DECARBONIZATION OF BRESCIA DISTRICT HEATING SYSTEM – EXECUTIVE SUMMARY

With the document "The European Heating and Cooling Strategy" from February 2016, the European Commission emphasized how the synergistic use of waste-to-energy systems and district heating, as well as cogeneration systems, can promote decarbonization and produce cleaner, more affordable energy.

It is precisely with this vision that, with foresight starting in 1972, the city of Brescia has positioned itself at the forefront of the national and European energy landscape, creating an **integrated system of energy production, district heating, and thermal recovery from industries**, resulting from a **long-term plan** developed by the Municipality and the municipal utility company (A2A Calore e Servizi).

Over the years, the expansion of the district heating network, the introduction of cogeneration systems (1978-1982: Lamarmora and Nord plants), and the Waste-to-Energy Plant (1998) have enabled the system to evolve into what is now an internationally recognized **model of circularity and efficiency**. The European Landfill Directive requires EU countries to reduce landfill disposal rates to 10% or less by 2035. Brescia already boasts a landfill disposal rate of 0%. This is made possible, on one hand, by the ability to separate urban waste collection, which in Brescia has exceeded 70%, and on the other, by the **ability to process waste, recovering it 100%, either as material or as energy**.

Since 2015, A2A Calore e Servizi has launched a decarbonization project to improve and further decarbonize the energy system. The most important milestones are:

- 2016, with the installation of a Waste Heat Recovery from “Ori Martin”, a steel factory
- 2019, with the commissioning of a Thermal Heat Storage at the “Lamarmora” site
- 2020, with the improvements on the DeNOx system in Lamarmora. Additionally, this year marked the complete phase-out of coal
- 2021, with the commissioning of Thermal Heat Storages at the “Centrale Nord” after the demolition of 2 Heavy Fuel Oil tanks, with the installation of a PV system in “Lamarmora” on boiler building roof top and with the installation of a Waste Heat Recovery from “Alfa Acciai”, a steel factory in the city
- 2023, with the installation of 9 Big Heat Pumps for Heat Recovery from flue gas condensation at the WtE plant
- June 2025, when the inauguration of a new Waste Heat Recovery system from the data center will take place

These projects greatly improved the share of renewable energy and waste heat while reducing emissions and with limited land occupation, reducing soil sealing and environmental impact. Between 2015 and 2024, the project led to a progressive reduction in the district heating network’s supply temperature, enabling efficient solutions such as atmospheric thermal storage systems, the recovery of waste heat from the steel plants, and innovative strategies including the installation of cascade large heat pumps within the flue gas condensation system of the Waste-to-Energy (WTE) plant Furthermore, the implementation of an IT-based thermal load forecasting and optimal dispatching system enables the optimized operation of the plants, maximizing key performance indicators (KPIs) for both thermal and electrical production.
In 2024, the district heating system used **83% non-fossil fuels.**
Compared to the 2016 baseline, in 2024 **CO2 emissions decreased by 73%, NOx emissions by 92%, and SO2 emissions by 100%.**

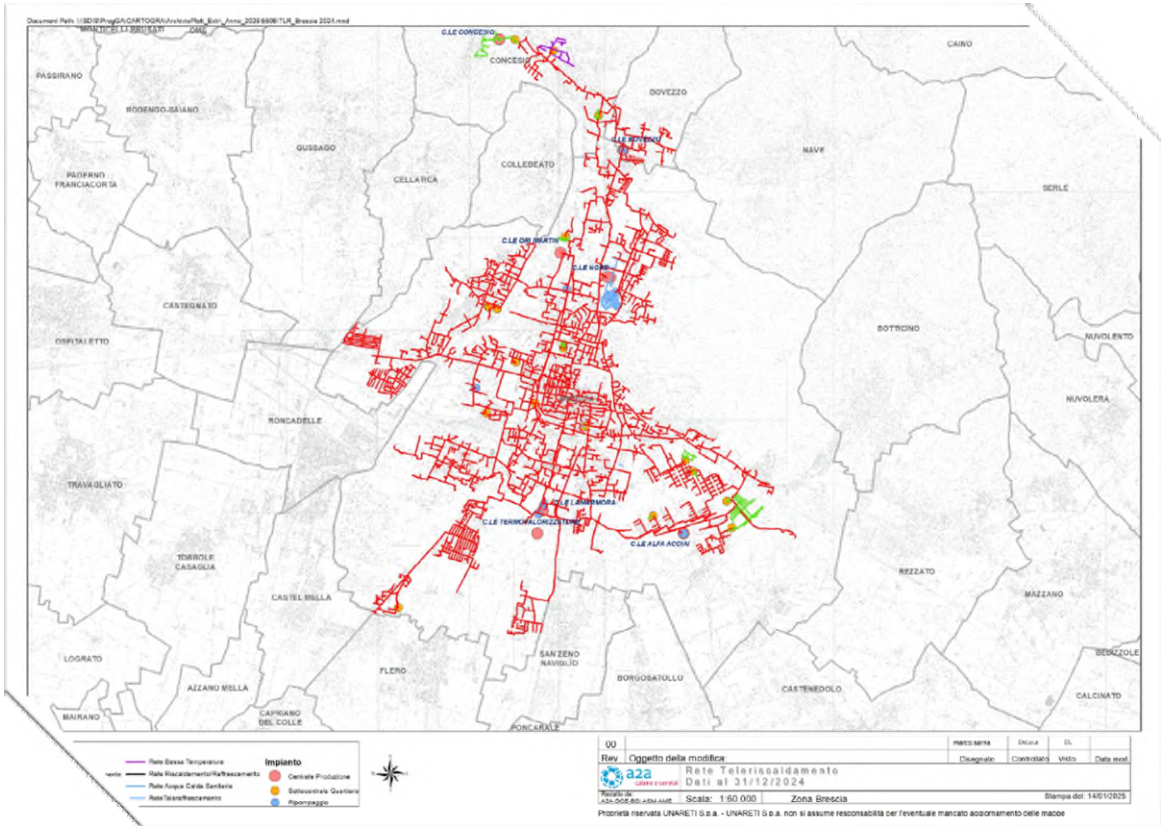
District Heating Location: Brescia, Italy

Utility: A2A Calore e Servizi (100% controlled by “A2A Life Company” group)

Year of DH system establishment: 1972

Duration of the project “Sistema Ambiente Energia Brescia”: 2015-2024

Map of the system (at December 2024):



Network:

----- District Heating Network

----- Direct Network

----- Low Temperature DH Network

----- Heating/Cooling Network

----- DHW only Network

----- District Cooling Network

Plants:

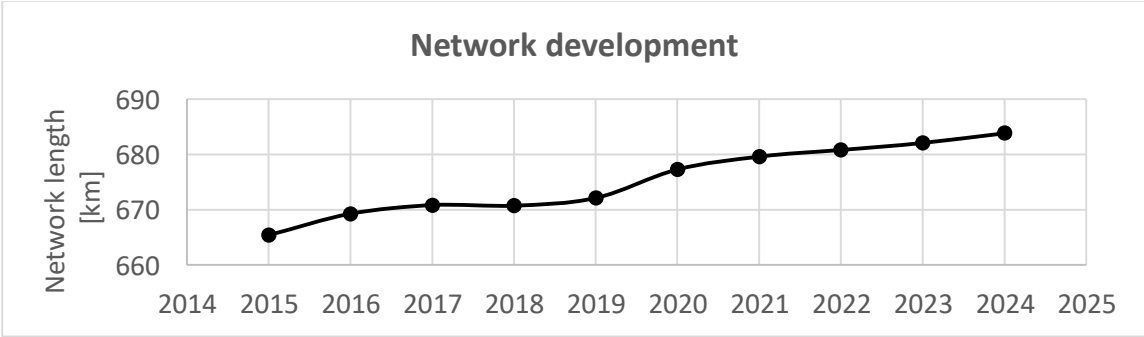
- Main Heat Production Facility
- Neighborhood Heat Production Facility
- Pumping station

Existing Production Locations, Existing Production Units, Planned future installations, Decommissioned units

Site	Plant type	# Units	Nominal size [MWe]	Nominal size [MWt]	Storage size [m3]	Installation year	Decommissioning year
Lamarmora	CHP Group 1 (Coal+Natural Gas)	1			-	1978	2019
	CHP Group 2 (Oil+Natural Gas)	1			-	1981	2015
	CHP Group 3 (Multi-Fuel)	1	72	110	-	1988	2015
	Boiler	3	-	255	-	2015/2016	-
	Thermal Storage	1	-	-	7200	2020	-
	Waste heat recovery (Data Center)	1	-	0.1	-	June 2025	-
TU	WtE	1	117	180	-	1998	
	Heat pump - Flue Gas Cond.	3	-	60	-	2022	
Centrale Nord	CHP (Diesel Engines)	2			-	1987	2007
	Boiler	6	-	164	-	2007	
	Thermal Storage	2	-	-	4400	2022	
Concesio	Boiler	2	-	2	-	2005/2010	
Bovezzo	Boiler	2	-	11.6	-	1975	
Alfacciai	Waste heat recovery (Steel)	1	-	25	-	2021	
OriMartin	Waste heat recovery (Steel)	1	-	10	-	2016	

Distribution Network:

The network during the same reference period (2015-2024) has developed according to the following trend:



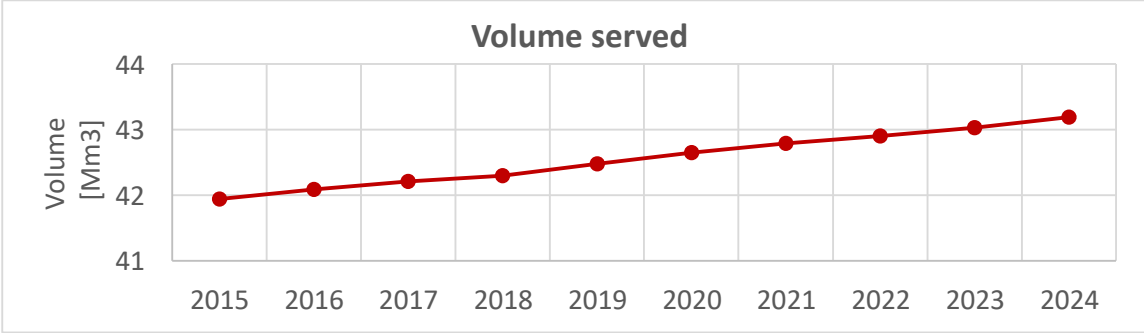
The existing network's dimension and the installation period, in terms of percentage, is outlined below:

DN	%
<40	22%
40	1%
50	25%
80	19%
100	9%
125	0%
150	8%
200	5%
250	4%
300	2%
350	2%
400	1%
500	1%
600	1%
>600	1%
Total	**100%**

Installation period	%
Before 1980	9%
1980-1990	19%
1990-2000	28%
2000-2010	32%
2010-2020	9%
After 2020	3%
Total	**100%**

Customer facilities served:

Types of buildings: The customers and the buildings served in Brescia are of all types: residential, commercial, industrial, and public sector. During the period 2015-2024 the volume of building served (in cubic meters) developed with the following trend:



The following graph illustrates how the various projects, depicted by black vertical lines, impacted the mix of the heat production. It distinguishes between heat produced from fossil fuels (represented by the grey area) and non-fossil sources (represented by the green area). The graph also shows the percentage contribution of each source to the total heat production with the same color coding: