District heating and cooling

Providing energy to communities through efficient and decarbonized district energy solutions
Group profile

Key figures as of December 31, 2016

ENGIE develops its businesses (power, natural gas, energy services) around a model based on responsible growth to take on the major challenges of energy transition to a low-carbon economy: access to sustainable energy, climate-change mitigation and adaptation, and the rational use of resources.

24 billion CAD of growth investment over 2016-2018, inc.
1.5 billion CAD for innovative and digital projects

153,090 employees throughout the world

Revenues of 101 billion CAD in 2016
Operations in 70 countries

An investment fund of 76 million CAD committed to energy access
An investment fund of 175 million CAD dedicated to innovative startups

1,100 researchers and experts in 11 R&D centers

The Group provides individuals, cities and businesses with highly efficient and innovative solutions largely based on its expertise in four key sectors: renewable energy, energy efficiency, liquefied natural gas and digital technology.
The world is increasingly urban: 75% of the world population will soon be living in cities. And as the places where major demographic, economic and environmental trends overlap, cities are essential for the ongoing energy revolution.

ENGIE’s goal is to continue pioneering their transformation. We are making this a reality by integrating what we do into local ecosystems and working with community stakeholders to make cities safer and more efficient, more sustainable and more vibrant. District energy networks are a major component in addressing these challenges, since they help cities optimize their energy supply and reduce their environmental footprints.

Renewable district heating and modern district cooling are among the most efficient and cost-effective ways to reduce the carbon footprint of densely-built areas like city centers and industrial or office parks. They can be fueled by resources like biomass, geothermal, solar energy, and/or waste heat from industrial processes or energy from waste that could not otherwise be used. Doing so typically allows for 30% energy gains and up to 50% less CO$_2$ emissions.

ENGIE operates over 320 district heating and cooling networks around the world, meeting long-term energy needs for businesses and the public sector. We have a long history in Europe, where we are among the market leaders, and are developing our footprint in Asia, the Middle East and North America, to become in 2018 the world leader of highly efficient district cooling.

Over the past 30 years, we have honed our technological expertise in energy efficiency, renewables, and waste-to-energy solutions, and we take pride in designing, building and operating highly efficient district networks. And it is our conviction that district heating and cooling networks can be the backbone of better, more sustainable cities.
ENGIE district heating & cooling activities

Renewable district heating & cooling: the most effective solution to decarbonize dense areas

- Target by 2018: > 50% renewable energies in all our European networks
- 320 Networks operated in the world
- 2,000 employees
- 9,120 GWh/year from Combined Heat & Power (CHP) in France
- €1.7 billion Turnover + €700 million with Tabreed

With a strong ambition to develop 3 additional expertise centers by end of 2018

- North America
- Existing European expertise center
- Middle East & Central Asia, & Turkey
- Asia Pacific
District cooling systems

The solution for sustainable cities or industrial parks

What is a district cooling system?

A District Cooling System (DCS) is a centralized cooling system which provides chilled water for the air-conditioning system in user buildings for cooling purposes.

The DCS is an energy-efficient, air-conditioning system as it consumes 35% less electricity as compared with traditional air-cooled air-conditioning systems.

A typical DCS comprises the following components:

- Central Chiller Plant: generates chilled water for cooling purposes.
- Distribution Network: distributes chilled water to buildings.
- Energy Transfer Station: interface with the buildings' own air-conditioning circuits.

Key benefits

- Less CO₂ emissions
- Reduction of primary energy consumption (less electricity & less water consumption)
- Less usage of chemicals
- Improvement in energy efficiency
- Renewable energy integration
- Reduction of noise and valuable space needed inside buildings
- Freed up roof space

District cooling systems as backbone of smart city.
District heating systems

The most efficient way to decarbonize city centers

What is a district heating system?
A district heating network is a system that produces heat from a central location via one or more production units, generally using different energy sources. It is a primary means of supplying local and renewable energy. Underground pipes are used to deliver heat to customers in the form of hot water or steam.

Heat networks can be fed by a diverse range of often renewable, or waste heat, sources including:
- Waste heat from power stations or industrial processes.
- Energy from waste (EfW) facilities.
- Biomass and biogas fueled boilers and CHP plants.
- Gas-fired CHP units.
- Fuel cells or solar thermal.
- Heat pumps.
- Geothermal sources when available.
- Electric boilers (usually from wind or PV renewable electricity).

Key benefits
- Efficient transportation and use of heat for a wide variety of customers
- Lowering costs of energy generation
- Fuel flexibility and access to otherwise lost waste heat sources

The most efficient way to integrate renewable or waste heat.
ENGIE international presence in district energy operations

Global leadership in district energy

ENGIE is a DHC leader in countries like the UK, France, Italy, Spain and Portugal, as well as Malaysia and the Philippines.

Over 320 district heating and cooling networks operated in almost 20 countries

ENGIE expertise covers operation of steam, hot and chilled water networks as well as embedded generation.
Our references in district cooling

Megajana – a joint venture between Cyberview Sdn Bhd and ENGIE Services Malaysia Sdn Bhd, has developed a District Cooling System in Cyberjaya since 1998, supplying round-the-clock chilled water to data centers, malls and office towers for their air-conditioning purposes.

The District Cooling System of Northgate is a project of Philippine DCS Development Corporation, a joint venture between Filinvest Land Inc. and ENGIE Services Philippines. By mid-2017, the DCS will efficiently cater the 24/7 cooling requirements of business process outsourcing office buildings at Northgate Cyberzone.

**Key facts**

- Climespace
  - 10 districts cooling plants
  - Distribution: 73 km network length
  - Cooling capacity: 360 MW
  - 3 energy storage facilities
  - 600 connected customers
  - 5 millions m³ refreshed

- Megajana
  - 2 districts cooling plants
  - Distribution: 12 km network length
  - Cooling capacity: 49.2 MW
  - Thermal storages: 95,500 RTh
  - 43 buildings connected

- Northgate
  - 1 district cooling plant
  - Distribution: 3.4 km network length
  - Cooling capacity: 42.2 MW
  - 12 buildings connected
  - 8,640 RT buildings peak demand

**Key benefits**

- Climespace
  - +50 % of energy efficiency
  - -50% CO₂ emissions
  - -35 % of electricity consumption
  - -65% water consumption

- Megajana
  - 15% improvement in energy efficiency
  - More than €200K saving by improved plant operation

- Northgate
  - 35 % improvement in energy efficiency
  - 11,500 tons of CO₂ savings per year
  - 13 % savings for the clients

*Compared to stand-alone systems.
Our references in district heating

CPCU (Compagnie Parisienne de Chauffage Urbain), the first district heating network in France, is operated by ENGIE since 1927. Today, CPCU is distributing more than 50% of renewable or waste heat.

ENGIE through the Telcha project company has designed, built and manages a district heating network in the city of Aoste in Italy. The project of the district heating of Aoste with the recovery of fatal heat from a steel factory was one of the most innovative examples of the new energy strategy of Italy.

The Metro Wastewater Reclamation District is the wastewater treatment authority for most of metropolitan Denver. Treating 140 million gallons per day, it is the largest wastewater treatment plant between the Mississippi River and the West Coast.

CPCU

AOSTE

METRO Wastewater Cogeneration

Key facts

8 district heating plants
Distribution: 470 km of interconnected networks
Heating capacity: 3,291 MW
Connected customers 465,000 housing-units equivalents heated (equivalent of 200,000m²)
Energy mix
Biomass, ULS (Ultra-Low Sulfur) fuel oil, gas & gas-fired cogeneration, energy recovery from household waste, hard coal

Key benefits*

A responsible commitment from the public utilities sector
Growing energy efficiency
Greater environmental efficiency

Key facts

1 district heating plant
Distribution: 47 km network length
Heating capacity: 95 MW
Connected customers 500 buildings for more than 25,000 habitants

Key benefits*

Reduction of CO₂ emissions by 30,000 tonnes
Reduction of the energy bill by as much as 20 %

Key facts

1 wastewater treatment plant
Heating capacity: 9 MW/h
5 MW of power and hot water
Connected customers 1.8 million people across a 715-square mile service area including Denver, Arvada, Aurora, Brighton, Lakewood, Thornton and Westminster

Key benefits*

Reduction of the transmission and distribution charges
Capitalization on waste fuel source
Less emissions for the water treatment facility

*Compared to stand-alone systems.
Our references in district heating and cooling

**Queen Elizabeth Olympic Park & Westfield Stratford City**

The Energy Center for the Olympic Park & Stratford City, built and operated by ENGIE UK, includes a 3 MW wood chip biomass boiler and Combined Cooling, Heat and Power (CCHP) plant to generate heating, Cooling and electricity. Hot and chilled water are distributed through a district energy network to the Olympic Park.

**Districlima**

Districlima was Spain’s first urban heating and cooling district network. The project was initially located in an urbanistic remodeled area of Barcelona that includes the Cultures Forum 2004 (Besos seafront). The project encompasses the design, construction and later use, over a 25 year concession of the Forum’s production station and energy distribution network.

**Climaespaço**

Based on an international call for tenders through the International Exposition of Lisbon EXPO’98, Climaespaço introduced the concept of centralized thermal distribution at an urban scale in Portugal. As a result of an important combination of innovative technologies in the production and distribution of thermal energy, the Lisbon network is the first of its kind and widely recognized around the world. Climaespaço is in charge of the design, financing, construction and operation of the entire system.

### Key facts

- **2 integrated tri-generation energy centres (heating, cooling and power)**
- **Distribution**: 16 km of distribution pipework
- **Current cooling capacity**: 57 MW
- **Current heating capacity**: 92 MW
- **3,000 current connected residents**
- **Design, build, finance, operate and maintain contract**

### Key benefits*

- **24% reduction in CO₂ emissions**
- **75% of area electricity needs covered**
- **40% savings in energy consumed equivalent to a reduction of 2,900 metric tons of CO₂ emitted, compared with conventional facilities.**
- A key element of the Olympic legacy for London

### Key facts

- **2 district heating & cooling plants**
- **Distribution**: 18 km network length
- **Cooling capacity**: 45.4 MW
- **Heating capacity**: 46.8 MW
- **94 connected buildings**
- **Supplied by a Waste Incineration Plant with 3 incineration lines**

### Key benefits*

- Reduction of greenhouse effect gas emission
- Significant reduction of refrigerant losses into the atmosphere
- More space available for business or other uses

### Key facts

- **1 trigeneration plant**
- **Distribution**: 85 km of grid pipework
- **Using co-generation with Gas turbines and absorption chillers**
- **Cooling capacity**: 35 MW
- **Heating Capacity**: 29 MW
- **Electrical capacity**: 5 MW
- **3,500 customers**
- **130 connected buildings**

### Key benefits*

- **-40% CO₂ emissions**
- **-20,000 tons per year**
- Possibility of using high efficiency technologies (cogeneration, waste heat, heat pumps...)
- Preserves architecture

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*Compared to stand-alone systems.*
In April 2017, ENGIE (50%) and Axium Infrastructure US (50%) won a 50-year concession valued at $1,165 billion USD to address the Ohio State University’s (OSU) energy sustainability goals for its 485-building campus in Columbus, Ohio, one of the largest university campuses in the United States.

The Ohio State University was founded in 1870 and welcomes approximately 100,000 people every weekday during the academic year.

The Ohio State University owns its existing utility system and historically operated it as well. After a more than two-year-long process in which 44 interested parties initially participated, ENGIE and Axium Infrastructure US won the opportunity to operate and maintain this utility system and provide the university with an ambitious program of energy savings.

ENGIE and Axium Infrastructure are in charge of:
- The operation and optimization of the university’s utility system.
- The implementation of energy conservation measures and future projects to improve the university’s energy efficiency by 25% within 10 years.
- The construction of a new Energy Advancement and Innovation Center for energy research. The Center would create a living laboratory where faculty, students, alumni, entrepreneurs, industry experts, and ENGIE researchers can collaborate on next-generation technologies and services in areas such as smart energy systems, renewable energy, and green mobility.
By acquiring a 40% stake in Tabreed, ENGIE becomes the worldwide leader in independent district cooling.

Key benefits*

Its services have reduced energy consumption in the GCC by more than 1.4 billion kilowatt hours annually, which has led to the elimination of over 713,000 tons of carbon dioxide emissions yearly from our atmosphere – the equivalent of removing over 143,000 cars from our streets every year.

In the 19 years since its establishment, Tabreed has become the region’s leading district cooling provider. Its portfolio now includes 71 plants in the GCC that deliver over 1 million refrigeration tons to projects vital to their respective nations’ economic development and diversification.

In June 2017, ENGIE acquired a 40% stake in National Central Cooling Company PJSC (Tabreed) from Mubadala Investment Company (Mubadala), the Abu Dhabi based strategic investment company. Through the partnership with Mubadala, Tabreed is becoming one of ENGIE’s main regional district cooling’s development platforms.

Tabreed has steadily grown over the years to become a key player in enabling the region’s economic development. The company today provides its innovative, efficient and reliable cooling solutions to iconic infrastructure projects in the United Arab Emirates (UAE) and across the Gulf Cooperation Council (GCC).

With over 71 district cooling plants located throughout the GCC, the company today delivers over 1 million refrigeration tons to key developments in the region. Its portfolio includes Abu Dhabi’s Al Maryah Island, Yas Island, Sheikh Zayed Grand Mosque, the Dubai Metro, Dubai Parks. And among prestigious customers: Ferrari World and World Trade Center in Abu Dhabi and Marina Mall in Dubai.

*Compared to stand-alone systems.