APPENDIX D

District Energy Report

DISTRICT ENERGY
PRE-FEASIBILITY ASSESSMENT

Prepared by:
FVB ENERGY INC.
Suite 200, 3901 Highway # 7
Vaughan, Ontario
L4L 8L5
Phone; (905) 265-9777

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1 EXECUTIVE SUMMARY

District Energy could be an effective way to integrate sustainability into the development of neighbourhoods planned for Central Pickering. It would integrate with renewable energy systems and allow the construction of lower cost, higher quality and more energy efficient buildings.

Several factors are currently in alignment making the present an opportune time for the City to move forward on this initiative, including:

1. Electricity procurement programs recently issued by the Ontario Power Authority encourage distributed generation, which can be a favourable source of heat for new district energy systems
2. Neighbourhood Plans must soon be developed for Central Pickering
3. District Energy decisions are best taken prior to new developments been approved

It would be reasonable to assess the feasibility of starting separate district energy systems in particular neighbourhoods. The best approach would be to include district energy feasibility studies as part of the Neighbourhood Plans.

Based on this high-level pre-feasibility assessment, district energy may be competitive and bring benefits to the City in some of the planned neighbourhoods; for example, those identified in the Central Pickering Development Plan as #'s 11, 9 and 4 are identified in this report as being especially favourable for district energy (See Map of Neighbourhoods, Appendix 1.)

The recommended target market would be apartments, commercial and community buildings and stacked townhouses in the neighbourhoods. It is not recommended that a great deal of effort be expended in trying to develop district energy in the employment lands, because this quality of service and long-term contracts typically do not suit industrial customers.

Realization of the potential for district energy in Central Pickering will require the City to take a proactive role. Therefore, prior to the Neighbourhood Plans, basic general information, plans and policies need to be developed in order to give the City a suitable framework for the development of district energy. These include:

- understanding the potential benefits to the City of Pickering
- selecting potential energy sources
- developing a preliminary business plan
- understanding the nature of Thermal Energy Service Agreements
- assembling an information package for developers
- having an overview understanding of thermal energy metering and billing
- applications for funding

The district energy framework should be prepared as an integral component of an overall energy management plan for the City.

Suggested Draft Terms of Reference for a RFP to select a suitable Consultant to assist the City in developing the above framework is attached as Appendix 4 to this report.

2 BACKGROUND

2.1 Introduction

This report is an adjunct to the City of Pickering Sustainable Neighbourhood Plan by Dillon Consulting Limited. It presents a high-level assessment of the prospects for district energy (DE) in Central Pickering and suggests an approach and terms of reference for more detailed evaluation.

2.2 Expected Development of Central Pickering

Central Pickering lies north of the current built-up area and south of Highway 7. Plans have been made for significant urban development with a high level of sustainability.

The Central Pickering Development Plan (CPDP)[1] calls for fifteen new residential neighbourhoods in a green-field area spanning approximately 6 km east-west and 4.4 km north-south. The planned neighbourhoods are separated by areas designated as Natural Heritage Systems that all appear to have watercourses running through them and must be kept largely in their natural state[2].

The new neighbourhoods are expected to be built over the next ten years, probably starting with mostly single homes (including detached, semi-detached and townhouses), later adding apartments, stacked townhouses, community and commercial/industrial buildings and eventually reaching an aggregate population of 70,000. The exact timing and rate of development in any particular neighbourhood cannot be precisely predicted at this time, but individual Neighbourhood Plans must be prepared and will form the basis for amendments to the Pickering Official Plan. The amendment must be adopted by the City of Pickering and conform to the Durham Regional Official Plan and the CPDP. Further, the Neighbourhood Plans must be approved prior to or concurrent with other development approvals.

This overall development scenario strongly suggests a DE vision not of a single large system serving all of Central Pickering, but rather comprised of multiple systems sized and timed to serve developments when they occur within particular neighbourhoods. These small DE systems (DES) would not likely serve single homes, but rather the larger buildings, i.e. most ideally apartments[3], community, commercial and industrial buildings, with stacked townhouses as a further possibility.

2.3 Benefits of District Energy

Over the last 50 years, DE has significantly reduced consumption of fossil fuel in many countries around the world. This has been accomplished by connecting buildings to a variety of alternative energy sources, including Combined Heat and Power (CHP – also known as cogeneration) and renewable energy. In contrast, the business-as-usual approach locks-in long-term dependence on fossil fuel and electricity.

Eliminating the cost of in-building heating and cooling equipment helps developers make buildings greener with a lower construction cost than green buildings without DE.

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[1] May 2006, Ontario Ministry of Municipal Affairs and Housing (MAH)

[2] CPDP page 91

[3] The word apartment will be used herein to also denote apartment-style condominiums

DE delivers quality and higher standards. It is more reliable than in-building or in-suite mechanical systems and quieter, safer and more durable. Service calls are less frequent. Buildings are free from explosive or combustible fuels, refrigerants and water treatment chemicals. No gas pipes are needed. Electrical service may be downsized. There is more useful and congenial space both in-doors and on roof-decks or patios with no exhaust stacks, cooling towers, a/c units or make-up air heaters.

2.4 The Opportunity

A possible opportunity for DE in Central Pickering has been recognized because:

1. Central Pickering will be all green-field development: the net capital cost of DE is lower for new development as a result of avoided cost for furnaces and boilers in each building.
2. DE is expected to become more generally accepted in the GTA over the next few years, due to developments such as:
    a. Continued expansion of district heating and cooling in downtown Toronto by Enwave, including their signature Deep Lake Water Cooling project.
    b. Markham District Energy (MDE) has been in-service since December 1st, 2000 and is expanding rapidly with the goal of eventually serving 100% of Markham Centre.
    c. CHP projects based on DE were recently awarded contracts under a RFP from the Ontario Power Authority (OPA) and are expected to commence service within the next few years.
    d. The Regent Park redevelopment will use DE: – the Phase 1 DE system is currently at the 90% design stage. The Regent Park DE system will expand along with the redevelopment for the next 10-15 years.
    e. The Toronto Waterfront Revitalization Corporation (TWRC) has committed to install DE in the West Don Lands and East Bayfront precincts with a planned development schedule essentially concurrent with Regent Park. All of these new DE systems are expected to employ CHP and/or renewable energy sources when they have developed sufficient heat load.
    f. The Renewable Energy Standard Offer Program (RESOP) for distributed generation has been issued by the OPA and a CESOP (for Clean Energy) has been promised for early 2007. The CESOP will cover small gas-fired CHP. These SOP's provide price certainty, which is expected to encourage distributed generation projects that could serve as potential heat sources for DE.
3. The target population of 70,000 and associated community, commercial and industrial development (35,000 jobs) will have a significant demand for energy – to put it in perspective, this population will be more than Markham Centre, Regent Park, West Don Lands and East Bayfront combined. (But these developments will have higher density and more favourable ratio of larger buildings to single homes, and the crucial difference this makes for DE is explained in this report).

4. The Neighbourhood Plans could be effective instruments for considering and, if desired, mandating DE on a specific neighbourhood-by-neighbourhood basis[4].

Establishment of DE will take proactivity on the part of the City and this report provides some guidance based on FVB's experience of having been involved in the feasibility studies, design and construction of 85% of the DES built in North America over the last two decades. FVB has conducted many DE feasibility studies and has been a respondent to several RFP's for DE engineering and related services.

3 DISTRICT ENERGY POTENTIAL IN CENTRAL PICKERING

This is a high-level assessment based on FVB's experience and some preliminary calculations from data provided by City Planning & Development. It focuses on:

1. Density
2. Size of Buildings
3. Distinctions between District Heating and District Cooling
4. Proponency and Risk
5. Potential Heat Sources

3.1 Density

Although the plan aims for sufficient density to support transit, the target densities are generally lower than those found in precincts in the GTA where DE has recently being shown to be feasible, i.e. Markham Centre, Regent Park, West Don Lands and East Bayfront. The exceptions are in High Density Areas where the upper end of the expected range approximately equals Markham Centre. The density planned for Central Pickering is compared to other areas in Table 1.

Table 1 Relative density, expressed in residential units per net hectare

	Units/Net Hectare	Data Source
Central Pickering		
Local Nodes	40-80	(1)
Community Nodes	80-140	(1)
Mixed Corridors	40-140	(1)
Low Density Areas	25-40	(1)
Medium Density Areas	40-80	(1)
High Density Areas	140-250	(1)
Markham Centre	250	(2)
Regent Park	380	(3)
West Don Lands	470	(4)
East Bayfront	300	(5)

Sources of data for Table 1:

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[4] The Neighbourhood Plans should cover not just DE, but the whole energy supply plan for a neighbourhood including input from the electricity and gas distributors. Specifically, they should consider impacts on the power transmission grid. This may point to the desirability of distributed generation.

(1) Central Pickering Development Plan, pages 70-71
(2) Downtown Markham Precinct Plan, April 2002, The Remington Group, pages A2 and D2
(3) Regent Park Revitalization Study, Dec 2002, The Regent Park Collaborative Team, pages 3 and 93.
(4) West Don Lands Precinct Plan, May 2005, TWRC, page 36 and www.towaterfront.ca – Current Projects – West Don Lands.
(5) www.towaterfront.ca – Current Projects – East Bayfront

Notes:
(1) Net Hectares excludes roads, parks, non-developable land, schools and similar public lands.
(2) Source (1) provided data for Units/Net Hectare directly. The others were calculated based on the reported Net Hectares divided by the planned number of residential units, as tabulated below.

Table 2 Planned densities in precincts with District Energy in operation, design or committed

	Net Hectares	Units	Units/Net Hectare
Markham Centre	13.5	3,444	250
Regent Park	13.4	5,115	380
West Don Lands	12.27	5,800	470
East Bayfront	21.1	6,300	300

By itself, the above density comparison is not prima facie evidence that it would be unreasonable to attempt to develop DE in any form in Central Pickering; it only shows that planned density is generally not as high as those precincts in the GTA where DE has so far been shown to be feasible. It highlights the probability that DE may develop in Central Pickering in a different way to those more dense precincts, e.g. it may not serve 100% of the buildings, it may not involve so much district cooling and it may not be in the form of a single, large system.

The variation in density between different parts of Central Pickering suggests that while DE may be reasonable in some particulars areas of Central Pickering it may not be for the whole. It follows that several smaller DES is a more reasonable vision than one large system encompassing all neighbourhoods.

Before describing this possibility further, the other key issues will be explained.

3.2 Size of Buildings

The size of buildings is more significant than the overall density. This is because DE is a “cost of service” utility, where the revenue from each customer should pay for not only the variable cost of energy, but also amortize the connection cost.

The connection cost per unit of energy delivered is very high for single homes. In order to appreciate the relative economics of this, FVB estimates the incremental connection cost of a typical townhouse for heating only, including the total cost of branch-lines and Energy Transfer Station (ETS) with fan-coil unit and controls, including construction, engineering, sales tax and 10% contingency, to be, conservatively, in the order of $19,500 (perhaps a little lower). The avoided cost of a furnace installation, using similar estimation methods, is in the order of $6,200 (perhaps a little higher), so the incremental investment is in the order of $13,300 (perhaps a little lower).

Comparing this investment against the possible savings in annual energy and maintenance costs for a single unit of in the order of $600 per year, it can be seen that even with some reduction in the actual incremental investment, it still just won’t pay. The economics of semi-detached and detached and would be similar.

But a multi-unit residential building would have much more favourable economics. Whereas the annual energy and, to an extent, the maintenance cost savings would be almost a linear extrapolation from the single unit case, the connection costs are nowhere near linear. For example, FVB's estimated cost of branch-lines and ETS for a typical 50 unit apartment is conservatively in the order of $85,000 (gross, i.e. before netting out avoided capital cost).

Strathcona County Community Energy System is an example that illustrates this point. It is a district heating only system currently under construction near Edmonton, serving a site with a density of approximately 100 residential units per gross hectare, estimated to be approximately 140 units per net hectare. The overall density to be served is similar to a good part of Central Pickering, but the customers are all either larger community buildings or apartments averaging 4 storeys, to a maximum of 6 storeys (see Site Plan, Appendix 2).

Stacked townhouses are an interesting case that deserves further study. The author of this report lives in one that is organized as a condominium. In this case, there is no immediately obvious reason why a single block connection and ETS could not be built in and treated as a common element with any sub-metering to individual units being of an inexpensive flow metering type. Hence, the economics could approach that of a block of apartments with a similar number of units. The DES would have one customer, which would be the condominium corporation, whose property managers would look after sub-metering and billing (just as they may be doing for electricity).

The issue is worth exploring further for Central Pickering because adding stacked townhouses to the apartments would double the potential residential market, according to MAH projections[5].

FVB knows of a few existing district heating systems that serve detached single residences but they usually represent a small portion of the load and are probably being subsidized by the rest. The exceptions are in the special circumstance of isolated communities in northern Canada, where fuel is extremely expensive but they have alternative low cost heat sources suitable for central energy plants, either local biomass or waste heat from diesel generators. For example, Ouje Bougoumou (biomass), Fort McPherson and Arviat (waste heat).

There are a lot of systems in Europe serving single detached residences, but the advice from our European colleagues is that these connections are generally not regarded as good economic investments, even in Europe, which has higher energy costs.

For the above reasons, FVB's opinion is that there is next to no hope of economically connecting detached or semi-detached homes to DE, and, probably little hope for townhouses, unless the connection and metering arrangements can be somehow organized to resemble multi-unit residential buildings, which seems like it may be possible in the case of stacked townhouses. As a further qualifier, there is more potential for heating than cooling and this subject is discussed further below.

Whereas a number of townhouse DE connections are at the construction stage in Markham and even more planned in Regent Park and West Don Lands, this is not necessarily a green light for Central Pickering where they would represent a much greater percentage of the total load. It's much easier to bear the cost of connecting townhouses when they are a small fraction of the whole, which is the case in Markham and Toronto.

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[5] MAH Web Site for the CPDP: Background Report – Housing and Mixed Use: Table 1

The ratio of single homes (including detached, semi-detached and townhouses) to apartments in Central Pickering is expected to be almost the reverse of that planned for DES in Markham and Toronto. Specifically, over 85% of the residential units in Central Pickering are expected to be single homes.

The fact that the single homes are not a good market for DE does not totally preclude DE in the new neighbourhoods. The apartments and larger community, commercial and industrial buildings could form the customer base for small DE systems in each neighbourhood, or at least some of them. This is the natural customer base for most DE systems.

As an example, the first DE project FVB designed in Ontario was in Cornwall in 1993. This was in an area comprising mostly detached residences, but the DE system did not connect any of the residences. Its customers were all larger community buildings such as schools and hospitals, spread over a larger area than appears to be envisaged for each of the neighbourhoods in Central Pickering.

In this regard, potential heat sources are important. Small DES would have a better chance of being economic if a base-load supply can be secured that is from an inherently lower cost source than what the customers would otherwise use. This may well be possible, e.g. with biomass-fuelled CHP, as discussed in more detail below under Potential Heat Sources.

3.3 Distinction between District Heating and District Cooling

The four areas in the GTA that are developing DE, per Table 2, are all examples of district heating and cooling. And Enwave has developed a large district cooling system in downtown Toronto to complement its district heating service. The Windsor DE system includes district cooling. However, it must be noted that all of these examples have significantly higher density and, more importantly, larger customer buildings than planned for Central Pickering.

District cooling is generally not viable for low-density areas and small buildings. The basic reason has to do with the relatively low amount of energy required for cooling on an annual basis relative to the peak demand and the fact that the key sales proposition for DE is that it saves energy by being more efficient, but the capital cost of DE infrastructure is driven by the capacity that must be provided and this is a function of peak demand.

An appreciation of the difference between heating and cooling in our northern climate can be gained by considering typical numbers. For each MegaWatt (MW) of peak heating demand a typical residential unit in the GTA would consume approximately 2,500 MegaWatt hours (MWh) of heating energy per year. But for each MW of cooling peak demand, the same unit would consume only 700 MegaWatt hours of cooling energy[6] per year (mostly in June through August).

This is exacerbated by the relatively small difference in supply and return temperatures (often referred to as ΔT) for cooling - much less than for heating, e.g. 10°C versus up to 45°C for heating. Pipe capacity in MW is a function of flow and ΔT and heat exchanger

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[6] These ratios are often expressed as Equivalent Full Load Hours (EFLH). In this case, the EFLH would be 2,500 for heating and 700 for cooling. These numbers correspond to the average of a number of multi-residential buildings in Toronto for which the author recently analyzed records of hourly energy consumption data for the last three years.

capacity is a function of surface area and ΔT. This means that the Distribution Pipe System (DPS) and Energy Transfer Stations (ETS) have to be that much larger and therefore more capital intensive to supply cooling as compared to an equivalent capacity of heating.

Therefore, whereas the capital cost of DE infrastructure to supply a MW of cooling capacity is more expensive than a MW of heating capacity, the potential energy savings are less[7], especially for residential buildings.

On the other hand, a commercial office building with lots of computers and lights and other devices that give off heat could have an EFLH double that of a residential building and district cooling becomes more economically attractive. District cooling may also be attractive for owners of larger commercial buildings for precisely the same reasons as it is difficult to provide – complex technology, high capital and high maintenance costs. Therefore, it is possible to sell district cooling, but primarily for business reasons, not energy savings reasons[8].

Townhouses are to be served with both heating and cooling in the Markham, Regent Park and the TWRC precincts, but these will be the only developments FVB knows anywhere in the world that will have connected townhouses to district cooling. And the majority (approximately 90%) of the residential units in these precincts will be apartments.

The possible application of district cooling in Central Pickering is likely to be for clusters of larger buildings, perhaps a mix of community, commercial and apartments. In fact, the developers of new large buildings often demand that they be supplied with cooling as well as heating, since it makes more sense for them to outsource both if any.

This is essentially the same market as recommended for district heating in the previous section. But we have more confidence in the general viability of district heating than cooling. The economics of district cooling is extremely project specific, being most of all related to customer capital avoidance, rather than being an energy play (as is the case for heating). Therefore, it is beyond the scope of this pre-feasibility to adequately address. Any such opportunity would have to be evaluated on its merits at the time that the building project parameters become known for a specific development proposal.

District heating on the other hand, offers the possibility of a drastic improvement in efficiency and cost effectiveness through the use of CHP and/or by using renewable energy sources such as bioenergy. It is reasonable to generally expect good economics for district heating for new developments with a compact urban form.

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[7] To elaborate a little further, it is easy to get confused about this because different forms of energy are typically used, i.e. electricity for cooling and some fuel like natural gas for heating, and it is generally known that a conventional power plant needs three units of fuel to produce one unit of electricity. But this is more than off-set by the ratio of conversion efficiencies for customer heating and cooling equipment where one unit of natural gas will generate on average approximately 0.65 units of heat energy while one unit of electricity will generate on average around 2 units of cooling energy. Although the DE cooling plant can be even more efficient, generating 4 units of cooling energy per unit of electricity, it is difficult to justify the capital cost from these savings with ELFH of only 700.

[8] This is not meant to diminish the success of Deep Lake Water Cooling where 90% of the electricity requirement is saved. In the absence of readily available naturally cold water, the energy savings are much less.

The combination of high annual energy demand, high potential for efficiency improvement and support for CHP based on renewable or clean fuel displacing coal-fired generation means that district heating can achieve major reductions in CO_2 emissions, much more than district cooling.

For all the above reasons, district heating is a logical candidate to be a public policy directive for new development. District cooling on the other hand should be optional, employed only if and when a mutually satisfactory business deal can be negotiated between the real estate developer and the DES.

3.4 DE Proponents and Risk

The DE proponent must manage and mitigate the cost and risk of the uncertain and extended development period of green and brown field development.

FVB has been involved in most new DES developed in the last two decades in Canada and most of its clients are either municipalities or municipally owned electric utilities. This raises the interesting question of how risks are mitigated since, as a matter of regulation, neither municipalities nor regulated electric utilities are supposed to expose their rate base to risk for projects that serve a narrow segment of their customers or rate payers.

The Cornwall, Sudbury and Hamilton DE projects targeted existing buildings and could thereby mitigate risk by securing long-term service contracts prior to committing capital for detailed design and construction. The Windsor and Markham projects targeted new development, but similarly obtained long-term service contracts at least from large anchor customers (respectively the Casino and the IBM Software Laboratory) prior to committing to design and build their DES.

While the Regent Park, West Don Lands and East Bayfront DES have been committed in principle for design prior to service contracts with developers, energy service contracts are expected to be in-place prior to major commitments of construction capital. Furthermore, the land is publicly owned and connection to DE will be mandatory. While real estate development risk exists, the market for multi-unit residential buildings in downtown Toronto is very strong.

Lessons learned from these previous projects suggest that the City of Pickering would be the most likely proponent for DE at least during the feasibility and planning stages. The Federation of Canadian Municipalities (FCM) is a possible source of funding for development costs and, if the project proceeds, possibly some of the design and construction costs.

In any case, the City should direct whether DE would be employed and control the nature of its design at a high level, i.e. the location and type of central energy plant, DPS route and customers served. This could be done through the Neighbourhood Plans and other planning approvals.

Final release of funds for detailed design and construction would be contingent upon satisfactory energy service contracts with the building developers sufficient to ensure adequate payback of the initial capital cost. The real issue, addressed in Section 4 of this report, is what *level* of payback is likely to be achievable given the potential in Central Pickering.

In order to partially address this risk, consideration should be given as to whether to make connection mandatory as in Regent Park, West Don Lands and East Bayfront (and

South East False Creek in Vancouver) or to give strong incentives to connect through some type of points system in the planning process as in Markham. FVB would recommend the simplest approach of making connection of suitable DE prospects mandatory in certain designated areas where feasibility studies have shown it to be economic. Alternately, a point system should be devised, carefully weighted to achieve the same result.

Developing a recommended framework for the DE development process that minimizes risk is a task that belongs in the early phase of a feasibility assessment. The success of DE hinges on having a clear institutional framework for the DE entity.

The feasibility assessment should also explore in more detail the availability of potential heat sources and the following preliminary discussion is intended to introduce some of the issues and options that need to be investigated.

3.5 Potential Heat Sources

An important objective for any new district heating system should be to eliminate the use of fossil fuels as the primary resource as soon as possible.

The obvious alternatives to consider are CHP and bioenergy. The CHP might itself be fuelled by bioenergy, or by natural gas. Natural gas fuelled CHP has been the common practice for district heating systems developed in Ontario over the last decade (Cornwall, Sudbury, Markham and Hamilton). However, it is FVB's opinion, based on trends in Europe, that the future of district heating is to be supplied from various forms of bioenergy, whether in heat only or CHP configuration.

Possible sources of bioenergy include a wide variety of wastes from agriculture, forestry, food processing and the food service industry and the organic fraction of municipal solid waste (MSW) – essentially any non-fossil hydrocarbon (in other words of recent animal or vegetable origin) that can be obtained for a delivered price that is sufficiently lower than fossil fuels per unit of recoverable energy, e.g. as expressed in $ per Giga-Joule (GJ) to justify the additional capital required for this type of plant, and/or, in the case of CHP, to allow an economic project in view of the potential electricity sales revenue.

Of course, the issue of recovering energy from MSW is controversial and involves waste management plans that would be beyond the scope of the DE feasibility assessment. Fortunately DE is not dependent on MSW as there are many other adequate sources of biomass and this point could be well made in the feasibility study.

Technologies of energy conversion include digestion, gasification and combustion. These technologies are well proven. Digestion produces biogas (approximately 50% methane and 50% CO_2), which can fuel reciprocating engines similar to those used for natural gas-fired CHP, but it may have a higher value use as a transportation fuel.[9]

Gasification can be visualized in simple terms as a slow burn with a low airflow such that carryover of particulate emissions is almost eliminated and combustible gases produced. Gasification and combustion processes produce heat usually used to raise steam that can then be used either to generate hot water for district heating directly, or to drive steam turbines generating power, from which low pressure steam may be simultaneously extracted to cogenerate hot water. This is a type of CHP.

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[9] FVB in Sweden designed Europe's largest production and distribution system for biogas in a City called Linkoping, primarily to fuel public transit.

Bioenergy has the dual advantages of: 1) generally low price and 2) being CO_2 neutral[10]. Sourcing biofuel within the community can also create local jobs for collection and transportation, while supporting local agriculture and industry.

The recently issued RESOP from the OPA provides certainty for distributed generation developers. Now they know that if they can manage to develop a project that meets certain specified requirements, they will be given a contract for the power output at a known price, which is a base price of 11 cents/kWh, 20% escalated by CPI, plus a non-escalating premium of an additional 3.5 cent/kWh in on-peak periods (7 AM to 11 PM on business days).

In FVB's opinion, the RESOP price should be sufficient to trigger biomass fuelled power only projects in the 5 to 10 MW range of capacity. Such facilities generate power by first raising high-pressure steam, which is expanded through a turbine. It is possible at the project approval stage to specify that the steam turbine must have the capability to allow future extraction of low-pressure steam for the purpose of generating hot water for district heating. Extraction of low-pressure steam will slightly reduce the generator power output, but a fair agreement can be made that the DES will pay a price for the hot water that keeps the distributed generator whole. This would be a pre-determined ratio to the price they receive for electricity (in the order of 10%). This was done in the Grande Prairie, Alberta, community energy project.

Since 10% of 14.5 cents/kWh is equivalent to 4$/GJ[11], less than half the usual commodity price of natural gas including transportation to Ontario, currently around 9$/GJ, even before conversion losses in boilers or furnaces, this is a potential heat source that is inherently lower cost and more environmentally sustainable than its competition. From the experience of having conducted many DE feasibility studies, FVB would expect that a district heating system based on this resource would probably be viable for a reasonably compact area of multi-storey buildings, provided the development risk could be satisfactorily managed. Section 4 of this report will provide some illustrative numbers to support this.

The CESOP[12] is expected from the OPA early in 2007. But the uncertain price of gas relative to the price of electricity is a significant risk for gas-fired power generation projects and it remains to be seen how the CESOP will address this risk. Previous RFP's for clean generation were exceedingly complicated and difficult for small projects. In any case, gas-fired CHP is more applicable to existing heat loads than for uncertain, developing heat loads because it is less likely than a Biomass CHP to be economically viable on a power only basis.

The RESOP opens up a possible heat source procurement strategy of directing a distributed generation proponent to locate its facility advantageously for the future distribution of hot water. This would get the power plant in the right location, financed by others, early, or even prior to the start, of real estate development.

If there turned out to be no suitable real estate development, there would be no need for district heating and no regrets because the power plant would continue to be

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[10] This is the generally accepted view for bioenergy, based on the idea that the hydrocarbon was of a recent, renewable origin, which means that an amount of CO_2 equivalent to that released by oxidation of the material will soon thereafter be removed from the air by photosynthesis from re-growth of the tree or other vegetable species.

[11] 10% * 14.5 cents/kWh = 1.45 cents/kWh = 14.5 $/MWh ÷ 3.6 = 4 $/GJ

[12] Clean Energy Standard Offer Program, it will cover gas-fired CHP

economically viable based on electricity sales. But if and when suitable real estate development were to be committed, the DES owner/operators could negotiate energy service agreements with the real estate developers on the strength of the contingent supply agreement already in-place from the strategically located distributed generator. The district heating project risk would be mitigated. The DES would still need standby boilers, but these take much lower capital than base load heat sources.[13]

Alternately, the DES proponent could take the initiative to also develop the Biomass CHP, initially on a power only basis, prior to, or early on in the DES development. But the Biomass CHP project would be economically self-sustaining, with or without heat load, based on the RESOP contract and would therefore not represent any additional risk. It would require additional capital, but this is not studied in this pre-feasibility as it is not relevant to the feasibility of DE.

So-called geothermal energy is a potential heat source that has been getting a lot of media attention, often included in the same category as renewable energy systems, erroneously so in FVB's opinion for the following reasons.

The term "geothermal" was traditionally used for heat produced deep in the earth, believed to be by gravitational compression, that reaches the surface in some locations as volcanoes and hot springs. This has been used as a heat source for DE in the few places that happen to be near such geological conditions, notably Iceland and in the mountainous western regions of the U.S. FVB has been involved in a few of those projects in California, Nevada and Idaho.

Because of this traditional usage, it is misleading to use the same term to describe systems in Ontario that are nowhere near any volcanoes or hot springs and use totally different technology. These so-called geothermal systems employ ground source heat pumps to lift the temperature of heat to a useful range from the ground temperature, which is sometimes reported to have a year round average of approximately 10°C, but the actual operating temperatures could be lower, especially in winter and after several seasons of heat withdrawal, depending on a number of system design and site specific factors. The technology is similar to what we all have at home to pump heat from the inside to the outside of our refrigerators and freezers.

This requires mechanical compression driven by quite a lot of electricity. So although this is an apparently clean and efficient source of energy at point of use, it is actually powered by coal-fired generating plants at a net efficiency of around 30%[14].

It is important not to be misled by the fact that Ontario has a lot of hydro and nuclear power. These resources supply the base load. Any incremental, otherwise known as marginal, use of electricity, tends to be supplied by the load following resource, especially during severe weather, which is when more heating and cooling energy is required.

The load following resource will remain coal-fired in Ontario for the foreseeable future. If or when Ontario shuts-down its coal-fired plants, the load following resource is likely to become a mix of coal-fired power imported from the U.S. and local oil or gas-fired

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[13] Heat sources are distinguished in type of duty as between base-load, e.g. CHP or renewable energy that have high capital but low variable cost, and standby/peaking, e.g. gas-fired boilers that have low capital but high variable cost. A DE system will typically employ both, with 80% of the energy being supplied from the base-load source.

[14] Electrical efficiency delivered to point of use, including transmission and distribution losses.

generation, all of which produce greenhouse gas emissions. FVB would change the tenor of its advice on this subject if the load following resource became some form of renewable energy, which may be the case in future, but not in the foreseeable future.

Heat pumps can make sense in regions where all or most of the electricity is generated from hydroelectric plants, e.g. in Quebec, Manitoba and British Columbia. They are also more efficient in more moderate climates than Canada.[15]

FVB recommended heat pumps as a heat source for the South East False Creek DES in Vancouver because the source of electricity is mainly hydroelectric and the winter (usually) not as cold as Ontario.

FVB has been involved in many heat pump projects, including in their hometown of Vasteras, Sweden, where a large heat pump is used to produce heating and cooling simultaneously from treated sewage water. But the heat pump projects in Europe were conceived at a time when it was believed that plentiful electricity would be available from nuclear power. They are now no longer being considered. Instead, the trend in Europe is towards bioenergy, as mentioned previously.

FVB has also been involved in seasonal thermal underground storage projects. In one project in Sweden, FVB designed a system that is a combination of deep lake water cooling and seasonal cold storage. Cold water is pumped from a deep lake continuously cooling an underground aquifer year round, which is then used for district cooling during the cooling season. Economic seasonal thermal storage is dependent on very specific hydrogeological and other local conditions and should not in a general way be thought to be a possible “magic bullet”.

4 ILLUSTRATIVE FEASIBILITY OF A NEIGHBOURHOOD DE PROJECT

For illustrative purposes, a high-level exploration of economic and environmental benefits for a realistic DES in one of the neighbourhoods is presented here.

4.1 Thermal Loads

This necessarily makes assumptions about the type, size and location of buildings. But these assumptions are largely consistent with the CPDP. It also assumes that stacked townhouses can be treated as condominiums with common elements including a single ETS per block and will therefore be deemed to be economic DE connections, but other townhouses, detached and semi-detached residences are not connected. The distribution of building types stays close to that identified in the MAH background study.

This illustration also assumes a heating only service and a large percentage of the thermal energy supplied from a Biomass CHP, both of which are considered reasonable assumptions as outlined in Section 3. If cooling were to be added to this service, it should be justified on its own incremental merits.

The example neighbourhood chosen is depicted in Appendix 3, reproduced from page 95 of the CPDP. The CPDP uses it to present guidelines for Neighbourhood Plans, but

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[15] Heat pumps are more efficient in moderate climates where the required lift in temperature can be kept down to about 50°C, i.e. from the ground at 10°C to the heating system at about 60°C. But severe winter weather in Canada usually requires ambient reset up to 90°C to meet peak demand.

it is clearly Neighbourhood # 11[16]. From hereon in this report, specific neighbourhoods will be identified like this example, N11. It is also portrayed on page 90 of the CPDP, which has a scale of 1 cm = 500 m, allowing rough measurements of the hectares for each type of development area, and hence an estimate of the number of residential units, assuming 70% net to gross and the mid-point of the density ranges per Table 1, in each case, as follows.

Table 3 Potential buildout of units in Neighbourhood 11.

	Gross Ha	Net Ha	Units/Net Ha	Units
High Density	2.25	1.575	195	300
Mixed Corridor	31.25	21.875	90	2000
Community Node	12.25	8.575	110	900
Low/Medium Density Area	62.5	43.75	52.5	2300
Totals	108.25	75.775		5,500

For the purpose of this analysis the following assumptions are made about the distribution of these units among type of buildings.

Table 4 Units of different building types assumed in Neighbourhood 11

	MURBs	STH	TH	D & S-D	Total
High Density	300				300
Mixed Corridor	100	300	600	1,000	2,000
Community Node	100	200	300	300	900
Low/Medium Density Area			250	2,050	2,300
Totals	500	500	1,150	3,350	5,500
% of Total	9.1%	9.1%	20.9%	60.9%	100.0%

STH = Stacked Townhouse, TH = Townhouse, D & S-D = detached and semi-detached

The % of townhouses assumed in Table 4 is close to the MAH prediction of 20% but the % of apartments and stacked townhouses are higher than the 7.5% predicted by MAH for the average of the development period, but close to the 2015 and beyond prediction, hence the % of detached and semi-detached is slightly lower than the 65% predicted for the development period but close to the 60% predicted for beyond 2015. This minor departure from mean predicted values is considered defensible because N11 clearly has above average areas of the higher density type development.

The Gross Floor Area (GFA) of each building type can now be estimated based on the above assumptions and typical values per unit as follows.

Table 5 Estimated GFA in m^2 of building types in Neighbourhood 11.

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[16] Neighbourhood numbers are given on page 79 of the CPDP, a copy of which is pasted into Appendix 1.

	MURBs	STH	TH	D & S-D	Total
m2/Unit	100	120	120	150	
High Density	30,000	0	0	0	30,000
Mixed Corridor	10,000	36,000	72,000	150,000	268,000
Community Node	10,000	24,000	36,000	45,000	115,000
Low/Medium Density Area	0	0	30,000	307,500	337,500
Totals	50,000	60,000	138,000	502,500	750,500

The Mixed Corridor and Community Node area is also assumed to accommodate related commercial and institutional uses, which are estimated to occupy space equivalent to 33%[17] of the residential space in this neighbourhood. Therefore, the related commercial and institutional space is assumed to be 247,000 m^2, assumed to consist of around 7 buildings, e.g. a school, community centre, health-care, retail mall, hotel/restaurant, church and commercial office complex.

These assumptions of the gross floor area in this neighbourhood when fully built-out can be translated into thermal energy load using archetypal energy intensities for the various types of buildings given the local climate and FVB's experience related to buildings designed to meet the Energuide 80 standard.

This is not an exact science but the following load estimate was thereby derived for the High Density Area plus Mixed Corridor plus Community Node segment, and as mentioned earlier, connecting only the apartments, stacked townhouses, commercial and community buildings. This is the target market that FVB would recommend.

Table 6 Illustrative district heat load for Neighbourhood 11

Undiversified Demand MWt	Annual Energy MWht
18	30,000

Note: MWt= Mega-Watts thermal, MWht = Mega-Watt hours thermal

This would be a district heating system of a similar order of size as Cornwall or Hamilton. Furthermore, it has an interconnection possibility with the nearby High Density Area and Mixed Corridor of N9, and possibly N4, as well as some upside within itself (more commercial and community, higher density and possibly some cooling).

4.2 Preliminary Technical Concept

Even on a standalone basis, high-level cost estimation and projection of potential cash flow indicates this hypothetical DES could be economically viable.

A Central Energy Plant (CEP) is proposed to meet the 15 MWt diversified peak demand[18] with a 5 MWt base load steam converter, supplemented with three 5 MWt

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[17] As advised by Pickering Planning & Development

[18] A diversity factor of 85% is applied to undiversified aggregate demand for this mix of buildings

natural gas fired standby/peaking boilers. The steam converter would heat the district heating return using low pressure steam from an adjacent Biomass CHP (built by others, or, in any case justified independently, under a RESOP contract) and thereby supply approximately 75% of the annual energy.

The normal district heating supply temperature would be 60°C. On the coldest days, one peaking/standby boiler would automatically kick-in to further heat the district heating water up to 90°C in order to keep up with the higher demand. Installation of the second and third 5 MWt standby/peaking boilers could be delayed in line with load build-up. The design and installation staging would meet the diversified peak demand with any one production unit out of service – this is called "N+1 reliability".

A realistic scenario would see around 22 buildings in total connected to the system (5 apartments, 10 blocks of stacked townhouses and 7 community/commercial buildings). Each of these buildings would have an Energy Transfer Station (ETS). The ETS would be connected to the CEP via a closed loop (supply and return) Distribution Pipe System (DPS), having a total length of 2,500 trench meters, plus branch connections totaling 440 trench metres.

The above describes a very basic concept. It would be optimized during conceptual engineering to develop the design basis document.

4.3 Cost and Revenue Projections

The capital investment of the DES can be approximated from similar projects to be in the order of $10.7 million, broken down as follows. The ETS, DPS and CEP estimates include construction costs and engineering, including support during construction and 10% contingency.

Table 7 Capital cost for illustrative DES in Neighbourhood 11

ETS	$1,484,000
DPS	$4,238,000
CEP	$5,050,000
Total	$10,772,000

The DPS includes branch-lines.

The revenue would be in the order of $3 million/year, based on a competitive price of $100/MWht. For example, it would cost approximately $1,400/year for space heating and domestic hot water for a unit in a stacked townhouse, which would be a saving versus a comparable gas utility bill including water heater rental of around $1,500/year. The DES would look after all maintenance of the ETS. The customers would be left responsible only for maintenance of their internal distribution systems, which are not high maintenance items. Another big sell for customers is that district heating service charges could remain relatively stable, since only around 25% of the cost is tied to energy commodity prices (electricity and gas).

The biggest selling point of this proposal is to the building developers who would save in the order of $4,000 - $6,000, or more, per unit on the cost of installing boilers or furnaces and ancillary elements, like stacks. This cost reduction by DE could be used by the City as leverage to demand more green and quality features in these buildings during planning approvals.

The operating cost at today's energy prices would be in the order of $1 million/year, broken down as follows.

Table 8 Pro Forma operating cost for Neighbourhood 11 illustrative District Energy System

Gas	$314,000
Steam	$337,000
Operators	$160,000
Maintenance	$100,000
Administration	$50,000
Electricity	$62,000
Insurance	$25,000
Total	$1,048,000

Therefore, the annual net operating cash flow at today's energy prices and full build-out would be approximately $2 million ($3 million revenue less $1 million expenses) resulting in a simple payback of around 6 years ($11 million divided by $2 million) if all of the load were to be connected in Year 1. However, the challenge with green-field development is that load builds slowly, resulting in losses during the early years.

Understanding the economics under load building scenarios requires predicting the build-up rate, and knowing the break-down of operating costs into fixed and variable and the extent to which capital investment can be staged in line with load build-up. From experience, FVB has a good idea of the last two parameters and, for the purpose of this high-level pre-feasibility, assumptions could be made regarding the build-up rate.

For example, if the load build-up rate is linear at 10% per year over the planned 10 year development period, ignoring escalation, and using a conservative approach on the capital expenditure flow, which assumes $8 million would be required in Year 1, this hypothetical DE project can be projected to have a simple payback of 11 years and a real, unleveraged Internal Rate of Return (IRR) of 11% over 20 years. That is actually quite good for a municipal infrastructure investment.

Of course, this is a hypothetical exercise but illustrates the point that economic DES could be viable in some neighbourhoods based on the apartments, stacked townhomes and community/commercial buildings. It may be noted that this relatively positive result is sensitive to connecting 100% of the commercial load.

4.4 Environmental Benefits

The environmental benefit would be to displace, at full build-out, approximately 130,000 GJ/year of natural gas that would otherwise be consumed in customer boilers. This would have the effect of reducing the neighbourhood CO_2 emissions by approximately 6,300 tonnes a year, which is equivalent to taking 1,260 cars or trucks off the road.

This takes no credit for the environmental benefits of backing off coal-fired generation. That could be in the order of 30,000 tonnes a year of CO_2 emission reduction to the credit of the associated CHP project, which might alternately be part of the scope of the DE project, or vica versa.

This is the type of strategy and calculations that need to be refined through the DE feasibility assessment for the purpose of responding to the FCM RFP for DE.

5 EMPLOYMENT LANDS

In addition to the more residential neighbourhoods, Central Pickering is expected to include significant employment lands along Highway 407, similar in character to the Whites Road Prestige Business Park. The use of space in this business park is reported to be broken down as follows:

office	9%
cafeteria	0%
laboratory	0%
mezzanine	1%
warehouse	27%
manufacturing	2%
plant	15%
plant/warehouse	8%
industrial	37%

From a strictly technical perspective, these buildings could easily be heated using DE. However, the business case would be very challenging. As outlined in this report, DE has relatively high capital costs but delivers a high degree of comfort, very reliably with low operating costs and low environmental impact. These benefits are valued by residential customers to the extent that they will pay prices that make it economic to provide this quality of service. And residential buildings have high domestic hot water consumption which increases the total amount of heat energy supplied and thereby increases the potential for energy savings.

The problem with warehousing and industrial loads is that these customers tend to be very sensitive to the capital cost of their internal systems. DES supply buildings with hydronic (hot water) internal systems, which are more capital intensive than the roof mounted air-handling units normally used in warehouses and industrial plant.

These customers tend not to have a long-term perspective so as to value the benefits of DE. Their domestic hot water consumption is low, comfort is not a priority and there is low long-term security of demand.

The last point would probably be the killer for a DE business plan, which depends on customers signing 20 year firm supply contracts with fixed capacity requirements. These are not a problem for residential buildings because it is a certainty that the heat demand will always be there for as long as the building is standing. That is not the case with warehouse and industrial customers, who, consequently, are generally very reluctant to sign long-term contracts.

In conclusion, it is not recommended that a great deal of effort be expended in trying to develop DE in the employment lands.

6 RECOMMENDED APPROACH FOR DISTRICT ENERGY IN CENTRAL PICKERING

In conclusion, the development pattern for Central Pickering would not support economically viable DE designed to serve all types of buildings in all neighbourhoods from one central plant.

It would be more reasonable to start separate DES in only those particular neighbourhoods where it can be seen to make economic sense. Therefore, the viability of DE in Central Pickering needs to be assessed through feasibility assessments of its application in each neighbourhood.

The ideal approach would be to first focus on the single most promising opportunity, which would be the conglomeration of N11, N9 and N4. The DES could be started in any of these and extended to the others. It should be started in the one that has the earliest prospects for development of suitable district heating customers, i.e. apartments, commercial and community buildings.

The City could take either a higher investment strategy of being itself also the developer of a base load CHP or a lower investment strategy of being the developer of only the DES, in concert with a parallel path of encouraging another party to develop a distributed generation plant that would be CHP-capable, and be committed to supply base load heat if and when required.

Besides developing that strategy, there are a number of other up-front issues the City should consider prior to or concurrent with the feasibility assessments of each neighbourhood. And these could all be included in an early phase of the DE feasibility.

The issue of proponency, i.e. what entity would design, finance, build, own and operate the DE is so important that a definite plan should be developed, approved and committed by the City before having consultants engage building developers in feasibility studies for particular neighbourhoods.

FVB's experience has been that the most successful DE proponents are generally municipally owned. This has been the case for all the new DE projects built in Ontario over the last decade (Cornwall, Sudbury, Windsor, Markham and Hamilton) as well as several in Alberta and B.C. (Revelstoke, Strathcona, North Vancouver, South East False Creek and Prince George and Grande Prairie that are still in the planning stages).

In order to muster the political will to proceed with what is probably a departure from business as usual for City politicians and senior staff, some help from the consultant is often needed to highlight the benefits of DE in relation to the City's goals. These benefits relate primarily to sustainability, which is stated to be an integral part of the CPDP.

This feasibility assessment should start with a more detailed, but still high-level, economic risk analysis and expenditure forecast for delivering DE wherever it might be feasible throughout the whole of Central Pickering based the type of information assumed in this pre-feasibility but with City staff verification of the key data points.

Following satisfactory progress on the above mentioned "foundation issues", a council or high level staff decision might then be made whether to proceed further with more detailed feasibility assessments as part of the Neighbourhood Plans. Hence, the DE feasibility work should be structured to be released in stages in concert with certain decision-points.

Prior to engaging developers, other clients have found it useful to prepare a Developer Information Document. Preparation of the Developer Information Document also enhances the DE proponents understanding of their own business.

In order to complete a DE feasibility study for the neighbourhood, the consultant would need a map to scale together with information on the type of buildings intended for each block and their floor area. Based on this basic information, the consultant would be able to determine which, if any, blocks, would be good prospects for district heating and/or cooling, what the thermal loads would be and what type of central plant would be recommended and, therefore, its foot-print and other physical characteristics, (e.g. esthetics, emissions, fuel consumption).

Through consultation with the City and the development proponent, one or more suitable sites for the central plant could be selected and preliminary route for the DPS developed. If designed to be compatible, a CEP located adjacent to the urban area appears to be a permitted use for the Natural Heritage Areas.[19]

The conceptual CEP design, DPS routing with length and size of pipes, together with the cost of ETS (a function of the number, type and size of ETS) will allow a capital cost estimate to be made. The customer's estimated avoided Business-as-Usual costs determine the revenue stream. Typical fixed and variable operating costs from similar DES then allow the net revenue and return on investment to be projected. The project cash flow and strength of the assumptions characterizes the economic risk.

If the pro forma risk/return ratio is acceptable to financial decision makers, customer contracts can be negotiated. When sufficient customer contracts are secured, the project then moves into design and construction.

The implementation process for the urban community specified by the CPDP requires detailed Neighbourhood Plans[20] to be prepared prior to or concurrent with other development approvals. While not as detailed as subdivision plans, the Neighbourhood Plans do identify the location and size of development blocks and specify in general terms what type of building would occupy them.

The conclusions and recommendations of the neighbourhood-specific DE feasibility assessment and the City's decision thereon, could become part of the Neighbourhood Plan.

In view of the above remarks, a Terms of Reference for a RFP for a DE Feasibility Assessment is outlined in Appendix 4.

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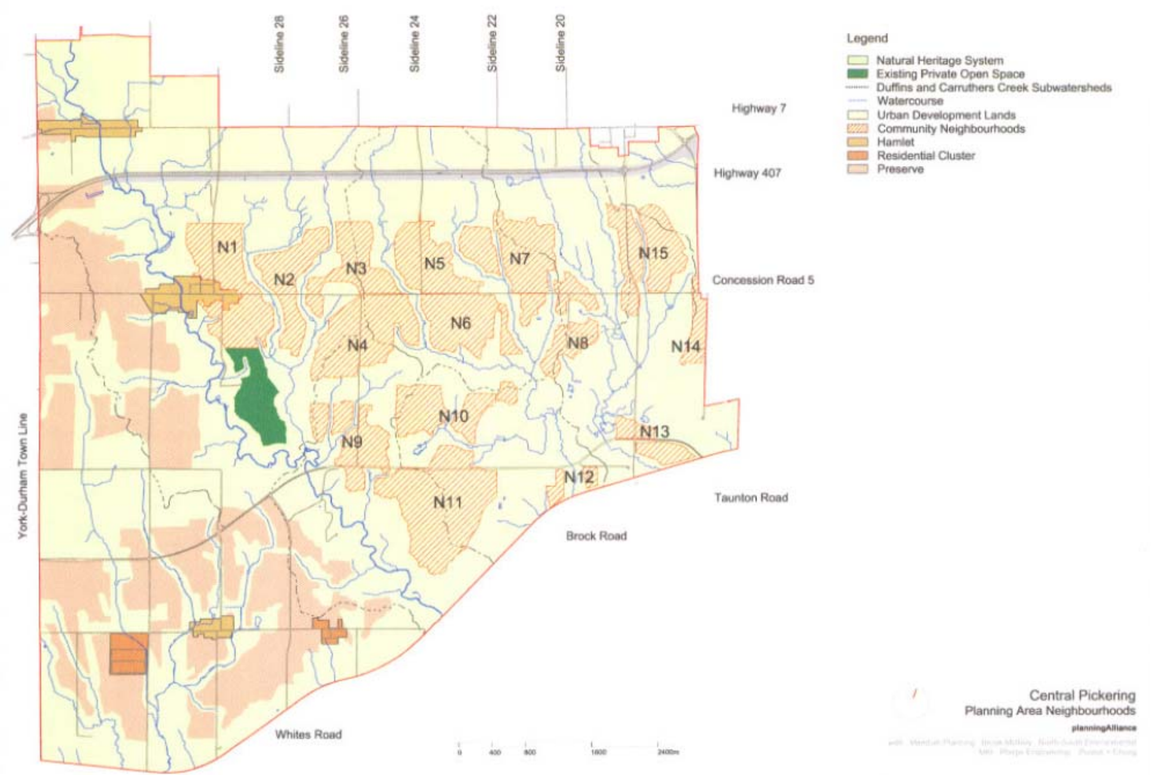
[19] CPDP page 35, 4. f)

[20] Guidelines given in the CPDP, pages 95-97

APPENDIX 1: MAP OF NEIGHBOURHOODS.

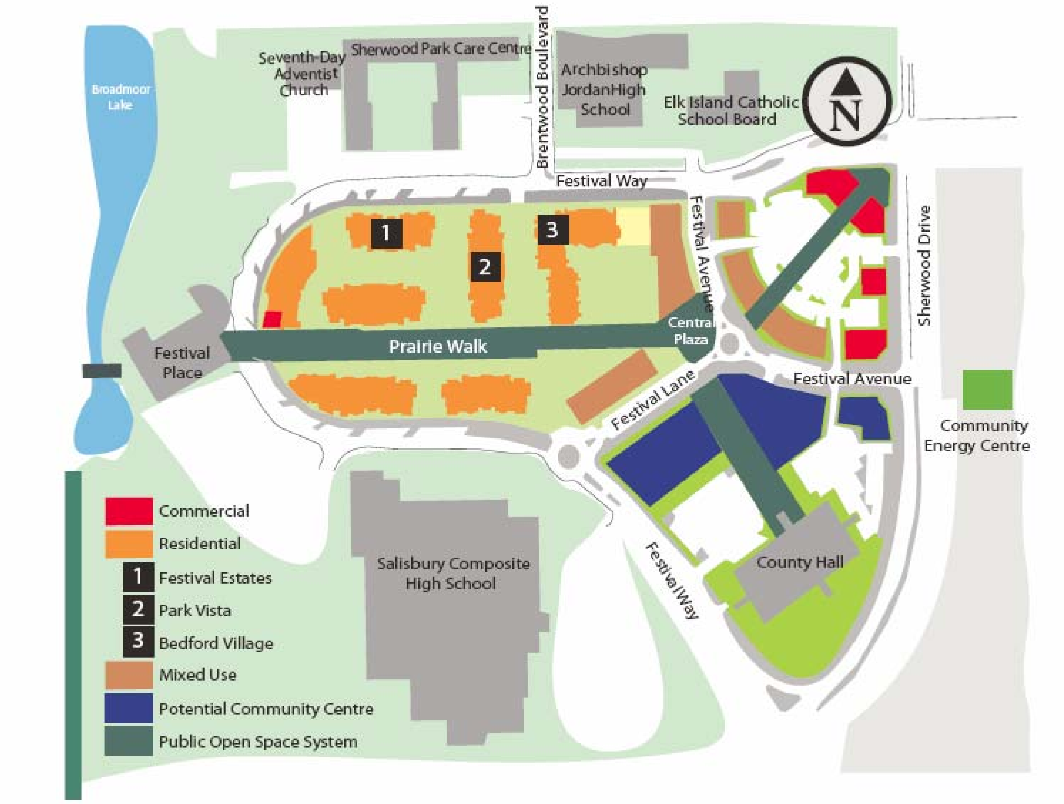


APPENDIX 2: STRATHCONA COMMUNITY ENERGY SYSTEM SITE LAYOUT

Centre in the Park

Strathcona County

Site plan



APPENDIX 3: CENTRAL PICKERING NEIGHBOURHOOD #11 LAND USE

APPENDIX 4: DISTRICT ENERGY FEASIBILITY ASSESSMENT TERMS OF REFERENCE

INTRODUCTION AND BACKGROUND

Overview of Central Pickering Development

Central Pickering lies north of the Canadian Pacific (Belleville) Rail line (the approximate limit of the existing built-up area) and south of Highway 7. A Provincial Development Plan has been approved for significant urban development with a high level of sustainability.

The Central Pickering Development Plan (CPDP)[21] calls for fifteen new residential neighbourhoods in a green-field area spanning approximately 6 km east-west and 4.4 km north-south. The planned neighbourhoods are separated by areas designated as Natural Heritage Systems that all appear to have watercourses running through them and must be kept largely in their natural state[22].

The new neighbourhoods are expected to be built over the next ten years, probably starting with mostly single homes (including detached, semi-detached and townhouses), later adding apartments, stacked townhouses, community and commercial/industrial buildings and eventually reaching an aggregate population of 70,000. The exact timing and rate of development in any particular neighbourhood cannot be precisely predicted at this time, but individual Neighbourhood Plans must be prepared and will form the basis for amendments to the Pickering Official Plan. The amendment must be adopted by the City of Pickering and conform to the Durham Regional Official Plan and the CPDP. Further, the Neighbourhood Plans must be approved prior to or concurrent with other development approvals.

DE as a Sustainability Strategy

Over the last 50 years, DE has significantly reduced consumption of fossil fuel in many countries around the world. This has been accomplished by connecting buildings to a variety of alternative energy sources, including Combined Heat and Power (CHP – also known as cogeneration) and renewable energy. In contrast, the business-as-usual approach locks-in long-term dependence on fossil fuel and electricity.

Eliminating the cost of in-building heating and cooling equipment helps developers make buildings greener with a lower construction cost than green buildings without DE.

DE delivers quality and higher standards. It is more reliable than in-building or in-suite mechanical systems and quieter, safer and more durable. Service calls are less frequent. Buildings are free from explosive or combustible fuels, refrigerants and water treatment chemicals. No gas pipes are needed. Electrical service may be downsized. There is more useful and congenial space both in-doors and on roof-decks or patios with no exhaust stacks, cooling towers, heat rejection coils or make-up air heaters.

Objective of this RFP

The City of Pickering is seeking by way of this RFP to identify a Consultant to provide engineering and business analytical services to assess the feasibility of DE in Central Pickering.

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[21] May 2006, Ontario Ministry of Municipal Affairs and Housing (MAH)
[22] CPDP page 91

Proponents are advised that the work will be released in stages in concert with certain decision-points, related to the DE development strategy that the City will decide to adopt, based, partly on the results of the initial work of the Consultant.

Invitation to Submit Proposals

Only the following Proponents, who have been prequalified by the City, are eligible to submit Proposals.

.1

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.3

SCOPE OF WORK

The City will give Instructions to Proceed for each of the following Tasks or Sub-tasks individually.

Task1: Development of a DE Development Framework

The City seeks to develop a coherent DE Development Framework prior to engaging developers in feasibility studies for DES in specific neighbourhoods. This will involve completion of some, or all, of the following Sub-tasks.

Sub-task 1.1: Assess Potential Benefits of DE to the City of Pickering

The Consultant will provide a general assessment of the economic and environmental benefits of DE to the City of Pickering, based on the potential for DE in Central Pickering. This is to include:

- a range of positive economic outcomes for the City and DE customers
- projected reduction in regional greenhouse gas emissions
- projected savings in building construction costs

Sub-task 1.2: Potential Energy Sources

The Consultant will identify and assess the potential availability and cost of suitable energy sources for DE in Central Pickering.

In particular, the Consultant will provide information to help the City decide whether to develop heart sources itself or to encourage other parties to develop them.

Sub-task 1.3: Preliminary Business Plan for DES

The Consultant will examine potential corporate structures for the DES and assess their advantages and disadvantages for the City, specifically including its sustainability goals.

The Consultant will discuss the pro’s and con’s of making DE connection mandatory or giving incentives to connect through a points system in the planning process. If the latter route is chosen, the Consultant will collaborate with others in its development. In either case, the Consultant will advise as to which type and size of buildings should be connected to DE.

The Consultant will research and make recommendations on the feasibility of connecting different types of buildings to DE, specifically including stacked townhouses.

The Consultant will project capital requirements and pro forma cash flows for hypothetical DES of a size and type the Consultant identifies as realistic possibilities, given a range of development scenarios by City staff.

Sub-task 1.4: Generic Energy Service Agreements

The Consultant will advise the City on the nature and content of appropriate Energy Service Agreements for DE.

Sub-task 1.5: Information Package for Developers

The Consultant will develop an Information Package for Developers, covering such topics as

- What DE is
- What DE means to the building .. including generic designs for Energy Transfer Stations
- What are the business arrangements .. including appropriate pricing, generic service contracts, metering & billing

Sub-task 1.6: Metering and Billing

The Consultant will advise the City on suitable metering and billing procedures for DE.

Sub-task 1.7: Application for Funding

If directed by the City, the Consultant will prepare material in support of City application(s) for funding – including possible response to an RFP for DE of the Federation of Canadian Municipalities.

Task 2: Feasibility Assessments for Specific Neighbourhoods

If and when the City decides to investigate the feasibility of DE in any specific neighbourhood, it will instruct the Consultant to conduct a feasibility study, and provide a budget with an Upset Limit and a required schedule for the work, together with all information that the City can provide that it considers relevant.

Such feasibility studies will include the following sub-tasks at a minimum:

1. Estimates of Thermal Load
2. Estimates of Customers Business-as-Usual Costs
3. Identification of Blocks to be Served with District Heating or Cooling
4. Selection of Potential Energy Sources and Confirmation of Fuel Supply
5. Conceptual Plant Layout & Process Flow Schematic
6. Preliminary Distribution Pipe System & Energy Transfer Station Designs
7. Capital Cost Estimates
8. Revenue & Expenses Projections
9. Economic & Environmental Benefits
10. Risk Assessment and Mitigation

Task 3: Collaboration with Related Work by Others

Upon instruction by the City, and being given a budget to do so, the Consultant will collaborate with related work by others, including, but not limited to the following sub-tasks:

1. Building Standards
2. Neighbourhood Electricity Supply Plan
3. Neighbourhood Gas Supply Plan
4. Neighbourhood Infrastructure Plan

INSTRUCTIONS

Timetable

A Briefing Session for Proponents will be held on _____

Proponent Questions will be taken until _______

Addenda may be issued until _______

Responses to this RFP are due by _______

The City intends to award the Consultant contract by _______

Submission Process

Proponents should submit two (2) double-sided hard copies, along with an electronic copy on a CD to the following address by the due date.

Proposal Format

Each Proponent should prepare its Proposal according to the following format, without separating Proposal components into different envelope/packages:

Proposal Submission Form (The City's standard form per Schedule A)

Pricing

The Proponent should fill in Schedule B, stating the hourly rates of named Team Members, along with estimated hours and estimated costs for each of the Tasks and Sub-tasks outlined in the Scope of Work above.

At the City's discretion, Upset Limits may be set for specific Tasks or Sub-Tasks, prior to Instructions to Proceed. Such Upset Limits shall be negotiated following definition of work requirements and all work awarded to the Consultant shall be contingent upon mutually satisfactory agreements on schedule as well as Upset Limits or budget. The Consultants RFP response shall be a basis for negotiations.

Identification of Project Team

The names of the Project Team members should be confirmed to be available. Resumes need only be provided for any new names for which resumes were not already provided in the prequalification process.

Project Understanding

The Proponent should summarize its understanding of each Task and Sub-Task

Responsibility Assignments

Responsibility for completing each Task and Sub-Task should be assigned to Team Members and an overall Project Manager should be named who will be the primary contact with the City's DE Project Management Team.

Work Plan

The Proponent should outline, in general terms, a work plan, including a schedule and estimates of hours, for each Task and Sub-Task.

SELECTION PROCESS

Compliance Review

The City may at its discretion eliminate any Proponents who do not submit Proposals that comply with the Instructions.

Evaluation Criteria

The Proposals will be evaluated on a combination of evaluated cost, evidence of project understanding, experience of Team Members in relation to their assigned responsibilities and adequacy of work plan.

Interviews

The City may at its discretion conduct interviews with any or all of the Proponents.

LEGAL MATTERS

(Usual boiler-plate)

Limitations of Liability

Acceptance of Terms

Negotiations

Costs Incurred by Proponents

Errors and Omissions

Communications

Procedural Rights of the City

Verification of Proposals

Proposal Clarifications

Disqualification

Governing Law

SCHEDULES

SCHEDULE A; PROPOSAL SUBMISSION FORM

SCHEDULE B; PRICE PROPOSAL

SCHEDULE C; PROFESSIONAL SERVICES AGREEMENT TEMPLATE

SCHEDULE D; REFERENCES TO OTHER INFORMATION ABOUT PROJECT