



H-REII Project

Policy and governance actions to reduce CO2 emissions by Energy valorization of process effluents in Energy Intensive Industries



energy audit

energy consumption

energy efficiency

recovery of waste

PROJECT DESCRIPTION

Some industrial processes are characterized by a significant quantity of waste heat, which, when unused, is dispersed in the environment in the form of hot gases. The **H-REII** project was designed on the assumption that it is possible to **recover the not used energy produced by the residual heat of many industrial processes** (especially those of the energy-intensive industries) obtaining at the same time a **significant reduction of the greenhouse gas emissions**. H-REII developed a pilot model of heat-recovery, based on existing technology, and therefore ready for distribution in the industries, contributing at the same time to the promotion of **integrated policy and governance actions** supporting the quickness of the distribution.



OBJECTIVES

Other project objectives were:

- promoting the **reduction of global CO2 emissions** through the creation of a **pilot Observatory** for mapping the potential of effluents recovery in energy-intensive industries;
- developing and implementing in the city of Brescia a **demonstration model of energy audit**, to be potentially replicated in similar territorial contexts, in order to contribute to the CO2 reduction in industrial processes;
- providing an **instrument to institutional authorities** of various levels to promote and develop **innovative CO2 reduction initiatives** through incentives and simplification of the related administrative procedures.

PROJECT PHASES

H-REII was the first pilot project to map the effluents recovery potential in the energy-intensive industries with the application of ORC (*Organic Rankine Cycle*) technology allowing a generation range between 0,5 MWe e 5 MWe.

The project was articulated in 9 actions, the main milestones of which were the following:

- establishment of an **Observatory** for the launch and management of a technical, scientific and legislative committee of energy efficiency experts specialized in particular in heat recovery aimed at electricity production and CO2 emission reduction in energy-intensive industries;
- definition and classification of *energy-intensive* companies, development of a related list with ranking of the companies based on the feasibility of a heat recovery system;



- identification of the **most suitable industrial sectors** to install heat recovery systems (steel, glass, cement, non-ferrous metals, oil & gas);
- implementation of **preliminary energy audits** to test the model developed within the project, both in Italian and Austrian companies ("replicable" approach);
- estimation of the energy potential of the various analyzed sectors, extended subsequently to the industrial sector to which they belong. To do this it was decided to use the emission quotas assigned by the EU-ETS (Emission Trading Scheme), which takes into account the annual production of the company considered proportional to its energy consumption;
- outreach on the topic of heat recovery for energy production in the perspective of extension of rules, regulations, and policies at Italian and European levels;
- development of an **operational and environmental licensing procedure model** for heat recovery systems, implemented by the Province of Brescia in collaboration with other Italian provinces, to promote the standardization of the regulatory landscape;
- proposal to revise the European guidelines for the Best Available Techniques (BREFs - BAT REFERENCE DOCUMENTS) introducing in BREFs indications on heat recovery related to the cement and energy efficiency sectors;
- organization of an intense outreach campaign aimed at presenting and disseminating the project activities.

The experiment started with HREII continued in 2010 with **HREII DEMO** equally co-funded by the European LIFE program.

PROJECT RESULTS

Thanks to the project it has been possible to identify the industrial sectors with the greatest potential for recovering waste heat for the purposes of electrical exploitation using ORC technology, which are: cement, glass and steel. For all other sectors this solution must be assessed on a case-by-case basis in relation to technical and economic problems (too long return time on investments). On the basis of all collected data, using an ad hoc calculation model, the heat recovery potential and related avoided CO₂ emission have been calculated. The solution of electricity generation with ORC technologies has the advantage of being able to work in synergy with heat recovery already put in place for process uses or air conditioning of the environments, adding to the amount of energy recovered in these areas the benefits of the on-site electricity generation and being able to be used in industrial applications where such heat recovery is not feasible. The project made it possible to evaluate and verify the potential of a new sector that can be classified as "white economy", a branch of economy concerning energy redevelopment. There have been many aspects emerged in relation to environmental, industrial and innovation issues that, thanks to the implementation of H-REII, allowed to identify heat recovery from energy-intensive industrial processes as a tool to achieve the objectives of energy efficiency at national level and an opportunity for greater environmental and energy sustainability of the industrial processes.

Results of the analysis and observations carried out within the project have been incorporated into the following national and regional policy documents:

- **Italian Action Plan for Energy Efficiency 2011**, including waste heat recovery among the most effective measures of energy efficiency improvement, indicated as "IND-5 - refrigeration, inverter, boiler replacement, heat recovery", with more than **47%** of energy saving at annual level attended in 2016 for the whole industry sector;
- Guidelines related to **White certificates**, on preparation, execution and evaluation of projects referred to in art. 5, paragraph 1 of the Ministerial Decrees 20 July 2004 and related amendments, and on definition of criteria and procedures for issuing energy efficiency certificates - (Decision n° EEN 9/11 of the Gas and Electricity Authority);
- **PEAR** (*Regional Program for Energy and the Environment*) of Lombardy indicating waste heat recovery as an energy efficiency improvement measure and product.

Further important achievements of the project have been:

- Creation of a **Pilot monitoring observatory** to map the effluents recovery potential in the energy-intensive industries in Italy - in particular in the steel, glass, cement, non-ferrous metal, oil and gas sectors - applying ORC (*Organic Rankine Cycle*) technology allowing a generation range between 0,5 MWe e 5 MWe.
- Elaboration of **Guidelines** to summarize the sector's regulation;
- Implementation of an **energy audit model** able to become a reference both at national and European levels;
- Realization of **46 preliminary energy audits** in Italy. It has been estimated (see in the document **CO₂ emission reduction**) that the maximum potential of the investigated sectors corresponds to a total of approximately **1.263 GWh** energy per year for 5.000h/year with an emission saving equal to **499 Kton of CO₂**, and to **2.021 GWh** for 8.000h/year equal to **798 Kton of CO₂** emission saving;
- Preparation of a document presenting the background, objectives and **lessons learnt from the HREII Project**;
- Preparation of the document **Description of ORC technology and its application for heat recovery**;



- Development of an **authorization model for installation of heat recovery plants applying ORC technology**.
- The paragraph "Heat recovery by ORC technology", has been added to the BREF - "Energy efficiency", considered transversal to all industrial sectors including also glass and steel, and where at present there are no applications functioning at full capacity.

In 2011 the H-REII project was chosen by the European Commission as official partner for the final edition of the information campaign *Sustainable Energy Europe*, launched in 2005 and later transformed in *EU Sustainable Energy Week*.



Acronym
H-REII

Number of reference
LIFE08 ENV/IT/000422

Reference Programme
[LIFE](#)

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Turboden

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EU contribution
436.205,60

Call Year
2008

Start Year
2010

End Year
2012

Beneficiary headquarters

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Region
Lombardia

Description
Brescia