The 2014 District Energy Inventory for Canada

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CIEEDAC began in 1993 under an agreement with NRCan’s Office of Energy Efficiency

- Part of Energy and Materials Research Group (EMRG) at School of Resource and Environmental Management at Simon Fraser University
- Primarily focused on industry data related to industry production, energy use and emissions
- Fills data gaps related to CHP (cogeneration), renewable energy and district energy
- Non-profit, utilizing students at EMRG and a research team.
CIEEDAC’s DE Goal

1) Address the gap in the reporting of information about district energy (DE) systems

2) Understand the impact of DE on energy use, GHG emissions, investment, employment…

3) Advance DE deployment in Canada
District Energy

CIEEDAC defined a district energy system to be:

...a system designed to supply thermal energy (and possibly electricity) to multiple buildings from a central plant or from several interconnected but distributed plants.
Data History

CIEEDAC began the process in 2012, collected data in 2013 and 2014 and is currently running the 2015 survey

- Funding provided by Natural Resources Canada, CanmetENERGY program
- Initial collection gathered basic information on number of sites and their location, energy type used, service area and other principle statistics
- Data gathered in 2014 expanded the list of known systems to 128 and the number of respondents to 67
Data Highlights

- Over half of the known facilities are in Ontario (40) and BC (26)
- Over half of all facilities were commissioned since 2000
- Reporting facilities (67) served over 2,600 buildings.
  - 75% - served more than 1 building type
  - 39 - average # of buildings served per facility
  - 302 - largest # of buildings served by a single facility
- Energy supplied to heat or cool – 5.3 million MWh in 2013 (est. 1% of total building thermal energy use in Canada)
- More than half plan expansions in the near future
Graphic Look at the Data

– Provincial / Regional details
– Energy Supply Types
– Energy Service and Quantity
– Community, Employment and Investment
– Growth
Provincial / Regional Data

Facilities by province / territory

Number of facilities

British Columbia Alberta Saskatchewan Manitoba Ontario Québec New Brunswick Prince Edward Island Nova Scotia Newfoundland & Labrador Northwest Territories Yukon Nunavut
Provincial / Regional Data

Facilities by services provided

- Combined heat and power
- Cooling (water)
- Heating (steam)
- Heating (water)

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Provincial / Regional Data

Facilities by year of commissioning

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Energy Supply Data

Base and Peak Load energy supply (heat and cool)

- Natural gas
- Biomass
- Geoexchange
- Oil & diesel
- Electricity
- Industrial/other surplus
- Waste water effluent
- Sea and lake water
- Municipal solid waste
- Solar
- Other

Share of facilities

- Base load (n=67)
- Peak load (n=63)

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## Energy Supply Data

### Base Load energy supply (heat and cool)

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Number of facilities</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas only</td>
<td>25</td>
<td>37%</td>
</tr>
<tr>
<td>Biomass only</td>
<td>13</td>
<td>19%</td>
</tr>
<tr>
<td>Geoexchange only</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td>Natural gas and electricity</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td>Industrial/other surplus and diesel</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Wastewater heat recovery (and geoexchange)</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>Oil and natural gas</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>Biomass and natural gas or oil</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Water for cooling, natural gas (and geoexchange)</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Electricity and geoexchange</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Municipal solid waste and biomass</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Solar only</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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Energy Service and Quantity

Facilities by type of service

- Heating (water): 49
- Cooling (water): 33
- Heating (steam): 28
- Electricity from a combined heat and power facility: 12

Service provided (n=67)

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Energy Service and Quantity

Facilities capacity and type of service

Number of facilities

Capacity (MW)

- Electrical (n=12)
- Cooling (n=30)
- Hot water (n=37)
- Steam (n=24)

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Energy Service and Quantity

Facilities annual generation by type of service

- Electrical (n=9)
- Cooling (n=23)
- Hot water (n=36)
- Steam (n=24)
Community, Employment and Investment

Facilities by size of municipality

Number of facilities

Municipality size (n=67)

- Rural: 3
- Small population centre: 18
- Medium population centre: 12
- Large population centre: 34

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Community, Employment and Investment

*Number of customer types served by a facility*

![Bar chart showing the number of customer types served by facilities.](chart.png)

- 17 facilities serve 1 customer type.
- 29 facilities serve 2-5 customer types.
- 17 facilities serve 6-10 customer types.
- 4 facilities serve more than 10 customer types.

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Community, Employment and Investment

Number of full time equivalent positions by a facility

- 40 facilities with 0-5 full-time equivalent positions
- 6 facilities with 5-10 full-time equivalent positions
- 21 facilities with >10 full-time equivalent positions

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### Community, Employment and Investment

**Facilities by system owner**

<table>
<thead>
<tr>
<th>System owner</th>
<th>Number of facilities</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutionally owned, either by academia, healthcare, or other institutional body</td>
<td>21</td>
<td>31%</td>
</tr>
<tr>
<td>Municipal government</td>
<td>13</td>
<td>19%</td>
</tr>
<tr>
<td>Private corporation</td>
<td>13</td>
<td>19%</td>
</tr>
<tr>
<td>Crown corporation</td>
<td>5</td>
<td>7%</td>
</tr>
<tr>
<td>Federal government</td>
<td>7</td>
<td>10%</td>
</tr>
<tr>
<td>Cooperative ownership</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>First Nations government</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Provincial government</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Public corporation owned, where shares can be sold on stock exchanges</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Growth

Historic growth, last 5 years

Increase in installed generation capacity
Increase in size of distribution network
Increase in the number of end-user connections

Proportion of facilities (n=66)

- 0%
- 0-5%
- 5-10%
- 10-15%
- 15-20%
- >20%

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Growth

**Planned Growth**

- **Installed generation capacity**
- **Size of distribution network**
- **Number of end-user connections**

**Planned growth** (n=65)

- No expansion is planned
- Next 2 years
- 2-5 years
- >5 years
Next Steps

CIEEDAC generates an Annual Report on the data. The report contains some analysis and reveals data shortfalls. In order to advance DE deployment we are seeking to gather data to better address:

- Investment opportunities and benefits for the private sector
- Community benefits and employment
- Energy savings associated with DE compared to the alternative heating / cooling supply
- Associated GHG reductions in a “climate” sensitive world
- Energy use and capacity utilization
Thank you!

CIEEDAC wishes to thank:

Natural Resources Canada, CanmetENERGY for consistent support and annual funding.

All DE respondents to CIEEDAC’s survey.

The Annual Report is available at:
www2.cieedac.sfu.ca/media/publications/District_Energy_Inventory_Report_Final_2015.pdf

The Data are available at:
www.cieedac.sfu.ca/DB_DEnew/