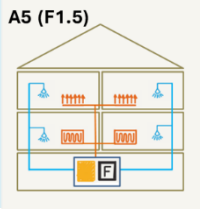
# Versoix-Centre, Geneva – Switzerland

A 4-pipe district heating and cooling network with a 400 $kW_{th}$ HP on lake water, for mixed-use building complex.




## Key facts

**Building**

| | |
|---|---|
| Location | *Geneva, Switzerland* |
| Construction | *2011-2015* |
| Type | *Mixed use: activities, hotel, nursing home, multifamily building* |
| Heat distribution | *Underfloor heating* |
| Heated area | *27'300 m²* |
| Cooling demand area | *24'800 m²* |
| Level of insulation | *High performance* |
| Heat production | *1.7 GWh/y (63 kWh/m²/y)* |
| Cooling demand | *30 kWh/m²/y* |

**Heat pump and source**

| | |
|---|---|
| Number of HP | *1* |
| Installed capacity | *400 $kW_{th}$* |
| Operation mode | *Bivalent* |
| Heat source | *Deep lake water* |
| Backup heat source | *1.4 MW gas boilers* |

**Heating system**

| | |
|---|---|
| SH share, demand | *68%, 43 kWh/m²/y* |
| Heating temperature | *Max. 40°C at -5°C* |

**Domestic hot water**

| | |
|---|---|
| DHW share, demand | *32%, 20 kWh/m²/y* |
| Type of system | *Decentralized with one booster HP on DH in each building* |
| Max. temperature | *60°C* |
| Circulation system | *Yes* |

**Other information**

| | |
|---|---|
| Heat mix (2018) | *77% HP, 23% boilers* |
| Cooling mix (2018) | *61% lake, 39% HP* |
| HP SPF (measured) | *3.24 (annual)* |
| | *3.21 (winter)* |
| | *3.90 (summer)* |

**Lessons learned**

- Discrepancy between subscribed capacity and real capacity needs of the customers.

In this study, we investigate the operation of the "Versoix-Centre" thermal network in the canton of Geneva during 2018. The network provides heating and cooling to several new buildings (built after 2010) with a total surface area of around 27'000 m².

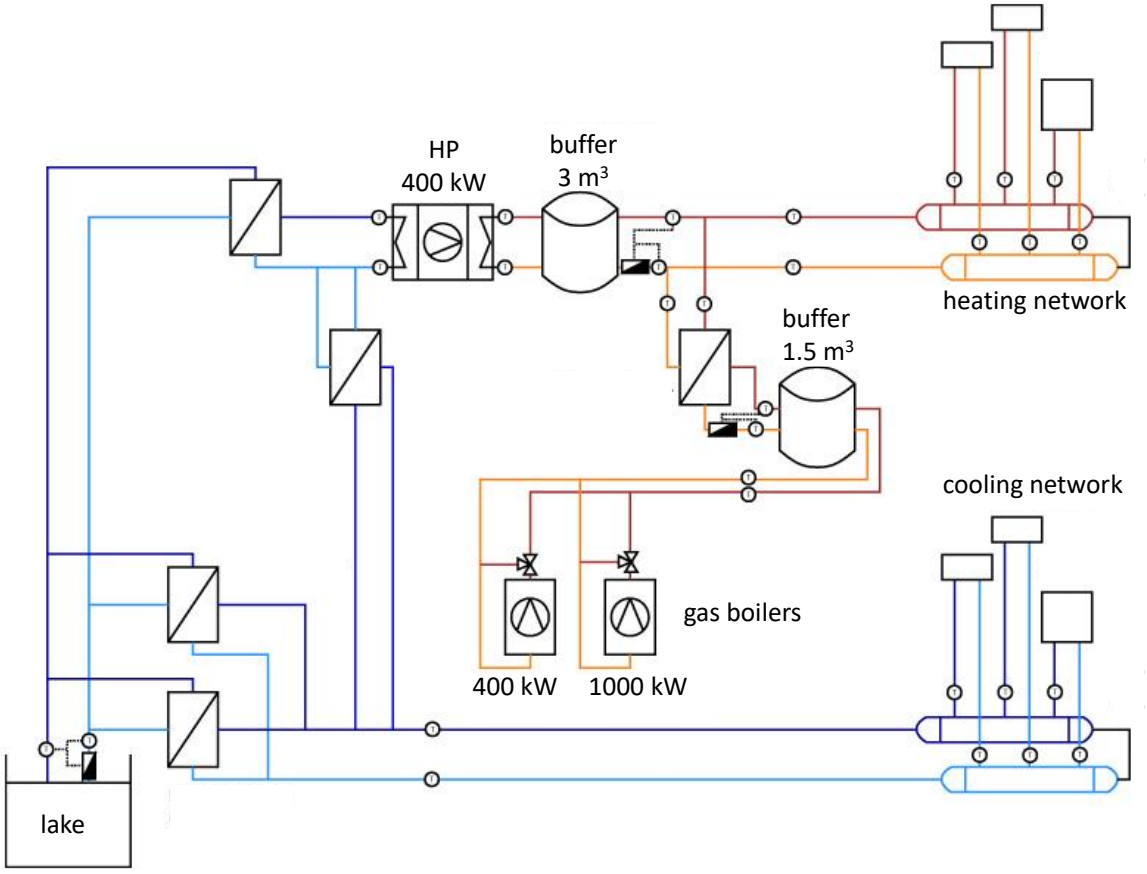
For year 2018, the heat mix is 75% HP & 25% fossil fuel boilers, and the cooling mix is 60% lake & 40% HP. The centralized HP has a SPF of 3.24 (3.21 in winter; 3.90 in summer).

For 2018, a warm year yet with outside temperature range close to normative values:

- The overall DH oversizing is almost 2 times the actual building requirements (contract power/delivered power = 1.8).
- For DC, the oversizing reaches a factor of 3 (contracted power/delivered power = 2.9).

As the real capacity needs of the buildings connected to this DH/DC are close to those estimated for the connected buildings based on normative indications, this oversizing situation could be partly explained by differences between the project and realization phases.

# Versoix-Centre, Geneva – Switzerland: Technical details




## Description of the technical concept

"Versoix-Centre" is a 4-pipe thermal network in Versoix (Geneva). The network has a single thermal power plant, with two distribution networks: one for heating (DH), and the second for cooling (DC) the buildings connected to the thermal grid. The 7 connected buildings were built between 2011 and 2015 and have an energy reference area of about 27'300 $m^2$, with mixed use (administrative, home for the elderly, cultural activities, hotel, shopping center, multifamily building). The heating base load is produced by a 400 $kW_{th}$ centralized HP, which heat source is Lake Geneva (at a depth of 45 m, where temperatures vary between 7°C and 10°C). Heating pic load and backup is provided by two boilers: a condensing gas boiler (400 kW) and a second dual-fuel boiler (1 MW) without possibility of heat recovery on flue gases.

The distribution temperatures of the DH network are relatively low, with a supply temperature of 45°C. The production of DHW at higher temperatures is the responsibility of the customers, who use the DH as a cold source for decentralized HP in the substations, after the primary heat exchanger of the DH substation.

Cooling is either done directly with lake water used to cool down the DC network via a heat exchanger, or by the centralized HP transferring heat from the DC network to the DH network. In this second option, the HP covers simultaneously the heating and cooling demands on the two distribution networks (to pool energy needs). The distribution temperatures of the DC network are considerably high, with a supply temperature that can reach 10°C, a temperature compatible with the deep waters of the lake.

Final report: DE OLIVEIRA FILHO, Fleury, HOLLMULLER, Pierre (2020). Réseau thermique Versoix-Centre : Analyse du fonctionnement et bilan énergétique. Url: https://archive-ouverte.unige.ch/unige:145705