

The management of the electricity distribution network of Rome and Formello is characterized by the **continuous improvement of the performance**, with a particular focus on energy efficiency. Areti implements **initiatives to reduce network losses**, which include the reclassification of medium voltage levels from 8.4 kV to 20 kV and the installation of MV/LV transformers with very low losses. For further information see the *Energy savings* section, in the chapter *The use of materials, energy and water*.

The initiatives launched to **improve the resilience of networks and optimise their management, through technological innovation** applied to the infrastructure, are illustrated in the chapter *Institutions and the Company*.

Also as a result of the activities mentioned above, **energy losses on the network** during the year amounted to **approximately 6% of the total transported**, a decrease compared to the 7% of 2019.

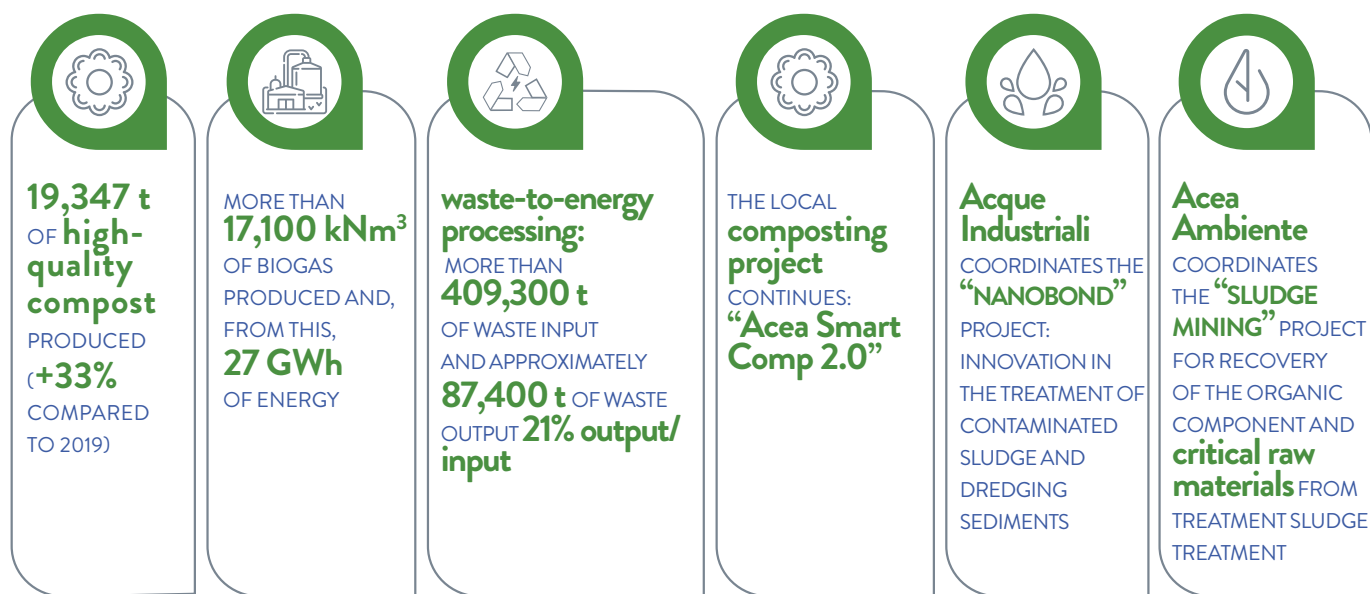
Furthermore, in 2020 Areti began the **replacement of traditional meters with 2G electronic devices**, for a total of 1.7 million units. In addition to the expected benefits for customers (see the sub-section *Service quality* in the paragraph *Customers and communities*), the initiative will also generate positive environmental impacts, with a **forecast reduction in emissions by 2024 of 200 t of CO₂** due to the convergence of several factors:

- a reduction in operational actions, with consequent decrease in vehicle journeys and kilometres travelled by personnel in the field or by personnel of the contractors performing readings of meters that cannot be reached remotely;
- a reduction in paper bills, no longer issued to end customers upon replacement of the meter;
- a reduction in polluting emissions and carbon dioxide output with the obligation to use electric or low-emissions vehicles, imposed on contractors involved in mass replacement of meters.

ENVIRONMENT SEGMENT – WASTE MANAGEMENT

SCOPE

The chapter includes ACEA Elabari, for the project “Smart Comp”; the activities of the waste treatment hub, waste-to-energy plants and compost production plants, all within Acea Ambiente; and the activities of Aquaser and Acque Industriali.



Acea manages the end part waste cycle in order to **recover, recycle and reuse waste in the best possible way** and, when possible, **recover energy**. Specifically, it oversees:

- the **treatment of municipal solid waste (MSW)** and other types of waste (like green waste from separate collection, industrial waste, etc.), **for the recovery of material** and disposal of only the residues in landfills;
- the **treatment of liquid wastes** such as leachates and liquid sludge;
- **incineration with energy recovery** with consequent reduction of the soil needed for disposal;
- the **production of high quality compost** for agriculture.

The management of solid and liquid waste is performed **using advanced technology and modern systems**, recently upgraded or expanded, in order to improve and renew processes and increase recovery of material and/or energy. The Companies operating in waste management **carry out research**, also in collaboration and partnerships with university institutions and

Companies in the circular-economy field. Included in this context is the **“Acea Smart Comp” local composting** activity performed by Acea Elabari, the **“Sludge Mining”** project for the **recovery of critical raw materials** coordinated by Acea Ambiente and the **“NANOBOND”** project coordinated by Acque Industriali (see specific info. boxes).

During 2020, **Acea Elabari**, with the support of the University of Tuscia and Enea, has continued with the **“Acea Smart Comp” local composting** project. This project will enable the Company to become organic waste free during 2021 and to patent the system for its industrialisation. In 2020, research and development activity led to the creation of a new Smart Comp Unit prototype, which will form the basis of the new version “Acea Smart Comp 2.0”, and there are plans for the creation and installation of new-generation machines at Enea, FS, Porte di Roma, Centro ELIS and serving barracks of the Italian Carabinieri military police force.

The “**Sludge Mining**” project, coordinated by Acea Ambiente as the leader in this area, aims to contribute to identification of solutions to two significant problems: the lack of plants for recovery and disposal of treatment sludge, with the goal of offering sector operators, at sustainable costs and in line with circular-economy principles, forms of disposal that promote the recovery and reduction of certain raw materials considered “critical” (*Critical Raw Materials*) by the European Union, such as minerals, nutrients and fossil fuels, due to intensive exploitation of mines and deposits.

The design solution proposed **combines advanced industrial technology and innovative processes for the recovery both of the organic component and materials of value contained within treatment sludge, transforming waste into a resource**. “**Sludge Mining**” combines technologies for upgrading of products obtained from the hydrothermal carbonization reaction, referred to as hydrochar, and the liquid phase. The aim of the process is to **extract the highest-value in-**

ert products from the solid (critical raw materials), including **phosphorus, silicon and magnesium**, and reduce the content of ash, increasing the concentrators of **carbon**. The carbon produced will be used as a replacement for coal, for the production of advanced materials and innovative biological products, thus contributing to achievement of the goals for **reduction in the use of fossil fuels** in manufacturing and energy industries. The liquid phase will be processed by anaerobic digesters to produce biogas, which will be separated to form biomethane. The process will enable optimised energy efficiency throughout the system. A demonstration plant will be developed aimed at validation of the project.

The project partners, in addition to Acea Ambiente, are the National Interuniversity Consortium of Materials Science and Technology, The University of Florence, the University of Pisa, the University of Siena, the Politecnico di Milano university and the Renewable Energy Consortium for Research and Demonstration.

The following paragraphs provide further details of operational aspects of activities in the circular-economy field.

WASTE MANAGEMENT: COMPOSTING, WASTE-TO-ENERGY, DISPOSAL OF LIQUID WASTE AND RELATED SERVICES

INTEGRATED WASTE TREATMENT – ORVIETO PLANT

In Umbria, the Company **Acea Ambiente** manages an important **systems hub for waste treatment, recovery and disposal**, ensuring the integrated cycle of municipal solid waste and equivalent materials, produced in the regional basin that includes all municipalities in the province of Terni. The landfill site is also authorised to receive special waste.

The main plant sections are mechanical biological treatment of municipal solid waste, composting and refining of the organic fraction of the sorted waste and disposal in landfills. Management takes place in accordance with the certified Management Systems (see the section *Management systems* in the chapter *Corporate identity*), with the goal of **maximising recovery of materials** (production of high-quality compost) and supporting both the **production of renewable energy** (utilising biogas produced for energy) and the **reduction of waste sent to landfill**.

In 2020, total waste entering the plant was **106,477 tonnes**. 64% (approximately 67,700 tonnes) was sent to landfill and almost all of the remainder was sent to the **anaerobic digestion and composting** section of the treatment plant for the **production of biogas and compost**. Biogas, used for the production of electricity, is also produced naturally by the landfill (see the *Environmental Accounts* for details). At the Orvieto site there are **two energy production plants** powered respectively by the biogas produced by the anaerobic section of the treatment plant and by the biogas produced by the landfill. The electricity generated is broken down as follows:

approximately **2.5 Mm³ of biogas** and **5.3 GWh of energy** were produced at the treatment plant in 2020;

- approximately **8.3 Mm³ of biogas** and **12.3 GWh of energy** were produced at the landfill.

Overall, approximately 16.5 GWh of electricity was fed into the grid. The Orvieto hub is also equipped with a **photovoltaic plant** owned by Acea Produzione, which generated about 239 MWh in 2020, used to **cover part of the plant’s electricity consumption**.

HIGH-QUALITY COMPOST PRODUCTION

Experimentation is currently underway with the University of Tuscia on high-quality compost produced by the Orvieto plant hub, totalling 4,618 tonnes in 2020, for use as agricultural fertiliser, applying the direct product and sowing wheat crops on land at the plant itself.

In addition to the Orvieto site, Acea Ambiente has **three other composting plants** in Aprilia, Monterotondo Marittimo and Sabaudia respectively.

The Aprilia plant, still under seizure, is now operating almost at full capacity, and was the subject of an expansion completed in 2020, which **will enable the recovery of 120,000 tonnes of organic fraction per year**, while the **Monterotondo Marittimo plant**, which has undergone expansion and revamping over the last two years, now has a **recovery capacity of 70,000 tonnes/year for organic waste fraction, green fraction and sludge**. Both sites have implemented a **new anaerobic digestion and composting section**, which has enabled **recovery of electricity and thermal energy**, starting from 2020. For details on the quantities of biogas and energy produced, see the chapter *Energy segment* and the *Environmental Accounts*.

At the Sabaudia plant, operations were suspended from 31/10/2019, to allow **upgrading work** on the plant¹¹⁹. The liquid waste treatment section is currently inactive. The plant has a treatment capacity of 20,000 tonnes of compostable material per year and the aim is to proceed with upgrading to achieve a capacity of 60,000 tonnes/year.

INTERMEDIATION AND TRANSPORT OF WASTE

¹¹⁹ During 2021, it is hoped that the pending authorisation procedures will be concluded so that the tender procedure for the executive design and construction of the new composting plant can be published. The upgrading project will increase the treatment capacity to 60,000 t/year of incoming waste.

In 2020, **Aquaser**, which **loads, transports, recovers and disposes of waste produced by treatment plants**, managed a total of **493,000 tonnes of waste** (580,000 tonnes in 2019).

With regard to **intermediation**, during the year Aquaser took charge of **approximately 207,000 tonnes of waste**, of which **152,000 tonnes of sludge** is attributable to the **Group's water companies¹²⁰**, and in particular approximately **93,400 tonnes to Acea Ato 2, AdF and Acea Ato 5**. The dried out and dehydrated sludge coming from these Companies was sent to the following end destinations:

- 58% to material recovery operations (pretreatments aimed at agricultural use and composting);
- 8% to recovery of energy (waste-to-energy);
- 34% for disposal.

Also this year, due to regulatory constraints direct spreading was not used in agriculture.

Aquaser in particular **used its own means** to transport approximately **52,000 tonnes of non-hazardous waste**.

WASTE-TO-ENERGY

Energy recovery from waste is an important part of the circular economy, which provides energy and economic advantages, it leads to a **notable volumetric reduction and the biological stabilisation of waste**, avoiding as far as possible the disposal of this waste in landfills as such.

In addition to the activities already described of waste treat-

ment and anaerobic digestion, **Acea Ambiente** also manages the waste-to-energy process through the plants of San Vittore del Lazio and Terni. The two plants are operated according to the certified Environmental Management Systems and registration with the European EMAS III scheme (see also the chapter *Corporate identity, Management systems*).

In its current configuration, the San Vittore del Lazio plant is **the largest in the Lazio Region** and plays an important role in the management of municipal waste, both for the advanced technologies used for its construction and for its considerable treatment potential¹²¹. It is composed of **three independent lines** of waste-to-energy designed to be fed with refuse-derived fuel (RDF), now called Solid Recovered Fuel (SRF), with these characteristics:

- 52 MW_t of thermal power for line 1 and 56.7 MW_t of thermal power installed for each of the other two lines;
- 13.9 MW_e of electric power for line 1 and 15.1 MW_e for each of the other two lines, for a total power of approximately 44 MW_e;
- approximately 400,000 t/year of SRF, sludge and other waste at full capacity.

In 2020, approximately **319,100 tonnes of waste** has undergone waste-to-energy processing, and approximately **269 GWh** of electricity has been produced. There has been a slight decrease in this activity, primarily due to a plant shutdown for technical reasons.

The **Terni plant** is composed of **a waste-to-energy line** and has

TABLE NO. 54 – THE SAN VITTORE DEL LAZIO WASTE-TO-ENERGY PLANT: OPERATING DATA (2018-2020)

	u. m.	2018	2019	2020
incinerated fuel	t	357,174	340,531	319,122
gross electricity produced	GWh	306.73	276.27	269.38
conversion efficiency ^(*)	kWh/kg SRF	0.86	0.81	0.84

(*) Relationship between gross electricity produced and quantity of SRF converted to energy.

the following characteristics:

- 52 MW_t of thermal power installed;
- 13.6 MW_e of electrical power installed;
- 120,000 t/year of pulper waste (paper mill waste resulting from the pulping of waste paper), as the maximum potential for incoming waste.

The waste-to-energy plant is **also equipped with photovoltaic**

systems, the primary system on the pulper waste pre-treatment area and a secondary system on the adjacent building, which in 2020 generated approximately 483 MWh of electricity, with around 54% consumed on site and the remainder sold to the grid. For data on the emissions of both waste to energy plants see the chapter *Air emissions*, in addition to the data in the *Environmental accounts*.

DISPOSAL OF LIQUID WASTE

TABLE NO. 55 – TERNI WASTE-TO-ENERGY PLANT: OPERATING DATA (2018-2020)

	u. m.	2018	2019	2020
pulper waste converted to energy	t	99,971	94,092	90,215
gross energy produced	GWh	82.41	80.93	76.77
conversion efficiency ^(*)	kWh/kg pulper waste	0.82	0.86	0.85

(*) Relationship between gross electricity produced and quantity of pulper waste converted to energy.

The Company **Acque Industriali¹²²**, which is part of Environment Operations, performs intermediation services and treatment of liquid waste for private and public companies, as well as activities connected to the integrated water cycle, primarily consisting of the **recovery and disposal of organic sludge**, through management of **four main platforms** located in Pontedera, Pisa Nord, Empoli and Poggibonsi. In 2020, the

four plants received over **111,000 tonnes of liquid waste**. For details of the type of incoming waste, the resources used, the waste produced and other specific information, see the *Environmental Accounts*.

Acque Industriali use technologies that **support recovery of raw materials contained in waste, energy savings and efficient use of resources**, such as stripping/absorption of ammonia in a closed

¹²⁰ The data detailed here for the sake of completeness concerns sludge for which Aquaser has managed the entire supply chain, from loading to transport and final disposal, originating from the following Group Companies: Acea Ato 2, Acea Ato 5, AdF, Umbra Acque, Publiacqua, Acque, Acea Molise and Umbria2.

¹²¹ With reference to Decree Law 133/2014 (referred to with the name "Sblocca Italia"), the plant has been defined as a strategic structure of primary national interest for the protection of health and the environment, as per Lazio Regional Decree no. 199 of 24/04/2016.

¹²² The Company Acque Industriali was included within the reporting scope of the 2020 Consolidated Non-Financial Disclosure.

cycle that enables **recovery of ammonium sulphate**, which can be used as an agricultural conditioner. In 2020, **255,000 tonnes** of this were produced. The Company also provides services for design, creation and management of plants for the treatment of wastewater for third parties, decontamination of polluted sites and environmental consulting for the management of plants, investing in research and development in the relevant sectors, in collaboration with recognised Research Bodies. Included in this context is the “NANOBOND” project, coordinated by

Acque Industriali, which combines traditional technology and innovation to develop an **integrated treatment system for the management of contaminated sludge and dredging sediments**, based on the use of **innovative nanostructured materials** with eco-compatible and environmentally sustainable characteristics. The project, amongst many expected benefits, will also enable **waste to be transformed into a resource**, from a circular-economy and environmental-protection perspective (see info. box for details).

ACQUE INDUSTRIALI COORDINATES THE “NANOBOND” PROJECT: TREATMENT OF CONTAMINATED SLUDGE AND SEDIMENTS

The project **coordinated by Acque Industriali**, entitled “**NANOBOND**” – **Nanomaterials for the decontamination associated with dewatering of environmental materials** – approved for regional co-financing through the **European Development and Research Fund** (POR-FESR 2014-2020), proposes the development of a new integrated treatment system for the management of contaminated sludge and dredging sediments, based on the use of innovative nanostructured materials with eco-friendly and environmentally sustainable characteristics. **The project aims to implement tubular elements in draining geotextile for the dehydration of sludge and sediments (dewatering), integrating this with the decontaminating action of nanostructured materials (nanoremediation).** This will allow the removal of contaminants present in wastewater and sediments, significant reduction of the volumes and relative costs of transport and transformation of processed sediments from “**waste**” into a **resource**, for the **management of riverbanks**, recovery of the water component and other possible applications.

Through development of **nanoremediation techniques associated with dewatering**, “**NANOBOND**” approaches dredging and management of sludge and sediments, connected with the **stabilization of watercourses**, providing tangible solutions for hydrogeological instability and maintenance of port areas, increasingly subject to build-up

of sand. This technique is **efficient in terms of its capacity to reduce contaminants and implementation times**, and it is easily scalable for on-site applications on a large scale with competitive costs.

The system **has been tested** on dredging of marine sediments (Port of Livorno), brackish waters (Navicelli Canal) and freshwater (drainage channels), where the need to remove variable quantities of contaminated sediments has become an absolute priority at the regional, national and European level. There has been a particular focus on the choice of **raw materials from renewable sources**, also from **recycling**, starch from tubers and waste paper pulp for the synthesis of nanomaterials/structures, with competitive production and process costs, and environmental compatibility. These are the principles underlying green nanotechnology for the development of nanotechnologies that are safe for the environment and human health (**nano-ecosafety**), which minimise the risks linked to production and use throughout their life cycle.

In addition to Acque Industriali, heading up the project, partners include: the National Interuniversity Consortium of Materials Science and Technology, the Universities of Siena, Pisa, Turin, and the Politecnico di Milano, ISPRA, ERGO (start-up of the Scuola Superiore Sant’Anna high school in Pisa), LABROMARE, BIOCHEMIE Lab and the BARTOLI paper mill for the production of (nano)materials and ASEV Ag. for development and Technology District.

WATER SEGMENT

SCOPE

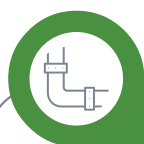
The scope includes the Companies Acea Ato 2, Acea Ato 5, AdF, Gori and Gesesa.

Acque, Publiacqua and Umbra Acque, water Companies not included in the scope of the *Consolidated Non-Financial Disclosure* (pursuant to Legislative Decree no. 254/2016). They have been

included only in the water graphs, with evidence of their contribution, and in a few other global data (water fed into the system and analytical calculations). Specific data concerning these Companies are provided in a separate chapter: *Water Company data sheets and overseas activities*.



6.1 million CITIZENS SERVED AND **480 Mm³** OF DRINKING WATER SUPPLIED BY ACEA ATO 2, ACEA ATO 5, GORI, ADF AND GESESA



APPROXIMATELY **34,100 km** OF DRINKING-WATER NETWORK MANAGED BY ACEA ATO 2, ACEA ATO 5, GORI, ADF AND GESESA



769,888 analytical tests ON DRINKING WATER (ACEA ATO 2, ACEA ATO 5, GORI, ADF AND GESESA)

The Acea Group is a national leader in terms of number of citizens served and one of the primary operators in the water sector. Activities regarding **management of water resources** for all phases defined by the **integrated water service** are performed with an increasing focus on preservation and safeguarding of water and natural ecosystems (from springs to receiving bodies of the water returning into the environment).

Safeguarding of water resources translates into the priority action of **recovering leaks** (see the section *Attention to water consumption*), the **circular economy**, activities to combat **climate change**, **protection of springs** (see the paragraph *Protection of the territory*) and also increasingly precise **monitoring** of internal water consumption, with the end goal of reducing consumption.