Green Bond Project (post issue)
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Waste to energy plant for heat production in Parma

1 WASTE MANAGEMENT BU
Ref.: project 1-ISIN XS1704789590

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project	Financed amount	KPIs
216.5 mln	**Total 4.4 mln**	• PES Primary Energy Saving Indicator per operating year [%] • Renewable energy share in percent on total [%] • Thermal energy recovered from waste to Parma DH network in MWh per operating year [GWh]

Project description

The waste-to-energy plant (WTE) for municipal and special solid waste in Parma was built between 2009 and 2013, the year in which it entered service.

The site, called PAI, located in the Municipality of Parma also provides for the construction of other waste treatment plants, including an urban waste pre-treatment plant.

The waste-to-energy plant, made up of two 35.7 MW combustion lines, can supply a nominal electric power of 22.25 MW and a thermal power of 43.5 MW.

The thermal energy produced is transferred to the city district heating network, to which the plant is directly connected.

Waste to energy plant for heat production in Piacenza

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project	Financed amount	KPIs
8.9 mln	**Total** **8.9 mln**	• PES Primary Energy Saving Indicator per operating year [%] • Renewable energy share in percent on total [%] • Thermal energy recovered from waste to Piacenza DH network in MWh per operating year [GWh]

Project description

The project involves the construction of a cogeneration section at the existing solid waste-to-energy plant located in Piacenza.

The current state consists of two combustion lines (input 22.7 MW each) that feed a steam cycle with a 11.6 MW condensing type turbine.

In order to strengthen the urban district heating in the city of Piacenza, the city network is expected to be extended and connected to the existing waste-to-energy plant with its consequent modification in order to recover the thermal energy necessary for heat distribution.

Development of separate waste collection services

Eligible Category *Waste management efficiency and recycling (Waste collection and sorting upgrades)*

Full amount project	Financed amount	KPIs
69.1 mln	**Total 27.0 mln**	• Total sorted waste collection [t] • Total of non sorted waste disposed [t] • Number of bins for sorted waste [N] • Volumes of bins for sorted waste [mc] • Door to door collection system [N] • Sorted waste collection hubs [N] • Volumes of waste collected in the collection hubs [t]

Project description

The project concerns the development of separate waste collection through:

1) transformation of the separate collection system in Turin with the extension of home collection to about an additional 150,000 inhabitants compared to the 404,000 inhabitants served in 2012; in the Emilia Area, anticipating the regional planning, IREN has implemented a progressive transformation of waste collection services to the door-to-door model, with prodromal methods for the application of punctual pricing.
2) collecting centers in Emilia area, a capillary computerized system used to register inputs, through a personal badge, and to check the volumes of waste conferred. This allows to activate competitions with prizes for citizens.

Biowaste recovery to produce compost and biomethane - Ferrania (SV)

Eligible Category *Waste management efficiency and recycling (Waste collection and sorting upgrades)*

Full amount project	Financed amount	KPIs
8.8 mln	**Total** **8.8 mln**	• Production of compost [%] • Production of biomethane [Msm^3] • Avoided CO_2 emissions from fossil sources per operating year [t] • Primary energy saving per operating year [Toe]

Project description

The second of July 2019, Iren Ambiente acquired the whole property of FERRANIA ECOLOGIA, owner of an existing plant. The total cost of the acquisition is around 8.8 million Euros.
The plant actually treats 30,000 t/y of bio-waste municipal waste which are turned into compost.
In 2018, the local authority approved to increase the total amount of waste from 30,000 t/y to 60,000 t/y and in meantime approved the production of Biomethane.

The aim of the project is the construction of a bio-waste treatment plant exploiting the organic and green waste collected in the Liguria region, in particular in the provinces of Savona and Genoa, and for remaining part the bio-waste available on the market.
The proposed plant falls into the category of projects identified in Annex IV, Part Two of Legislative Decree 152/2006.

The Biomethane is produced in accord to the incentivisation law of the biofuel and biomethane, D.M. 2.3.2018.

ISIN XS2065601937-FINAL 2019

Biowaste recovery to produce compost and biomethane – Santhìa (TO)

Eligible Category *Waste management efficiency and recycling (Waste collection and sorting upgrades)*

Full amount project	Financed amount	KPIs
6.9 mln	**Total** **6.9 mln**	• Production of compost [%] • Production of biomethane [Msm^3] • Avoided CO_2 emissions from fossil sources per operating year [t] • Primary energy saving per operating year [Toe]

Project description

In the month of July 2019, Iren Ambiente acquired the whole property of the company TERRITORIO E RISORSE, owner of an existing plant. The total cost of the acquisition is around 6.5 million Euros.
The plant actually is authorized to treat 36,000 t/y of bio-waste municipal waste (26,000 t/y Bio-waste and 10,000 t/y Green waste) which are turned into compost.
In 2018, the local authority approved to increase the total amount of waste treated to 50,000 t/y (40,000 t/y Bio-waste and 10,000 t/y Green waste) and in meantime the production of Biomethane.

The aim of the project is the construction of a bio-waste treatment plant exploiting the biowaste and green waste collected in the Piemonte region, in particular in the provinces of Vercelli, Novara, Verbano Cusio Ossola and Alessandria, and for remaining part the bio-waste available on the market.
The proposed plant falls into the category of projects identified in Annex IV, Part Two of Legislative Decree 152/2006.
The Biomethane is produced in accord to the incentivisation law of the biofuel and biomethane, D.M. 2.3.2018.

ISIN XS2065601937-FINAL 2019

Cogeneration plant Torino Nord

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project	Financed amount	KPIs
351.5 mln	**Total 40.1 mln**	• Electrical energy produced per operating year [MWhe] • Thermal energy produced per operating year [MWht] • Primary energy saving per operating year [MWh] • Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

The Turin North Plant is an important electrical energy and heat production plant within the Turin metropolitan area and, together with the Moncalieri Plant, it forms the basis of the city of Turin's district heating system.
The start dates for the Plant's construction and operation are provided below.
- 2010: start of construction of the Turin North Plant;
- 30 April 2012: start of commercial operation.

The Plant is made up of the following production groups, functioning on natural gas only:
- 1 Combined-cycle cogeneration thermoelectric group (CCTG);
- 3 Supplementary and reserve boilers;
- 1 Auxiliary boiler for starting the combined cycle;
- 6 Heat accumulators.

VDE hydroelectric plant (Chiomonte-Susa) Repowering project

7 ENERGY BU
Ref.: project 9-ISIN XS1881533563

Eligible Category *Renewable energy (Mini hydro power)*

Full amount project	Financed amount	KPIs
8.7 mln	**Total 5.0 mln**	• Electrical energy produced from renewable non-fossil sources per operating year [MWhe] • Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

The upgrade entails modernising the two plants located in Valle Dora, specifically:
- the upstream plant with intake in the Municipality of Salbertrand and the hydroelectric station in Chiomonte;
- the plant with intake in Chiomonte and the station in Susa.

The project is divided into three consecutive phases:
- an initial authorisation phase;
- a second executive design phase;
- a third site preparation and construction phase.

During the initial phase, which is already complete, the thirty-year water diversion concession and the single authorisation for construction were obtained in order to be able to prepare the site for the works and operate the two plants in the future. The second executive design phase was completed in the first few months of 2018. The upgrade project consists of replacing the currently existing energy production groups with 4 new groups, providing a total installed power of 15 MW. Two groups will be installed in the Chiomonte plant and two in the lower Susa plant. The upgrade activities will also entail the extraordinary maintenance of the electromechanical works, the adduction and regulation works, with the replacement of the bridge cranes and civil works from the intake in Serre La Voute to the Chiomonte Plant, then restarting with the new intake in Chiomonte, where the new fish ladder will be built, and finally the modernisation of the Susa station. The third and final phase will consist of the actual preparation of the worksite. The works began in December 2017. Meanwhile, the plants are expected to enter into operation by November 2019.

Cogeneration plant Moncalieri–GT2 RPW

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project	Financed amount	KPIs
161.7 mln	**Total 20.9 mln**	• Electrical energy produced per operating year [MWhe] • Thermal energy produced per operating year [MWht] • Primary energy saving per operating year [MWh] • Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

The second combined-cycle thermoelectric group (called RPW 2GT) was built from a pre-existing plant for the conventional-cycle production of electrical and thermal energy (2GT) and made up of a conventional combustion vapour generator (CSG) which fed a condensation vapour turbine. The project consisted of converting the conventional-cycle 2GT into the combined-cycle RPW 2GT.
The second closed-cycle thermoelectric group is made up of:

- an electric-powered gas turbine of approximately 260 MW, powered by methane gas, with an air-cooled electric generator;
- a heat RVG, with chimney, into which the gases discharged from the gas turbine are piped;
- an electric-powered condensation vapour turbine of approximately 138 MW, with the related air-cooled electric generator, with low-pressure vapour intake for the production of superheated water for the district heating system, complete with a vapour bypass system;
- a condensation system for the vapour turbine, using cooling water taken from the diversion channel;
- system of exchangers for producing heat for the district heating system, using the low-pressure vapour taken from the vapour turbine;
- a gas decompression and fiscal measurement station.

The single-camshaft and single-body gas turbine (GT) in use, which has a multistage axial compressor and a multistage turbine, is equipped with:

- a discharge gas collector;
- a natural gas intake and regulation system;
- a turbine and generator lubrification systems;
- a system for filtering the air drawn into the turbine, complete with silencers;
- expansion joints, connecting ducts and accessories;
- acoustic cabins for protecting and soundproofing the GT and alternator, complete with ventilation and fire detection and extinction systems (the latter for the GT area).

Torino LED (I and II phases)

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
13.0 mln	**Total** **13.0 mln**	• Primary energy saving per operating year [MWh] • Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

Since 1986, the public lighting service in Turin has been managed by the Iren Group: the plant consists of around 98,000 lighting points, the total luminous flux is 1,530 million lumens. The electricity network that powers the light centers extends for 2,800 km, the total electrical power is 18,900 kW.
The project was divided into two phases. The first phase, started in 2015 and concluded in 2017, led to the replacement of approximately 53,000 public lighting points, equal to 53% of the lighting fixtures in the city, with LED lights, with important benefits on the economic and environmental front.
The territory of Turin was divided into five lots, about 11,000 appliances for each lot.
The efficiency and reliability of the new LED lamps guarantee a reduction of over 50% in the electricity consumption of the plants affected by the intervention. The new LED lamps installed with a color temperature of 3,000 and 4,000 kelvin emit a pleasant white light and moreover the luminaires have a greater control in the emission of the luminous flux, offering a greater luminous coverage of the streets and increasing the perception of safety for the citizens who travel through them. Furthermore, the new lighting fixtures with LED technology do not contain polluting substances and, by not producing light scattered upwards, they also reduce light pollution. The second phase of the project, during the start-up phase, involves intervention in the following areas:
• lighting systems for the main city underpasses and high-power lighting devices
• traffic light systems.
The replacement of approximately 900 high-power lighting fixtures and 6,000 fixtures in the city underpasses (Bramante, Lingotto, Mortara, Oddone, Repubblica, Rivoli, Spezia) is expected, as well as 13,000 traffic lights and 414 traffic light regulators. The efficiency and reliability of the new LED lamps guarantee a reduction of approximately 50% in the electricity consumption of the public lighting systems affected by the intervention and of about 85% of the consumption of the traffic light systems. The replacement plan, which will involve all the city districts at the same time, will start in 2019 and will last one year for public and three-year lighting systems for traffic light systems.

ISIN XS2065601937-FINAL 2019

Smart solutions

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
19.8 mln	**Total** **19.8 mln**	• Avoided CO_2 emissions from fossil sources per operating year [t] • Primary energy saving per operating year [Toe]

Project description

The energy efficiency project produces positive impacts in terms of reducing electricity and thermal consumption, thanks to the activities developed in 3 areas of intervention:

1) **Public lighting of the Municipality of Fidenza.** Redevelopment and energy efficiency of the city's public lighting system: replacement of 6,174 lighting fixtures with others with new LED technology; rebuilding of electrical panels; remote control implementation on electrical panels; city smart interventions: electric car charging stations, event communications boards, etc.
2) **Technological renewal of thermal power stations of municipal buildings in Turin:** energy pre-intervention redevelopment diagnoses and Energy Performance Certificates; installation of high efficiency boilers in 224 municipal buildings; EPC contracts to guarantee efficiency gains.
3) **Interventions to improve the energy efficiency of technological systems**
   Teatro Regio: replacement of 11 AHU fan motors; centralized cooling and heat recovery with the installation of 4 latest-generation refrigeration units and replacement of the cooling towers; thermal power plant requalification: installation of 6 condensing thermal groups of 840 kW; building management system with the implementation of a new automation system of the BACS type.

   Municipality of Grugliasco: insulation of the opaque building envelope; replacement of windows and doors; installation of a new heat recovery building air conditioning system; installation of an energy supervision system; local re-lamping (replacement of existing lamps with LED technology elements); installation of a new photovoltaic system.

ISIN XS2065601937-FINAL 2019

Improvement of Genova plants

Eligible Category *Waste water treatment (Wastewater treatment plant upgrades)*

Full amount project	Financed amount	KPIs
111.2 mln	**Total 14.1 mln**	• Treated population equivalent (potential) [N] • Analytic parameters (Abb % BOD, Abb % COD, Abb % SST, Abb % Ntot, Abb % Ptot) [%]

Project description

The project includes interventions on different plants:

1. revamping of the purification plant in the Municipality of Recco and of the wastewater collecting system from the Municipalities of Camogli, Pieve and Sori;
2. construction of the sea pipeline of the Darsena purifier;
3. construction of the new water treatment plant in the central area of Genoa;
4. adjustment of the treatment plant at the service of the Municipality of S. Margherita Ligure with the construction of a modern membrane system;
5. adjustment of the treatment plant at the service of the Municipality of Rapallo with the construction of a modern membrane system;
6. rationalization of the purification system, consisting of 4 plants, at the service of the Gulf of Tigullio and of the Val Fontanabuona, which is not provided;
7. new purification plant at the service of the capital and some neighbouring fractions of the Municipality of Torriglia.

Improvement of Parma plants

Eligible Category *Waste water treatment (Wastewater treatment plant upgrades)*

Full amount project	Financed amount	KPIs
4.6 mln	**Total 0.7 mln**	• Treated population equivalent (potential) [N] • Analytic parameters (Abb % BOD, Abb % COD, Abb % SST, Abb % Ntot, Abb % Ptot) [%]

Project description

The project includes interventions on different plants:

1. Monchio purifier: replacement of two imhoff pits (I level) with a last generation MBR plant
2. Vestola purifier: replacement of an imhoff pit (I level) with a biodisk (II level) plant
3. complete revamping of the purification plant located in the Municipality of Sorbolo (PR)

Cogeneration turboexpansion plant “Celsius”

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project	Financed amount	KPIs
3.0 mln	**Total** **1.5 mln**	• Net produced electricity from renewable non-fossil sources per operating year [kWh] • Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

Cogeneration turboexpansion plant for the exploitation of the pressure drop between the national and city gas distribution networks in the methane arrival cabin of Genoa Gavette. Combined electricity production (1 MW installed power) and heat.

The plant, already tested, will be in continuous operation starting from the 2-Q of 2018.

Investments in sewage and waste water plants (Emilia and Liguria)

Eligible Category *Waste water treatment (Wastewater treatment plant upgrades)*

Full amount project	Financed amount	KPIs
195.7 mln	**Total** **12.2 mln**	• Water Treatment plants [N] • Sewage systems [km]

Project description

The project aims to extend the drainage networks and build new purification plants aimed at increasing the level of collection service coverage and reducing pollution deriving from untreated discharges in the Emilia and Genoa territories.

Investments in drainage and purification (La Spezia - Liguria)

Eligible Category *Waste water treatment (Wastewater treatment plant upgrades)*

Full amount project	Financed amount	KPIs
15.4 mln	**Total 13.1 mln**	• Treated population equivalent (potential) [N]

Project description

The project aims to extend the drainage networks and build new purification plants aimed at increasing the level of collection service coverage and reducing pollution deriving from untreated discharges in the La Spezia territory.

The amount of this project is determined starting from the year of acquisition by IREN Group.

ISIN XS2065601937-FINAL 2019

Electricity distribution investments

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
110.1 mln	**Total 55.9 mln**	• Network leaks [%] • Network leaks [GWh] • Electricity fed into the network [GWh]

Project description

MV Underground Cables: project to renew the electricity distribution network's MV lines to improve the qualitative and technical levels of the network structure. In particular, through the renewal of the MV backbone cables and the laying of 22 kV MV cabling (approximately 400 km), the project will make it possible to:

- Renew network assets that finish their useful operating life or are inadequate compared with the required level of operation;
- Rationalise the layout and structure of existing networks;
- Reduce the energy losses in the network;
- Improve the quality of the service, as instructed by ARERA [the Italian Regulatory Authority for Electricity Gas and Water], in terms of both number (therefore reducing the failure rate) and duration.

During the course of 2016, approximately 31 km of 22 kV MV cables were laid, as well as approximately 3 km of MV network relating to the laying of the backbone cables for the new HV/MV stations called SPIP and BOTTEGHINO.

LV Network: project to renew the electricity distribution network's LV lines to improve the qualitative and technical levels of the network structure. In particular, the project will make it possible to:

- Resolve the critical issues present in the LV distribution network;
- Adapt the lines that are no longer suitable for the load that they have to support;
- Electrify new areas in order to adapt the network at the request of new users.

During 2016, 28 km of LV network cabling were laid.

Water distribution Smart Metering (Emilia, Liguria and Piemonte)

Eligible Category *Adaptation (Water efficiency)*

Full amount project	Financed amount	KPIs
4.7 mln	**Total** **4.7 mln**	• Smart meters installed [n] • Percentage of smart meters on the total [%]

Project description

IRETI is the company of the Iren Group which, also through its subsidiary companies manage the water distribution and metering services in several north western cities of Italy (for example Genoa, Reggio Emilia, Parma, Piacenza, La Spezia, Vercelli), providing water to about 870.000 supply points (PDFs).

The present project consists in the replacement of the traditional mechanical meters with a new generation of meters (smart meters), enabled for the functions of remote reading. Such metering system allows collecting a much higher amount of measurement data, guaranteeing the billing of due payments based on the actual values of their water consumption, therefore making less use of advance payment invoices, which are more likely to be error-prone, since they are based on estimated measures.

A greater availability of real measures provides to the end users a higher awareness of their own water consumptions, supporting virtuous behaviours which lead to a water consumption reduction, with consequent environmental benefits, in terms of efficient utilisation of water resource, and also lower energy consumptions.

Another related environmental effect is the reduction of measurement data collected “in the field” by operators, with a reduction in consumption of fossil fuels and related CO2 and other harmful emissions.

ISIN XS2065601937-FINAL 2019

Gas distribution Smart Metering (Emilia and Liguria)

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
96.1 mln	**Total** **96.1 mln**	• Smart meters installed [n] • Percentage of smart meters on the total [%]

Project description

IRETI is the company of Iren Group that manages the gas distribution and metering services in several north western cities of Italy (for example Genoa, Reggio Emilia, Parma), providing gas to about 750.000 supply points (PDRs or Points of Delivery).

Promoted by Del. n. 575/2012 of ARERA (Authority for Regulation of Energy, Networks and Environment), the present project consists in the replacement of the traditional mechanical meters with a new generation of meters (smart meters), enabled for both the functions of remote reading and remote management. Such metering system allows collecting a much higher amount of measurement data, guaranteeing the billing of due payments based on the actual values of their gas consumption, and improving the management of payment delay, as well as the service transfer or switching procedures, based on the actual measurement data.

A greater availability of real measures provides to the end users a higher awareness of their own gas consumptions (see Directive 2012/27/EU), supporting virtuous behaviours which lead to an energy consumption reduction, with consequent environmental benefits.

Another related environmental effect is the reduction of measurement data collected “in the field” by operators, with a reduction in consumption of fossil fuels and related CO2 and other harmful emissions

ISIN XS2065601937-FINAL 2019

Electricity distribution Smart Metering 1G (Torino and Parma)

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
51.3 mln	**Total 40.1 mln**	• Smart meters installed [n] • Percentage of smart meters on the total [%]

Project description

IRETI is the company of the Iren Group that manages the electrical energy distribution and metering services in the cities of Turin and Parma, providing electricity to more than 700.000 supply points (PODs - Points of Delivery), approx. 560.000 of which located in Turin and approx. 140.000 in Parma.
Promoted by Del. n. 292/06 of ARERA (Authority for Regulation of Energy, Networks and Environment), the present project consisted in the replacement of the traditional electromechanical meters with a new generation of meters (smart meters), enabled for both the functions of remote reading and remote management. Such metering system allows collecting a much higher amount of measurement data, guaranteeing the billing of due payments based on the actual values of their electricity consumption, and simplifying several activities such as the activation/deactivation of a supply contract, the increase/decrease of the committed power capacity, as well as the service transfer or switching procedures, based on the actual measurement data.
A greater availability of real measures (the smart meters allows their collection with a 15 minutes resolution) provides to the end users a higher awareness of their own electricity consumptions (see Directive 2012/27/EU), supporting virtuous behaviours which lead to an energy consumption reduction and to a better employment of the energy commodity, with consequent environmental benefits.
For instance, a pilot project promoted by ARERA (Del. ARG/elt n. 39/10) showed that the availability of a larger amount of actual measures, achieved through the installation of the smart meters, contributed to increase the end users awareness of their consumptions, resulting in an average energy saving of approx. 7%

ISIN XS2065601937-FINAL 2019

Replacement of gas distribution networks

Eligible Category *Energy efficiency (Energy distribution and management)*

Full amount project	Financed amount	KPIs
268.1 mln	**Total 100.8 mln**	• Average network leaks (underground network measured with planned inspection) [n]

Project description

Network maintenance and replacement: it is a continuous project developed by IRETI that consists in replacing and doing systematic maintenance of the gas distribution network's lines in order to improve the qualitative and technical levels of the network structure. Through the project it will be possible to:

- Renew network assets that finish their useful operating life or are inadequate compared with the required level of operation;
- Rationalise the layout and structure of existing networks;
- Resolve the critical issues present in the gas distribution network;
- Reduce the gas losses in the network and by consequence:
  - o Avoid CO2 emissions;
  - o Diminish the number of vehicles used for operative activities (such as P.I.);
  - o Mitigate the excavations made in order to repair the distribution pipeline.
- Improve the quality and continuity of the service, as required by ARERA [the Italian Regulatory Authority for Electricity Gas and Water];
- Improve the safety of the grid.

ISIN XS2065601937-FINAL 2019

E-mobility initiatives in the Iren offices

Eligible Category *Transport (Electric vehicles)*

Full amount project	Financed amount	KPIs
13.8 mln	**Total 2.6 mln**	• Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

The objective of this project is to replace some in the company transport fleet with new electric vehicles and to build the necessary infrastructure to support the project on the various sites. In particular, the project can be divided into 3 main activities:

- Environmental vehicle replacement: replacing the current electric quadricycles (most of which are currently in operation in Turin) with new vehicles, and replacing 100% of the current heat-powered quadricycles and obsolete cars, planned to take place within the 2018-2023 plan.
- Group vehicle replacement: approximately 400 vehicles from all of the company's main sites (cars used for short distances and small vans)
- Installation of infrastructure: installing Wallbox branded charging posts and wall boxes for charging vehicles at the various sites distributed throughout the territories, in parallel with the replacement plan in place for both environmental and other vehicles.