

Brescia District Energy System

In Brescia, the choice of district heating, already starting from the 1970's, has continued to make an important contribution to the containing of atmospheric pollution in the city. To date, over 70% of the population of the Brescia Municipality lives or works in district-heated area.

The project born in 1972, with the first pilot experiment, consolidating itself over the years with a continuous development of the network and with the starting up of new production plants, always realized with the best technology available in the market and with particular attention to systems of tackling and monitoring polluting emissions.

In 1978 the first cogeneration plant was launched (named "Lamarmora Plant"), combining the production of electrical energy and heat. Cogeneration permits a primary saving in energy in a range of 20-30% compared to the separate production of electricity and heat. Different fuels can power the Plant: natural gas and coal, with a fuel mixture too. In 1998 the waste-to-energy plant came into operation, using as fuel solid urban waste. This plant, able to burn 700 thousand tons of waste and biomass annually, provides annually 528 million electric kilowatt-hours and 505 million kilowatt-hours of heat, with a saving of 150 thousand ton oil equivalent, and avoiding the emission into the atmosphere of 400 thousand tons of carbon dioxide. A further step forward was taken in 2004 with the completion of the plant with biomass-powered design. The heat produced by waste to energy covers over 60% of the heating requirements of district heating connections. The district-heating network of Brescia goes beyond the municipal boundaries to serve, as well a good, part of the adjacent municipalities of Bovezzo and Concesio.

At 31st December 2016 buildings for over 41 million cubic meters were connected.

The "Efficient District heating and Cooling Systems in the EU" study, prepared by Joint Research Centre, identifies Brescia District Heating as one of eight case studies that has key factors enabling to develop high quality, efficient and low-carbon DHC system.

Brescia's DHC system is a good example of an efficient and integrated approach to energy and waste management. The key success factors identified in this case study are summarised below.

- I. *Support from the Municipality. Since the DH grid commissioning in 1972, the Municipality of Brescia has strongly supported its deployment. The Municipality realised since the beginning the importance of taking an integrated approach for developing the DH grid and followed the best available practices, mainly based on Scandinavian examples. DH was used as a tool to reduce CO2 emissions and Brescia's carbon footprint and the results have exceeded the initial expectations.*
- II. *ii. Integrated approach to energy and waste management, including long-term heat planning. The DH system was carefully designed taking a long-term approach and seeking a performant, cost-efficient and sustainable heat supply at competitive prices.*
- III. *iii. Use of local fuels, namely waste-to-energy and surplus heat.*
- IV. *iv. Successful cooperation between public and private parties (PPP). The Municipality of Brescia holds 25 % of the shares of the DHC grid operator A2A, which is translated into a high influence on the Group's strategic decisions.*
- V. *v. Competitive prices. The prices of Brescia's DH grid are competitive against the alternative options for heat supply (natural gas). This is mainly due to the use of efficient state-of-the-art technologies and local fuels.*
- VI. *vi. Innovation. The DHC system integrates innovative technologies and management modes to enhance its competitive position and the quality of the service.*

The district heating network has almost reached its maximum extension; nowadays the main challenge is to make the system more efficient in terms of sustainable resources. IRecovery is an example of our efforts toward this objective.

Summary

The innovative iRecovery project is the first of its kind in Italy, and now the heat from the steelworks that is normally lost will be caught and exploited to produce electricity and heat for our city of Brescia.

Together Ori Martin steelworks, Tenova (technological engineers), Turboden (turbo-generator manufacturers) and A2A (multiutility and energy supplier), have created a sustainable energy and environmental project that truly integrates industry and the city.

An enormous amount of heat is lost during steel production, so iRecovery will carry this heat to a recovery system that will then generate steam. Initially the steam is stored and then later converted to electric power through an Organic Rankine Cycle turbine, and to thermal power that supplies the Brescia remote heating grid.

It is a totally closed cycle so there isn't leakages of water.

iRecovery will provide heat to 2000 families in the winter, and in the summer will produce clean electricity able to satisfy the needs of 700 families, in a manner that totally respects the environment and guarantees a reduction of 10,000 tons of CO₂ into the atmosphere.

Every year the factory will provide the city with 50 thermal GWh, thanks to a network of 4 companies and to the Pitagoras project promoted by the European Union, combined to make Brescia a real Smart City.

iRecovery: steel heat to heat the city.

Description

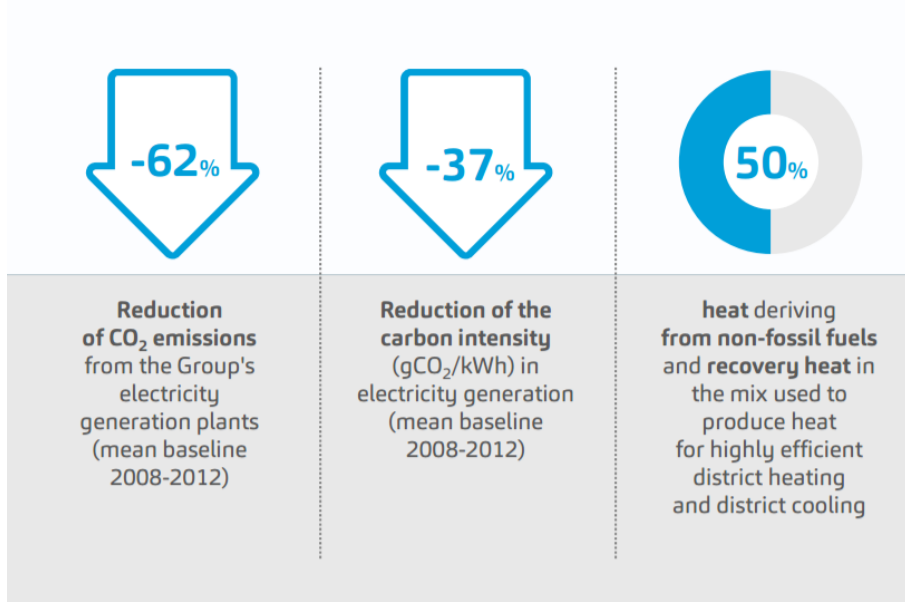
To A2A, sustainability is a strategic element, integrated into the growth and development of the business, to facilitate the generation of shared value in the short, medium and long term.

In early 2016 a process of gradual consultation with senior management and the main areas of the company was launched in order to stimulate constructive dialogue concerning the strategic direction of future sustainability efforts. The outcome of this process was the definition of a Sustainability Policy and Plan capable of satisfying the Group's ambitions and contributing to the achievement of the United Nations 2030 Sustainable Development Goals (SDGs).

In its statement, the Sustainability Policy defines the meaning of sustainability for the A2A Group: "Helping communities be sustainable". For the Group, this commitment means improving the quality of people's lives through a new, low-carbon circular economy based on smart networks and services. The Policy is built around four pillars (Circular Economy, Decarbonisation, Smart Networks and Services and People Innovation), which sum up the process that the Group wishes to follow to spread sustainability among all of its stakeholders.

Decarbonisation means contributing to achieve national and EU targets for the reduction of greenhouse gas emissions. In particular, A2A want to increase, up to 50%, the heat deriving from non-fossil fuels and recovery heat - in the mix used to produce heat for highly efficient district heating and district cooling. A2A is aware that, in the residential and tertiary sector, district heating networks are a major component of any policy to promote the rational use of energy. They are a particular effective way of making the best possible use of local of energy (geothermal energy, incineration of urban waste, burning of wood and waste heat from industry).

Decarbonization - 2030 TARGETS



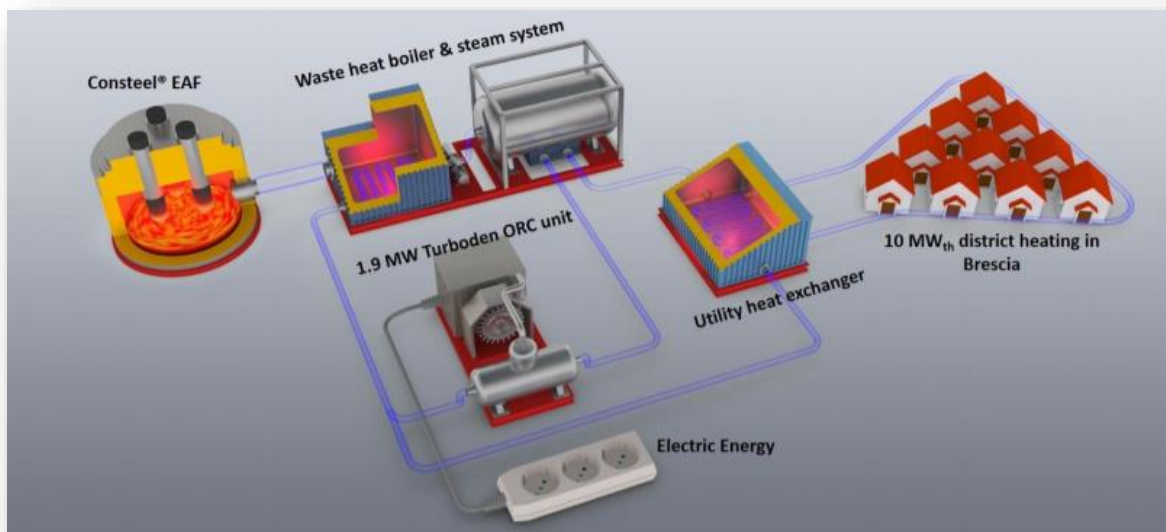
Two important steelworks in Brescia generate a large amount of medium-low temperature heat that is normally lost. The iRecovery project aims to exploit this dispersed heat to produce electricity and heat for the city of Brescia.

iRecovery technology is a heat recovery cooling system for different industrial furnaces, among others the electric arc furnaces (EAF), submerged arc furnaces (SAF), basic oxygen furnaces (BOF), walking beam furnaces and pusher type furnaces. The difference between iRecovery technology and the conventional cooling system is related to the use of energy alternatively lost, now recovered as steam. The energy recovered can be flexibly used for process steam, heating purposes and electricity power generation.

Ori Martin operates in Brescia, Italy a 90 t/h EAF. The hot off gases leaving the EAF are used to preheat the continuous scrap flow towards the furnace. After leaving the charging system, the off gases still have a temperature of approx. 500 °C. Therefore they were cooled down to 200 °C by a water quenching tower. This technology dissipates energy without any utilization. Since energy costs are a becoming issue and environmental awareness is increasing, Ori Martin decided to install an iRecovery system.

The off gases coming from the charging system are passed through a refractory lined tunnel into the waste heat boiler. The existing quenching tower is kept as backup and can work in a bypass. The waste heat boiler is composed by a membrane wall casing, evaporator, economizer bundles and a steam drum. The steam drum stores the boiler water and collects the steam/water mixture returning from the evaporators and walls. Dust sticking to the bundles is removed by knocks coming from a pneumatic rapping system. This dust falls into hoppers and is discharged by a water-cooled chain conveyor. The generated steam feeds two different systems depending on seasons:

- In the summer: to an ORC module which transfers the thermal power inside the steam into electric energy.
- In the winter: to a heat exchanger connected the municipal district heating network of Brescia. The returning condensate of both systems is forwarded to the feed water station and afterwards pumped back into the boiler.



With this system, iRecovery will provide heat to 2000 families in the winter, and in the summer will produce clean electricity able to satisfy the needs of 700 families, in a manner that totally respects

the environment and guarantees a reduction of 10,000 tons of CO₂ into the atmosphere. Every year the factory will provide the city with 50 thermal GWh.

https://drive.google.com/open?id=0B_mQhC8AYFAhNC03dnNsRVJtMXM

The innovative iRecovery project is the first of its kind in Italy, and now the heat from the steelworks that is normally lost will be caught and exploited to produce electricity and heat for our city of Brescia, aimed at creating a sustainable energy and environmental project that truly integrates industry and the city.