Energy efficiency in the agri-food industry: the results of EU-MERCI project and the technical validation of the good practices selected

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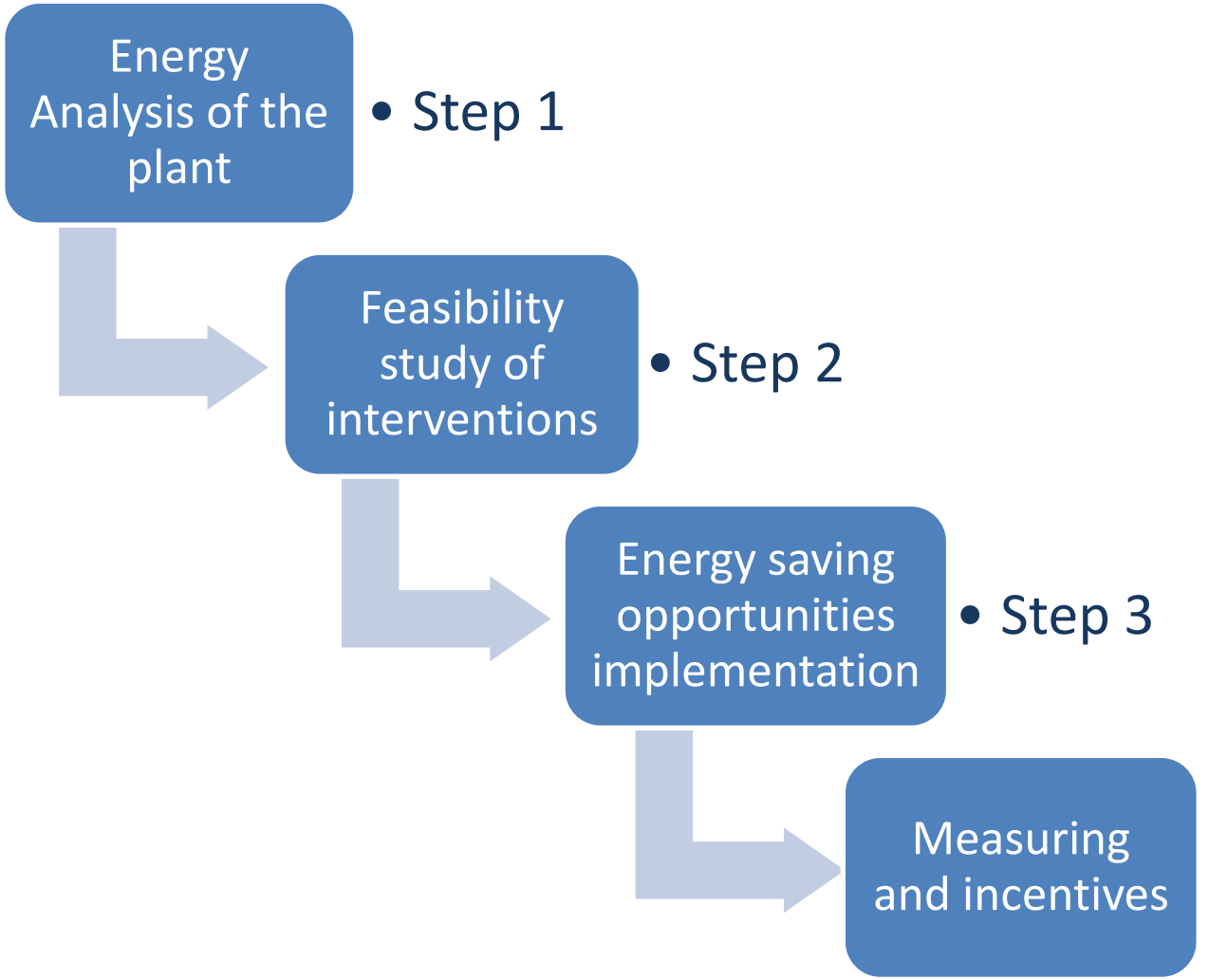
Agenda

Energy Efficiency opportunities in the Agri-Food Sector: a success case in using efficient refrigeration systems

- Plant Energy Analysis
  - Context
  - Results
- Technical-economic feasibility study
- Energy saving intervention implementation
- Incentives obtained

Project road map

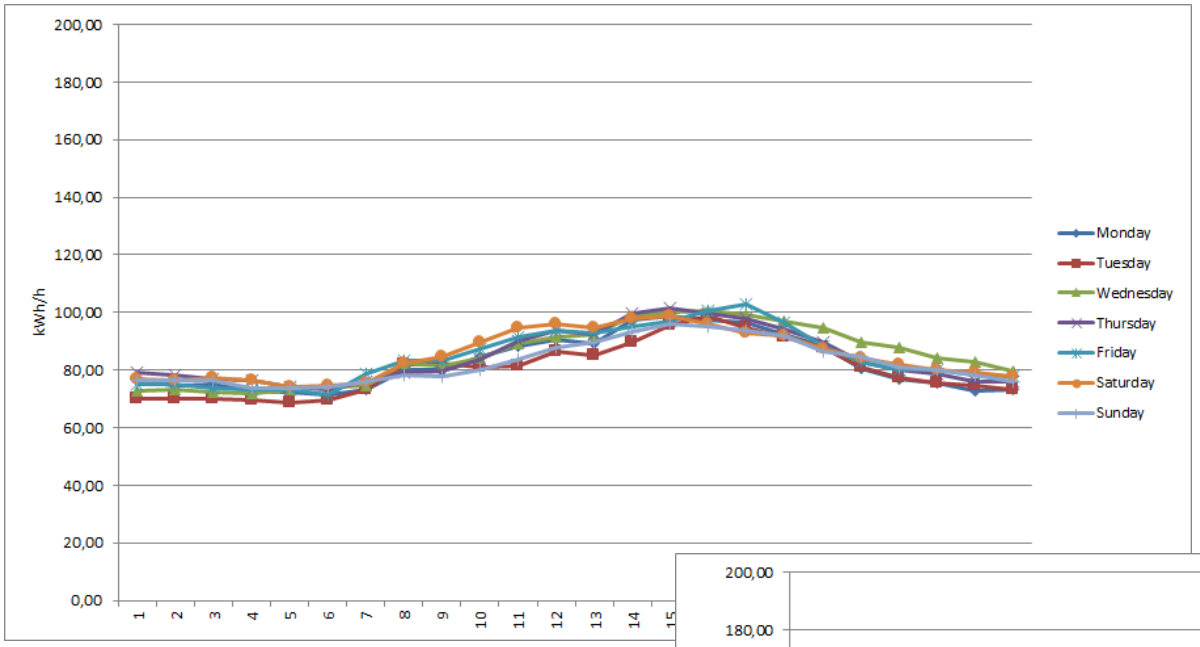
Integrated approach towards Energy Efficiency



Energy Analysis

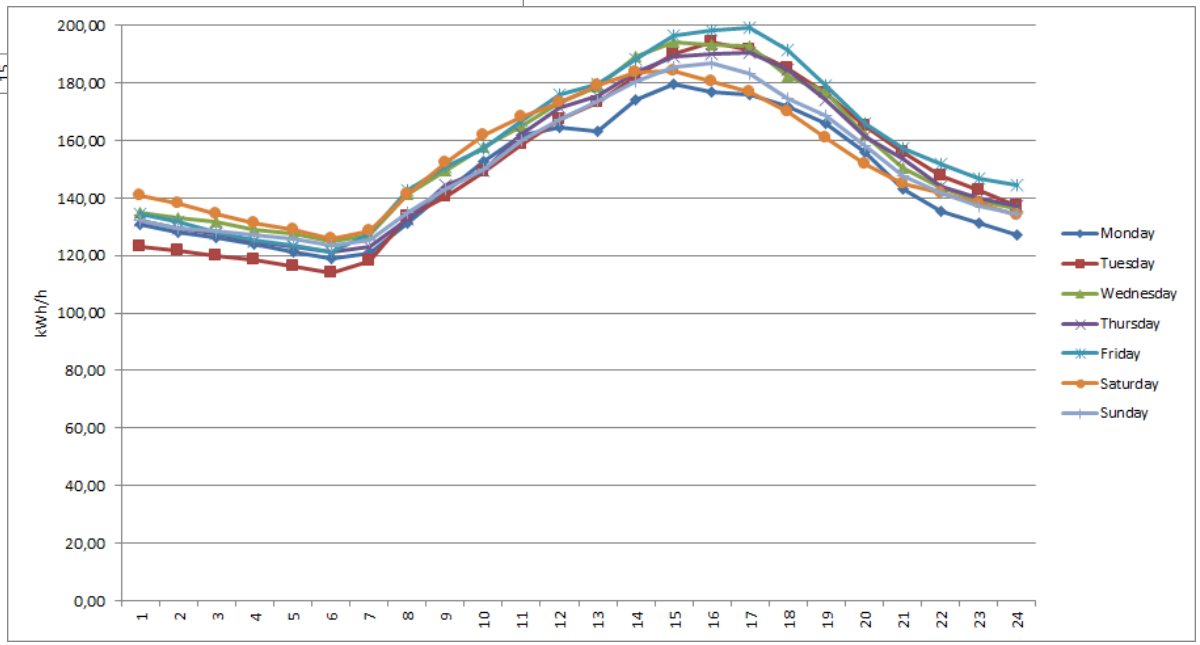
Structured analysis of the energy consumption of the plant aimed at:

Energy Analysis

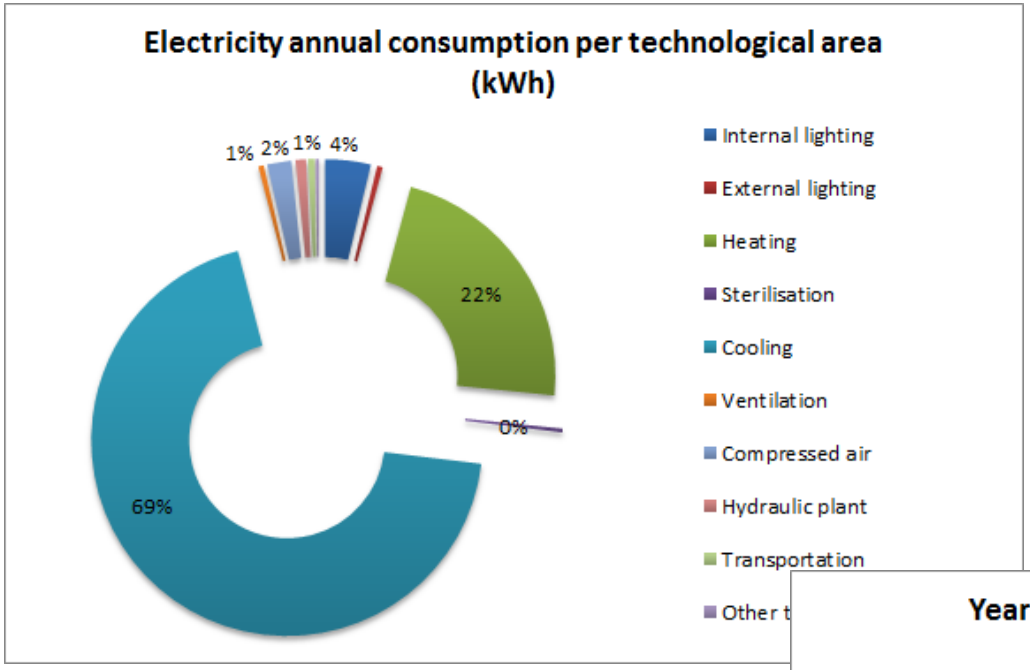


Electric energy seasonal load profile (winter)

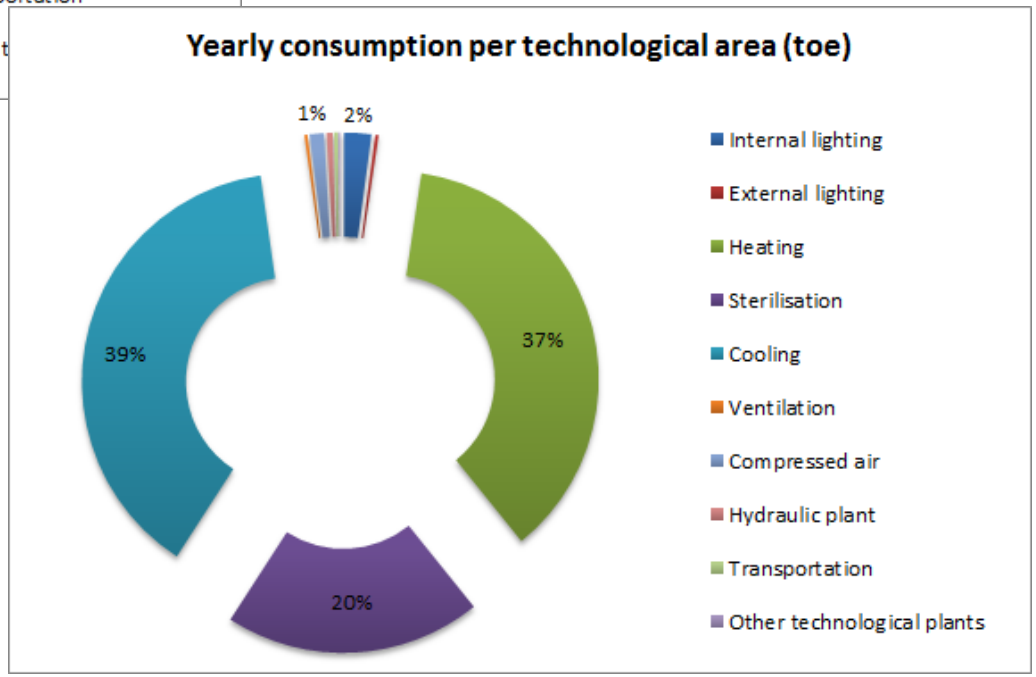
Electric energy seasonal load profile (summer)



Energy Analysis



Electric consumption classification by technological area



Overall consumption classification by technological area

Energy Analysis

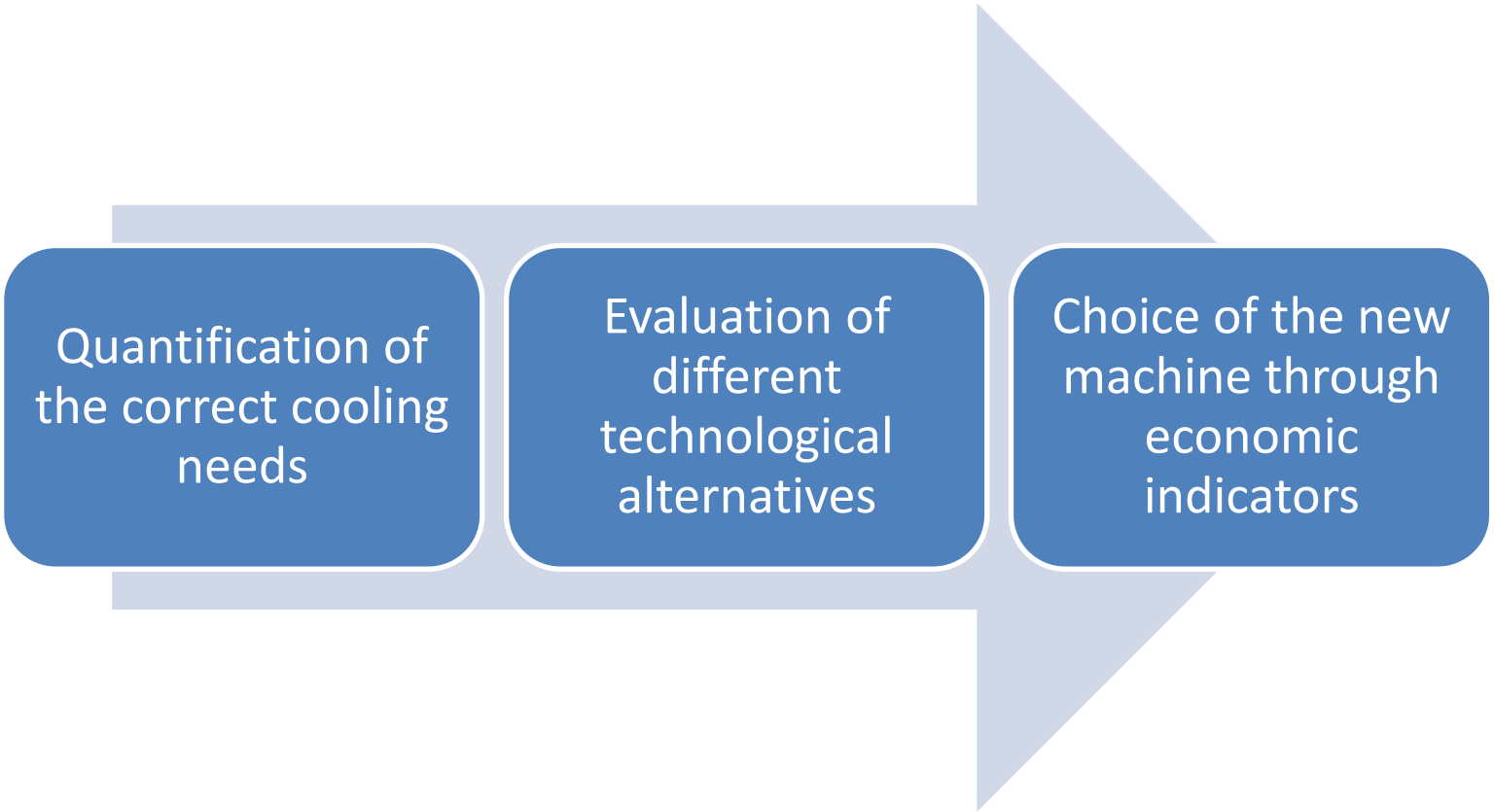
Intervention proposals

Intervention	Priority	Intervention classification	Incentives
Replacement of the current chiller with a high-efficiency unit	High	Technological	Yes
Installation of speed-regulation systems according to effective load on pumps for chilled water	High	Technological	Yes
Enlarge the tolerance of temperature and humidity set-points to avoid continuous heating/cooling and humidifying/drying in cells	High	Managerial	No
Specific maintenance activities on air treatment centres	High	Procedural	No
Introduction of maintenance and equipment/machinery purchase policies, focusing on energy consumption drivers and costs on plant lifecycle	High	Procedural	No
Intervention on batteries of condensers of the current re-phasing system (the value of the power factor is below 0,9 in all months)	Medium	Technological	No
Installation of a plant for pre-cooling in summer and pre-heating in winter for external air of all air treatment centers	Medium	Technological	Yes
Replacement of current fluorescent T8 tube bulbs having a ferromagnetic power unit with LED lamps	Medium	Technological	No
Replacement of heaters burners (now using agricultural diesel) with new natural-gas burners	Medium	Technological	No
Installation of a natural gas CHP plant	Medium	Technological	Yes
Installation of a high-pressure humidification plant	Low	Technological	No
Installation of a photovoltaic plant on the roof of the building	Low	Technological	No

Feasibility study

Intervention:

- Replacement of the existing chiller with a new high-efficiency machine

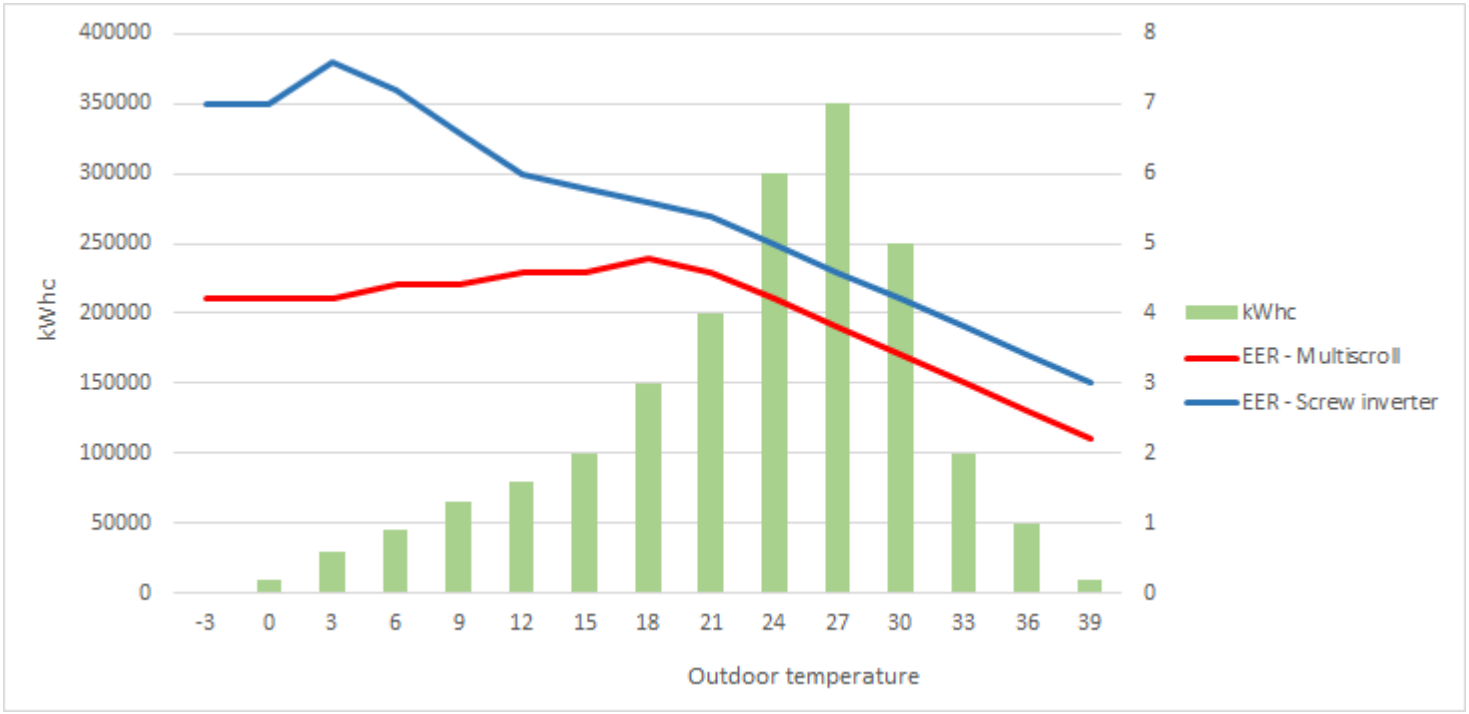


Feasibility study

CHILLER	Circuits	kWc	kWe *	EER
30 GX 247 (EXISTNG)	2	809	297,0	2,72
30 RB 0802 - MULTISCROLL	3	768,8	300,7	2,56
30 XAV 0800 - SCREW INVERTER	2	813,1	242,5	3,35
* Standard Eurovent Conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Outdoor air temperature 35°C				

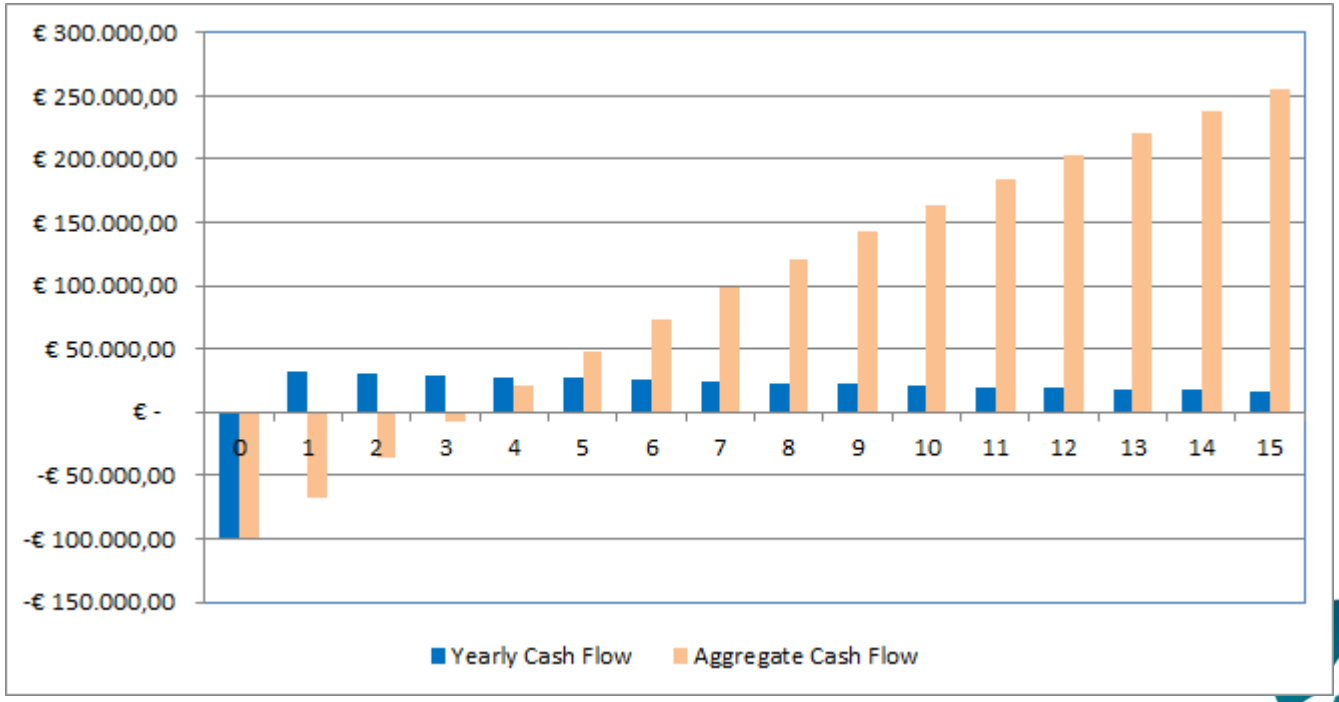
Technological alternatives

Cooling needs



Feasibility study

Economic Indicator	Value
Pay-Back Time (PBT)	3,2
Net Present Value (NPV)	255.000 €
Internal Rate of Return (IRR)	33,8%



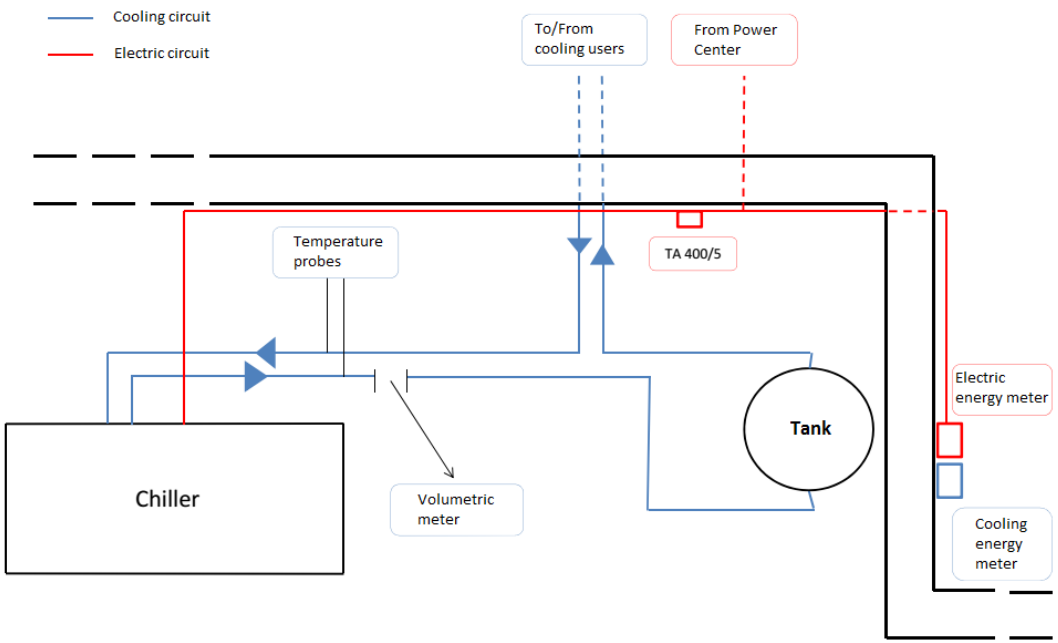
Incentives

White Certificates scheme of incentives

Definition of a consumption reference (baseline)

Measuring of:

- Electric energy absorbed
- Cooling energy produced



Incentives

After 2 years of operation

	Meter n. 1	Meter n. 2					
	Electric energy absorbed by the new chiller	Cooling energy produced by the new chiller	Energy Efficiency Ratio of the new chiller	Energy Efficiency Ratio of reference (baseline)	Savings obtained	Conversion factor	Savings obtained
	kWh_e	kWh_{cool}	EER_i	EER_{ref}	kWh_e	toe/kWh_e	toe
01/10/2015	24.502	131.600	5,37	3,0	19.365	0,000187	3,62
01/11/2015	9.034	49.800	5,51	3,0	7.566	0,000187	1,41
01/12/2015	7.122	41.000	5,76	3,0	6.545	0,000187	1,22
01/01/2016	5.122	25.500	4,98	3,0	3.378	0,000187	0,63
01/02/2016	6.588	34.600	5,25	3,0	4.945	0,000187	0,92
01/03/2016	9.454	50.900	5,38	3,0	7.513	0,000187	1,40
01/04/2016	22.407	119.500	5,33	3,0	17.426	0,000187	3,26
01/05/2016	40.993	202.700	4,94	3,0	26.574	0,000187	4,97
01/06/2016	48.842	218.700	4,48	3,0	24.058	0,000187	4,50
01/07/2016	78.247	312.700	4,00	3,0	25.986	0,000187	4,86
01/08/2016	68.083	291.700	4,28	3,0	29.150	0,000187	5,45
01/09/2016	52.402	229.900	4,39	3,0	24.232	0,000187	4,53
TOTALE	372.796	1.708.600	4,58		196.737		36,79

						Conversion factor	Savings obtained
				EETs year 1			97
	kWh_e	kWh_{cool}	EER_i	EER_{ref}	kWh_e	toe/kWh_e	toe
01/10/2016	19.153	105.900	5,53	3,0	16.147	0,000187	3,02
01/11/2016	11.716	67.100	5,73	3,0	10.651	0,000187	1,99
01/12/2016	4.728	27.000	5,71	3,0	4.272	0,000187	0,80
01/01/2017	6.239	33.700	5,40	3,0	4.994	0,000187	0,93
01/02/2017	6.809	38.600	5,67	3,0	6.058	0,000187	1,13
01/03/2017	12.498	67.400	5,39	3,0	9.969	0,000187	1,86
01/04/2017	15.710	85.300	5,43	3,0	12.723	0,000187	2,38
01/05/2017	38.413	177.800	4,63	3,0	20.854	0,000187	3,90
01/06/2017	64.616	261.000	4,04	3,0	22.384	0,000187	4,19
01/07/2017	64.960	255.900	3,94	3,0	20.340	0,000187	3,80
01/08/2017	80.949	330.200	4,08	3,0	29.118	0,000187	5,45
01/09/2017	35.907	182.400	5,08	3,0	24.893	0,000187	4,65
TOTALE	361.698	1.632.300	4,51		182.402		34,11
				EETs year 2			90

Next steps

ENERGY COSTS REDUCTION

Certification ISO 50001

Energy Management System (EMS)

Energy Analysis and interventions

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