Outline

- **RINA Consulting contribution to HEATLEAP project in Action C3 - Replicability and transfer:**

Elaboration of Business Models to be implemented at the end of the project (shared savings, guarantee savings contracts and first out approaches)

- **Main topics:**

• Value chain analysis: LHP, GEX and monitoring system

• Business models and insight regarding EPC (Energy Performance Contract)

• Refinement of BMs applied to 3 case studies in three different countries

GEX replicability

GEX ITALIAN MARKET OPPORTUNITIES:

The theoretical potential Italian market can be described as follow:

Stations	Units	potential GEX production	potential generation	potential investments
Small	n. 530	100 ÷ 550 kWe	584 [11] GWh/y of clean energy	690 M€ [12]
Large	n. 70	550 kWe up to 2+MWe	208 [1] GWh/y of clean energy	140 M€ [2]

- Small Station: NG flow rate capacity in the range from 100 kSm3/day to 1 MSm3/day;
- Large Station: NG flow rate capacity >1 MSm3/day

GEX EUROPEAN MARKET OPPORTUNITIES:

Specifically, considering Italy, Spain, France, Germany, The Netherlands, Belgium, Poland and Austria, the overall potential would result in 3.660 GWh/y producible through GEX and potential investments volume of approx. 3.8 B€

Energy Performance Contract

How the EPC (Energy Performance Contract) works:

The EPC requires the ESCo (Energy Service Company) to carry out improvement interventions in the energy efficiency of systems owned by the customer. The investment is borne by the ESCo, which can use its own financial resources or those of third parties. The customer, for the duration of the contract, pays the ESCo a part of the energy savings generated by the efficiency measures. In this way the ESCo recovers the initial investment.

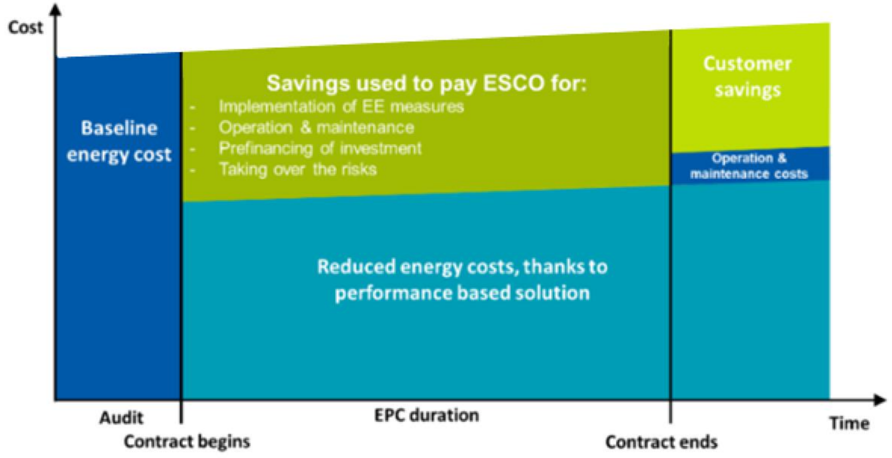
Customer benefits:

- There are no financial charges for the customer: the ESCo invests the CAPEX;
- There are no technical and financial risks for the customer: the amount paid to the ESCo depends on the savings achieved, therefore the more the customer saves, the more the ESCo earns;
- The customer can rely on the expertise and experience of a company specialized in the energy efficiency sector.

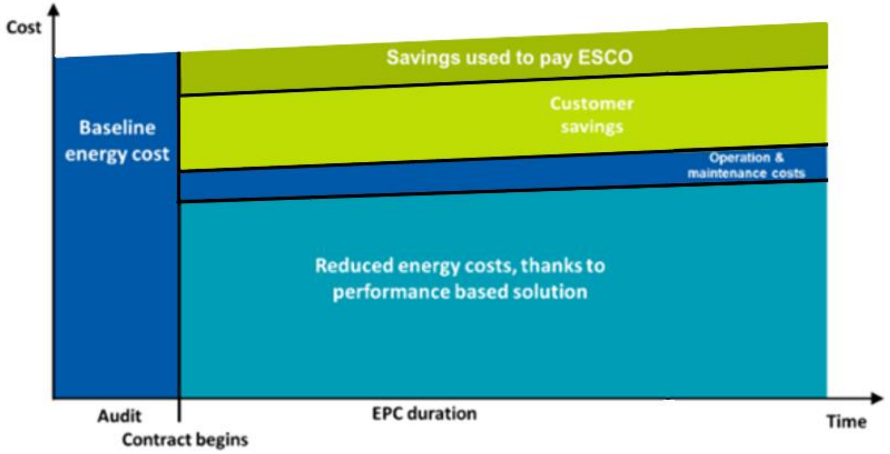
First Out and Shared Saving contracts

Analyzed types of EPCs:

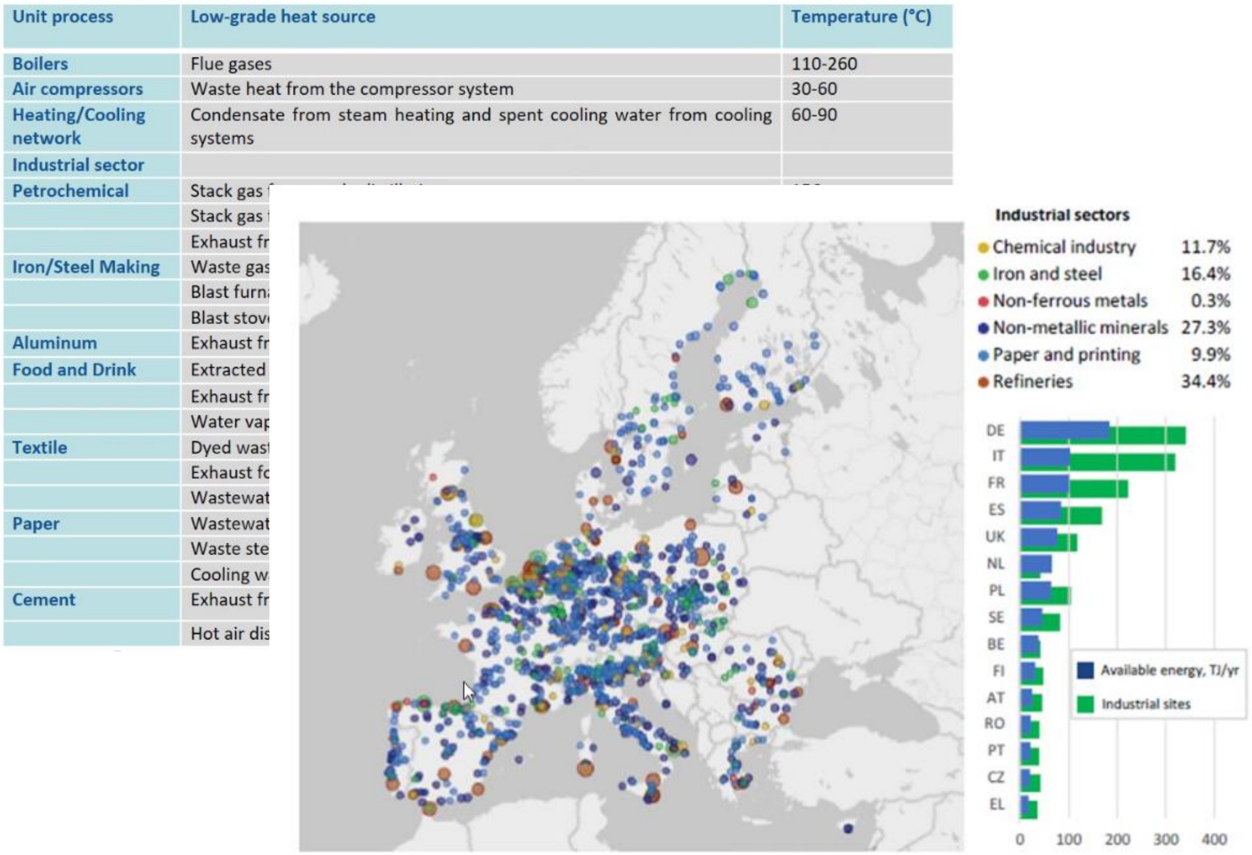
1) First Out contract: the energy savings achieved are used entirely to repay the initial investment provided by the ESCO. Upon expiry of the contract, the savings and ownership of the systems pass entirely to the customer. With this approach, the ESCO collects 100% of the savings actually obtained up to the contractual expiry.



1) Shared Savings contract: the ESCO provides the capital and holds ownership of the plants; the savings are divided between the parties.



Replication cases



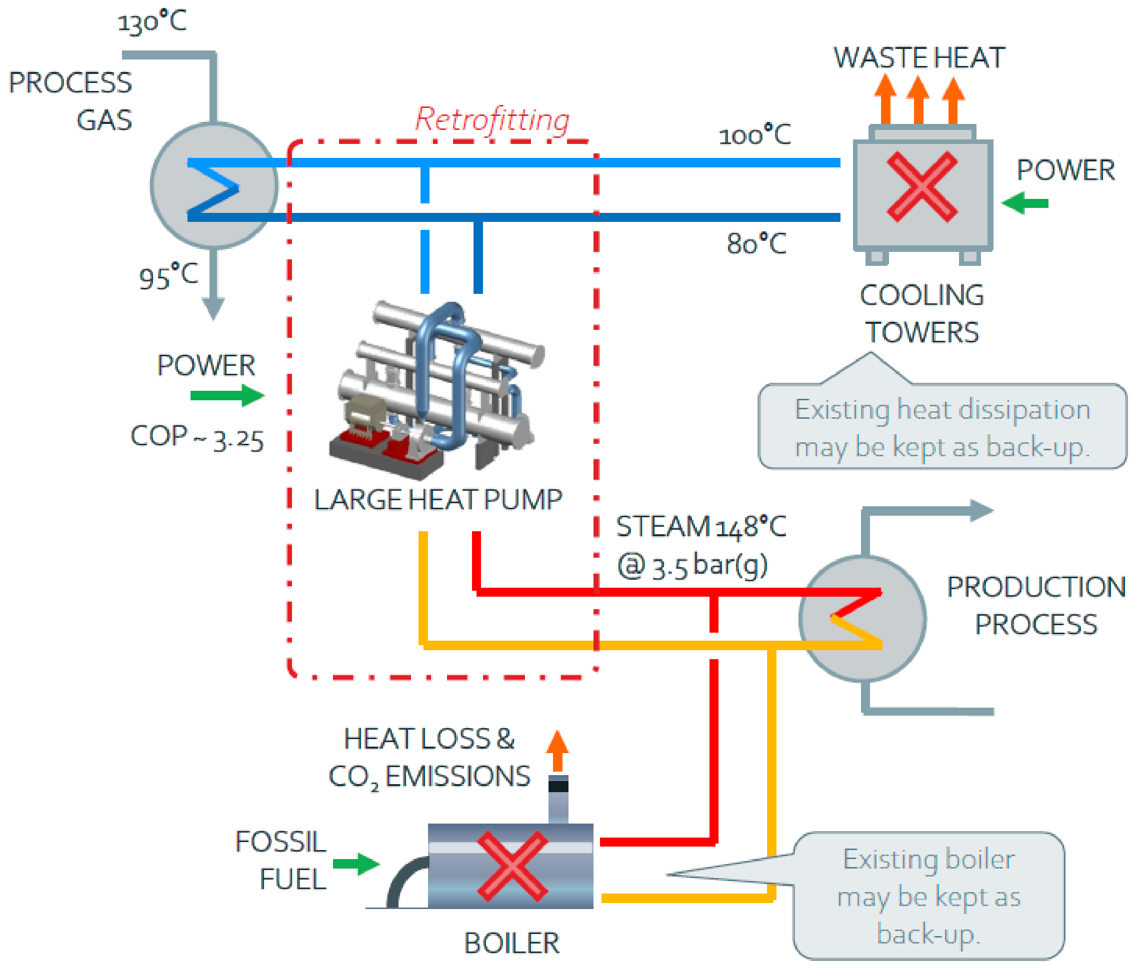
BMs applied to three replication cases:

1) Refinery plant in Netherland

2) Chemical plant in Belgium

3) Dairy plant in Italy

Refinery plant in Netherland



Large heat pump can be applied in the refinery sector to provide widely used steam via heat recovery from available waste heat sources. There are many potential applications for heat pump technology; here only one of them is presented.

PROJECT BENEFITS:

- Avoided consumption of fossil fuel for heat generation, significant carbon footprint reduction
- Avoided waste heat, cooling system' consumptions from existing systems.

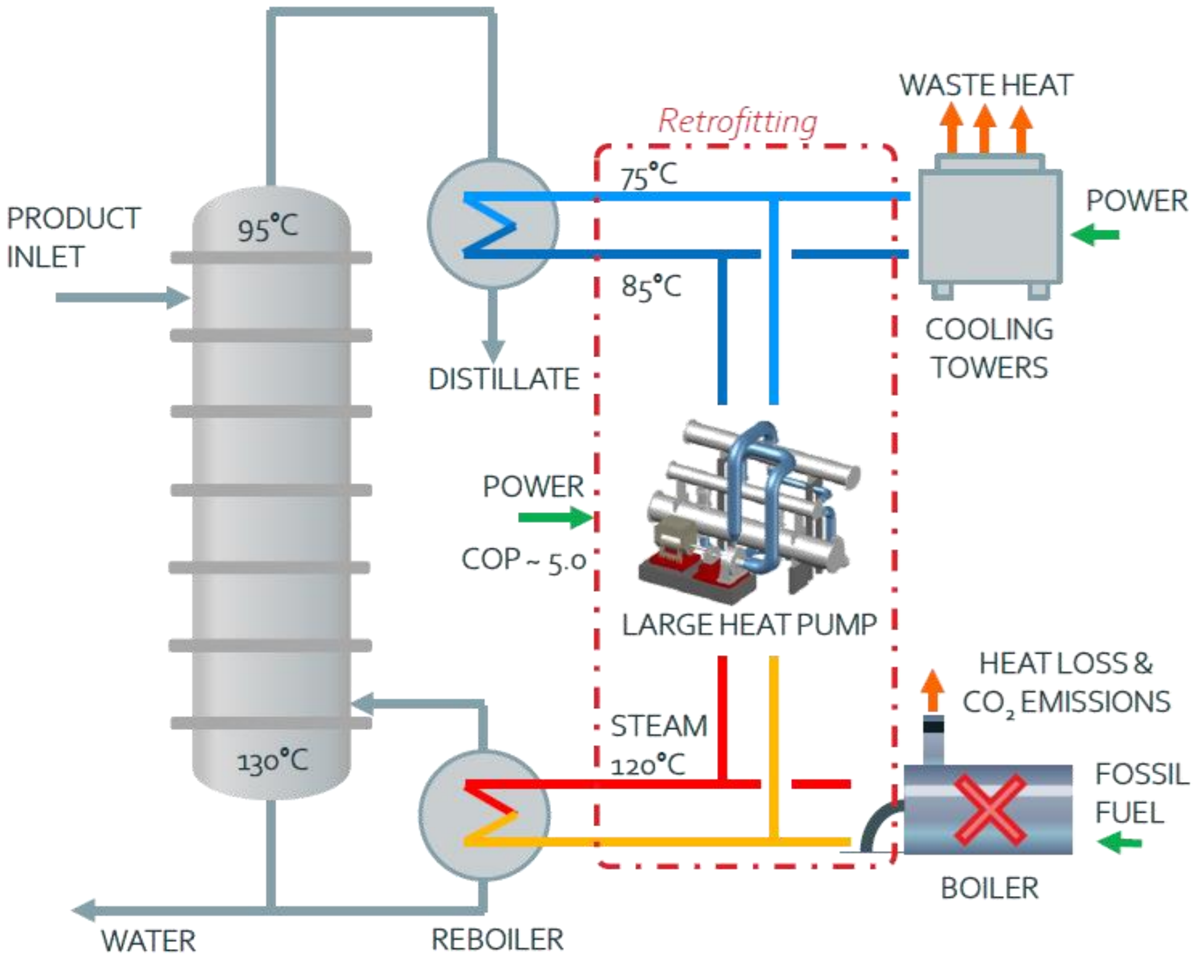
PROJECT FEASIBILITY:

Heat output: 20 MWth
Electric input: 6.2 MWe
COP: 3.25
Natural gas saving: 18.9 MSmc/yr
CO_2 saving: 36.900 tonCO_2/yr

Main parameters influencing PBP

Cost of electricity [€/MWh el] (2019)	68.20	
Cost of natural gas [€/Sm3] (2019)	0.29	

Chemical plant in Belgium



Large heat pump can be applied in the chemical sector to provide widely used steam via heat recovery from available waste heat sources. There are many potential applications for heat pump technology; here only one of them is presented.

PROJECT BENEFITS:

- Avoided consumption of fossil fuel for heat generation, significant carbon footprint reduction
- Avoided waste heat, cooling system' consumptions from existing systems.

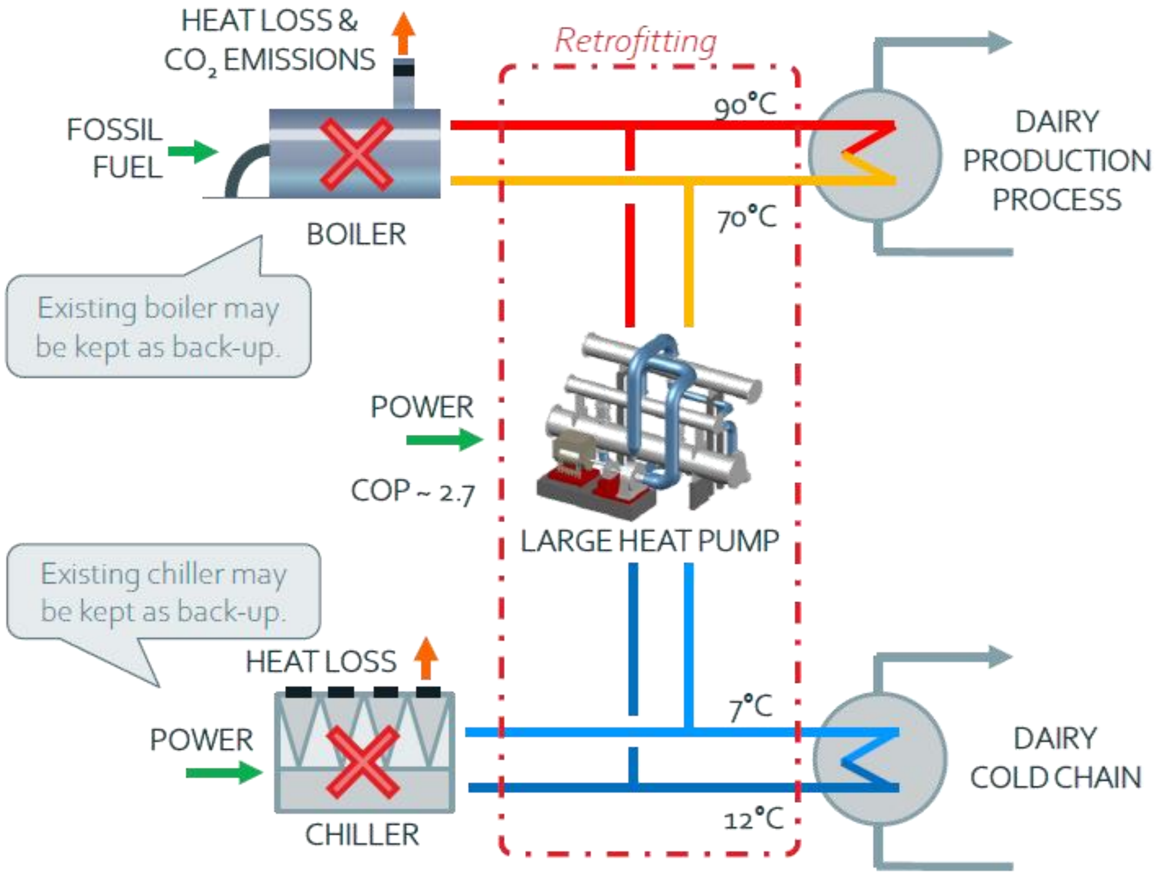
PROJECT FEASIBILITY:

Heat output: 14 MWth
Electric input: 2.8 MWe
COP: 5.0
Natural gas saving: 13.2 MSmc/yr
CO2 saving: 25.800 tonCO2/yr

Main parameters influencing PBP

Cost of electricity [€/MWh el] (2019)	78.70	
Cost of natural gas [€/Sm3] (2019)	0.52	

Dairy plant in Italy



Large heat pump can be applied in food & beverage sector providing simultaneously cooling and heating services. This H/C solution maximizes heat pump technology' benefits, thus saving both heat losses from conventional refrigerated water chillers and fossil fuel for heat generation.

PROJECT BENEFITS:

- Avoided consumption of fossil fuel for heat generation, with carbon footprint reduction
- Avoided heat loss from traditional chillers for water refrigeration

PROJECT FEASIBILITY:

Cold output: 8 MWth
Heat output: 12.7 MWth
Electric input: 4.7 MWe
Chiller avoided input: 1.1 MWe
COP: 2.7
Natural gas saving: 11.6 MSmc/yr
CO_2 saving: 22.740 tonCO_2/yr

Main parameters influencing PBP

Cost of electricity [€/MWh el] (2019)	102.70	
Cost of natural gas [€/Sm3] (2019)	0.31	

Conclusions

- Analysis of GEX market opportunities – Italian scenario and European scenario
- Feasibility analysis on EPC applied to three replicability cases
- Economic feasibility study for Shared Savings contract and First Out contract
- Identification of the main parameters influencing the PBP