Green Bond Project (post issue)
ISSUED 2018-MATURITY 2025
(ISIN XS1881533563)

February 2019

Revamping Saliceti Plant owned by ReCos company (WDF recovery)

Eligible Category

Waste Management efficiency and recycling (Waste collection and sorting upgrades)

Full amount project (2008-2019)
7.3 mln

Re/financed amount	
2008-2018:	7.3 mln
2019:	- mln
Total	**7.3 mln**

KPIs

- Waste-derived fuel (WDF) per operating year [t]
- Percentage of WDF on total treated waste per operating year [%]

Project description

The plant is reserved for the treatment of unsorted, non-dangerous urban waste for transformation into fuel to be used in the production of alternative energy.

The plant was subject to revamping, leading to positive environmental effects.

The WDF production cycle entails mechanical-biological type processes which do not involve the use of heat or chemical substances and/or preparations. The process is sub-divided into 3 phases:

Phase 1: receipt of the unsorted waste

Phase 2: Biostabilisation of the waste

Phase 3: WDF refining and production.

As regards the incoming quantities of urban waste, the plant makes it possible to:

• transform a significant portion of urban waste into WDF to be used in energy production plants;

• select a portion of urban waste (about 3%) to be earmarked for recovery;

• reduce the quantities of outgoing waste compared to incoming waste, due to the biostabilisation process, which entails evaporating the wet components.

The applied technology is bio-oxidation in biocells and WDF production and has a capacity of 85,000 tonnes/year

ISIN XS1881533563-FINAL 2018

Accumulators district heating in San Salvario (TO)

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

Full amount project (2008-2019)
8.2 mln

Re/financed amount	
2008-2018:	1.6 mln
2019:	1.2 mln
Total	**2.8 mln**

KPIs

- Primary energy saving per operating year [MWh]
- Electrical energy produced from renewable non-fossil sources per operating year [MWh]
- Avoided CO_2 emissions from fossil sources per operating year [t]
- Avoided CO_2 emissions from fossil sources per operating year by photovoltaic plant [t]

Project description

Heat accumulation system, located in the San Salvario area of Turin, serving the City of Turin's district heating network. The district heating network is made up of approximately 554 km of double pipelines and heats approximately 60 million m³ (figures from December 2016).

The project makes it possible to increase the connected volume by 2.3 million m³, corresponding to approximately 350 new users.

The project consists of:
- a heat accumulation system for superheated water made up of 3 pressurised tanks above ground, with a total capacity of 2,500 m³;
- a system for pumping and re-pumping the superheated water in the district heating network;
- auxiliary systems: a filing/emptying and level restoration system, an electrical power system, a regulation system , a control and supervision system, an HVAC system, a fire safety system, a fire safety system, a lighting and motive power system, a CCTV system, a video surveillance system - anti-intrusion and access control, etc.;
- a district heating network building and all of the civil works necessary for the construction of the plant;
- a photovoltaic plant, with a nominal power of 14 kWp, connected to the site's electric power system.

ISIN XS1881533563-FINAL 2018

Accumulators district heating in Piacenza (PC)

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

Full amount project (2008-2019)
1.7 mln

Re/financed amount	
2008-2018:	- mln
2019:	- mln
Total	**- mln**

KPIs

- Primary energy saving per operating year [MWh]
- Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

Heat accumulation system serving the Piacenza district heating network. The Piacenza district heating network is fed by a flow of vapour produced by the Levante cogeneration plant, owned by A2A, and the supplementary and reserve plant on via Diete di Roncaglia, owned by IREN Energia. Both plants are located north-east of the city's district heating network, beyond the rail intersection, and the heat produced is transported to the city. The Piacenza district heating network is made up of 22 km of double pipeline, with a connected volume of approximately 1.6 million m³ as at 31/12/2016.

The project consists of installing a heat accumulation system made up of 3 accumulators, with an overall capacity of 1,200 m³, in the northern part of the city of Piacenza.

The function of this system is to store the thermal energy produced by the cogeneration thermal power plants, when heat demand is lower, in order to transfer it later, when the district heating network is operating with its maximum load, thus reducing the use of supplementary boilers.

The energy contributed by the accumulation system makes it possible to achieve objectives such as increased operating flexibility and commissioning speed, increased flexibility in managing thermal energy flows, saving primary sources and reducing greenhouse gases.

Accumulators district heating in Parma (PR)

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

Full amount project (2008-2019)
1.7 mln

Re/financed amount	
2008-2018:	- mln
2019:	- mln
Total	**- mln**

KPIs

- Primary energy saving per operating year [MWh]
- Avoided CO_2 emissions from fossil sources per operating year [t]

Project description

Heat accumulation system serving the Parma district heating network. The Parma district heating network is made up of 98 km of double pipeline, with a connected volume of approximately 5.8 million m³ as at 31/12/2016. It is powered by thermal energy generated by the following three plants:
- the Environmental Integrated Centre (EIC), made up of a cogeneration vapour-cycle heat recovery section, fed by two waste-to-energy lines and one supplementary section with boilers and natural gas;
- the Plant on Via Lazio, made up of five supplementary and reserve boilers powered by natural gas;
- the Plant on Strada Santa Margherita, made up of two supplementary and reserve boilers, powered by natural gas and a 500 m³ accumulation system.

The new accumulator system being planned has a volume of 1,200 m³ and will be installed at the Via Lazio plant. The function of this system is to store the thermal energy produced by the EIC's waste-to-energy cogeneration system thermal power plants when heat demand from the district heating network is lower, in order to transfer it later, when the district heating network has its maximum demand for thermal load, thus reducing the use of supplementary boilers.

The energy contributed by the accumulation system makes it possible to achieve objectives such as increased operating flexibility and commissioning speed, increased flexibility in managing thermal energy flows, saving primary sources and reducing greenhouse gases.

Accumulators district heating in Reggio Emilia (RE)

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

Full amount project (2008-2019)	Re/financed amount		KPIs
2.2 mln	**2008-2018:**	- mln	• Primary energy saving per operating year [MWh] • Avoided CO_2 emissions from fossil sources per operating year [t]
	2019:	- mln	
	Total	**- mln**	

Project description

Heat accumulation system serving the Reggio Emilia district heating network. This network is made up of approximately 219 km of double pipelines and heats approximately 13.3 million m³ (figures from December 2016).

The Reggio Emilia district heating network is fed by a cogeneration section and supplementary and reserve boilers in the north-east area of the network (Energy Hub), the supplementary and reserve boilers in the south-west (Network 1 Plant), south-east (Pappagnocca Plant) and north-east (Via Sardegna Plant) areas of the network.

A 1,600 m³ accumulation system is already installed in the Reggio Emilia district heating network at the Energy Hub, with a daily loading/unloading operation during the heating season.

The new accumulator system being planned has a volume of 1,200 m³ and will be installed at the Via Sardegna Plant. The function of the accumulation system is to store the thermal energy produced by the cogeneration thermal power plants when heat demand is lower, in order to transfer it later, when the district heating network is operating with its maximum load, thus reducing the use of supplementary boilers.

The energy contributed by the accumulation system makes it possible to achieve objectives such as increased operating flexibility and commissioning speed, increased flexibility in managing thermal energy flows, saving primary sources and reducing greenhouse gases.

ISIN XS1881533563-FINAL 2018

San Mauro/Diga del Pascolo Mini Hydro plant

Eligible Category *Renewable energy (Mini hydro power)*

Full amount project (2008-2019)
3.0 mln

Re/financed amount	
2008-2018:	- mln
2019:	- mln
Total	**- mln**

KPIs

- 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 project entails building a run-of-the-river mini hydro plant at the barrier across the Po river in the municipality of Turin, which would use the discharge of the minimum vital flow (MVF) on the existing drop between the upstream reservoir and the level of the Po river downstream of the Pascolo barrier.

Plant features:

- Maximum derived capacity: 21 m3/s
- Gross drop: approx. 5 m
- Maximum power: approx. 1 MW
- Machinery: to be defined
- Planned days in operation: to be defined
- Expected annual productivity: to be defined

Cogeneration plant Torino Nord

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project (2008-2019)
352.2 mln

Re/financed amount	
2008-2018:	185.1 mln
2019:	- mln
Total	**185.1 mln**

KPIs

- 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

ISIN XS1881533563-FINAL 2018

Valle Orco hydroelectric plants

Eligible Category *Renewable energy (Mini hydro power)*

Full amount project (2008-2019)
104.0 mln

Re/financed amount	
2008-2018:	102.0 mln
2019:	- mln
Total	**102.0 mln**

KPIs

- 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 Valle Orco hydroelectric system is made up of seven plants for producing electrical energy, subdivided into the following hydraulic shafts. Between 2006 and 2011, repowering activities were carried out on the Villa Plant, the Bardonetto Plant, the Rosone Plant and the Telessio Plant.

The main technical features of these plants are specified below:

- Agnel-Serrù-Villa Plant
- Ceresole-Rosone Plant
- Telessio-Eugio-Rosone Plant
- Valsoera-Telessio Plant
- S.Lorenzo-Rosone Plant
- Rosone-Bardonetto Plant
- Bardonetto-Pont Plant

ISIN XS1881533563-FINAL 2018

VDE hydroelectric plant (Chiomonte-Susa) repowering project

Eligible Category *Renewable energy (Mini hydro power)*

Full amount project (2008-2019)
12.5 mln

Re/financed amount	
2008-2018:	1.0 mln
2019:	5.0 mln
Total	**6.0 mln**

KPIs

- 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.

ISIN XS1881533563-FINAL 2018

Cogeneration plant Moncalieri–GT2 RPW

Eligible Category *Energy efficiency (Cogeneration facilities)*

Full amount project (2008-2019)
161.2 mln

Re/financed amount	
2008-2018:	18.6 mln
2019:	- mln
Total	**18.6 mln**

KPIs

- 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).

ISIN XS1881533563-FINAL 2018

Mini Hydro Fornace plant in Baiso (RE)

Eligible Category *Renewable energy (Mini hydro power)*

Full amount project (2008-2019)
7.4 mln

Re/financed amount	
2008-2018:	3.8 mln
2019:	- mln
Total	**3.8 mln**

KPIs

- 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

The La Fornace mini hydroelectric plant was built on the Secchia river, along the stretch that lies within the municipality of Baiso, in the province of Reggio Emilia.

It is a run-of-the-river plant, built with particular attention to the minimisation of its environmental impact, in terms of altering the landscape profile and in interacting with the micro ecosystem of the underlying river.

Plant power (kW): 990

ISIN XS1881533563-FINAL 2018

Photovoltaic plants owned by "Varsi" company

Eligible Category — *Renewable energy (Solar PV energy generation)*

Full amount project (2008-2019)
27.5 mln

Re/financed amount	
2008-2017:	16.8 mln
2018-2019:	- mln
Total	**16.8 mln**

KPIs

- 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

Varsi Fotovoltaico encompasses 12 photovoltaic plants: 8 on the ground and 4 on roofs, with an overall power of 8.4 MWh.

Plant	Municipality	Province	Power (KWP)	Type
Gonzaga Fiera	Gonzaga	Mantua	741	Roof
Gonzaga Bocciodromo (Bocce hall)	Gonzaga	Mantua	43	Roof
Gonzaga middle school	Gonzaga	Mantua	64	Roof
Rigosa PTV [photovoltaic plant]	Roccabianca	Parma	890	Ground
Canesio PTV	Pellegrino P.se	Parma	551	Ground
Bellario, road to Soragna PTV	San Secondo P.se	Parma	998	Ground
Rimale PTV	Fidenza	Parma	998	Ground
Italian Isolating Plants	Porto Torres	Sassari	972	Roof
Priorato PTV	Fontanellato	Parma	995	Ground
Busseto Fotovoltaico SRL	Busseto	Parma	432	Ground
Medesano Fotovoltaico SRL	Medesano	Parma	832	Ground
Villora PTV (Municipality of Varsi)	Varsi	Parma	851	Ground
Total			**8,367**	

Photovoltaic plants owned by “Greensource” company

Eligible Category *Renewable energy (Solar PV energy generation)*

Full amount project (2008-2019)
16.8 mln

Re/financed amount	
2008-2017:	7.6 mln
2018-2019:	- mln
Total	**7.6 mln**

KPIs

- 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

Green Source PTV encompasses various photovoltaic plants, with an overall power of 3.9 MW

Plant	Municipality	Province	Power (KWP)	Type
C8	Reggio Emilia	Reggio Emilia	1.212	Roof
Tennis Club	Reggio Emilia	Reggio Emilia	200	Roof
Pluris Energy	Castellarano	Reggio Emilia	710	Ground
ITIS Parma	Parma	Reggio Emilia	170	Ground
Mancasale	Reggio Emilia	Reggio Emilia	993	Roof
Scandiano indoor sports arena	Scandiano	Reggio Emilia	95	Roof
Tressano	Castellarano	Reggio Emilia	122	
School Facilities	Reggio Emilia-Parma-Piacenza	Reggio Emilia-Parma-Piacenza	357	Roof
Total			**3.859**	

E-mobility initiatives in the Iren offices

Eligible Category *Transport (Electric vehicles)*

Full amount project (2008-2019)
10.4 mln

Re/financed amount	
2008-2017:	0.9 mln
2018-2019:	9.5 mln
Total	**10.4 mln**

KPIs

- 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.

ISIN XS1881533563-FINAL 2018

Investiments in Sewage and Waste water plants (Emilia and Liguria)

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

Full amount project (2008-2019)
139.9 mln

Re/financed amount	
2008-2017:	20.1 mln
2018-2019:	- mln
Total	**20.1 mln**

KPIs

- Water Treatment plants [N]
- Sewage systems [km]

Project description

Works 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.

Electricity distribution investments

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

Full amount project (2008-2019)
80.0 mln

Re/financed amount	
2008-2017:	32.9 mln
2018-2019:	- mln
Total	**32.9 mln**

KPIs

- 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.

ISIN XS1881533563-FINAL 2018