New projects for the development of biomethane production

Inauguration of the Cavaglià plant for the recovery of plastic (+45 kt treated per year)

Purchase of new photovoltaic systems (+99.8 MW of installed capacity and + 65 GWh of annual production)

Flexibilization work completed in the power plants of Sermide and Ponti sul Mincio

77% of joints of the electricity grid of Milan replaced to ensure greater reliability of service

Replaced about 30 km water network and enhanced activity for the search for losses
## EFFICIENT MANAGEMENT OF GROUP INFRASTRUCTURES

Efficient management of Group infrastructures, promoting technological innovation, performance improvement, continuity and reliability of service; development of waste treatment plants capacity, investments in renewable energy and innovative technology, including through the acquisition of new companies strategic to the Group; guarantee of high safety standards in infrastructure management.

<table>
<thead>
<tr>
<th>RISK FACTORS FOR SUSTAINABILITY</th>
<th>OPPORTUNITY FACTORS FOR SUSTAINABILITY</th>
<th>MANAGEMENT METHOD</th>
<th>2018 ACTIONS</th>
<th>SUSTAINABILITY PLAN ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to meet targets on energy efficiency, recovery and treatment of waste and generation from renewable sources.</td>
<td>Not yet identified.</td>
<td>Identification of dedicated teams into corporate functions focussed on the development of energy efficiency initiatives; construction and commissioning of plants for waste recovery and processing and the acquisition of energy generation assets from renewable sources.</td>
<td>Start-up of the new plastic selection plant in Cavaglià</td>
<td>CIRCULAR ECONOMY - Recovery and treatment</td>
</tr>
<tr>
<td>Malfunctions and interruptions in plant activities and network infrastructures.</td>
<td></td>
<td>Efficient management of plants and networks so as to prevent any disservices or failures and guarantee the reliability and performance in operation, also thanks to preventive maintenance and a careful management of emergency intervention teams to cope with emergency situations.</td>
<td>Numerous activities for the monitoring and safety of dams.</td>
<td>- Water</td>
</tr>
<tr>
<td>Possible vulnerabilities of ICT infrastructures and applications for IT, logical and viral attacks and/or system failures.</td>
<td></td>
<td>Adoption of mechanisms to defend and protect against logical and viral attacks and/or possible system failures; projects to improve the infrastructures of the DPCs (Data Processing Centres), rationalization and improvement of IT platforms and applications and control of industrial processes (OT) and segregation of accesses to information, thanks to the definition of a multi-year master plan of initiatives linked to cybersecurity in the Group infrastructures.</td>
<td>Completed the activities of flexibility of the CCGT of Sermide and Ponti sul Mincio and started the process for the CCGT of Cassano.</td>
<td>DECARBONISATION - District heating</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>77% of Milan’s electricity distribution network joints replaced to improve resilience.</td>
<td>- Renewables</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A system for the efficiency of gas preheating activities has been implemented in order to reduce gas consumption.</td>
<td>SMARTNESS - Smart grid</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The first 30 km of the sewerage system for connection to the new Val Trompia purifier have been built.</td>
<td>- Smart city</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Three hexavalent chromium treatment plants were built in Villa Carcina, Sarezzo and Gardone.</td>
<td></td>
</tr>
</tbody>
</table>
6.1 The manufacturing capital in the Environment Business Unit

The plants managed by the Environment Business Unit cover all phases of the integrated waste cycle: from recycling management, ecological platforms and landfills through to energy and material recovery and processing plants.

### Figure 13. Plants of the Environment BU and geographical location

<table>
<thead>
<tr>
<th>TYPE OF PLANTS</th>
<th>NUMBER OF PLANTS</th>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material treatment and recovery</td>
<td>21</td>
<td>1,226,000 t/y</td>
</tr>
<tr>
<td>ITS</td>
<td>7</td>
<td>642,000 t/y</td>
</tr>
<tr>
<td>Waste-to-energy plants</td>
<td>7</td>
<td>260 MW*</td>
</tr>
<tr>
<td>Landfills</td>
<td>10</td>
<td>7.696 Mt/a</td>
</tr>
<tr>
<td>Biogas production</td>
<td>16</td>
<td>24 MW*</td>
</tr>
</tbody>
</table>

In all, waste treated in Group managed plants totalled 4.8 million tonnes, of which: 3.8 at the Group owned plants (+4.1% compared to 2017) and approximately 1 million at the plants managed on behalf of third parties (Acerra waste-to-energy plant and Caivano plant).

The BU’s thermal energy production remained almost constant at 1,403 GWh, as did its electricity production, which amounted to 1,183 GWh. Compared to 2017, the Group has the largest presence along the supply chain, increasing the material treatment and recovery capacity of the BU, reaching approximately 1 million tonnes of waste treated per year (+6% compared to 2017), mainly thanks to the new plastic sorting plant at Cavaglià and an increase in the treatment capacity of some existing plants.

The portion of waste treated in waste-to-energy plants also increased (+7%), thanks above all to the completion of extraordinary maintenance activities at the Silla2 plant in Milan. On the other hand, the waste managed in the Group’s landfills decreased (-5% compared to 2017), in line with the policy of gradually reducing the use of this type of plant. The portion of waste treated in bi-drying plants remains constant.
Two new plants for the recovery of separately collected plastics

The Cavaglià plant, inaugurated in November 2018, has a production capacity of 45,000 tonnes per year, which through the use of innovative sorting machinery, divides plastic waste into different streams by type of material (e.g.: PE, PET, PP, film, etc.) and then send them for recovery. The plant also produces ferrous and non-ferrous metals, which are also sent for recovery, and the waste that cannot be recovered in terms of material is sent to the waste-to-energy plants for their energy recovery. The selection process inside the plant takes place thanks to 8 high-tech optical scanners able to recognize the polymers and divide them by type, shape and colour, all in an automated way. Once the individual fractions have been selected, they enter the manual sorting station, where the personnel can carry out the final quality control. The energy aspects of the plant have also been the subject of great attention: the new construction is in fact equipped with a 300 kW photovoltaic system that allows to produce 350 MWh/year, equal to 15% of the energy needs of the plant.

The Muggiano plant will have similar characteristics to the one built in Cavaglià. The site, started in December 2017, is at an advanced stage of construction: in October 2018, the civil works were completed and the assembly of the machinery is also nearing completion. Start-up is expected in spring 2019.

New energy from the fumes of the Brescia waste-to-energy plant

As part of the strategy to completely eliminate coal as an energy source for the city of Brescia, among the various interventions planned, a project will be carried out to increase the heat produced by the waste-to-energy plant through a revamping of the flue gas line. In particular, by 2022 the "flue-gas cleaning" heat recovery technology will be put into operation on all three lines of the plant serving the city. This intervention involves the installation of an innovative system that will allow a further improvement in emissions and at the same time an increase in the recovery of thermal energy from combustion gases of about 150 GWht per year, transferable to the district heating network. This energy will replace part of the heat produced today by the coal line of the Lamarmora power plant. The project also includes the installation of a new very high efficiency catalytic system for the abatement of nitrogen oxides, thus contributing to further reducing plant emissions. The investment envisaged is approximately 60 million euro.

NEW PROJECTS FOR THE DEVELOPMENT OF BIOMETHANE PRODUCTION

The transition to a circular system requires, among its pillars, the closure of the cycle with the re-entry into the production system of materials derived from waste and the energy recovery of waste fractions not otherwise recoverable. The Business Plan of the Environment Business Unit provides for the construction and management of 4 plants for the treatment of the organic fraction of solid urban waste collected separately. The plants will have a total capacity of over 280,000 tonnes per year and will all consist of an anaerobic digestion section with biogas production and subsequent refining of biomethane and a composting section for the treatment of waste material leaving the digesters for its transformation into compost. All these plants will produce more than 20 million Sm³ of biomethane, which will be fed into the SNAM national transport network or gas distribution network and used for transport. The design of the plants includes technological solutions and state-of-the-art technical devices to maximize reliability, minimize the escape of odours and maximize the production of biomethane and represent a concrete development of the circular economy.

In 2018, Linea Green also started studies for the design of plants for the transformation of biomass into biogas, which, after appropriate chemical-physical treatments (purification or upgrading), will be converted into biomethane to be fed into the gas distribution networks.
6.2 The manufacturing capital in the Generation and Trading Business Unit

The Generation and Trading Business Unit manages the Group's electricity production, through:
- **hydroelectric plants** using various different technologies, with a major component of storage and regulation capacity, thanks to the significant size of the reservoirs and the power of the plants;
- **thermoelectric plants**, mainly comprising plants based on high-performance combined cycle gas (CCGT) technology and two coal-powered plants (of which one was decommissioned in 2012) and one that uses heavy fuel oil;
- **photovoltaic plants**, installed at the sites of some Group thermoelectric plants or in areas close to them, plus a series of photovoltaic plants purchased in the secondary market as of 2017.

**Figure 14. Plants of the Generation BU and geographical location**

<table>
<thead>
<tr>
<th>TYPE OF PLANTS</th>
<th>NUMBER OF PLANTS</th>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroelectric plants</td>
<td>5</td>
<td>2,070 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td>Thermoelectric plants</td>
<td>9</td>
<td>6,895 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td>Photovoltaic plants</td>
<td>46</td>
<td>94 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

- Hydroelectric
- Thermoelectric
- Photovoltaic (only provinces where there are plants are reported)
In 2018, the BU slightly increased its production (+1.9% compared to 2017), with a marked improvement in the mix of sources used to benefit renewable ones. Unlike the previous year, there was a sharp increase in hydroelectric production (4,464 GWh), due to a more favourable weather season and market logic that push for the use of this source. This trend resulted in a decrease in the output of thermoelectric power plants (771 GWh less than in the previous year), mainly due on the one hand to a reduction in the use of the heavy fuel oil plant in S. Filippo del Mela, and on the other hand, to the fact that in 2017, the CCGT plants were called upon to produce more energy due to the unavailability of power plants in Switzerland and Germany. The demand for energy from the market remains constant for the more flexible CCGTs, for the balancing of the electrical system, and for the production of the Monfalcone power plant.

There was also a significant increase in the contribution from photovoltaic production, linked to the recent acquisitions described above.

The process of change required in recent years in the energy production sector covers many areas: from the transition to low-carbon, to the adaptation to climate change and the needs of the market, to the safety and modernization of the plant fleet. The following are some of the main initiatives carried out by the Business Unit during the year.

A2A RINNOVABILI FOR THE GROWTH OF THE GROUP IN THE SECTOR OF GREEN SOURCES

In line with the strategic plan and international objectives for the fight against climate change, the Group began to invest in renewable sources in 2017, through the implementation of innovative experiments and by seizing market opportunities with targeted acquisitions.

A2A Rinnovabili, a Group company that controls all the companies that own photovoltaic plants purchased in the secondary market, in 2018, acquired two additional plant portfolios (IMPAX and Talesun) for a total of 59 MW, reaching a total installed capacity of 93.8 MW and an estimated annual production of approximately 65 GWh. On-ground installations account for 63% of assets, the remaining 37% are systems installed on roofs of industrial customers.

During 2018, a partnership with the Talesun Group, one of the world’s leading operators in the field of solar energy, was launched, which gave rise to the creation of a dedicated vehicle called “758AM Srl”, for the development of new greenfield photovoltaic plants.

In addition A2A Rinnovabili was awarded the tender for the construction of a 10.5 MW photovoltaic system for the industrial buildings of the Rho Fiera exhibition area which will serve the underlying users.

In 2018, the BU slightly increased its production (+1.9% compared to 2017), with a marked improvement in the mix of sources used to benefit renewable ones. Unlike the previous year, there was a sharp increase in hydroelectric production (4,464 GWh), due to a more favourable weather season and market logic that push for the use of this source. This trend resulted in a decrease in the output of thermoelectric power plants (771 GWh less than in the previous year), mainly due on the one hand to a reduction in the use of the heavy fuel oil plant in S. Filippo del Mela, and on the other hand, to the fact that in 2017, the CCGT plants were called upon to produce more energy due to the unavailability of power plants in Switzerland and Germany. The demand for energy from the market remains constant for the more flexible CCGTs, for the balancing of the electrical system, and for the production of the Monfalcone power plant.

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Hydroelectric plants: activities for the protection of safety

The constant change of climate in an area at risk of hydrogeological instability, such as our country, has as its main principle the raising of safety levels for plants most exposed to this risk. Among the most relevant activities for 2018 are interventions to ensure the safety of dams and plants in extreme hydraulic situations (floods, alluvial events, etc.).

From an organizational point of view, the appropriate Civil Protection Documents have been issued or are in the process of being approved by the competent bodies, which are rigorously applied in A2A also through internal procedures. Similarly, in continuity with 2017, procedures were adopted for the management of the safety of dams and plants in situations of seismic events, which are tested and implemented through special simulations involving operators.

In this regard, special studies and designs of a high technical-scientific nature are underway to improve the seismic behaviour of the most sensitive dams, such as that of the Ambieta plant, as well as the execution of works to ensure complete safety even for the accessory works of the dams.

With regard to the actions to be implemented for the "environmentally sound" management of the river basins and channels relevant to them, including the management of sediments, management projects are underway, which define the appropriate methods of emptying.

Flexibilization measures on CCGT systems

At the end of 2018, works were completed to increase the flexibility of 2 turbogases of the 800 MW unit of the Sermide Plant, with the installation of hardware and software packages similar to those installed at the Chivasso CCGT in order to improve plant performance, reducing flue emissions of NOx and improving production unit management.

In 2018, the flexibilization activity was started up and completed, also at the Ponti sul Mincio plant.

At the end of 2018, in accordance with the "Co-Development Program Framework Agreement", signed between the A2A Group and the General Electric Group, the start of the flexibilization project for the Cassano CCGT was agreed, which will start in the first half of 2019.

These interventions have made it possible to significantly reduce the technical minimum and the start-up time of the combined cycles.
6.3 The manufacturing capital in the Networks & District Heating Business Unit

The Networks & District Heating Business Unit is responsible for coordinating, implementing and maintaining the electricity, gas, heat and water cycle network distribution infrastructure as well as for managing plants used to produce thermal energy and electricity. The maintenance and evolution of these infrastructures are amongst the key factor necessary to achieve the national and European energy policy goals.

Gas and electricity distribution networks

The electricity distribution network extends for over 15,000 km in high, medium and low voltage (of which 85.5% underground), with 31 primary stations and substations and more than 9,352 secondary stations.

The length of the gas distribution infrastructure is nearly 11,200 km, in medium and high pressure, with 188 primary stations (REMI) and 2,199 secondary stations.

The electricity distribution activity is managed by Unareti and LD Reti in Lombardy, in the provinces of Milan, Brescia and Cremona.

The gas distribution activity is managed by Unareti, LD Reti and ASVT in Lombardy, in the provinces of Milan, Brescia, Bergamo, Cremona, Lodi and Pavia, in Veneto, in the provinces of Padua and Vicenza and in Emilia Romagna in the province of Parma.

In 2018, electricity distributed came to 11,747 GWh with an increase of 1.4%. The distribution of gas, equal to 2,425 Mm³, is in line with the previous year.

In December 2015, Milan City Council and A2A announced an extraordinary plan to improve the resilience of the electricity grid in the most critical parts of the city, thereby making it able to support any exceptional electrical loads, with a total investment of 13 million euro.

In 2017, the plan was extended to envisage the replacement of a total of 14,500 network joints by 2020.

By the end of 2018, 11,200 joints had been replaced, representing 77% of the total to be completed by 2020.

Through the subsidiary Retragas S.r.l., the Group also manages the regional transmission of natural gas in Lombardy, Trentino Alto Adige and Piedmont, with more than 399 km network and moving more than 365 million cubic metres of natural gas each year.
AWARD OF THE GAS DISTRIBUTION TENDER OF THE MUNICIPALITY OF MILAN

The tender for the concession for the natural gas distribution service in the ATEM "Milan 1 - City and plant of Milan" was awarded to Unareti S.p.A. on September 3, 2018, with a score of 98.12. However, the award was not followed by the signing of the contract and the start of operations in consideration of the notification of the appeal by Zi Rete Gas before the Regional Administrative Court of Lombardy - Milan.

The investment plan offered has been built on the basis of the objectives and requests reported by the Contracting Authority, in accordance with the indications of the municipalities belonging to ATEM, among which the prevailing one is the modernization of distribution systems and development of energy efficiency. The "ATEM Milano 1" network is made up of assets with significant obsolescence, in some cases reaching the useful life limit during the new concession. This will therefore require a series of replacement measures to increase efficiency, reduce the number of leaks and modernize the overall distribution system serving the community, while at the same time improving energy efficiency and environmental impact.

The modernization and reorganization of the distribution system are also key factors in enabling the integration and development of alternative energy sources - element expressly requested by the Contracting Authority - and in particular of the district heating service to allow the replacement of heating systems powered by diesel, extremely polluting and still widespread, especially in the historic centre of Milan. In this sense, Unareti has planned to carry out the necessary interventions to extend the network and upgrade the plants to enable the replacement of boilers fuelled by diesel, estimated at over 4,000, already in the early years of the concession.

As far as improving energy efficiency and reducing environmental impact are concerned, Unareti has planned, over the 12 years of the concession, the implementation of measures aimed at recovering and self-producing energy, reducing consumption in its offices and in the management of company vehicles, encouraging the use of biomethane in the distribution network.

In addition, with a view to contributing significantly to the development of further actions, Unareti has offered an additional 20% share of energy efficiency certificates compared to the compulsory quantity defined by the legislation in force. The procurement of these certificates - which will also take place through the purchase of securities deriving from projects already defined by companies of the A2A Group - will allow energy savings of more than 360 million cubic metres of natural gas to be obtained in the territory of ATEM.

New interventions by LD Reti on the gas distribution network

The preliminary design for connection to the grid of the composting plant in Vellezzo Bellini (PV), for the supply of the biomethane produced, was carried out, according to the regulations in force.

During the year, a system was implemented to improve the efficiency of gas preheating activities, in order to reduce consumption in REMI stations with a higher regulated flow rate.

The gas preheating thermoregulation system was activated in 2018 with the installation of a further 15 units, reaching 100% of the 37 REMI stations involved in the project. A comparison between the consumption for the year 2016 (without thermoregulation) and the year 2018, restated on the basis of the methane gas injected into the distribution network, showed a saving of 152 thousand cubic metres in methane gas used for the preheating of the REMI.
Integrated water service

The A2A Group, through its subsidiaries A2A Ciclo Idrico and ASVT, manages services related to the integrated water cycle in almost the entire province of Brescia.

In all, in 2018 the Group distributed 54 million cubic metres of water. In the municipalities overseen for the sewage and purification service too, approximately 52 million cubic metres of waste water were treated.

Figure 16. Plants of the Networks & District Heating BU for integrated water service

<table>
<thead>
<tr>
<th>TYPE OF PLANTS</th>
<th>EXTENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueduct network</td>
<td>4,010 km</td>
</tr>
<tr>
<td>Sewers network</td>
<td>2,567 km</td>
</tr>
<tr>
<td>Purifiers</td>
<td>61</td>
</tr>
<tr>
<td>Treatment capacity</td>
<td>49 Mm³</td>
</tr>
</tbody>
</table>

In 2018, several actions were implemented to achieve the objectives of the Sustainability Plan that reflect an integrated logic, aimed at improving the entire service in terms of quality of water distributed, reduction of network losses and extension of the number of citizens served.

The most impressive and significant work is certainly the construction of the new ASVT Valtrompia Purifier: it will be the largest plant in the province of Brescia and will use the MBR (Membrane Bio Reactor) ultrafiltration purification technology, already tested at the A2A Ciclo Idrico purification plant in Verziano, guaranteeing very high purification yields. The plant, located in Concesio, will serve 11 municipalities with a capacity of 85,000 population equivalent, for a planned investment of about 27 million euro. Further activities for about 45 million euro will concern the construction of a collector to connect the sewerage networks of the various municipalities adjacent to the Valtrompia, then making the sewerage flow to the new purifier. By 2018, approximately 30 km of sections had already been completed.

In 2018, ASVT invested 1 million euro in the same area for the construction of three hexavalent chromium treatment plants in Villa Carcina, Sarezzo and Gardone. This investment has made it possible to comply with the new stringent regulatory limits imposed on the presence of hexavalent chromium, further improving the quality of drinking water throughout the Brescia hinterland.

In December 2018, A2A Ciclo Idrico also completed work on the construction of the new water treatment plant in Nuvolera. The plant serves about 25,000 equivalent inhabitants, for the purification of wastewater from 5 municipalities. The commissioning of the new plant will allow a decisive improvement in the quality characteristics of the Naviglio Grande Bresciano, the receiving watercourse of the new purified wastewater that until now has received a slurry that has only undergone physical pre-treatment. The plant is equipped with high efficiency equipment that allows a very advanced purification system:

- an ad hoc biological system for the abatement of odorous impact;
- noise mitigation measures;
- a system for continuous monitoring of both the functioning of the equipment and the characteristics of the slurry, both at the plant inlet and outlet;
- automatic control of process instruments, in order to optimize energy consumption and above all to operate the plant in optimal conditions of efficiency.

Many initiatives were also launched during the year to support the policy of reducing water leaks in the network. In organizational terms, a structure was set up to implement the plan to reduce water losses and the equipment park was modernized and expanded in order to identify leaks on the part of operating personnel.

In 2018, about 30 km of the network were replaced and the leakage research activity was strengthened: more than 2,000 km of the network were analysed, equal to almost 2/3 of the entire network managed. This has allowed to intervene for the repair of about 300 hidden leaks, not otherwise identifiable. In addition, activities were carried out to reduce the operating pressure on the networks, identifying new minimum levels of pressure for about 9 municipalities.

With regard to the detection of volumes not recorded in the accounts, the installation of more than 250 meters on fire-fighting equipment was started, which made it possible to identify volumes not recorded for about 120,000 m³/year. A further 1,500 such meters are planned for 2019.

As regards the reduction in metering errors of user meters, in 2018, in line with as indicated by Ministerial Decree 93/17 of the ARERA, about 27,000 user meters have been replaced, while in the two-year period 2019/2020 another 123,000 will be replaced.

The plan also provides for the strengthening of the structures for the analysis and monitoring of leaks through the installation of new flow meters on the network and the implementation of dedicated IT tools.
Cogeneration plants and district heating networks

Through its subsidiaries A2A Calore e Servizi and Linea Green, the Group builds and manages the district heating network in Milan, Sesto San Giovanni (Mi), Novate (Mi), Cassano d’Adda (Mi), Brescia, Bovezzo (Bs), Concesio (Bs), Bergamo, Crema (Cr), Cremona, Lodi and Rho (Mi), for a length of 1,200 km, with a service capacity of 464,000 equivalent apartments and a volume of 111.4 million cubic metres served.

For the year 2018, the distributed thermal and cooling energy stood at a value in line with the previous year of 2,620 GWh.

Figure 17. Plants of the Networks & District Heating BU for district heating service

In line with the main objectives of the Business Plan, A2A’s Sustainability Policy is based on circular economy, decarbonisation, smart networks and services that contribute to the economic and environmental well-being of the communities of reference. The development of district heating networks is also part of this perspective, which allows the replacement of old inefficient and polluting heating systems, reducing consumption and contributing to the improvement of air quality. Thanks to district heating it is possible to optimize the use of traditional sources through highly efficient technologies, recover and exploit waste heat from the combustion of waste not usefully recyclable or from industrial processes, and exploit the thermal potential of renewable sources.

Investments are thus oriented towards the search for solutions aimed at optimizing the efficiency of existing systems, for example by maximizing heat recovery through the installation of thermal storage, and the implementation of innovative projects with little or no environmental impact.

2. Network consisting of a double pipe for the distribution of heat, in the form of hot or superheated water, widespread located in the urban area.
**Thermal storage at the service of the district heating network of Brescia**

After a careful design phase, the district heating network of Brescia will see the construction of three thermal storage systems, advanced heat storage systems, which allow better management of the urban energy system. The storage, through their ability to store heat during the hours of the day with less demand, usually at night, allow to increase the recovery of heat from more efficient and sustainable plants by reducing the use of production from fossil fuels. This results in the dual advantage of a more balanced and environmentally friendly system.

The first storage, of 5,200 m$^3$ will be built at the Lamarmora power plant and is scheduled to go into service at the end of 2019. Two further storages of 2,200 m$^3$ will instead be built at the North Thermal Plant during 2020.

As a result of these interventions, the total volume of heat storage at the service of the Brescia district heating network will be about 11,000 m$^3$, with a capacity of about 500 MWh available to meet and balance the thermal demand in the hours of greatest demand.

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**Figure 18: Extension of the district heating**

<table>
<thead>
<tr>
<th>Province of Bergamo</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USERS</strong> (NO.)</td>
<td>585</td>
<td>614</td>
<td>647</td>
</tr>
<tr>
<td><strong>VOLUMES SERVED</strong> (Mm$^3$)</td>
<td>6.5</td>
<td>6.8</td>
<td>7.0</td>
</tr>
<tr>
<td>NETWORK DEVELOPMENT (DUAL PIPE) km</td>
<td>71.2</td>
<td>74.7</td>
<td>75.0</td>
</tr>
<tr>
<td>APARTMENT EQUIVALENTS</td>
<td>27,100</td>
<td>28,100</td>
<td>29,100</td>
</tr>
<tr>
<td><strong>USERS</strong> (NO.)</td>
<td>20,392</td>
<td>20,487</td>
<td>20,584</td>
</tr>
<tr>
<td><strong>VOLUMES SERVED</strong> (Mm$^3$)</td>
<td>42.1</td>
<td>42.2</td>
<td>42.3</td>
</tr>
<tr>
<td>NETWORK DEVELOPMENT (DUAL PIPE) km</td>
<td>669.2</td>
<td>671.0</td>
<td>671.0</td>
</tr>
<tr>
<td>APARTMENT EQUIVALENTS</td>
<td>175,400</td>
<td>175,800</td>
<td>176,200</td>
</tr>
<tr>
<td><strong>USERS</strong> (NO.)</td>
<td>3,181</td>
<td>3,389</td>
<td>3,495</td>
</tr>
<tr>
<td><strong>VOLUMES SERVED</strong> (Mm$^3$)</td>
<td>47.0</td>
<td>49.7</td>
<td>52.6</td>
</tr>
<tr>
<td>NETWORK DEVELOPMENT (DUAL PIPE) km</td>
<td>298.8</td>
<td>330.9</td>
<td>339.0</td>
</tr>
<tr>
<td>APARTMENT EQUIVALENTS</td>
<td>195,800</td>
<td>202,300</td>
<td>210,929</td>
</tr>
<tr>
<td><strong>USERS</strong> (NO.)</td>
<td>206</td>
<td>206</td>
<td>206</td>
</tr>
<tr>
<td><strong>VOLUMES SERVED</strong> (Mm$^3$)</td>
<td>2.7</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>NETWORK DEVELOPMENT (DUAL PIPE) km</td>
<td>16.0</td>
<td>26.0</td>
<td>26.0</td>
</tr>
<tr>
<td>APARTMENT EQUIVALENTS</td>
<td>11,150</td>
<td>12,100</td>
<td>12,200</td>
</tr>
<tr>
<td><strong>USERS</strong> (NO.)</td>
<td>145</td>
<td>147</td>
<td>-</td>
</tr>
<tr>
<td><strong>VOLUMES SERVED</strong> (Mm$^3$)</td>
<td>2.7</td>
<td>2.7</td>
<td>-</td>
</tr>
<tr>
<td>NETWORK DEVELOPMENT (DUAL PIPE) km</td>
<td>16.0</td>
<td>16.0</td>
<td>-</td>
</tr>
<tr>
<td>APARTMENT EQUIVALENTS</td>
<td>11,150</td>
<td>11,150</td>
<td>-</td>
</tr>
</tbody>
</table>

**TOTAL** 24,158 25,564 25,681

95.6 107.0 111.4

1,039 1,195.0 1,188

398,300 456,150 464,021

* May not coincide with a single housing unit.

** The network is intended as the sum of heat transmission, distribution and supply pipes.

*** Province of Milan has also included, from 2017, the district heating service of Linea Green, at Rho Nord and Rho Sud.
Pilot project for heat recovery from electric substations

In the city of Milan, a pilot project for the recovery of waste heat from electrical substations is being studied. It is a system capable of using the low-temperature thermal energy released by the cooling systems of electrical transformers. The recovery takes place through the use of modular heat pumps to serve the district heating network.

The integration of the two systems (district heating/electrical system) will thus make it possible to transform waste heat locally available into a useful resource, without any additional burden on the energy and environmental balance of the territory.

Green investments for the district heating network in Lodi

At the biomass plant in Lodi a project has been activated for the use of biomass from the recovery of green pruning. At the end of 2018, an incidence of about 6% on the total biomass fed was recorded, with consequent savings in forest-based material.

In October 2018, LGH submitted to the Province of Lodi a request for authorization for the concession for use of groundwater for energy recovery through heat exchange in heat pump systems in the municipality of Lodi. The heat pump's thermal energy production will replace the production from natural gas boilers for an expected total of more than 6 GWh. The project will avoid more than 1,500 tonnes of CO₂ emissions.

The integration of the two systems (district heating/electrical system) will thus make it possible to transform waste heat locally available into a useful resource, without any additional burden on the energy and environmental balance of the territory.