social shifts that could result from greater local power such as greater conservation through attitudinal and behavioural change associated with better understanding and connection to energy, and the democratization of the power system. A few talked about the fundamental consumption between our lifestyle and our approach to and consumption of energy.

5.5.1 Awareness of energy production, consumption and cost

- 38% of respondents identified greater consumer awareness of energy production and consumption as a key benefit.

A good number of respondents felt very strongly that DG facilitates the rapid expansion of community-based electricity generation, giving rise to many social benefits. Centralized power grids and electricity sources "tend to lack the qualities of user controllability, comprehensibility, and user-independence".[58] Essentially, this means that individuals and communities

58 Lovins, A.B., Data, K.E., Feiler, T., Rabago, K.R., Swisher, J.N., Lehmann, A. (2002). Small is profitable: The hidden economic benefits of making electric resources the right size. Snowmass: Rocky Mountain Institute. Accessed at **http://www.smallisprofitable.org/207Benefits.html**

are unable to participate in electricity generation. Community power promotes awareness of the source of electricity generation, and encourages community participation in electricity generation; this in turn facilitates a more profound understanding of the impacts of electricity use and consumption. Community-owned and controlled DG also tends to be more acceptable to local people from a siting perspective than large, centralized power plants.

> *DG has the added benefit of putting it in front of the consumer in terms of shaping their perspective, being able to understand the ups and the downs of energy generation and energy choices and consumption, so when it's more local, people see it, they recognize the kinds of choices that they're making. That's a sort of social behavioural change recognition opportunity, well-recognized, well-identified and people, once they see that they're producing green energy, they're more likely to buy into it.*

5.5.2 Acceleration of conservation culture

- 36% of respondents identified the acceleration of a conservation culture as a key benefit arising from more widespread DG.

By increasing the efficiency of energy transmission, DG can also reduce the overall demand for electricity, reducing not only the number of new generators but also the transmission and distribution infrastructure required for the delivery of electricity. Eliminating these structures also eliminates their potential environmental impacts, further increasing the attractiveness of DG from an environmental perspective. Offsetting the impacts of siting new transmission and distribution infrastructure is a significant opportunity presented by increasing the percentage of DG relative to centralized generation.

Having electricity that is more visible and accessible will foster greater understanding of consumption and supply, and play a strong role in raising awareness, shifting attitudes and ultimately changing behaviours.

> *Distributed generation is often also quite visible and, being visible, it is in the public's eye more often and it just creates a more engaged public. That helps with creating a conservation culture. It helps with just the awareness of our energy decisions. When people drive by the windmill and see it generating power, then they have that connection to the fact that you can produce power in a more environmentally friendly way. Conversely, when they drive by and see that that windmill is not operating, they can see that—especially during very hot days—that it's probably quite a challenge to meet their demand and they may take actions in order to reduce their demands. I think that visibility factor of distributed generation can have a very positive influence on society.*

5.5.3 Use of community/local resources

- 31% of respondents identified greater use of community and local resources as a key benefit.

Many anticipate that DG will foster community participation in electricity generation, and open important opportunities for more integrative community planning and use of community resources. Communities will retain and spend more of their energy dollars.

One great benefit is that is builds a sense of community planning – integrated planning. There's a greater use of local resources to meet the local needs, and a greater awareness of those uses.

More optimum use of resources and savings. For example, in the distribution transmission, costs can be very important if you produce where you use the energy. So it can be based more, in some cases, on local resources including renewable energy. Often when we think of co-generation, we can think of gas-fired co-generation which is probably very important, but it can be supplemented by other resources, be it municipal waste or even in some cases, we have micro-generation, distributed generation such as solar.

In [the] community housing setting, the perceived benefits include potential security of power, provide emergency standby power if CHP is used in the DG solution. DG is a cleaner energy solution than relying on the grid and other forms of carbon intensive technologies. DG usually provides an energy efficiency opportunity to high-density development, thereby reducing the carbon footprint of the company operation.

5.5.4 Local jobs and economic activity

- 38% of respondents identified increased local jobs and economic activity as a key benefit.

Many respondents expressed the view that DG will result in many more local energy jobs, DG industry development and economic spin-offs. Importantly, too, it will build local expertise, skills development and training opportunities, all of which build greater momentum and potential for DG. This, in turn, could aid in giving Ontario a foothold in the global green economy and over time to establish the Province as a global leader.

It will also create green jobs in Toronto. Instead of sending our dollars to the United States to buy coal, to Saskatchewan to buy uranium, to Alberta to buy natural gas, or to Bruce County to buy nuclear power, we can create jobs right here in Toronto. And the expertise. Green jobs, expertise, knowledge that can lead to export jobs, and again, great jobs in Toronto. Lower bills of Toronto businesses; make the whole Toronto economy more competitive.

5.6 Economic Benefits

DG enhances energy security: overall energy security is part of the financial competitiveness of any community, in terms of employment opportunities, in terms of your energy demand and not worrying about a lot of large-scale interruption, depending on the type of DG that's selected.

Also local economic development, that it brings in a lot of jobs basically servicing, installing, fairly sophisticated jobs and it serves college graduates and skill trades people really well.

Local jobs, all these installations are done very locally. people can be trained locally and hopefully instead of being industries and nuclear plants, it's more local jobs and more integrated into the community.

5.6.1 Economic and Industry Development, Competitiveness

- 36% of respondents identified economic and industry development as a key benefit of increased DG.

With DG growth rates growing around the world, there is an important opportunity for Ontario and Toronto to become players in this growing market. This can only happen if we build a robust industry, with skills training and development, expertise and sufficient installation to be an industry leader.

At present, clean or renewable DG offers particular opportunities for industry and economic development. The role that renewable energy will play in the United States' stimulus roll-out will open up important market opportunities for Ontario. Globally, renewable energy is experiencing a meteoric rise, with the sector now accounting for 2.4 million jobs worldwide and doubled electricity generating capacity since 2004. In 2007, more than $100 billion was invested in new renewable energy capacity, manufacturing plants, and research and development – an increase of approximately 50% over 2006.

Another is that you're increasing the number of market players, the number of suppliers and players in the industry, and I think that's always a good thing. It increases the diversity.

The other advantage is contributing to reduction on centralized generation and the dollars that aren't going into centralized transmission and distribution on that larger scale. If you look at it from full-cost accounting perspective, what you're doing is recognizing that upstream costs are going to be more than local. And you're accounting for that in your overall evaluation. And those funds that aren't going in there can go into capital development of those DG systems. And it means more money available locally to be spent on improvements in that particular community.

Increased DG will bring local jobs – all the installations are done very locally. Local training, expertise, industry development – when we figure we have to retrofit 500,000 buildings over the next 20-30 years, that's a lot of local business that can be developed.

5.6.2 Energy Cost Savings

- 33% of respondents identified energy cost savings as a key benefit of increased DG.

DG can reduce costs for both electricity consumers and electricity producers.

There's a cost benefit in terms of saving money or, through a program, getting paid to provide generation capability on demand.

5.6.3 Make use of Existing/Idle Assets

- 10% of respondents identified energy cost savings as a key benefit of increased DG.

For the most part, respondents here are referring to back-up generation/emergency equipment which sits idle most of the time and which could in theory supplement local generation needs. As noted in Chapter 3, there is approximately 500 MW of installed capacity of emergency and back-up generators in Toronto, the vast majority being diesel-fueled and used for emergency purposes only. Operation of these generators is very limited for a number of reasons, outlined in Chapter 3, a chief one being the air pollution and emissions restrictions.

This led a number of respondents to suggest that, with the right incentives or programs, these back-up generators could be converted, or more likely, new back-up installations could be required to meet standards for DG installations.

> *DG can make use of existing resources potentially that are there already if you can modify them, such as back-up generators.*

5.6.4 Financial and energy savings for industry (CHP)

- 10% of respondents identified financial and energy savings for industry as a key benefit of increased DG.

Commercial and industrial facilities can create enormous energy savings through DG.

> *Any place that is going in new that's putting in steam boilers, you can generate electricity so you could then offset your demand requirements. Therefore you'd reduce the demand on the grid. Therefore you don't have the huge infrastructure costs in order to put power to a building, and the opportunity is there. Heat pump technology, you can use any (inaudible) systems that are on the EnWave, any system that you're putting in that has hot water or waste hot water depending on the temperature. Part of a project we're doing is absorption chiller and what that does is that offsets the load of the grid requirement. It's light generating electricity but what you're doing is your lowering your demand as opposed to actually generating electrons.*

> *Takes advantage of a couple of [industrial facilities] that are heavy steam users that could allow a combined heat and power plant that would be very efficient and we could bring stability to an area. We could add capital and they can help with putting our co-gen in. We would be part of an upgrade of the area and we'd be contributing towards that. I'm presuming we're not going to pay for all of it, but if it means an upgrade of a station or switch gear, our project would contribute towards that. I think we would, in the case of gear, they're saying that their switch yard is at capacity, this would be a perfect opportunity to increase the capacity of the yard and share the capital expense. So the economic benefit, I think the overall system upgrade benefit, I think, from a stability standpoint, it would improve.*

There is a particular case to be made for cogeneration.

Conclusions

- As a category of benefits, system benefits of DG were the most often identified and recognized by respondents, followed by environmental benefits, then social and finally economic benefits.
- The benefits of DG are well understood and appreciated amongst stakeholders, as evidenced also by the strong personal support expressed by the majority of respondents at the top of and throughout the interviews.
- There are a wide range of benefits to be derived from DG; however, they are insufficient at present to catalyze any large or widespread implementation of DG, as evidenced by the very low penetration of DG in Toronto or Ontario.
- The top 5 single benefits cited by respondents (unprompted to an open-ended question) are:
    - Reduction in line losses and efficiency gains, cited by 67% of respondents;
    - Reduction in carbon footprint/GHG emissions, cited by 52% of respondents;
    - Delayed or avoided infrastructure investments, cited by 52 % of respondents;
    - Reliability, security, stability of supply, cited by 48% of respondents; and,
    - Increase in clean energy, cited by 45% of respondents.
- These benefits also align closely with many of the Province's goals in respect of climate change, energy, sustainability and community development. At present, these values are not reflected in either the pricing or incentives for DG and cogeneration projects. Also, the playing field is skewed toward central generation and discriminates against smaller, local generation. Policy and leadership must be undertaken.

6. Barriers to Distributed Generation

Why isn't everybody doing distributed generation if it's so great? I ask myself that. It's going to be hard to overcome our current thinking. Grid energy is what we've all become entirely accustomed to and the notion of doing something different is difficult because it requires a different thought process to initiate. You're taking on risk that isn't your core business. All of a sudden you're in the energy business as well as whatever other business that you're in, and until there is an industry that supports that—it's going to be difficult.

6.1 Summary of Key Findings: Barriers

The barriers identified by respondents are laid out in on the next page according to frequency cited. Respondents were left to identify as many barriers as they deemed significant. No single barrier was raised by more than 60% of respondents. Key findings from the survey are as follows:

- The lack of adequate financial incentive, or a functioning Clean Energy Standard Offer Program (CESOP), was the top barrier identified by 25 of the 42 respondents as impeding the uptake of DG. Notwithstanding the establishment of a mechanism, being the CESOP or the newly-announced feed-in-tariffs, the actual price will be a critical determinant of the uptake of DG, particularly for much-needed CHP projects.
- Barriers were grouped into four categories: system barriers; financial barriers; technical barriers; and social barriers. System barriers were the most frequently cited category or type of barrier, a total of 115 times. These barriers tend to be systemic and reflect the system's design to serve the needs of large central generators and extensive transmission and distribution infrastructure.
- After system barriers, financial barriers were the category of barrier most frequently cited by respondents. Financial barriers include the lack of financial incentive, such as the CESOP – or "C-STOP" as one respondent referred to it. CESOP and RESOP were repeatedly characterized as being inadequate, or not working as intended (in the case of RESOP).
- Almost half of respondents identified a lack of vision and mandate – 19 out of 42 or 45% – as a real impediment to more concerted implementation of DG. The same percentage identified a lack of coordination and strategy across the system as a major barrier to individual projects.

The barriers to DG are consistently – and significantly – outweighing the benefits. Ultimately, regulators and policymakers must set appropriate policy goals and regulations so that implemented DG provides more benefits than costs. In other words, we must level the playing field for DG, and eradicate the system bias that is preventing its uptake, as so many other jurisdictions have done or are in the process of doing.

6.2 Principal Barriers to DG: Overview

One of the primary catalysts for undertaking this survey was to explore the barriers to DG in Toronto and Ontario, through the lens of first-hand experience.

The vast majority of respondents expressed the conviction that DG could bring a lot of benefits and alleviate a number of the problems in the Downtown Toronto grid (per Chapter 3). Given all the benefits associated with DG and the broad support, it is important to figure out why penetration remains so low.

As identified in Chapter 3 and explored in more detail below, there are important system constraints in Downtown Toronto, namely limited short circuit capacity that severely caps the scale of DG that could be implemented in the immediate term (2009-2010). However, these constraints do not explain the lack of progress in addressing the myriad other barriers that DG projects face across the board. Nor does it explain why DG penetration remains low in other areas of Ontario that could benefit from it, and which do not face the same issues as the Downtown Toronto grid.

As reviewed in Chapter 1, centralized generation has been the dominant paradigm for many decades. This inherent system bias is manifest in a host of inter-related system, financial, social and technical barriers. A 2007 UK Government Review of DG identified four over-arching barriers to DG in that country: cost, including a failure to fully account for the cost of carbon in electricity prices; lack of reliable information, mainly awareness of DG options and incentives amongst potential users; electricity industry issues such as system bias and LDC accommodation; and, regulatory barriers such as planning permissions and delays. Experience in other jurisdictions would indicate that these barriers are not insurmountable, but do require a concerted, driven effort based on a clear mandate and targets.

In Ontario, the barriers are largely the same as faced in other systems in North America, Europe and Asia. A 2007 study conducted for the Ontario Energy Board by EES Consulting[59] concluded that the benefits of DG "are offset by the potential barriers to DG adoption, including both real and perceived risks."[60] EES broke down the 'universal' barriers to DG adoption into the following categories: regulatory barriers, including issues such as inter-connection procedures, contract negotiations; cost barriers, including issues like the electric rate structure, stranded costs and credit for upstream savings; and, operational barriers, such as lack of industry experience, price volatility for DG fuel and difficult financing.

EES further identifies the key policy issues to address these barriers: system interfaces including access, net metering, and dispatch; Interconnection standards; stranded costs; system investments; and standby charges. It is clear that the barriers identified by respond-ents in the present survey are not unique to Ontario, though there are some unique circumstances as outlined in Chapters 1 and 3. In short, though, in Toronto and Ontario, the barriers to DG are consistently – and significantly – outweighing the benefits. The real rationale for DGis its ability to meet the fundamental energy challenges of our age: climate change, security of supply and conservation.

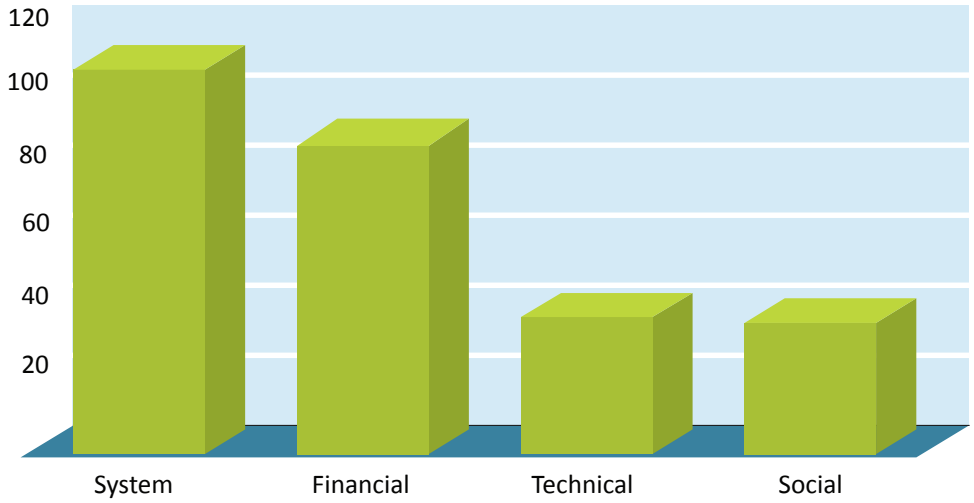
For the purposes of analyzing the results of this survey and relating the views as expressed by respondents, the principal barriers to DG in Toronto have been grouped into four main categories. Again, these issues are all inter-related: system barriers, which include things such as system bias, lack of LDC incentive, experience, and support; financial barriers, which include issues such as the lack of financial incentive and the spark spread; technical barriers,

59 EES Consulting for the Ontario Energy Board (2007). Discussion Paper on Distributed Generation (DG) and Rate Treatment of DG. Page 10.
60 Ibid, Page 15.

which include access to the grid/short circuit capacity and the complexity of contracts and arrangements; and, social barriers, which include NIMBYism, lack of awareness and the lack of a strong conservation culture.

Again, respondents were asked to identify what, in their opinion, were the principal barriers to DG in Toronto or Ontario more broadly (See Appendix C, Question 4), unprompted. Respondents were not provided a checklist or categories for reference, and were free to identify as many barriers as they deemed appropriate.

Barriers as Identified by Respondents by Category



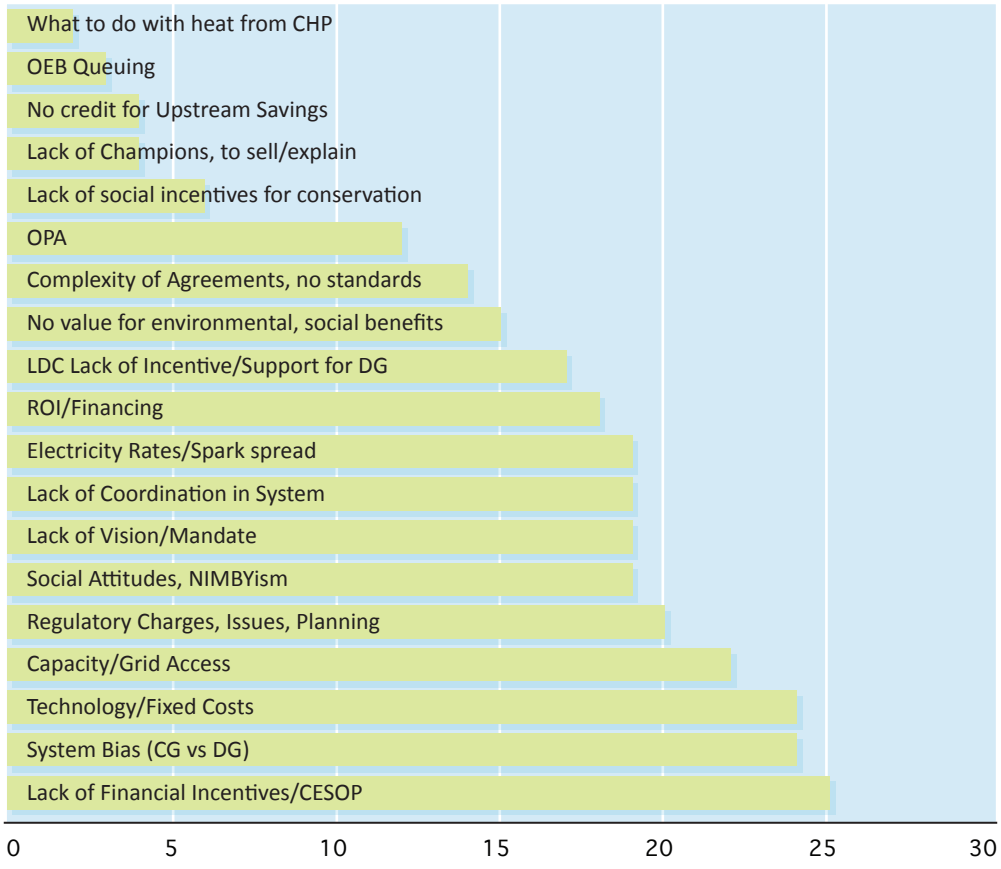
- Overall, system barriers were identified most frequently by respondents, cited a total of 111 times. System barriers were identified as follows:
  - System bias favouring Central generation over DG was identified by 24, or 57% of, respondents;
  - Regulatory charges, issues and planning were cited by 20, or 48%, of respondents;
  - Lack of coordination across the system for DG implementation was cited by 19, or 45% of respondents;
  - Lack of mandate and overarching vision for DG across the system was identified by 19, or 45% of respondents;
  - Lack of incentive for LDCs and their lack of support was identified by 17, or 40% of respondents; and,
  - OPA policies, programs and attitudes were cited by 12, or 29% of, respondents.
- Overall, financial barriers were cited a total of 90 times by respondents, broken down as follows:
  - Lack of financial incentives and the stalled CESOP was the most frequently cited barriers, indentified by 25, or 60% or respondents;
  - The fixed and technology costs of DG were cited by 24, or 57% of, respondents;
  - Electricity rates/the spark spread were cited by 19, or 45% of, respondents;
  - Poor return on investment and difficulty of financing for DG was cited by 18, or 43% of, respondents; and,
  - Lack of credit for upstream savings was cited by 4, or 10% of respondents.

- Overall, social barriers were cited a total of 40 times by respondents, broken down as follows:
  - Social attitudes, lack of acceptance and NIMBYism were cited by 19, or 45% of, respondents;
  - The failure to allocate any value for environmental and social benefits was cited by 15, or 36% of, respondents; and,
  - Lack of social incentives for conservation was cited by 6, or 14% of, respondents.
- Overall, technical barriers were cited 39 times by respondents, broken down as follows:
  - Grid access and short-circuit capacity-related issues were cited by 22, or 52% of, respondents;
  - Complexity of standards and agreements/lack of standardization across the system was cited by 14, or 33% of, respondents; and,
  - OEB Queuing was cited by 3, or 7% of, respondents.

Two issues did not fit neatly into the above categories, but warranted some exploration:

- The need for a champion or office for DG in order to sell the benefits and explain procedures, was identified by 4, or 10% of, respondents; and,
- Two respondents (5%) cited the problem of finding a heat host – "What do you do with the heat?" – as an important barrier to CHP, for consideration.

Specific Barriers Identified by Respondents



The barriers identified by survey respondents were largely consistent with those found in the literature. These barriers stem in the main from the fact that current systems have been designed and have evolved to serve the needs of large centralized generation; accommodating smaller distributed generators and CHP will require a "paradigm shift."

Barriers Identified by Type and Frequency

IDENTIFIED BARRIER	TYPE	NO. RESPONDENTS IDENTIFYING	PERCENTAGE OF RESPONDENTS
Lack of Financial Incentives/CESOP	Financial	25	60%
Technology/Fixed Costs	Financial	24	57%
System Bias (CG vs DG)	System	24	57%
Capacity/Grid Access	Technical	22	52%
Regulatory Charges, Issues, Planning	System	20	48%
Electricity Rates/Spark spread	Financial	19	45%
Lack of Coordination in System	System	19	45%
Lack of Vision/Mandate	System	19	45%
Social Attitudes, NIMBYism	Social	19	45%
ROI/Financing	Financial	18	43%
LDC Lack of Incentive/Support for DG	System	17	40%
No value for environmental, social benefits	Social	15	36%
Complexity of Agreements, no standards	Technical	14	33%
OPA	System	12	29%
Lack of social incentives for conservation	Social	6	14%
No credit for Upstream Savings	Financial	4	10%
Lack of Champions, to sell/explain	Miscellaneous	4	10%
OEB Queuing	Technical	3	7%
What to do with heat from CHP	Miscellaneous	2	2%

6.3 Overview of System and Technical Barriers in Downtown Toronto

The reliability and capacity challenges facing Downtown Toronto are outlined in Chapter 3. In summary, they are: supply capacity, infrastructure renewal, and vulnerability to high impact events. Short circuit capability at the three transmission stations is near capacity and major upgrades or station rebuilds will be required in order to incorporate additional generation. The necessary development work and uprating will take place through 2009-2010 and it is expected that no new projects – or any measurable integration of DG – will be possible until 2011 at the earliest.

Addressing these issues will be an involved process. Upgrading these transmission facilities is a highly complex and expensive undertaking: they are old, highly utilized and densely packed.

According to the OPA[61], major stations upgrades are required at the Leaside, Manby and Hearn transmission stations. These upgrades are required to increase the short circuit capability of the breakers, switchgear and grounding facilities. "Depending on where good DG potential is found, upgrades to certain transmission circuits may be required. Many of

61 Email correspondence exchange with OPA, in response to questions regarding DG implementation and barriers in Toronto from October 2008 to January 2009, and based on interviews with OPA officials.

these circuits are operating close to their capabilities. While the general notion is that DG sited in the right places will relieve transmission line loading, as we've observed, sometimes the good or realizable potential may not be at such locations."[62]

From a distribution perspective, equipment upgrades for high short circuit operation may also be required at some locations. Distribution modifications may also be required in situations where there is significant reverse power flow. Appropriate facilities for communication and control with distribution, transmission and IESO operating centres will be required. Much of the DG in central and downtown Toronto will need to be grid connected and coordinated to effectively mitigate impacts in the event of the loss of a major supply path (e.g. Leaside or Manby). Some of these communication and control facilities may be integrated with future smart grid plans. "It is unclear at this time what such plans may look like"[63]

On the physical side, because of the density in this urban area, space could be a limiting factor to site generation facilities, according to the OPA[64]. For example, the design of older buildings in some areas may prohibit the effective deployment solar panels. Proximity to sufficient water, gas and other infrastructure capacity can also greatly affect the cost of potential projects. In addition to the technical and physical issues, there are also potential approvals and public acceptance issues for certain DG technologies.

Again, while these barriers are very real, experience in other jurisdictions and even some examples in the City of Toronto, indicate that these barriers are not insurmountable. Moreover, much ca be done from now until 2011 to lay the groundwork for rapid deployment of DG in Toronto. Current capacity (up to 90 MW) would also allow a number of pilots in the interim.

6.4 System Barriers

6.4.1 System/Institutional Bias

- 57% of respondents identified system or institutional bias a ongoing barrier to DG in Toronto and Ontario more broadly.

As reviewed in Chapter 1, centralized generation has been the dominant paradigm for many decades. The resulting inherent system bias is manifest in all of the barriers identified by respondents, and a topic of some reflection in a number of individual interviews.

Because of the accumulated investment in the existing power system, DG often must adapt to existing systems in order to connect to the grid, rather than the grid adapting in any way to accept DG. While it is possible for DG to conform to the centralized power system, DG developers come up against inordinate burdens in their siting, interconnection to the grid, and their operation – specific barriers covered in the sections below. This can also perpetuate a general reluctance on the part of the grid operator or utility to deal with DG projects or to resolve these issues strategically for the long-term, in the absence of any incentive. This, in turn, results in every DG project being treated on a case-by-case basis.

62 Ibid.
63 Ibid.
64 Ibid.

Those participants who addressed system bias, felt these issues would not change In the absence of a clear mandate in Ontario for DG, and the necessary vision, authority and implementation strategy, including targets.

As Casten points out, "incumbents are vastly better financed to promote protective rules than insurgent companies blocked by current rules."[65]

> *So I think the biggest single barrier is the OPA themselves, and that also stretches out to the IESO, the folks there, and the LDCs; there's a certain subculture within the institutions and the system, really, that just don't want to have to deal with it. They see it as complex and problematic and having to deal with a bunch of small assets when they'd much rather keep their lives simple and just deal with one big facility.*
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> *Our system is geared to big nuclear plants; our nuclear commitment is preventing the wholesale change that we need.*

6.4.2 Lack of Coordination and Planning across the system

- 45% of respondents identified a lack of coordination and planning across the system as a main barrier to DG development.

Bringing a DG project to life in Toronto or Ontario is a long and arduous process. Developers will have to deal with multiple regulatory and approvals processes across jurisdictions, before they even know whether they will have access to the grid. A project must interact with a wide array of agencies and government jurisdictions and offices and many respondents felt there is a general lack of coherence, guidance and harmonization between these. When project developers are left with unresolved issues, they are often left with nowhere to turn.

Respondents pointed to a number of related issues and barriers (some are addressed below), such as the lack of streamlined or uniform process for project interconnection and fee requirements, as well as a lack of standardization. Moreover, there is little guidance as to what information is required for various agencies and authorities. In this context, it is important to remember that a large segment of current and prospective DG proponents are not in the business of generation – it is not their core business (if they are a business) and lack the expertise and knowledge, particularly on technical issues. This is of particular concern when we consider the role that CHP can play.

One particular manifestation of this lack of coordination is the lack of any clear rules or guidelines stipulating who is responsible for distribution system upgrades when they are needed for a project to proceed. Provincial and municipal regulations and practices offer no guidance on what share of the cost of upgrades must be borne by the developer as opposed to the LDC. Many respondents felt that project developers were bearing an undue share of the costs, considering the benefits of the upgrade are reaped not only by the proponent, but by the LDC, the system and so the public.

65 Casten, Thomas R. (2003). "Assessing Market Barriers to Distributed Generation: Backup Rates and Other Misleading Questions." Presentation March 28, 2003. Slide 6. Accessed at www.raabassociates.org/Articles/Casten032803.ppt

There's got to be some coordination between the involved parties. The OPA is trying to promote cogeneration and the other areas, being HyrdoOne or Toronto Hydro, they tend to be roadblocks and there's a clear absence of helping, or wanting projects to work. I don't think there's any coordination, or a commitment by all the parties.

Generally speaking, just the lack of coherence, overall planning. There is no point in putting in distributed generation in areas that do not have a significant benefit from that distributed generation. It's critically important for us to understand the areas that would benefit most, or need distributed generation most from a system point of view. You need to be strategic in where you actually put the distributed generators so that the system benefits overall. There are places you can put distributed generation where it will not help the system at all and there are places where you can put distributed generation that will be of significant benefit to the overall grid system. The bottom line is that both of those things will have an effect on cost, obviously, and then ultimately on the rate that electricity rate payers pay.

The element of responsibility and authority have been separated. So you have one body which, let's say, is the City of Toronto, who is responsible for managing, if you like, the quality of life and therefore energy consumption within the city. But the authority to make any changes lies with a different party and that's the OPA.

6.4.3 Lack of vision/mandate

- 45% of respondents felt that the lack of a clear mandate and vision for DG was a real impediment to wider long-term DG development.

Closely linked to the lack of coordination elaborate above, is the lack of vision, mandate and planning for DG identified by a number of respondents. It is inextricably linked to the system bias described above as well. There is no target, much less a path, for DG in either Ontario or Toronto – nothwithstanding recent information from the OPA that they will be looking for up to 400MW of DG in Downtown Toronto once development and uprating work there is completed.

DG is not broken out specifically in any fashion in the IPSP forecasts or as a share of current or projected supply. Chapter 3 details current penetration levels of DG in Toronto and Ontario – these figures were provided by the OPA, but not readily available because in the pre-filed IPSP, DG is spread out over a number of resource categories (renewables, RESOP, customer-based generation, local area supply etc.) and not separately summarized or, consequently, targeted.

Some respondents felt that in the course of the past decade there have been signals from government that DG would in fact be targeted – particularly with the early plans to liberalize Ontario's electricity market and the eventual restructuring, and again with the premature fanfare almost two years ago around CESOP (discussed in more detail under financial barriers). These respondents felt that these, ultimately, have been false starts and missed opportunities, and several expressed a real wariness toward present signals around DG and CHP.

Almost half of respondents expressed the view that a long-term strategy – with targets and a clearly defined authority and mandate – is vital if we are to accelerate or even facilitate DG. They also associated the commitment to DG with the commitment to the necessary policy, financial and other measures to level the playing field for DG.

> *Fluctuating governmental signals on DG has caused potential owners or stakeholders to take retreat from further investment and attention to DG.*
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> *There's just a real lack of vision for the future of the system, a lack of vision for DG capacity, nothing to build on or toward it seems. There's no mandate for DG. What we're seeing is the bureaucrats are not working on a mandate. I think they are just simply sort of reviewing a project on its merits and they're looking at their system on their merits as they stand as opposed to having a mandate to upgrade the system, develop the system, have a mandate to increase DG in the area.*

6.4.4 LDCs: Lack of incentive, support, experience

- 40% of respondents cited LDCs as a major barrier to the broader implementation of DG in Toronto and Ontario.

A significant portion of respondents cited LDC's as a main barrier to greater DG in Toronto, and Ontario more broadly. Given that this study focuses primarily on Toronto, respondents discussed their experiences with, and perceptions of, Toronto Hydro. A number of respondents did, though, talk about this being an issue with LDCs across the board.

Beyond the lack of incentive for and cooperation from LDCs, utilities or Toronto Hydro specifically, are implicated in a number of related system and technical barriers discussed below. One of the fundamental issues raised by a number of respondents, was the lack of knowledge and experience to properly manage DG projects from a technical perspective, so LDCs are learning as they are going. Toronto Hydro has one dedicated staff person to deal with DG projects – currently totaling 88 MW in the City, not very economical. More than one respondent felt that until there is a local industry and expertise to support DG development, every project will more or less be a "one-off."

The lack of incentive for LDC's was by far the focal point for respondents when it came to utility-related barriers. Utilities have an incentive to retain the load: DG development decreases the power purchased from the utility resulting in lost revenues. Even though DG projects can contribute to alleviating transmission constraint issues, utilities do not want to lose revenue. The Industry Task Force on Distributed Generation noted in 2005 that "continued difficulty in dealing with many LDCs," including excessive costs and time requirements, remained a pervasive barrier.[66]

66 Ontario Industry Task Force on Distributed Generation (2005), "Accessing the hidden value of distributed generation," response to the Government of Ontario's discussion paper on Electricity Transmission and

While not a DG project, Toronto Hydro's conservation and demand management projects have successfully reduced peak demand by many megawatts. This has had the effect of bringing down Toronto Hydro's revenues by as much as $ 10.4 million in 2007[67]. In response, Toronto Hydro sought a distribution rate increase[68]. IF DG projects present a potential for revenue loss, mechanisms need to be developed for grid operators to either recover costs in order to incentivize them to support and connect DG, according to some respondents, or to simply remove disincentives according to a few others. The Green Energy and Green Economy Act provides a framework to do this, pending the right modifications.

> *The utilities/LDCs are a roadbloack. If we had a chance to build another [facility], we would not touch Toronto. That would be my opinion: we would not touch Toronto. I mean, on the power side, they have just been absolutely brutal. There are other parts of the city that have been very good to deal with, but with this experience and the issues we have to go through and what makes sense, I would just say "Screw it." Not worth it: the lack of support, the lack of cooperation. And the lack of transparency. One is to say that the area is circuit limited or an area is circuit limited, that information should be disclosed so it allows us, then, to figure out where we can go, if we can go anywhere. Then, secondly, we need to know that that information is reliable, that it's not full of cushion.*
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> *But the biggest one relates to LDCs, the fact that they have little incentive for putting more DG on their grid, and the reason for that is the way the distribution code has been written. The distribution code specifically does not allow them to incentivize DG. They get nothing out of it if they do; in fact, quite the opposite.*
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> *There's lack of incentive for LDCs: Basically they're reducing their revenues, and although there are mechanisms for compensating them for that lost revenue, they are cumbersome. They have to make submissions to the Ontario Energy Board every time it happens. While there are some progressive CEOs at the distribution utility level, who see the future and kind of do what they can to enable DG, it's very spotty because, again, they don't have a financial incentive to do so.*

6.4.5 Regulatory Charges, Issues, Planning

- 48% of respondents identified regulatory issues, charges and planning as a key barrier preventing DG.

Respondents did not always elaborate in great detail on the specific regulatory issues they faced or saw in the system, but many did express frustration and dismay at the sheer volume of regulatory processes involved in developing a DG project. More than one respondent referred to the volume and complexity as "overwhelming." Many said these burdens were largely the same for a small DG project as for large central plants, which seemed unfair and another manifestation of the system bias.

Distribution in Ontario – a Look Ahead. http://www.mei.gov.on.ca/english/pdf/electricity/electricity_transmission_and_distribution_in_ontario.pdf

67 Sorensen, Chris. "Toronto Hydro seeks rate rise," Toronto Star, March 22, 2007. Accessed at **http://www.thestar.com/Business/article/194785**

68 Toronto Hydro Corporation. "Toronto Hydro-Electric System Files Application For Distribution Rates Increase," Press Release March 22, 2007. Accessed at **http://corporate.torontohydro.com/newsroom/files_application_for_distribution_rates_increase.html**

Regulatory hurdles cross jurisdictional boundaries, adding to frustrations and compounding the view that overall, there is a real lack of coordination across the system. Some respondents felt that these processes need to be streamlined as a matter of necessity, one respondent felt that we need to get as close to a one-stop DG regulatory window as possible.

Fees, application procedures, administrative and other requirements were also identified as impeding DG development. A number of respondents advocated a standardization of fees and charges associated with DG to bring clarity to the process and assist developers. A large portion of DG project proponents are not in the business of generation – their core business is something entirely unrelated, and they therefore do not have the internal expertise and resources to navigate these processes. Delays add to already additional costs, even before they get to the stage of implementation.

> *Regulatory uncertainty. For example, it now appears that Toronto Hydro is trying to retroactively apply standby charges to existing units that didn't anticipate that these were coming. So, have the ability of the utility, on the one hand, to say that they want to encourage distributed generation, but now, with people using distributed generation, applying some kind of arbitrary standby charge.*
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> *Municipal bylaws and zoning restrictions – now dealt with largely in Toronto – but these barriers are easier to overcome than provincial or utility barriers as the municipalities have the authority to change them, as demonstrated in Toronto. But they can be a big and time-consuming hurdle, and you often don't see them until you're well into things…*
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> *Interconnection, more broadly, is certainly an issue as well just with smaller households or small businesses trying to connect to the grid. It becomes burdensome. They have to get extra inspectors, there are extra fees, there is extra paperwork involved, so all of that—it's already a tough sell, in many cases, for distributed generation because it's expensive up front, but once you add all those other fees and things and delays, it can kind of turn people off. So that's certainly a problem.*

6.4.6 OPA Policies and Programs

- 29% of respondents felt that the OPA's policies and procedures were acting as barriers to DG.

Just under one-third of respondents identified the OPA's policies as a barrier to DG, for a number of reasons. The CESOP – a pending OPA policy – or lack of financial incentive was the top barrier cited by respondents (elaborated under financial barriers). The moratorium on the RESOP and associated backlogs have engendered a lot of uncertainty and missed opportunities. Two respondents talked about the lost opportunities for important DG installations in current large downtown condo and tower developments. The uncertainty has also had the effect of nixing financing in a number of cases, particularly as the credit crunch tightened – future revenue streams and payback periods could not be secured, and DG was foregone.

A number of respondents argued that the OPA was simply not facilitating DG in any meaningful way by, for example: 1) Limiting project size to over 10MW in the CHP 2 RFP precluded smaller cogeneration, particularly important in Downtown Toronto where there are limited

large-scale industrial CHP opportunities; and 2) RESOP caps and rates are insufficient to encourage significant DG development.

The RESOP and CESOP are discussed below in more detail under financial barriers, while Grid access, also related to OPA practices, is discussed further under Technical barriers. Beyond specific programs and practices, a number of respondents felt that the OPA perpetuated the system bias toward DG, in their pervasive reliance on and preference for large, centralized generation stations, and the predominance of the centralized model. Some of the quotes below express these views:

> *The OPA is the main barrier. The OPA is doing this because they have been forced to politically but there's a certain subculture, if you will, within the OPA that want to have nothing to do with DG. They just want to build 1,000-megawatt power plants or bigger and do what they've always done. They see it as complex and problematic and having to deal with a bunch of small assets when they'd much rather keep their lives simple and just deal with one big facility.*
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> *The OPA, itself, has its own problems in that it is dominated by supply side thinkers and all they want to do is sell power. The demand side management people are sort of the poor cousins and they're the ones who are trying to say, "Well, let's use this power wisely. Let's use this energy as and where we need it and not just because we have it."*
>
> *Now, the other issues that they have to contend with is the fact that they are Ontario Power Authority. They have a mandate to deal with electricity only. Energy is made up of two forms. When you get down to generation of electricity, you see electricity and its heat, and the heat is simply being ignored and the heat is a major component of the picture. As long as they continue to ignore that heat element and just focus on the electricity aspect, as far as I'm concerned, they're fighting an uphill battle.*
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> *The biggest barrier is the OPA. Years ago, they were given a directive from the Minister of Energy to pursue, to establish a standard offer for combined heat and power. They still haven't got it in place. That's the biggest barrier. We need to have the CESOP in place for price, for CHP, equivalent to the cost of the new nuclear generation and new transmission lines that will offset – if they pay that fair price – the avoided cost of new nuclear and the avoided cost of a new third line, then the market would deliver. The market would deliver huge, huge quantities that have combined heat and power. So that's the biggest obstacle, is the OPA. They've just got to put a price out, a fair standard offer price and then the market would solve this problem. That's the major problem. The OPA is the major barrier and they're just doing everything possible to hinder serious approach to energy efficiency and distributed generation.*

6.4.7 Lack of a Champion for DG, or Dedicated Office

- The lack of a dedicated champion for DG was cited by only 4 respondents (10% of those surveyed).

Though it was not a frequently cited barrier, the lack of a champion as a barrier warrants a brief elaboration. Those who did raise it, referred to the fact that the California Energy Commission had staff dedicated to promoting DG, getting out and explaining it to proponents and businesses. Having one or more persons dedicated to promoting awareness and understanding around DG benefits and opportunities, would raise awareness and increase accessibility and interest, particularly if this approach is married to a streamlined and more manageable process for these businesses.

Toronto Hydro currently has one full-time dedicated staff person to assist with DG installation customer service and issues – servicing approximately 88 MW. Though it is not economical for the Corporation, this should over time also increase Toronto Hydro's institutional knowledge and liaison with other agencies over DG, and individual projects will become easier to administer.

> *I think the biggest barrier in terms of implementation at the commercial level or maybe trying to sell DG to small and medium companies that could, in fact, have a business case for DG but aren't aware of it, and there's no present mechanism to make them aware of it. Short of knocking on every door and helping their CFO or their Operations Officer go through a business case, it just isn't happening, i.e., unless it pops up spontaneously in the mind of someone in that organization that this could be a business opportunity, it doesn't happen.*

6.5 Financial Barriers

Financial barriers to DG are significant. The final section of this Chapter relates respondents' views on the business case for DG, which most felt was largely non-existent. This has been identified as a barrier in most jurisdictions working to overcome the barriers to DG. The UK Government's Review of DG identified cost as the top barrier to DG in that country:

> *Firstly, the true cost of carbon is not yet fully incorporated in electricity prices and this disadvantages lower carbon technologies. Secondly, DG technologies tend to have higher capital costs. Finally, the rewards for exporting excess electricity produced by distributed generators were seen as small and difficult to access.*[69]

Addressing financial barriers will go a long way to level the playing field for DG and facilitate the shift to more decentralized energy.

6.5.1 Technology and fixed costs

Many DG technologies, particularly renewable energy sources are newer and, while becoming much more cost-effective, can still be very expensive without incentives and other measures in place. Also, because DG is not widespread in Ontario or Toronto, there is a dearth of expertise with it, and so every project "starts from the beginning again, like Groundhog Day," as one respondent put it.

Up-front costs for DG installation, operation and maintenance are presently quite high, acting as a disincentive to DG uptake, undermining the fragile business case. Viewed in conjunction with the failure at present to properly valuate and provide financial credit for system and other benefits resulting from DG projects, this is a stubborn barrier, but one that can be

69 UK DTI Ofgem Study on Decentralized Generation. 2007

improved through the right incentives and policies to level the playing field enough for DG to take off.

> *The fixed costs are high – you need operators, you need insurance, you need backup systems, you need space. If you do all of that for 9 MW or 10 MW, you could almost do not much more and put in 100 MW – the footprint of a 100MW unit is not different than a 9MW unit.*
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> *COST: Again, it all depends on the DG, but cost is still a barrier. Even though we have programs, a lot of this stuff is very marginal and the question then becomes: do you raise the cost? Then what's the impact on ratepayers if you do that? Or is there something else that's more effective to do rather than spend extra for DG? So cost always cuts through even though we've tried to set prices that we think can cause it to happen.*
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> *Although most of the DG technologies have a proven track record, the relative high capital cost and uncertain OM [operating and maintenance] costs has deterred private owners from participating.*
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> *A lot of the cleaner technologies are still prohibitively expensive – rooftop PV, micro turbines, fuel cells, small-scale CHP, etc - so you start to look at more feasible options, which have other issues. In the case of nuclear, the risks and costs and liabilities are not borne by small proponents or even municipal proponents as with DG, they're borne by the Province, the taxpayer.*

6.5.2 Financial/Lack of Robust Return/Payback periods

- 43% of respondents identified financing-related difficulties and issues as a main barrier to DG.

Close to half of respondents identified difficulty in securing financing as an important barrier to increasing DG. This, of course is closely linked to the availability of appropriate financial incentives, which would guarantee certain returns over time. A number of respondents explained that financing requirements for DG are more difficult than typical investments, requiring more risk and longer paybacks. In turn, credit and financing are more difficult to secure than for conventional energy projects.[70]

Considering the fact that many DG project developers are not in the business of generation, the added burden of making the case and securing financing for DG projects is compounded. Moreover, traditional corporate Net Present Value (NPV) calculations and policies and/or payback period considerations are not realistic for DG projects, which can take considerably longer than traditional capital expenditures for payback.

In short, financing in the current economic downturn and without any identifiable fixed returns, is extremely difficult. Section 6.8 below considers the participants' perceptions of the business case for DG – or perceived lack of – in more detail.

70 Toromont, The New District Energy: Building Blocks for Sustainable Community Development. Available at: http://www. Toromontenergy.com/UES_Handbook_Final_21_01_08.pdf

The following respondent quote captures the financing issues quite effectively:

> *Financing. It still comes down to: you have borrow the money to put the project in and in order to borrow the money, you have to have a rate of return that somebody's willing to invest in. So anything the OPA can do for incentives helps push that along. Also, if Ontario, in the struggling economy, wants to become a leader again at something, maybe district generation might be it. You'd have something. You could sell the technology all over the [world] and you would then spawn an industry and then say, "Okay, do you invest in that to make that happen?" That may be how you finance some of these projects to get some of these young companies started.*
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> *For example, we finally received payment for our photovoltaic system. We had signed the agreement a year ago but there was nothing at Toronto Hydro set up in place to actually execute it. There have been ongoing discussions on what CESOP means. Originally, when we put this in, there was a hope that we would get CESOP payment. At that time it was 11 cents a kilowatt regardless of when it was produced. Now it's 4¢, it's sometimes 9¢ and other times zero cents per kilowatt. We're just trying to get a lot of clarity because we need the clarity in order for other companies to then look and say, "How does this affect my payback?" Because until you know what all your revenue streams are, the finances are—there's not like a huge profit margin that you're going to make on these things. You look at it how do you put it in to be sustaining and yet be able to pay back the cost of the projects.*

6.5.3 Electricity Rates/Spark Spread

- 45% of respondents identified the spark spread and/or Ontario's capped electricity rates as a financial barrier to DG at present.

Electricity rates in Ontario are fixed or frozen, at least for the time being. This has two significant consequences for DG, both being effective barriers to DG.

The first consequence is the spark spread. The spark spread – the difference between the price of natural gas and the price of electricity – acts as a financial disincentive to DG in Ontario. The price of the output fuel of a gas-fired CHP facility for example, is artificially low and immobile, whereas the input fuel – natural gas – is deregulated and quite volatile. Firstly, this makes it very difficult to make these projects viable much less profitable; and secondly, it is extremely challenging to forecast costs and build a solid business case.

The second, more fundamental consequence, is the simple comparative cost of current electricity prices to DG costs. There is no comparison. As one DG project manager explained, their on-site facility loses money "out of the gate, every year," because it would be much cheaper to buy power from the grid than run their generator. This particular project was celebrated by all three levels of government at its launch, and hailed as precedent-setting.

So "cheap grid power," as many referred to it, is a real barrier from a financial perspective. It undermines the business case of DG projects. Increases in grid power prices have been hopeful but still not competitive enough and payback periods are too long to encourage more widespread pursuit of DG.

As a number of respondents noted, electricity prices do not reflect the full environmental and social costs of centralized power – particularly carbon costs – or the costs and benefits associated with DG. In that context, DG is not competitive. RESOP and CESOP were meant to compensate for the price differential, but as a number of respondents pointed out, they have not lived up to that goal as yet.

> *I've spent several years now working on this and the Province doesn't make it easy. Part of it is that when it comes to combined heat and power and co-generation, we have a really big challenge with the fact that you've got an input fuel that's deregulated and output fuel price or commodity price that is regulated, meaning that natural gas is all over the map in terms of pricing, and the price of electricity is very controlled. So if we want to get into modelling the economics and making a viable distributed generation plan work that includes natural gas, it's too complicated today without the province's participation and that's why we've been waiting to see how they're going to deal with that on the Clean Energy Standard Offer Program. So I guess if I had a policy opinion on it, it would have to be that there needs to be—that the province needs to come up with a very viable feed-in tariff or price support mechanism that essentially covers off the risk of the spark spread on those fuels.*
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> *The price of energy right now is the real barrier to DG. It should be higher, it should reflect externalities, it should be a real price of energy, and I think that should be equally true for DG and for centralized because then I think we would see 30% efficiency or 30% line losses, let's say, in the Niagara Falls, the Bruce or the Beck Power plant coming down here. How does that compare to DG?*
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> *In Ontario, the dominance of nuclear power, what that has done is essentially separated the price of electricity from its alternative. The alternative to the small generator is gas, natural gas. Now, if all our power was generated using natural gas, then if the price of natural gas goes up, then so does the price of electricity.*
>
> *It's what we call the "spark spread." It's the difference between the value of gas and the value of electricity. In Ontario, that linkage has been broken, and therefore, if the price of gas goes up, electricity doesn't necessarily change. In fact, it could come down. So you get a very unreliable spark spread. It's the spark spread that governs your economics of any small power generating system. Add to that additional costs, etc., in hooking into a grid or trying to get some sort an arrangement with the utility and the business case is quite weak if you take it under steady situations, quite weak.*

6.5.4 Lack of incentives/CESOP

- Lack of financial incentives and CESOP were the top barrier identified by respondents – with 60% citing it as a principal barrier to DG development.

The Clean Energy Standard Offer Program (CESOP) is program announced by the OPA (but not implemented) designed to encourage clean energy resources, such as recycled energy and CHP. The OPA backgrounder[71] on CESOP and the September 2008 "Updated Report on the Ontario Power Authority's Revisions to the Clean Energy Standard Offer Program" set out two primary restrictions[72] on DG. First, the projects must be less than 10MW and second that there will be limited capacity for the program in the transmission-constrained "Orange" and "Yellow" zones. (See section on Grid Access below).

The delays in the CESOP program have led to considerable uncertainty, missed opportunities for DG and CHP projects and mounting disaffection amongst stakeholders in the system. This has undermined the credibility of the program, before it has even been implemented; as mentioned, one respondent referred to it as "C-STOP," because it has in effect halted a number of prospective projects. Many went ahead with conventional facilities (see direct quotes from respondents in this section.) Ongoing delays in the CESOP's implementation was cited as a major barrier to DG, as the resulting uncertainty prohibited investment.

One manager of an existing DG installation explained that the facility, even though it is losing money due to the spark spread and its continued operation is in question, will not be eligible for CESOP because it predates the program's launch. This ensures that many prospective projects will not go forward until there is a viable CESOP. DG and CHP pioneers should be able to partake in CESOP even retroactively; to ensure their ongoing viability.

The Renewable Energy Standard Offer Program was not identified specifically by any respondents as a barrier, though a number made reference to it in their interviews. Accordingly, RESOP is not explored in much depth here. As far as financial incentives go, the RESOP was intended as an incentive to provide small generators of renewable power a standardized pricing structure for the electricity they produce. There were a number of limitations, including caps on capacity (maximum of 10MW), inadequate rates and the program's suspension, which has left a backlog of projects and uncertainty around their future. Generally speaking, the low rates under RESOP were thought to be debilitating, though some argue that the program was too successful, and the high response was unanticipated and somewhat overwhelming, leading to the suspension.

> *We just closed down a 1.4-megawatt DG plant that we were going to be building in Scarborough, because they just never formally announced the program. Their delay is foreclosing lots of options right now. We've got those two 40-story towers that were going to be using a micro plant. We're now just going to go back to business as usual. That's now a foreclosed option. The province is not willing to start even on a pilot basis. They're waiting to get everything completely figured out, which they're not going to be able to do, and then they're going to announce a program which is going to have unintended consequences because they didn't do pilots.*

71 Ontario Power Authority, CESOP Backgrounder. Accessed at http://www.powerauthority.on.ca/Page.asp?PageID=122&ContentID=6553&SiteNodeID=312

72 Casten, Thomas R. (2008) The Role of Recycled Energy and Combined Heat and Power (CHP) in Ontario's Electricity Future. Prepared for the Green Energy Coalition for Submission to the Ontario Energy Board IPSP Review. EB-2007-0707, Exhibit L, Tab 8, Schedule L.

In the current context, which is a hybrid market, the investment is attracted by the availability of suitable contracts. Of course, for urban investment of distribution-connected generation, there is supposed to be a Clean Energy Standard Offer Program which would attract that investment. That hasn't launched yet. I think that's an obvious one why [DG] hasn't taken off.

6.5.5 No credit to generator for upstream /system savings

- 10% of respondents identified the failure to credit generators for the upstream savings created by DG projects as a barrier or disincentive.

These respondents explained that credit for upstream savings should recognize the positive grid impacts of DG in terms of grid access and avoided system upgrade and refurbishment costs. For example, credit is not currently allocated for improved regional system reliability, local voltage support, reduced transmission losses (with greater penetrations of DG) and other system benefits outlined in Chapter 5. Financial recognition of these benefits, beginning with adequate measurement of the benefits already manifest, would help to alleviate the revenue concerns outlined above, and bolster the business case for DG projects.

The benefits to the distribution and transmission system that DG provides often go unaccounted for when setting rates. This is primarily because these benefits can lead to savings that are passed off to users in other ways, such as reduced transmission costs.[73] Ontario's Industry Task Force on Distributed Generation saw greater uptake of DG across the province as hindered by this "failure to recognize all the system benefits and savings of DG" and "inability to redistribute upstream savings to the owner of the DG project."[74]

It should be noted that the Ontario Energy Board is currently reviewing the rates and connection of DG. This review should yield some changes in the rate treatment of DG projects and hopefully will bring some clarity to bear on the issue of connection costs. In February 20009, The OEB announced new rules came into effect in Ontario which are expected to expedite the connection of small electricity generation facilities, such as solar, biomass/biofuel or fuel cell, to Ontario's distribution system[75].

From a policy perspective, a procurement program needs to be established and run in such a way that it brings substantial amounts of capacity onto the grid and by that, the obvious example is the CESOP program. That's just the elephant in the room. One of the policy questions that is unresolved is how distributed generation is treated by comparison to demand-side management (inaudible) eligible for the same kinds of regulatory treatment that demand response or demand reduction when it's located behind the customer's meter. That's a large unresolved policy question. The fundamental policy question is the return of upstream savings to the distributor customer who caused the upstream savings.

73 Association of Power Producers of Ontario (2007). APPRO Submission to the OEB Consultation on Distributed Generation: Rates and Connection. Accessed at http://www.appro.org/docs/APPrO_submission_to_the_OEB_consultation_on_DG_(EB-2007-0630)_August_24_2007.pdf.

74 Ontario Industry Task Force on Distributed Generation (2005), "Accessing the hidden value of distributed generation," response to the Government of Ontario's discussion paper on Electricity Transmission and Distribution in Ontario – a Look Ahead. http://www.mei.gov.on.ca/english/pdf/electricity/electricity_transmission_and_distribution_in_ontario.pdf

75 http://www.oeb.gov.on.ca/OEB/Industry+Relations/OEB+Key+Initiatives/Distribution+System+Code+Proposed+Amendment.

6.6 Technical Barriers

> *The biggest one is that we don't have the grid capacity to absorb the distributed generation. I guess what the OPA term as the Orange Zone. So we can be encouraging, and we're in this very difficult situation of encouraging people to think about distributed generation with the uncertainty that if they were to proceed with it, that they would get permission to actually tie into the grid and to be entirely self-contained seems unrealistic. So there's always going to be that grid connection to make it financially feasible through standard offer contracts [like] CESOP if that ever comes out.*

6.6.1 Short Circuit Capacity/Grid Access

- 52% of respondents identified capacity constraints and grid access as a major barrier to DG implementation in Toronto.

Coming back to the underlying issue of system bias, access to the energy system is generally designed for large, centralized generation units connecting at transmission voltages. Adding more complexity by including several DG units may increase the costs of system operation and maintenance. Access can be further hindered by technical requirements if DG must meet the same standards as large centralized units.

Many respondents talked about the transmission capacity issues and constraints in Downtown Toronto. These are explained in more depth in section 6.3 above and in Chapter 3. There are some immediate problems in Downtown Toronto, and they are compounded by related access and technical issues such as connecting to the Hydro One Transmission grid in particular, developing projects in the Orange/Yellow Zones defined by the OPA, and the need to reserve grid expansion for supply mix targets established for large centralized generation as opposed to small DG projects. An acceleration of small DG projects could conceivably cut into the supply share reserved for other energy sources with much longer lead-times and capital planning requirements.

The OPA identifies certain areas in the province as transmission-constrained, referred to as "Orange Zones" where there is insufficient transmission capacity and "Yellow Zones" where there are transmission constraints. DG projects may not proceed in orange zones, whereas in yellow zones some DG may proceed under circumstances.[76]

> *In a number of situations, a stronger grid will actually help facilitate greater distributed generation – in situations where the grid is weak or there is insufficient capacity and that limits the amount of small scale generation that can be connected in some of these areas. Not necessarily the case that DG will obviate the need for grid enhancements.*

> *The technical barrier is going to be tougher, and that's simply the fact that the grid was never configured for feeding power bi-directionally. It can be done up to a certain point, but our infrastructure was never designed for it, and so there is going to be major capital investment, particularly in those areas where there was already congestion like the City of Toronto. So dealing with the wires, just the wire's capacity, distribution transformer capacity, feeding power bi-directionally*

76 Standard Offer Program Development Archive, Phase 3: Final Rules & Draft Contract transmission Constraints.

is going to be an issue. It's an additional capital cost. Who's going to bear it? Will it be the distribution rate payers? Will it be the commodity charge? Will it be none of the above? That's a tough question.

Well, in the downtown area we have a real constraint issue just simply because of space on the larger transformer system, the transmission system, which obviously connects to the distribution system. The Leaside transformer station at Laird and Millwood is pretty much at capacity, so any lines that connect there is very challenging. We have very limited space.

6.6.2 Complexity of Contracts and Agreements

- 33% of respondents identified the complexity of agreements and contracts as a hurdle to implementing DG projects.

As has been elaborated in relation to other barriers, the complexity of arrangements, approvals and contracts for DG projects can be overwhelming, according to respondents, particularly when your core business is not power generation. A few respondents with direct experience with the recent CHP2 RFP were particularly critical of the 160-page RFP document, and the onerous time and money necessary simply to submit a bid. These can range from $200,000 to well over $1 million to develop, depending on the scale of the project.

Perhaps more complex and confounding for DG project developers, is the interconnection agreements with LDCs and other legal agreements. This lack of uniformity or standardization in interconnection and other kinds of agreements creates a lot of uncertainty for proponents. If they cannot see their way clear to the successful implementation of the project, their incentive diminishes accordingly. These uncertainties are like rocks beneath the weeds beneath the water that projects must navigate without knowing the outcome and end costs. This, of course, makes securing investment and financing very difficult.

In the case of the CHP2 RFP, proponents must bear all the financial risk, which again constrains their options in the dispatch of their core business. Again, this displays the system bias against DG; a number of respondents raised the issue of the favourable subsidies to nuclear power, and the fact that nuclear developers bear none of the financial risk and liability.

Financing per the [CHP2] contract is too complex, banks still want the company to back the deal, which limits the company's liquidity and other business goals – you have to ask, is it worth it?

The complexities arise from the multiple parties that need to come together to implement an opportunity like that. You need steam, gas, electricity host requirements. A deal is complicated when there are three parties, and many more times if there are four parties. So the number of parties, and the number of issues involved, when they increase, makes complexity of the deal quite high.

Then there's the actual connection agreements with Toronto Hydro in particular and the—I know a number of people have had difficulty through RESOP and solar PV. It's just not easy to get the actual connection agreement sorted out, and that's very discouraging because, again, that's at the end of the process. People have put in an investment, and then they find out, they need this or that...

Then the lawyers start attacking them and it's like a short feeding frenzy with the lawyers, and that's a lot of costs that people just don't build into this, and a great unknown. So, again, you get hesitant in encouraging it, especially with smaller projects, like an apartment complex or something like that, where you know that it would really be very detrimental if they made a big investment and then it didn't work out.

I know some of the big developers, but still, their margins weren't so great on projects. It would leave a very bad taste in their mouth to get all the way along in the project and find out they couldn't connect, either because there wasn't capacity or that Toronto Hydro said, "You know, you have to connect to a transformer," and the transformer is six miles away or something like that, and "you'll have to pay for that." Those issues are not well understood or developed at the beginning, so you can't really tell people the full picture at the beginning.

6.6.3 Ontario Energy Board (OEB)/Queueing

- 7% of respondents cited the Ontario Energy Board and /or its queuing rules for grid connection.

A limited number of respondents cited the OEB's regulatory processes and procedures as a cumbersome hurdle to DG; all of these respondents (3) cited the queuing rules for grid connection. Prior to November 2006, Hydro One had developed its own queuing rules for dealing with the hundreds of interconnection-related applications they were receiving. The OEB released rules that differed substantially form the Hydro One queue rules. Hundreds of applicants faced a change to the OEB's new queue rules as of November 2006, different to those under which they had applied. Respondents said that this resulted in considerable delays and uncertainty, not to mention confusion, and the stalling of many projects. Moreover, the queue guarantees an order of connection, so when projects waver or stall for reasons unrelated to the queuing rules – financing issues, unforeseen regulatory hurdles, or grid access issues, for example – then the projects behind it in the queue also become stalled, as one respondent explained.

6.7 Social Barriers

Despite the resounding support for green energy solutions, as compared with traditional and polluting energy forms like coal and nuclear, there are still a number of social attitudes and behaviours which act to impede the smooth implementation of more DG, along with energy efficiency and conservation.

6.7.1 Lack of public understanding/awareness, NIMBYism

- 45% if respondents cited lack of public acceptance for certain types of DG technology, or of very local installations as a barrier.

This is a significant number of people directly involved with DG who see public acceptance as an issue. It speaks to the lack of understanding of what green energy is and what it looks like in the community. This stands in stark contrast to the vast majority of citizens who state

a strong preference for green energy in opinion polls. In a September 2008 poll, 80 % of Ontarians were of the opinion that increasing green, renewable energy sources such as wind and solar was "very important" for Ontario.

Public acceptance issues range from visual impact from wind turbines or CHP, increased local pollution and noise concerns. They speak to the broader issues of a dearth of education about energy choices, particularly about the forms that renewable and local power can take. Public acceptance is also closely linked to permitting and approvals, as approvals processes require public consultation and input, and can become bogged down by this very step where opposition is strong. Present community opposition to the proposed Scarborough Bluffs Offshore Wind Farm, with community groups like Save the Blufffs (**http://www.savethebluffs.ca/**) springing up.

Ironically, DG can help in the education and awareness around energy types and consumption, as a number of respondents noted (see Chapter 5 on Benefits, sn. 5.5.1).

> *NIMBYism issue where people might think that if you get distributed generation they'll have noise and pollution, etc. I think that's maybe the biggest one in terms of awareness and perceptions of communities about distributed generation.*
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> *At a broad public level, there is a real lack of knowledge and understanding, not just of the system, but of what clean energy looks like at a community level, much less what distributed generation looks like. There's a real need for public education about the what a more diverse and more decentralized energy system looks like, and the change that's needed. And the fact there will be generation in neighbourhoods…*
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> *At the end of the day, there has to be public acceptance for these projects, and in a lot of cases, we're seeing that the public acceptance is not there. Even for the renewable projects, you're going to face a lot of resistance.*

6.7.2 No value for environmental benefits, priorities

- 36% of respondents felt that the failure to factor the environmental benefits and necessity for DG into the cost assessment was a barrier to projects coming forward.

Currently, environmental benefits are not factored into the costs of DG or into rates. This is another manner in which the system discriminates against DG. DG, in generating power where the thermal loads are, results in significant reduction in overall fuel consumption (greater than 25%[77]) versus the separate production of heat and power. Other environmental benefits accrue from greater efficiencies and reduced line losses.

This also comes back to the need for an overarching mandate and strong targets for DG – if green energy is a social and environmental and even an economic priority, then there needs to be direction, a strategy, and a means to factor the benefits into rates and costs.

77 Ontario Industry Task Force on Distributed Generation (2005), "Accessing the hidden value of distributed generation," response to the Government of Ontario's discussion paper on Electricity Transmission and Distribution in Ontario – a Look Ahead. Page 3. http://www.mei.gov.on.ca/english/pdf/electricity/electricity_transmission_and_distribution_in_ontario.pdf

We need systematic mechanisms for recognizing the environmental benefits from DG projects.

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If these are social goals, environmental goals, then that has to be factored into the value and return of the project, factored into the incentive that we devise.

6.7.3 Lack of strong conservation culture and social incentives/norms

- 14% of respondents identified our lack of a strong conservation culture as a barrier to DG.

Our reliance on cheap, centralized power has resulted in enormous over-consumption and the failure to foster a conservation culture, based on education, awareness and efficiency. DG engenders efficiency and promotes greater awareness of consumption and energy needs. Our deep-rooted reliance on abundant and relatively cheap grid power makes the change to more efficient energy behaviours less attractive.

We need to change the way we think about energy supplies and start building, sourcing, using and paying for our heat and power using principles of conservation and fuel efficiency.

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We need to address and dramatically reduce consumption or we will be bound to centralized generation; and the OPA is controlling the big conservation programs. GEA?

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We need a paradigm shift in the way we think about and consume energy. It's a very big change.

6.8 The Business Case

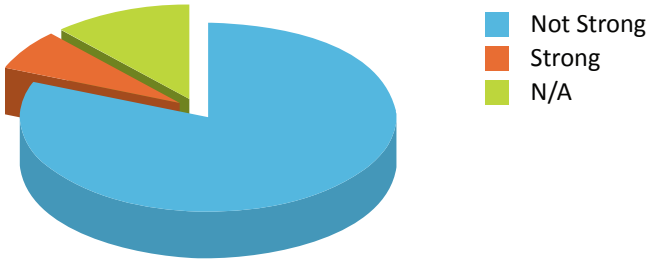
The business case is not good. We're not seeing much. We're seeing very little small CHP and that's obviously because it's not economically attractive to them. The reason it's not attractive is because we very substantially subsidize the price of grid-supplied electricity and that undercuts the market for distributed generation. As long as the Government of Ontario is going to continue to subsidize grid-supplied electricity, if it wants to get supply at the actual true lowest cost, it's got to establish a CESOP for the distributed generation to pay the full cost of developing this option.

The lack of a compelling business case is a huge barrier to the uptake of DG in Ontario and Toronto. Particularly when one of the system benefits is seen to be shifting the risks and costs to the private sector and away from the taxpayer (as cited by one respondent), the returns simply are not there on a wide enough scale to provide any kind of catalyst to project development.

Respondents were asked specifically how strong they felt the business case is for DG. Overwhelmingly, they felt that the business case for proponents to pursue DG projects is weak to non-existent in the current climate. Most frequently, respondents cited the spark spread or the cheap price of grid electricity vs. the volatile and high price of natural gas, as

being the principal barrier. As one respondent concluded, "You have to be doing it for other than financial reasons."

Perceived Business Case for DG in Ontario



- 81% of respondents (34 in total) expressed the view that the business case for DG in Toronto is not strong;
- Only 7% (3) expressed the view that there was a strong or feasible business case for DG under resent circumstances;
- 12% (5) did not offer a view either way.

A significant number also cited CESOP and the CHP II RFP as barriers. In the case of CESOP, most references to it were to criticize the fact that it has been so long delayed that projects have been bunked. See section 6 above on CESOP.

Even in liberalized energy markets, such as in Europe, the business case is constantly characterized as lacking. Even in those open markets, DG investments are seen to be at a disadvantage. And yet, the potential benefits – particularly in terms of meeting climate goals – have been so compelling that measures have been taken to level the playing, at least in an initial phase, as outlined above in Chapter 1 in the case of the Denmark, the Netherlands, the UK and a few US jurisdictions.

In Ontario the assessment is more dire. With a capped electricity rate – or "cheap grid power" – and a cruel spark spread, there is very little incentive to pursue DG. Additionally, the returns are low, the payback periods are far beyond normal business criteria, most residences and businesses are not in the generation business, and the complexities, and time and money required just to examine the feasibility and deal with utilities and regulators make it outright prohibitive. Nothwithstanding plans at the City level in Toronto, for retrofitting City buildings and the Tower Renewal Project and Toronto Community Housing's DG installations, we are not even seeing DG in any great number of public government buildings, particularly the Provincial level.

Respondent Perceptions and Quotes

> *It's CESOP. The biggest, biggest thing is CESOP. A lot of projects—we thought we knew what CESOP would look like, so a lot of people started planning and it was announced about a year and half ago that—it was announced that there'd be an announcement —so people have had a while to really think about this and a couple of projects have gone into the their planning stage and are faltering because CESOP is not being announced. They really don't know what the revenue stream can be, and it just doesn't work otherwise. You know, it requires that revenue stream for the electricity to make it work at this point. So that's the very biggest thing on the business case, is that it doesn't work without a subsidy or at least—I don't even like calling it a subsidy. The OPA is paying for it because,*

it's not out of the goodness of their hearts, it's because they need the electricity. When you compare it to nuclear, it's still cheaper.

I think there's an excellent business case for the system in Ontario, the electricity system, but as you get down into the specifics, case by case, it's not that easy to show what the business case for an individual investor is.

Spark spread: In Ontario currently there is no case. There is zero case. There's no program. You put in a generator today, all you've got is the Ontario wholesale price of power which everyone recognizes doesn't reflect the true cost of power and has been jockeyed around by the politicians over the years. So you can't finance a project based on just the HOEP price. So getting back to the answer, there is no program, there are no economics in Ontario right now.

CESOP: If and when the OPA re-releases or finally releases the CESOP and RESOP again, then we may see some economics. The CESOP economics, the rates that the OPA have floated are, in our opinion, insufficient to attract much investment. They're just a little too low, they're probably 20% too low from where they need to be to really get successful projects. I think there will some projects that come to the table based on CESOP, some kind of niche ones, but there won't be a lot if they use the numbers that they've floated whenever it was, two months ago now.

It's not there yet. We are one of those investors and we've looked at two projects recently and said, "No, we're not going to go there." There's a couple of different factors right now. The credit crunch is killing it from the standpoint of having available funds. The economics aren't there. The economics would have been there, like I say, the feeling on the distillery district. Those two towers that are going in there, the new ones, by Context, those two towers were supposed to have a cogeneration unit in them but they've opted not to go that way now because they couldn't make the economics work.

7. Overview of Stakeholder Views on Addressing Barriers to DG & Most Immediate Opportunities

Key Findings

The top six measures identified by respondents as necessary for advancing DG in Toronto were as follows:

- Having a clear plan for DG in Toronto and Ontario, with a strong vision and mandate and including specific targets, was the most often identified measure, with 69% percent saying this was vital to overcome the lack of leadership and ensure successful integration of more widespread DG;
- Upgrading of the short circuit capacity in Toronto and improving grid access more generally for DG as the second most cited measure, with 62% of respondents identifying this as critical.;
- Financial incentives, such as a viable CESOP, were cited by 60% of respondents as a critical measure for increasing DG in Toronto;
- Creating incentives for LDCs was seen by 55% of respondents as a vital measure to facilitate DG;
- Resolving and standardizing interconnection issues and agreements was cited by 48% of respondents as necessary to encourage greater uptake of DG; and,
- The same number of respondents – 48% - identified greater public education and acceptance as vital to the popularization of green energy and increasing understanding of local community energy.

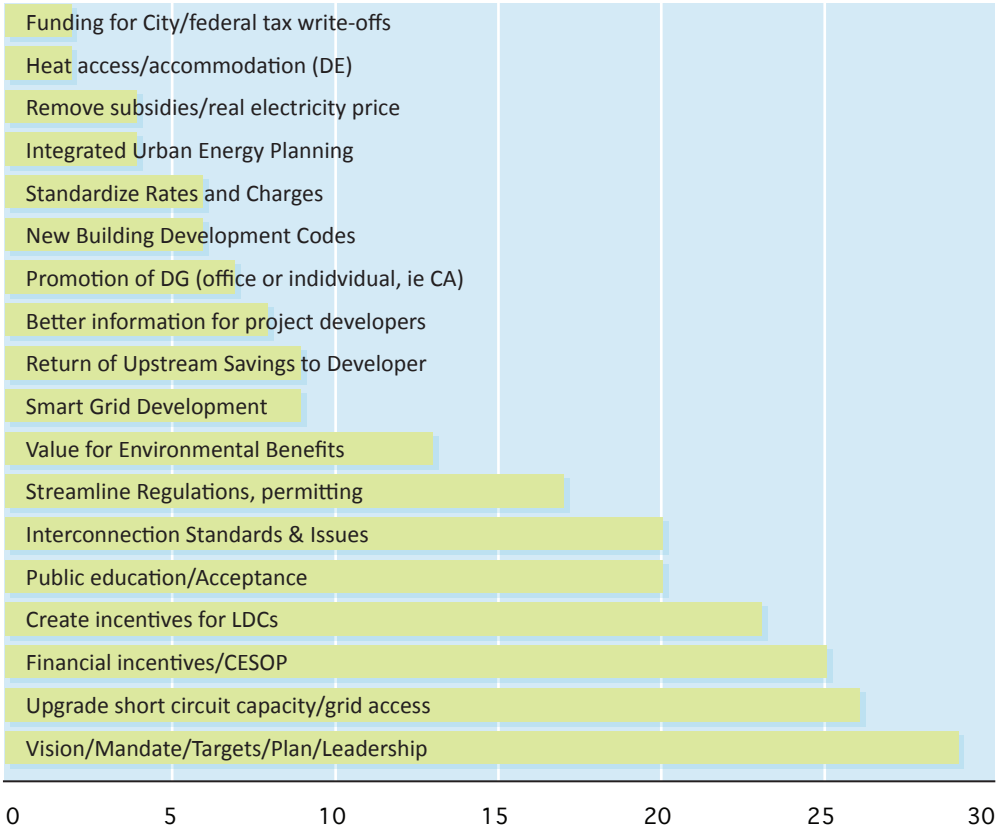
Not all respondents talked about immediate opportunities. Consequently, these were not quantified. The most frequently identified opportunities were:

- **Pilot projects in Toronto:** Use the limited MW space available from now until the uprating work is done (between 70 and 90 MW per the OPA) to initiate pilot projects, which will help to sort out and begin addressing some of the other barriers identified above through practical experience.
- **CHP or cogeneration projects:** Specific targets need to be established for CHP in Toronto and Ontario more broadly, in order to harness and re-use waste heat and gases. CHP is ideal for a number of facilities, including industrial/manufacturing sites, hospitals, municipal buildings, schools, etc. and will be critical to "greening the grid" in Ontario.
- **Provincial buildings/Building Code:** The Province must demonstrate leadership, and could, like Exhibition Place, use its own facilities and buildings to demonstrate the variety and potential of DG to become much more efficient and/or "grid-neutral." There is enormous potential in Toronto, with Queen's Park, and across the Province to convert these facilities as a priority. Over time, new private buildings could be addressed through the building code.
- **Hospitals:** A few respondents identified the potential for CHP facilities within hospitals. One respondent identified Sunnybrook as an ideal location. Other respondents felt the sector – and the broader MASH sector – were prime sites, particularly for new-build and newer communities, and this opportunity should be reflected in regional and community planning.
- **District energy planning:** Community district energy systems offer a great opportunity for increasing DG and clean energy in Toronto and Ontario more broadly, and should be integrated in local and provincial planning and associated policy development.

- **Loading preference:** Not cited by respondents, but identified in the literature as a successful measure in California, where new load priority is given to conservation and renewables.
- **Comprehensive rule to standardize and streamline interconnection criteria:** Based on California's Rule 21 (Appendix E).

This study is a survey of stakeholder views on the barriers, benefits and issues related to DG in Toronto and Ontario by extension. It does not purport to make detailed policy prescriptions for DG implementation in Toronto and Ontario. Rather, it documents and assesses the policy and technical measures respondents identified as being the most important to catalyze DG implementation.

Views on Most Important Measures to Address DG



Respondents were asked which policy and technical measures they felt were the most important in order to advance DG in Toronto and Ontario more broadly (see Appendix C, questions 6 & 7). They were not presented with a list, but asked to identify measures unprompted and were free to list as many measures as came to mind. Responses cover a broad range of issues and they have not been categorized.

> *There should be essentially an allocation on a megawatt basis by technology. In other words, each technology would be capped and an incentive put in place that is relatively encouraging because we don't have enough to guarantee to champion, that's building operators, to say that going this way would be a financially rewarding experience. So currently we're lacking enough in-depth experience with what works and what doesn't work, and we need to get that before we talk about any grandiose plans to deploy thousands of megawatts.*

Specific Measures to Advance DG as Cited by Respondents		
MEASURES TO ADVANCE DG	NO. RESPONDENTS IDENTIFYING	PERCENTAGE OF RESPONDENTS
Vision/Mandate/Targets/Plan/Leadership	29	69%
Upgrade short circuit capacity/grid access	26	62%
Financial incentives/CESOP	25	60%
Create incentives for LDCs	23	55%
Interconnection Standards & Issues	20	48%
Public education/Acceptance	20	48%
Streamline Regulations, permitting	17	40%
Value for Environmental Benefits	13	31%
Return of Upstream Savings to Developer	9	21%
Smart Grid Development	9	21%
Better information for project developers	8	19%
Promotion of DG (office or indidvidual, ie CA)	7	17%
Standardize Rates and Charges	6	14%
New Building Development Codes	6	14%
Remove subsidies/real electricity price	4	10%
Integrated Urban Energy Planning	4	10%
Funding for City/federal tax write-offs	2	5%
Heat access/accommodation (DE)	2	5%

A wide array of measures – policy, regulatory, market – have been undertaken in various jurisdictions in order to strengthen the viability of DG, and increase its implementation. Measures may differ depending on the type of electricity market, but the bucket of measures is largely similar. The OEB is in the process of examining rate-related policy issues, and a number of other studies make more detailed policy prescriptions for Ontario.

> *My feeling is that on the policy side, I mean, we all know the connection, the whole issue of connection is an issue, but that's more of a technical barrier. I think empowering LDCs to put more distributed generation into their mix, either behind the customer's meter or in front of the meter, whatever, giving them some mechanism to reward them for doing that would be the biggest incentive of all to enabling DG. So that's the policy barrier.*

Most immediate opportunities for DG in Toronto – Excerpts from Responses and Recommendations

> *I'm kind of showing my bias when I say commercial because although, you know, the whole issue of residential DG is often politically attractive, to be honest, it's not going to matter that much. What's really going to matter is when the commercial facilities, that are, in fact, the big users, address their own use with demand response or with local DG, and that's going to make the difference in the near term.*

Most immediate opportunities after modified back-up generators are rooftops and solar PV – ie Exhibition Place, big box stores

Opportunites: we do have industries that operate within the city's borders and perhaps there's an opportunity for them to have a cogen facility on their own.

Biggest opportunities are in the MASH sector. I was reading somewhere where a school could be the generator for a whole residential area. There's huge potential for that and so I think that when we're looking in the City of Toronto, I think a lot of it's taking advantage of dense, populated areas that already exist. However, when you look at development over the next 20 years in the Golden Horseshoe and were thinking about the types of development into our green fields and sprawl, I think if we have very clear district energy policies tied to urban planning, it could help facilitate, not only sustainable energy, but sustainable urban planning. If it means that we build our communities around district energy systems, then we're going to have a lot more dense, intensified smart energy planning as well as smart growth. So I think there's a huge opportunity rather than extending transmission lines from centralized grids. Start designing communities around district energy systems.

Distributed renewable resources on rooftops are the best opportunity, and they are going to be lower footprint if we can target areas that need investments, you can afford to pay more for distributed generation. We need investments in growing urban centres. Downtown Toronto core is one.

Combined heat and power plants, install them in manufacturing plants, make them more energy efficient, make them more competitive, reduce their cost. Yeah, it's the obvious thing to do. It's one of the best ways to help our manufacturing sector.

Things like solar could really help everywhere because it's generating during the peak periods and most of it is being consumed within the buildings where they are. That's good too. I think that should be of interest. Solar would be most immediate opportunity.

You've got the whole issue of solar roof panels, for example, which is really distributed. I think the issue with those is typically the price per kilowatt hour compared to what it would cost to get stuff off the system right now. It's quite different. I don't know, people have different views of where that price is going, but for the moment it's pretty expensive. You've got, obviously, combined heat and power opportunities in many places. You typically don't have land for things like wind farms

For the district generation, you don't have the economies of scale of a large power plant, but then you don't have the huge capital outlay costs of it either. As a project gets approved, or as a building gets approved you could say, "Okay, we'll give you certain incentives. You're putting in a lot of the infrastructure anyway, so therefore we'll give you whatever percentage extra in incentives so that you

can get a reasonable rate of return for putting the investment in and generate, locally, your energy."

Now, I've really been confined to talking about office buildings, where I'm thinking of peak shaving, but there is a case to be made for all these new condominiums where, if they sized it to approximately one third, one half the electrical load, they could use all of the waste heat for the domestic hot water which is an ongoing load in a multi-res building. It's not really evident in an office building where you don't have much, apart from handwashing in washrooms, you know, there's really no hot water load during the year. There's a hot water load during the heating season. Making use of the thermal energy in buildings, especially like multi-residential condominiums is a very pragmatic use. So that's another big opportunity, I feel.

I guess the biggest opportunity is in new construction, and I can tell you, we're involved with some of the big, new buildings going on downtown. We even had one developer say—what I can tell you is going up is just huge, huge diesel generators in these new bank towers going up downtown and new condos, and everything else, and they're going to be what I call "idle iron." They're just going to put diesel generators on transfer switches. I said, "What if there was a program to say, 'Hey, we'll pay the difference to make it a gas generator with a smart transfer switch.'" And the guys are all open to it, the developers, that is, because they see that as well.

Best opportunities: Sunnybrook. Co-generation in hospitals—because they're going to be there for 60 years, 70 years. They're an enormously important institution and they have good thermal needs. They're pretty steady as they go. They're a perfect candidate for co-gen, but the other flipside that I'm adding to this is that they have a need, they have a recognized need that they have to shore up this on site generation capacity beyond what they have to have from a code perspective, in other words, what they have now, and what they have to have in order to have business as usual, business continuity.

Biggest opportunity: CHP and advanced waste heat capture. Heating and cooling through recycling. The way I see it is, basically, as soon as we start mapping where's the heat and where do we need it, or where's the cold and where do we need it, and how do we take advantage of these opportunities, that's a heat pump answer. But that's my first one that I see much more so than any of the other options just because everything else is kind of variable and less costs effective.

I think it's the district energy that we can find in those large redevelopments. It's to do the district energy for the redevelopments, but then we also want to look at the opportunities to bring it out into the surrounding area. Like at Lawrence Heights, you've got major land, things like Yorkdale Mall, Baycrest Hospital, five schools and then you've just got the neighbourhood. So it's pretty daunting, financially, to put district energy into the residential neighbourhood. That's probably not going to work out financially. But when we look at being able to maybe bring Yorkdale in and Baycrest in, those are just examples of what we can possibly do

and that's being able to integrate it into the community. Then who knows where we go from there.

Downsview is just on the north side of 401 there, so then you start to connect these things together and they're just large—and the industrial area up on Chestwood, off Dufferin, that whole strip up that way. It starts to leap frog. So if we can get these new core developments on track with distributed generation, then who knows what the opportunities are going to be that we can look at, and I think that's how we, on a large scale, will get into the city.

The Mayor's Tower Renewal. So that's about 1,000 apartment buildings that were built between 1960 and 1980 in Toronto. They're all about 40 or 50 years old so they're really in need of some significant replacement. There's an opportunity there to go in and totally retrofit these buildings. Put new skins on, recladding. They don't have any insulation. They're basically just concrete and brick. There's no insulation. So put insulation on, reclad the outsides and take the opportunity to redo the whole HVAC systems. Most of them don't have air conditioning, but maybe put air conditioning in if it was done efficiently. But because they tend to be along main streets and that sort of thing, sort of one right after another...

You can picture going along on a street like Bathurst and Finch, you know, there's one right after another, and they're owned by different people, but many of them are owned by probably five or six major companies, and then some are individually owned. So can you put a co-gen plant in one that would of a sufficient size to service its neighbours, you get maybe a cluster of seven. That's what's coming next. Once we make these buildings super energy efficient, how can we look at doing a co-gen system for a group of them, cluster of them? It's a long term plan, but in our initial look at it, it makes sense.

8. Conclusion: DG and Cogeneration Roadmap for Toronto

DG and cogeneration are seen by many working in Ontario's energy sector as attractive energy resource solutions for Toronto, in the near and particularly the medium and long-term when critical supply and capacity issues must be addressed. They can provide added capacity to meet peak demand, provide additional energy supply, and reduce congestion. Stakeholders identify the top benefits of DG and cogeneration as: increased efficiency and reduced line losses; reduced greenhouse gas emissions; reduced transmission and distribution infrastructure spending (about 30% of the total cost of delivered electricity); enhanced stability and security; and greater modularity and flexibility. Additionally, greater distribution of energy resources will help to catalyze greater integration of green energy, as envisioned in the Province's *Green Energy and Green Economy Act*.

Defining DG and Cogeneration

DG and cogeneration represent a paradigm shift in the way we procure, generate and deliver energy in Ontario, away from the centralized model the Province was built on. DG is defined here as electricity production that is on-site or close to a load center, either interconnected to the utility distribution system or stand-alone. These generators can range from a few kWs to approximately 20MW. This definition includes such technologies as photovoltaics; small wind; small biomass; small combined small cogeneration (or combined heat and power, known as CHP); small combined cooling, heat and power (CCHP); small non-CHP systems; and gas fired CHeP systems.

Cogeneration is defined as electricity and heat production that is on-site or close to the load center that could be interconnected at distribution, sub-transmission, or transmission system voltages, combining heat and power and recycling heat and gases. These systems can range from several kWs to hundreds of MWs in size. Systems over 20MW in size are defined as large cogeneration projects.

A Roadmap

This DG and Cogeneration Roadmap proposes a long-term blueprint for advancing DG and cogeneration in Toronto. This is a critical first step, given the numerous barriers DG and cogeneration face, and the lack of overall leadership in catalyzing any meaningful uptake of DG in Toronto or Ontario to date. The Roadmap is modeled on the *Distributed Generation and Cogeneration Policy Roadmap for California*. It includes a 2020 DG and Cogeneration Vision and a Pathway outlining general milestones for addressing barriers and implementing measures and policies to advance DG in Toronto.

The 2020 DG and Cogeneration Vision will require some new policy initiatives. The seeds of some of these measures are contained in the present version of Ontario's *Green Energy and Green Economy Act* (April 2009), but will require amendment and elaboration in regulations to be effective. The Roadmap policy proposals are general, based on input from stakeholders, and by no means exhaustive or detailed – that will require a second phase of detailed mapping, hopefully by a group of stakeholders. The Roadmap also proposes general timelines, or phases, for achieving the Vision, and an overarching strategy. Other, non-policy measures are also included in the Roadmap, stemming from the recommendations of stakeholders.

Where we are: Status of DG and Cogeneration in Toronto

Currently, there are approximately 88 MW of installed DG capacity spread out over 77 projects in Toronto. Much of this embedded generation is used for purely back up purposes and is not used for grid generation purposes. Of the 88 MW, only roughly 0.1 MW or 100 kW is contracted through RESOP. Currently, the RESOP program has 6.7 MW in-service through 50 existing contracts in the Toronto Zone (which represents roughly the GTA). Of that 6.7MW, there is a single contract for 5.6 MW.

Across Ontario, total pre-filed generation of existing generators less than 20 MW amounts to 541 MW, according to the IPSP filing. A further breakdown shows that 52 MWs come from early RESOP contracts and the remaining 489 MW from non-RESOP generators.

The current regulatory framework and rate structure in Ontario discriminate against DG and cogeneration. There are limited subsidies, incentives and recognition of DG and cogeneration in procurement and planning processes. Rates are currently established through the lens of ratepayer protection; though an important principle, other principles and values must be brought to bear in pricing, and in planning. “Lack of a price signal that will change customer behaviour undervalues the environmental, temporal and locational aspects of many resources, including DG and cogeneration.”[78] Steps need to be taken in the short and medium-term to level the playing term for long-term growth in DG and cogeneration.

The DG and cogeneration industries are still nascent in Ontario, and they will need support in the short-term to build the presence, expertise and employment necessary to deliver longer-term goals.

Guiding Principles for the Development of DG and Cogeneration

Measures to assist the development of DG and cogeneration should:

- Be a clear target and objective in the Integrated Power Supply Plan and process, with clear leadership assigned within the system for delivery of increased DG and cogeneration;
- Catalyze low-CO2, low-waste and efficient forms of DG and cogeneration;
- Provide a means of enabling DG projects to realize a reasonable rate of return;
- Reduce the complexity involved in setting up DG and cogeneration projects; and,
- Ensure requirements on these smaller generators are proportionate to their size and the use they make of the wider public network.

78 California Energy Commission (2007). Distributed Generation and Cogeneration Policy Roadmap for California. Page 2.

A Vision for DG and Cogeneration

Toronto 2020 DG and Cogeneration Vision Statement

DG and cogeneration are significant components of Toronto's electricity system, meeting over 30% of the total peak demand

- DG and cogeneration are integral to procurement, transmission and distribution planning and operations, and to IPSP planning and targets.
- After conservation, renewable DG is a designated preferred option for new load generation in Toronto.
- Successful and widespread DG and cogeneration projects have resulted in a robust local industry fulfilling consumer and utility needs for clean affordable DG, and Toronto is seen as a leading jurisdiction in the development and implementation of DG technologies.
- Customers have multiple options, including DG and cogeneration, to consider as part of their energy sourcing strategy.
- Large cogeneration has increased its position as an important resource to Toronto and the GTA.
- Transparent, dynamic rates and market structures are in place that account for environmental attributes and incorporate locational and temporal power system needs.
- The Feed-in Tariffs, CHP procurements and other financial incentives (CESOP) have fulfilled their mandates.
- All other barriers to DG have been removed and all DG permitting is efficient and environmentally responsible, and meets the social and environmental priorities of the City and the Province.

Most Important Measures to Catalyze DG and Cogeneration Development

Stakeholders view the following as the most important measures (policy and non-policy) to facilitate and encourage DG and Cogeneration in Toronto:

- Establish a clear Vision for DG and Cogeneration, including a mandate, a strategy or plan and clear targets;
- Address and resolve the capacity issues in Toronto and broader grid access issues in Toronto and Ontario as a priority;
- Financial incentives including the Feed-in Tariffs, procurement and incentives for Cogeneration and other incentives (CESOP);
- Incentivize LDCs to pursue and implement DG and cogeneration (utility-owned as now envisioned in the Green Energy Act, and customer-owned) and develop LDC expertise and service for DG;
- Resolve and standardize interconnection issues, as in California's Rule 21 (see Appendix F);
- Streamline (other, non-interconnection related) municipal and provincial regulations to facilitate and encourage DG and Cogeneration; and
- Build public education, awareness and acceptance of DG and cogeneration as Green Energy, and important sources of local community power and pollution abatement.

A Strategy to Achieve the 2020 Vision

To achieve the vision, the Roadmap contains a five-part strategy:

1. *Develop and support adequate incentives and Rate Mechanisms for DG and Cogeneration* – Over the next 10 years, Ontario must provide incentives for DG and cogeneration.
2. *Break out and identify specific overall and regional DG targets in the IPSP* – The Province and the OPA must target DG and cogeneration, and establish a clear mandate within the system for achieving the targets, in order to overcome existing inertia.
3. *Reduce Remaining Institutional Barriers* – Ontario and Toronto need to make the elimination of the most pervasive barriers to DG a priority. In the case of barriers to DG in Toronto, this work can be undertaken immediately, while necessary development and uprating work is being undertaken. This will allow rapid deployment of DG in Toronto starting in 2011.
4. *Total of 70 MWs in Pilot projects in Toronto 2009-2011* – While development and uprating work is taking place, pilot projects could be deployed up to 70 MW in Downtown and Central Toronto, incorporating a variety of technologies and locations. This would help to work out and reduce barriers through practical experience. These projects should receive special one-time supports, as priority pilots.
5. *Particular strategy for Cogeneration* – Cogeneration is vital to the greening of the grid, and special attention must be paid to developing a strategy and clear, aggressive targets for cogeneration in Toronto.

Most Immediate Opportunities

- **CHP or cogeneration projects:** Specific targets need to be established for cogeneration, in order to harness and re-use waste heat and gases. CHP is ideal for a number of facilities, including industrial/manufacturing sites, hospitals, municipal buildings, schools, etc. and will be critical to "greening the grid" in Ontario.
- **Provincial buildings/Building Code:** The Province must demonstrate leadership, and could, like Exhibition Place, use its own facilities and buildings to demonstrate the variety and potential of DG to become much more efficient and/or "grid-neutral." There is enormous potential in Toronto. Also the Province should address DG and cogeneration in new buildings through amendments to the building code.
- **Hospitals:** Hospitals offer great potential in Toronto for cogeneration. Sunnybrook as an ideal first location. The broader MASH sector also offers great potential, particularly for new-build and newer communities.
- **District energy planning:** Community district energy systems offer a great opportunity for increasing DG and clean energy in Toronto, and should be integrated in local and provincial planning.
- **Loading preference:** This has been successful in California, where new load priority is given to conservation first and renewables second. DG and cogeneration could be specified in a Toronto-specific loading order.
- *(See Appendix E for immediate amendments to the Bill 150, the Green Energy and Green Economy Act.)*

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Appendix B: List of Respondents

RESPONDENT	ORGANIZATION
Adam White	AMPCO – Association of Major Power Consumers of Ontario
Jake Brooks	APPrO – Association of Power Producers of Ontario
Paul Doyle	Atlantic Packaging
Joe Vaccaro	BILD - Toronto GTA Building Industry and Land Development Association
Louis Marmen	CGA – Canadian Gas Association
Ted Kantrowitz	Canadian Geothermal Exchange
Brent Gilmour	Canadian Urban Institute
Robert Stasko	Centre of Excellence for Energy – Ontario OCE
Eleanor McAteer	City of Toronto, Energy Efficiency Office
Gord Perks	City of Toronto, Councilor and Board Member, Toronto Hydro
Richard Morris	City of Toronto, Better Business Partnerships
Tim Short	Enbridge
Mike McGee	Energy Profiles
Kevin Loughborough	Enwave
Mark Goss	Exhibition Place
Shawn-Patrick Stensil	Greenpeace Canada
Mark Graham	HydroOne
Ken Kozlik	IESO – Independent Electricity System Operator
Peter Ronson	Markham District Energy Inc.
Barry Beale	Ministry of Energy and Infrastructure (Ontario)
Allan Jenkins	Ministry of Energy and Infrastructure (Ontario)
Cisca McInnis	Ministry of Energy and Infrastructure (Ontario)
Ken Church	NRCan – Natural Resources Canada
Rob Brandon	NRCan – Natural Resources Canada
Jack Gibbons	Ontario Clean Air Alliance
Peter Fraser	OEB – Ontario Energy Board
Amir Shalaby	OPA – Ontario Power Authority
Bing Young	OPA – Ontario Power Authority
D. Brian Hay	OPA – Ontario Power Authority
Emay Cowx	OPA – Ontario Power Authority
Cherise Burda	The Pembina Institute
Jeff Bell	The Pembina Institute
Larry Brydon	Reliance Home Comfort
Ian Hamilton	Ryerson University
Phillip Jeung	TCHC – Toronto Community Housing Corporation
Joyce MacLean	Toronto Hydro Corporation
Vito Casola	Toronto Hydro Energy Services Ltd.
Bruce Dodds	University of Toronto
Beth Savan	University of Toronto
Anouk Kendall	WADE Canada
Mark Tinkler	Independent Energy Consultant
Jamie James	Windmill Development

Appendix C: Interview Questionnaire

WWF Distributed Generation Toronto Project

Stakeholder Survey Questionnaire:

1. Does your organization have a direct role in decisions regarding DG in Toronto/Ontario?
2. Does your organization have a policy position regarding decentralized generation in Toronto and the GTA/or Ontario more broadly? If so, what is it?
3. Do you have any personal insights or views regarding DG implementation in Toronto?
4. The OPA has identified distributed generation as an option for dealing with capacity infrastructure issues in Toronto. What do you see as the principal barriers and obstacles to moving forward with distributed generation and its ultimate implementation? (Technical, political, other)
5. What do you see as the benefits of the Distributed Generation option relative to other options? What do you see as the immediate opportunities, if any?
6. What are the most important policy measures that could be taken in your view to implement distributed generation in Toronto?
7. What are the critical technical/physical measures that need to be taken in order to implement distributed generation in Toronto? (or engineering/technical obstacles to implementation)
8. For potential hosts, proponents, developers, how strong is the business case? (probe re ROI, economics, policy environment and supports)
9. In your view, what have been the attributes of successful DG implementation/transition in other jurisdictions, ie California, Germany?
10. Do you foresee any problems with DG that would need to be addressed?

Any final insights you would like to add?

Appendix D: Timelines

- September 2008: Keith Stewart attends Conference on Distributed Generation, announces WWF research on DG in Toronto and Stakeholder survey.
- September 2008: Manifesto and Joslyn Higginson are commissioned to conduct the stakeholder survey and write the report in a first phase of work.
- September – October 2008: WWF and Manifesto develop Objectives, Methodology, List of Stakeholders/Interviewees and Questionnaire.
- October 2008 – January 2009: Interviews are conducted, preliminary survey results are compiled, Literature Review completed and follow-up questions to key respondents – particularly Bing Young at the Ontario Power Authority (OPA) – are posed and reviewed.
- January – February 2009: Final compilation of survey results; review of first draft of Bill 150, the *Green Energy and Green Economy Act* for DG and cogeneration implications.
- February 28, 2009 – Ontario Power Authority holds Stakeholder Conference on DG in Toronto, attended by Joslyn Higginson of Manifesto.
- March 2009 – Revisions and amendments to report based on OPA Stakeholder Conference information, and analysis of the Green Energy Act/Bill 150.
- February – March 2009: Preliminary development planning for phase 2 and Report release.
- April 2009 – Release of report and submission to the Government Standing Committee Reviewing Bill 150.

Appendix E: Proposed Amendments to Bill 150, the Green Energy and Green Economy Act (as at April 2009)

From, and with permission of, the Green Energy Act Alliance[79]. For more detailed proposals, see www.greenenergyact.ca.

1. Ensure ongoing priority for conservation and renewables in planning, regulation, procurement and operation.

While the preamble of Schedule A (the Green Energy Act) recites the government's commitment to promoting and expanding conservation and renewables, it falls short of ensuring that government agencies including the OPA, IESO and OEB will give these options the priority intended. There is considerable inertia that must be overcome.

Of particular concern is the failure of the Bill to ensure the pursuit of all cost-effective conservation in the various fuel sectors. In the case of electricity, most conservation costs less than 3 cents/kWh whereas new supply exceeds 10 cents. Conservation is the first choice for bill reduction, economic stimulation, environmental sustainability and energy security. It is vital that the regulatory and planning entities receive the clearest direction on this point. Renewable generation must then be the first priority after conservation.

A more explicit statement of, and requirement to reinforce, the government's priorities for planning, development and operation of the energy infrastructure of Ontario would assist in this regard.

2. Require feed-in Tariffs (FITs) as the *primary* procurement mechanism for renewables and refine the characteristics of FITs and Directives in that regard.

The Bill as drafted enables but does not require a feed-in tariff approach for the procurement of renewables. Well-designed FITs have been found to be the most efficient and cost-effective method to procure renewable energy.

The design of FITs is a complex matter best left in large part to regulation and directive mechanisms, but the choice to favour FITs should be entrenched in legislation to ensure its long-term availability.

Regard to resource intensity should be a necessary aspect of FIT development to ensure that FITs are cost effective and applicable to a broad range of communities.

3. Facilitate the development and enable the procurement of Combined Heat and Power (CHP) generation.

Apart from enabling investment in CHP by LDCs, the Bill is silent on this matter. CHP, if defined to include only highly efficient generation, offers the potential for vastly more efficient use of the gas resource, for dispersed development that will require less transmission and the potential to support greater penetration of intermittent renewables.

To accomplish this we recommend that the various sections enabling feed-in tariffs, the obligation to connect and streamlined approvals be expanded to include CHP.

One manner in which this could be accomplished is illustrated above where we suggest that FITs be utilized for "green energies" which should be defined to include high efficiency CHP. Alternatively, the various sections could be repeated and altered to address high efficiency CHP.

79 Accessed at http://www.greenenergyact.ca/Page.asp?PageID=122&ContentID=1180.

High Efficiency Combined Heat and Power should be added to the definition section in the GEA (section 1(1)). It should adopt the language in Schedule D. section 11 and in addition require that the facility achieve a minimum average efficiency of 6000 Btu/kWh (the federally mandated level for class 43.1 capital cost allowance).

4. Ensure that connection charges shall be shallow, and that deep connection and enabler line costs are spread to all customers.

The costs of connecting renewable energy generation to the grid (apart from the "shallow" connection costs that are in the control of and should be borne by the project developer) are being incurred to benefit society as a whole.

Accordingly, it is not appropriate to visit these costs on the particular generator or a particular distributor's customers.

5. Facilitate Community-based development.

The Minister's power to direct the architecture of FITs in Schedule B, section 7, which adds 25.35 (2) Subparagraphs (a) and (b) referring to aboriginal and local community development and establishment of renewables, should also refer to "ownership" and therefore read:

"in the development, *ownership* and establishment..."

This will ensure the Minister has the authority to direct the OPA to encourage community investment.

In Schedule C, section 6 (1), where the objectives of the Ministry are set out, item (h)(vii) should be amended to read: "to support planning *by government and communities* for growth and building strong communities in Ontario" to recognize the dual level of planning that needs to be supported.

The list of objectives should be expanded to explicitly include:

"*(viii) to support community-owned renewable energy and conservation projects*."

The regulation-making authority should specify that regulations may designate an officer, committee or agency as responsible for determining which projects qualify as 'community-owned renewable and conservation projects'. Selection of the appropriate authority and guidelines for the determination should be developed through a consultation process with organizations that represent the sector.

In several places the Bill empowers local communities, municipalities and distribution utilities to develop projects. These sections should be clarified to extend to First Nations. Specifically, Schedule B, section 5 creating subsection (4.5) should specify that it applies to facilities or systems both on and off of lawfully designated reserve and unceded reserve lands. Section 13 providing a definition for "municipal electric utility" should be extended to include First Nations utilities. Similarly, "municipal services corporation" defined in Schedule B, section 15(3) should include a First Nation Corporation incorporated under the laws of Ontario or Canada.

7. Ensure that all electricity costs are captured in the Time of Use pricing system.

The existing legislative regime does not ensure that the increasing portion of electricity-related payments that are related to the global adjustment are subject to time-of-use pricing.

Relevant sections of the Electricity Act and the Ontario Energy Board Act should be amended to ensure that the OEB will and the government may, via regulation, require such a payment structure.

8. Support the expanded role of the environmental commissioner.

Schedule D section 6 adds section 26 (2) which defines "special purposes" for which the OEB shall assess costs to be included in rates.

A new section 26.2(2)7. should be added as follows:

"*To fund the activities of the Environmental Commissioners Office under section 58 (1) 2 of Environmental Bill Of Rights, 1993, as amended.*" This will cause these costs to appear in rates rather than taxes and will help ensure that the Commissioner has the resources required to do a thorough job.

9. Amend the Condominium Act and the legislative mandate of municipalities to facilitate investment in conservation and renewables.

Toronto Atmospheric Fund and the City of Toronto are investigating the possibility of creating a mechanism to enable condominium developers and condominium corporations to invest in renewable power facilities and to enable innovative approaches to municipal financing and cost recovery for conservation investments made by property owners. We support these objectives and would support changes to the GEA to facilitate such a proposal.

Required Green Energy Regulations, Directives and Programs

As noted above the Bill has the potential to revolutionize energy policy, planning and development in Ontario *but will only do so if accompanied by regulations and directions that fulfill the Bill's promise*. We note the following goals that must be addressed by regulations and directions:

1. Tariff Program – Necessary elements to be established in regulation:

- Tariffs must be simple, comprehensible, and transparent,
- Provide sufficient price per kilowatt-hour to drive development and manufacturing,
- Provide contract length sufficient to reward investment,
- Be differentiated by technology, size, and resource intensity,
- No cap on project size and overall FIT program. Successful programs have either no cap on the program size (Germany), or the cap is so high (France and Spain) that there is no fear of reaching the cap in the early years of the program.

2. Right to Connect Details Established in Regulation

- Regulation developed detailing limits to the right to connect (economic test, cost sharing, cost recovery) must incorporate a shallow connection policy and ensure that community-based projects have equitable access to the grid.
- In situations where where the right to connect is constrained for a prolonged period while a distribution system is undergoing upgrades, the connection priority for renewable projects that is provided in Schedule B, section 10 should be further prioritized to municipal, distribution utility, First Nations and other community-based projects.
- Provide simplified interconnection.

3. Approvals and Permitting of Green Energy Projects Established in Regulation

New regulation is required to establish an updated Class EA for renewable energy projects as well as establish a "best practice" set of standards for set-backs, avoidance of key environmental features, etc. GEAA expects that to adequately promote renewable energy, Ontario

must embrace world-class standards for protecting communities. These standards, to be made under the regulation-making authority set out in the proposed Act should include:

- Stricter prohibitions on the siting of facilities that impact the environment. This should include so-called "no go" zones (e.g. preventing projects in Important Bird Areas and Provincially Significant Wetlands (PSW's) or habitats of endangered species);
- Renewable energy projects should not be located within sensitive receptor areas near residential dwellings or sensitive institutional or commercial land use;
- The Bill allows for applications to the Director for renewable energy approvals and for principled appeals of projects that may cause serious harm to health or the environment. To ensure that participatory rights of neighbouring members of the public are protected enhanced Notice and Comment provisions should be included.

4. Community Power Financing and Capacity Building

Fund one or more entities to offer loans, capacity building and community support – The province should establish a comprehensive financing program and fund one or more entities to accelerate the development of eligible projects and the resultant benefits to Ontarians regardless of financial market conditions.

The following functions are necessary to ensure the community power sector is successful in Ontario.

- Soft Loans and Grants - Community Power Projects require early stage funding to cover the soft cost of project development work:
  - Pre-feasibility: Grants
  - Capacity Building: Grants
  - Feasibility: Loan
  - Project Development: Loan
- Capitalization Loans - eligible Community Power Projects require simplified access to low-cost debt that enables them to retain control and ownership of projects.
- Capacity Building - The Community Power Sector requires resources to build the financial, technical, social, legal, and organizational templates and practices associated with the facilitation and development of locally-owned community-based renewable energy and conservation projects. There are several organizations (the Ontario Sustainable Energy Association, Green Communities Canada, the First Nations Energy Alliance, the Toronto Renewable Energy Co-operative/Our Power, Farmers for Economic Opportunity, Agri-Energy Producers of Ontario, the Ontario Federation of Agriculture, the Ontario Co-operative Association etc.), that have developed resources and expertise in this regard who need to be sufficiently resourced to vastly expand their efforts.

5. Renewable Energy Caps and Targets

IPSP revisions must leave a window open for the continued growth and expansion of renewable energy and conservation. GEAA calls for 10,000 MW of new installed renewable energy by 2015, over and above 2003 levels 25,000 MW of new installed renewable energy by 2025, over and above 2003 levels.