



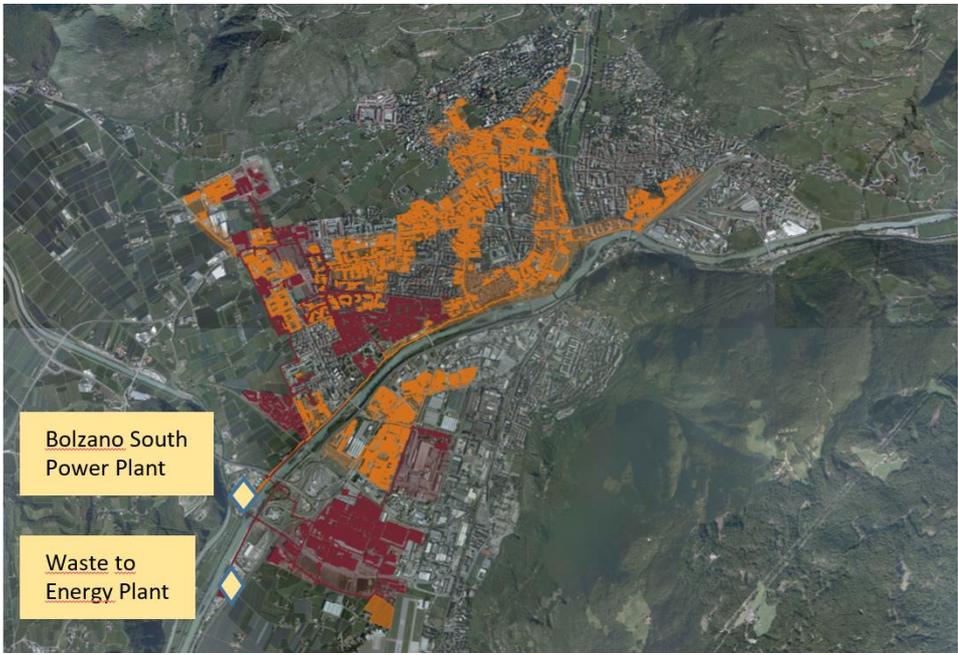
Factsheet

District Heating Bolzano



SINFONIA stands for "Smart INitiative of cities Fully cOmitted to iNvest In Advanced large-scaled energy". This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 609019

PROFILE

Name and address	ALPERIA ECOPLUS District Heating Bolzano <i>via Lungo Isarco destro 25</i> <i>39100 Bolzano (Italy)</i>
Map	 <p><i>Red – existing network; Orange – planned expansion</i></p>
Description	ALPERIA ECOPLUS operates the district heating plant in Bolzano South and manages the district heating system of the City of Bolzano. Bolzano’s existing DH system is composed by two generation units: <ul style="list-style-type: none"> ▪ Bolzano South thermal plant, which includes 2 combustion engines (natural gas) working in cogeneration mode and 5 boilers (natural gas and diesel). ▪ Waste to Energy plant with maximum capacity of 30 MWt and 10 MWe. The plant has just replaced the old incinerator and the large capacity is justified by the planned expansion project for the DH network. Bolzano’s current DH network operates, as the majority of the Italian systems, at a temperature level ranging from 80 to 95 °C depending on the season. Today the network provides heat to more than 200 users.
Ownership	ALPERIA ECOPLUS Srl Via Dodiciville 8 – 39100 Bolzano Ownership: 100% ALPERIA SPA



Technical details	<p>Total installed capacity of thermal power: 39 MW Current thermal energy production: 38.000 MWh/a</p> <p>Gas boilers: 35,5 MW 26.000 MWh/a NOx 114 mg/Nm³</p> <p>Gas engines (CHP): 3,7 MW_{th} 3,6 MW_{el} 12.200 MWh/a heat 13.000 MWh/a electricity NOx 234 mg/Nm³</p>
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THE CONCEPT

Concept and energy solutions	<p>1. In Bolzano, Alperia has been responsible for testing a more sustainable supply system for one of the two existing cogeneration engines in Alperia Ecoplus' district heating plant (Task 8.4.1 Smart cogeneration plant: emission reduction by using innovative gas blends): the engines have been prepared and converted for the use of methane/hydrogen blends.</p> <p>2. Alperia has also been responsible for introducing an intelligent and innovative control system for the optimal operation of the extended district heating network (Task 8.4.2: Forecast and prevent heat and cool peaks demands in the DH/C network).</p>
Performance targets	<p>Task 8.4.1: Emissions reduction</p> <p>Task 8.4.2: Enhancement of the distribution efficiency and reduction of energy losses.</p>
Financing model	<p>50% EU co-financing (SINFONIA) 50% own funds</p>

IMPLEMENTATION

Stakeholders involved	
Contracting authority	Alperia Ecoplus Srl



Project managers	Stephan Hasse, Alessandro Mazzocato, Giorgio Dalvit
Technical system designer	ITB (Ingenieurteam Bergmeister GmbH)
Manufacturer / supplier	Linde Gas Italia Srl INNIO Jenbacher GmbH & Co OG IIT (Institut für Innovative Technologien GmbH) FER Strumenti srl PETROL d.d. Ljubliana
Other involved companies	Eco-Research srl Danfoss Ges.m.b.H

Costs	
Cost breakdown	Task 8.4.1: 314.838,30 € Task 8.4.2: 157.486,75 € (as reported in the official Hand Over Certificates)
Description of the works	
Activity: Modification of one of the 2 gas engines, situated in the combined heat and power plant of Alperia Ecoplus at Bolzano, for the use of methane/hydrogen blends (Task 8.4.1)	
Site Location: Teleriscaldamento Bolzano, Lungo Isarco Destro 25, 39100 Bolzano	
Dates	Start Dates: 17.07.2015 ITB (risk assessment, assistance with authorizations, security coordination in the planning, final/construction, design hydrogen engine) 21.10.2016 FER Strumenti (supply and installation of a CO2 sensor and a CH4 sensor for measurement of emission) 11.05.2017 Linde Gas Italia (H2-piping, automatisisation, safety measures, hydrogen transport) 11.05.2017 INNIO Jenbacher (modification of the existing gas engine for the use of methane/hydrogen blends)



	24.08.2017 Eco-Research (within "supply and installation of a CO2 sensor and a CH4 sensor for measurement of emissions": Check of linearity of the Automated Measuring System (AMS) according to EN 14181:2015)
	28.08.2017 IIT (production and supply of green hydrogen)
	Completion Date: 02.07.2018 (communication of completion of work to the Municipality of Bolzano)

Description of activities performed / Technical specifications:

The aim of the project was to investigate whether and to what extent the admixture of hydrogen into the combustion gas of a Combined Heat and Power plant (CHP) can reduce the air pollutants. For this purpose the existing natural gas powered CHP was converted for the admixture of hydrogen. Then the emissions were measured with and without hydrogen admixture by an Automated Measurement System (AMS).

The project included the following performed activities:

- Planning and authorisations for the implementation of the project
- Conversion of the gas engine for the hydrogen (H2) admixture
- H2 piping & process control
- Extension of the existing Automated Measurement System with carbon dioxide sensor (CO2) and methane sensor (CH4) sensor
- Verification of the Automated Measurement System (AMS) by an accredited test laboratory
- Trial operations
- Measurement operation

Activity: Modification and adaptation of controls to forecast and prevent the peak heat load formation and to optimize DH temperature supply (Task 8.4.2)

Site Location: Bolzano (Italy)

Dates

Start Date: 08th March 2016 (Kick off meeting)

Completion Date: 31/12/2019 (End S&U phase)

Description of activities performed / Technical specifications:

- Analysis of how different operation strategies might affect DH users;
- Offline DH model creation and validation;
- Installation of sensors along the DH network;



- Update the architectural scheme of Alperia IT network;
- Real time DH model creation and calibration;
- District heating temperature supply optimization

Work progress

Milestones

Task 8.4.1

Figure 1: Initial situation Operation of the CHP-plant with natural gas

Before conversion, the combined heat and power plant (CHP) was operated solely with combustion of natural gas (NG). Emissions are recorded using continuously a Continuous Measurement System (CEMS). All limit values for emissions were within the legally required specifications.

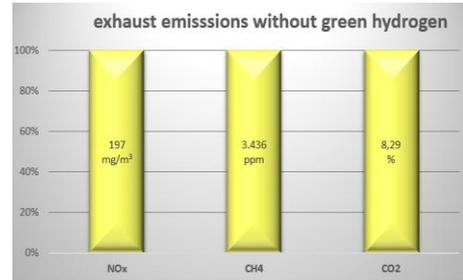


Figure 2 & 3: Modifications for the use of hydrogen

Modifications of the engine (turbocharger, motor valves, combustion control).



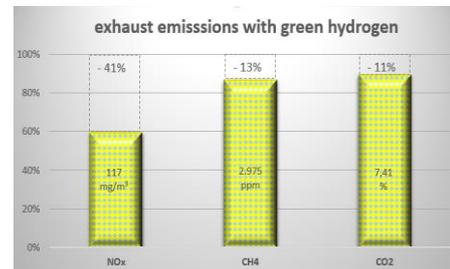
The green hydrogen production took place in the H2 Center South Tyrol in Bolzano and was transported in special trailers to the 4 km distant district heating plant.



Figure 4: Operation of the CHP-plant with H₂/natural gas mixture

The hydrogen admixture to natural gas was carried out up to a volume of 30%.

Results show a significant reduction of air pollutants, especially of nitrogen oxides.



Task 8.4.2

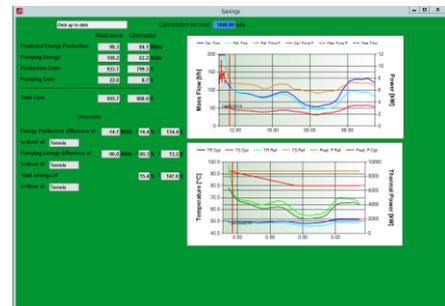
Figure 2
Real time monitoring



Figure 3
Heat load forecasting tool



Figure 4
Temperature optimization tool



MONITORING RESULTS

Monitoring results

- Task 8.4.1 Smart cogeneration plant: emission reduction by using innovative gas blends:* with a hydrogen additive of up to 30 percent by volume, Alperia has reduced carbon dioxide emissions by up to 15 percent and nitrogen oxide emissions by up to 40 percent.
- Task 8.4.2: Forecast and prevent heat and cool peaks demands in the DH/C network:* with this advanced control system, the district heating of Bolzano can now operate with maximum distribution efficiency and energy losses in the entire network can be reduced by up to 5%.

