Province de Liège
Infrastructures

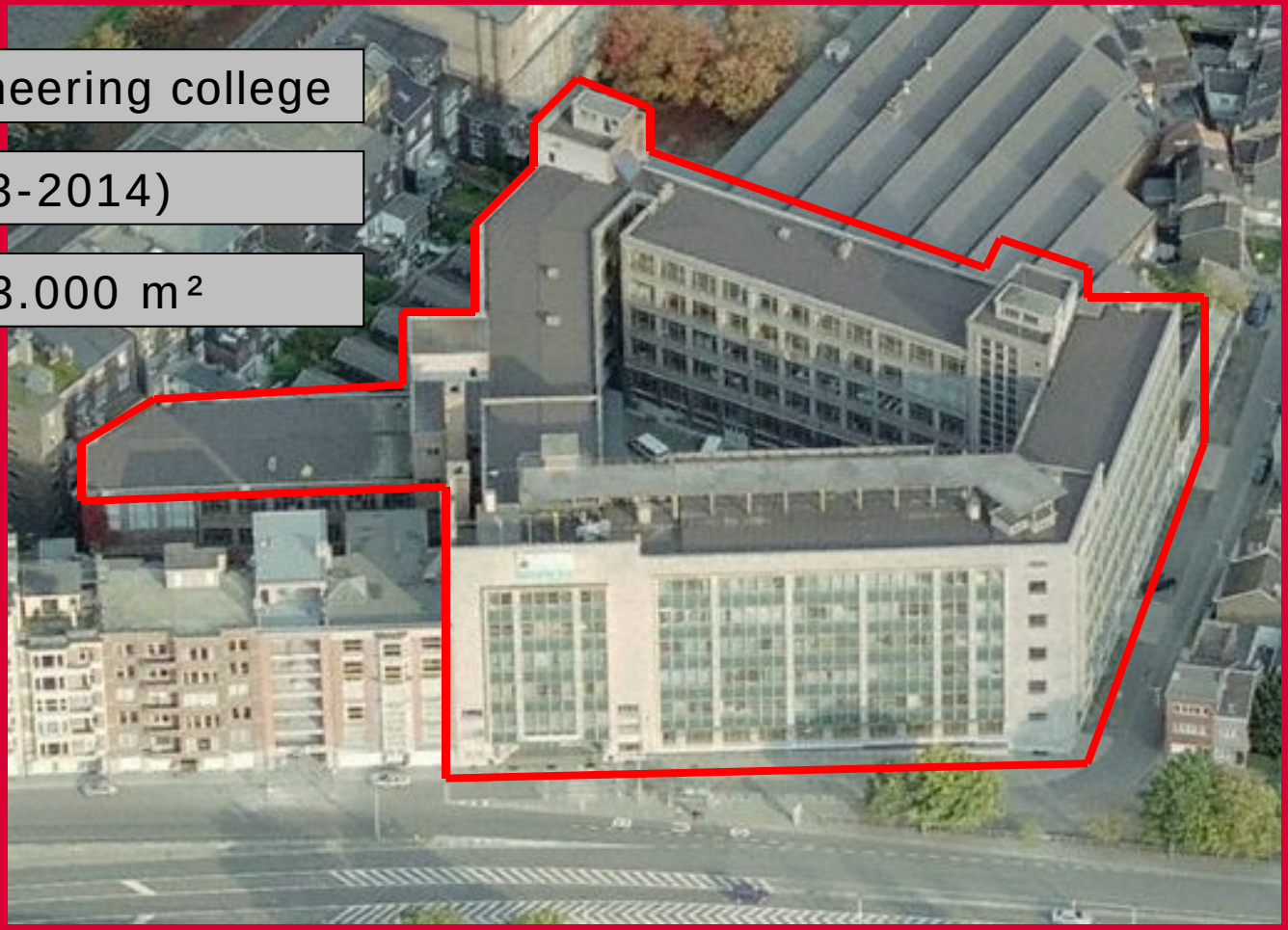
DEMONSTRATION SITE

BELGIUM – LIEGE - SCHOOL

University level engineering college

1.200 students (2013-2014)

Usable floor area : 23.000 m²



BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Province de Liège

Infrastructures

BRICKER

ENERGY REDUCTION IN PUBLIC BUILDING STOCK

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Passives technologies :

1. Replacement of the main curtain wall
2. Insulation of the roofs with PCM-panels
3. Replacement of the windows
   + Insulation of the facades
   + Decentralized ventilation

1. Main curtain wall

Before

After – Expected final look

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

1. Main curtain wall

Some pictures of works

February 2016 – Installation of elevators (lifts) on site

February 2016 – Dismantling Curtain Wall A

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

1. Main curtain wall

Works between January 2016 and June 2016

March 2016 – Rebuilding Curtain Wall A – Dismantling Curtain Wall B

April 2016 – Rebuilding Curtain Wall B

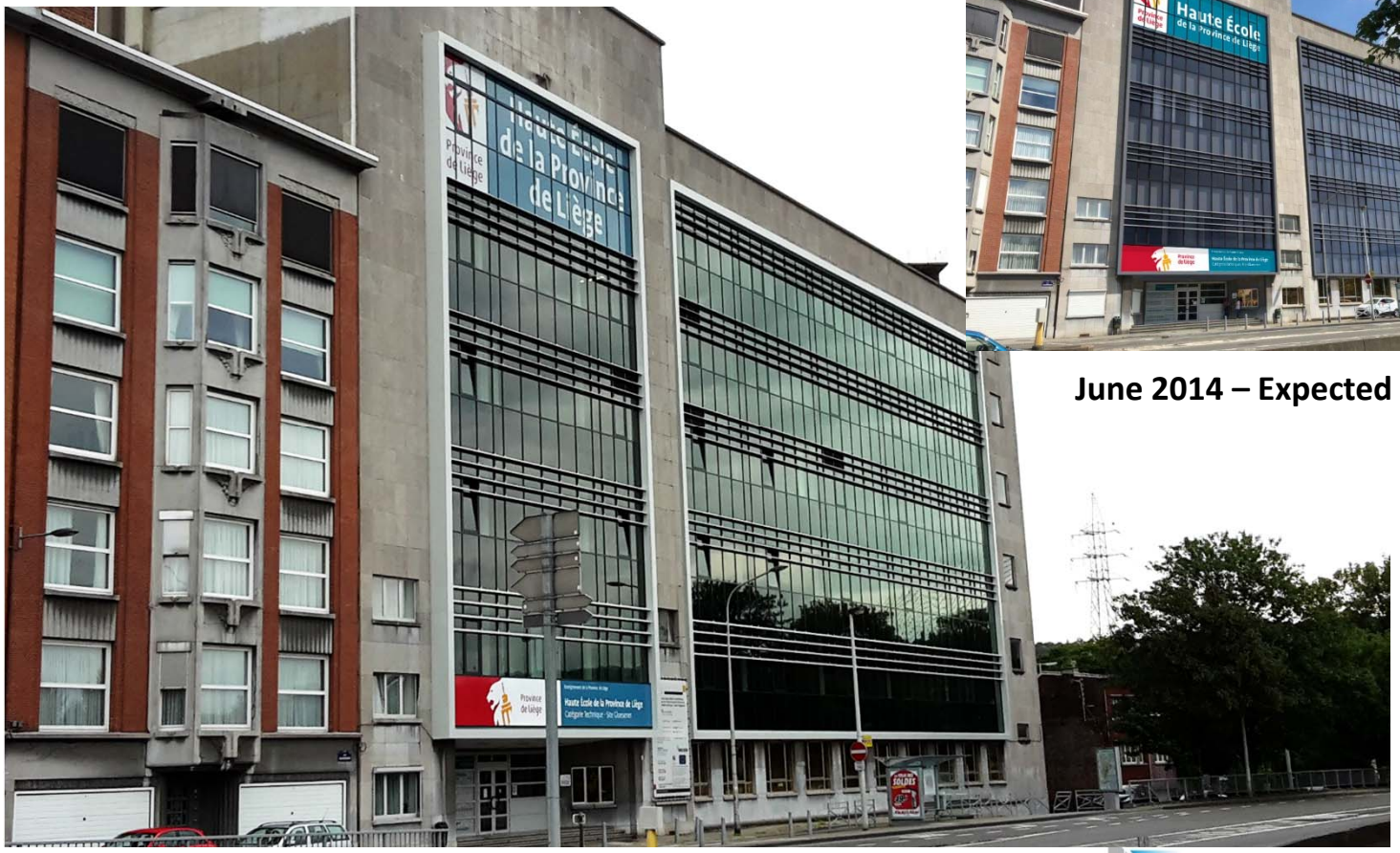
Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

1. Main curtain wall

Final result : Modern image of our school

June 2014 – Expected final look



June 2016 – End of works

Province de Liège

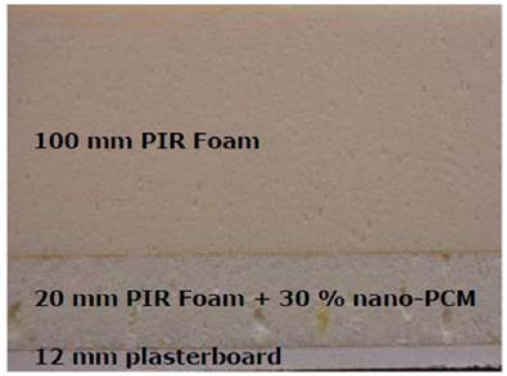
BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

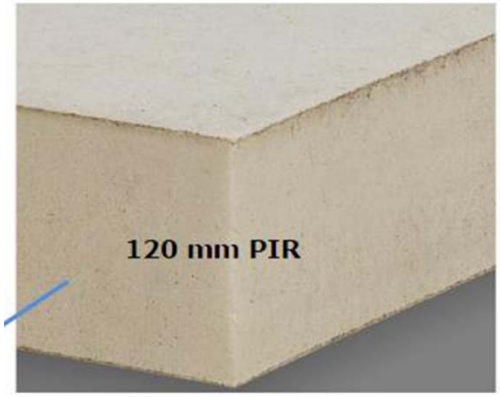
2. Insulation of the roofs – PCM panels

Roof in Block Nr 1 : Inside insulation (PIR + nano PCM)

Roof in Block Nr 6 : Outside insulation (PIR)

Before





After

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

2. Insulation of the roofs – PCM panels

Some pictures – April 2016 to December 2016

May 2016 – Dismantling of ceilings

May 2016 – Reception of Purinova's panels

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

2. Insulation of the roofs – PCM panels

Some pictures – April 2016 to December 2016

September 2016 – Works on the roof – New waterproofing

September 2016 – Installation works of Purinova's panels

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

2. Insulation of the roofs – PCM panels

Some pictures – April 2016 to December 2016

October 2016 – Acciona installs sensors into Purinova's panels – Post-monitoring

October 2016 – End of installation of Purinova's panels

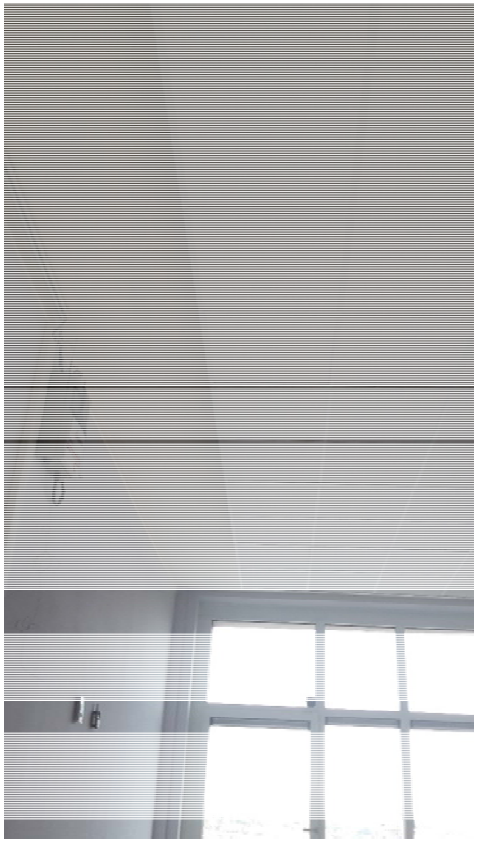
Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

2. Insulation of the roofs – PCM panels

Final result : Over-heating during summer avoided

Post-monitoring still ongoing



Final look of the classrooms in Level +5

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Refurbishment of 3 facades :

Before

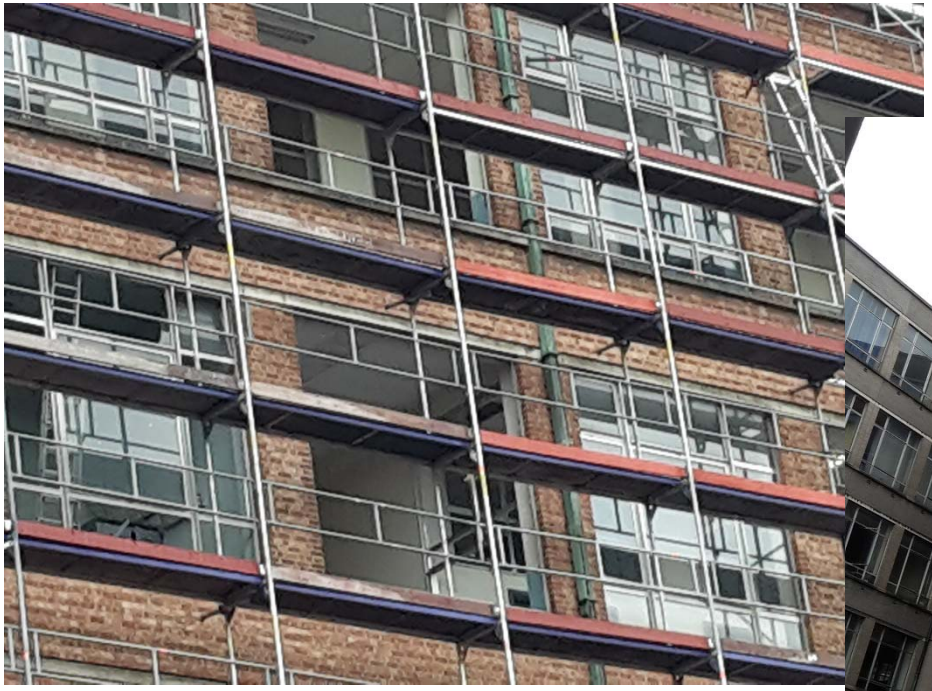
After – Expected final look

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Some pictures – February 2016 to Decembre 2016



March 2016 – Scaffoldings + dismantling of windows frames – Block Nr 6 – Rear Facade

March 2016 – Replacement of windows frames – Block Nr 6 – Facade in patio

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Some pictures – February 2016 to Decembre 2016

April 2016 – External insulation – Block Nr 6 – Rear Facade

May 2016 – Replacement of windows frames – Block Nr 1 – Facade in patio

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Some pictures – February 2016 to Decembre 2016

July 2016 – Internal finishing – Block Nr 1 – Facade in patio

September 2016 – Finishing plaster – Block Nr 6 – Rear Facade

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Some pictures – February 2016 to Decembre 2016

October 2016 – Insulation 14 cm rockwool – Block Nr 6 – Facade in patio

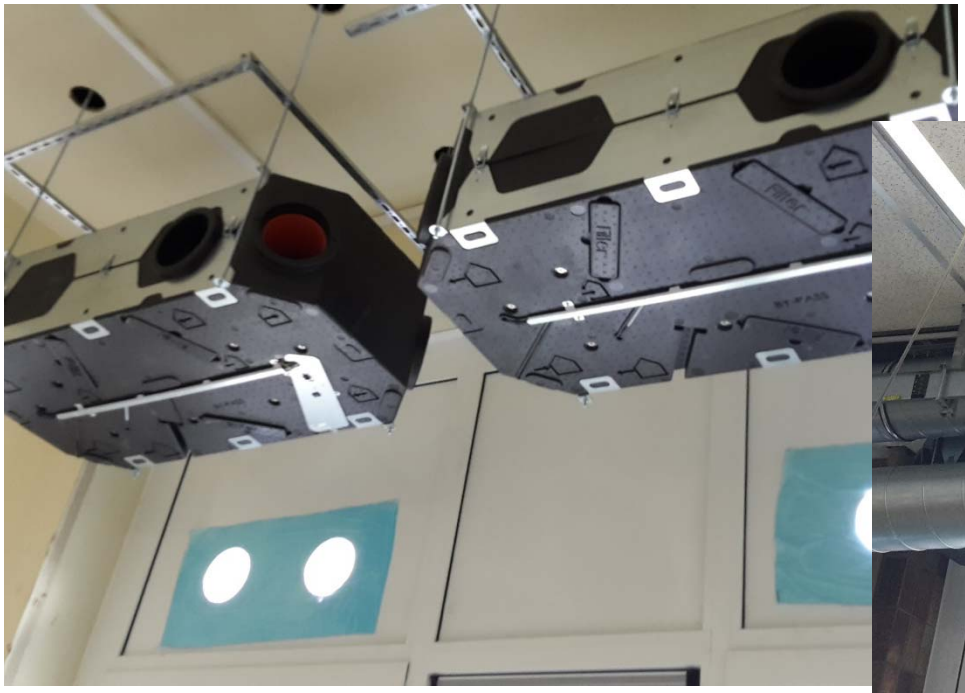
November 2016 – Finishing plaster – Block Nr 6 – Final look

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Some pictures – February 2016 to Decembre 2016



September 2016 – Smart ventilation modules
Block Nr 6 – Rear facade

September 2016 – Air duct
Block Nr 6 – Rear facade

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

3. Replacement of windows + Isolation + Smart ventilation

Final result : Increase of the air quality + energy saving

October 2016 – Smart ventilation modules
Block Nr 1 – Façade in patio

November 2016 – Smart ventilation
Block Nr 1 – Final look

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

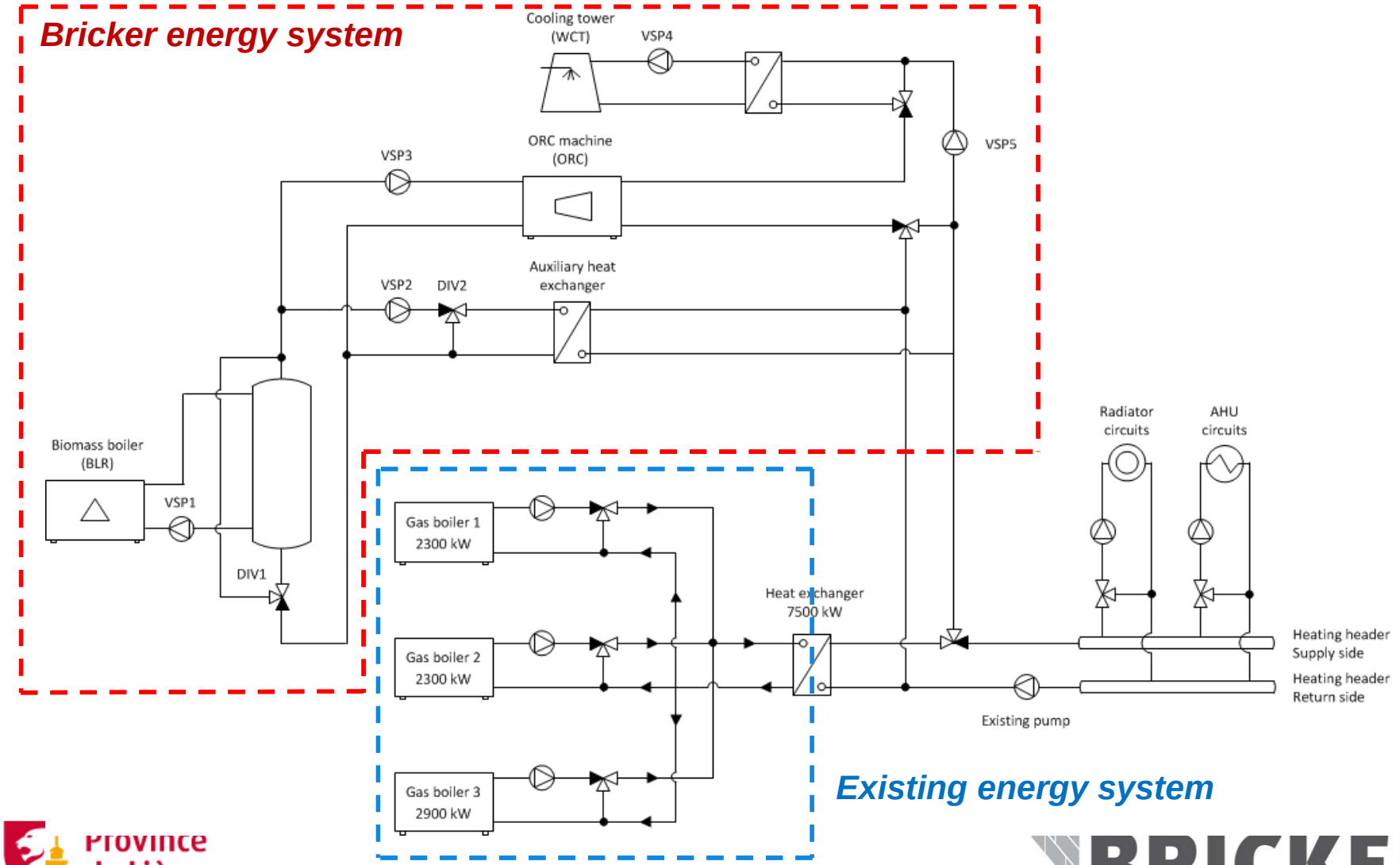
BRICKER

ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Active technologies :

Installation of a biomass boiler + ORC cogeneration-module

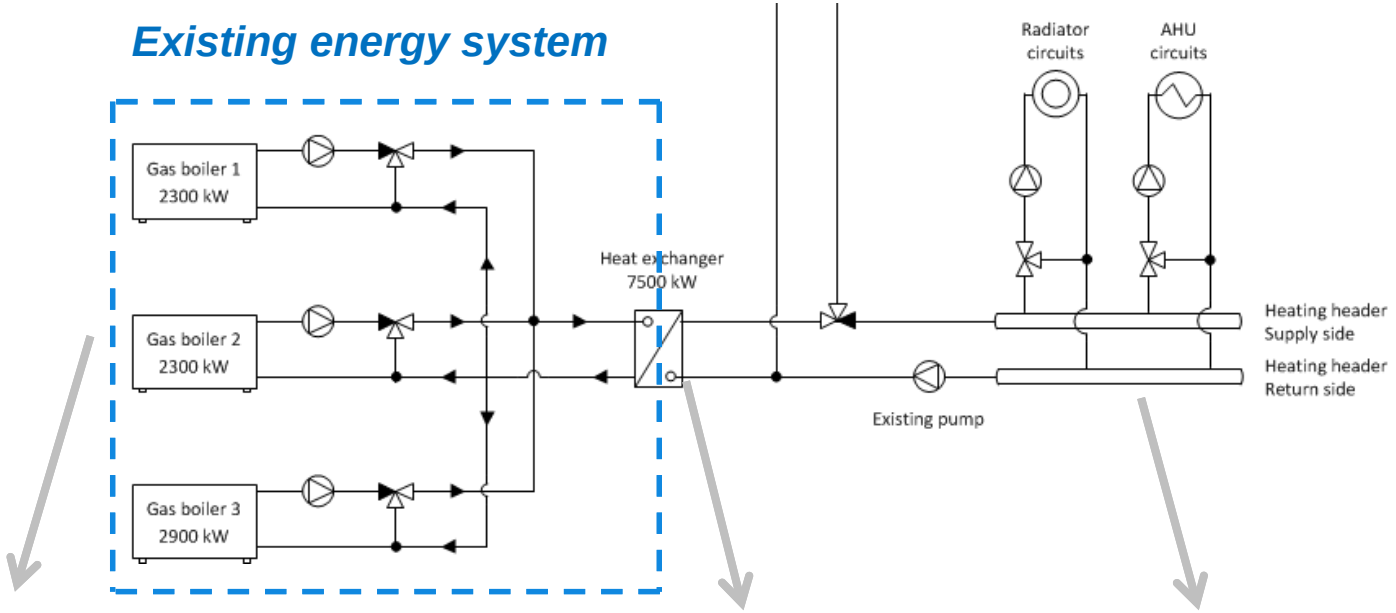
Biomass boiler and ORC-cogenerator



Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Existing energy system

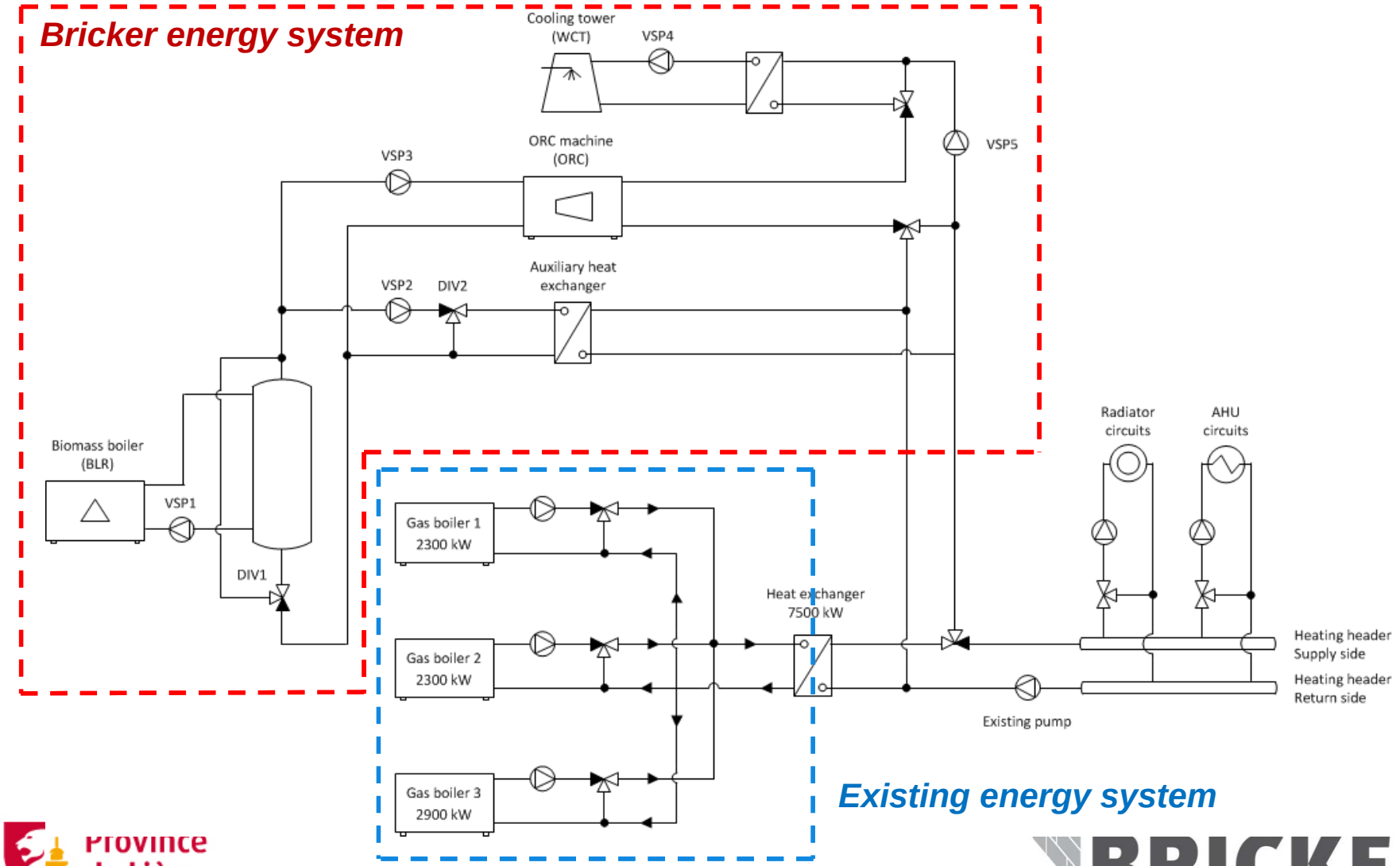


Gas boilers
3 x 2500 kW

Heat exchanger
7500 kW

Pipe manifold
11 Heating circuits

Biomass boiler and ORC-cogenerator



Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

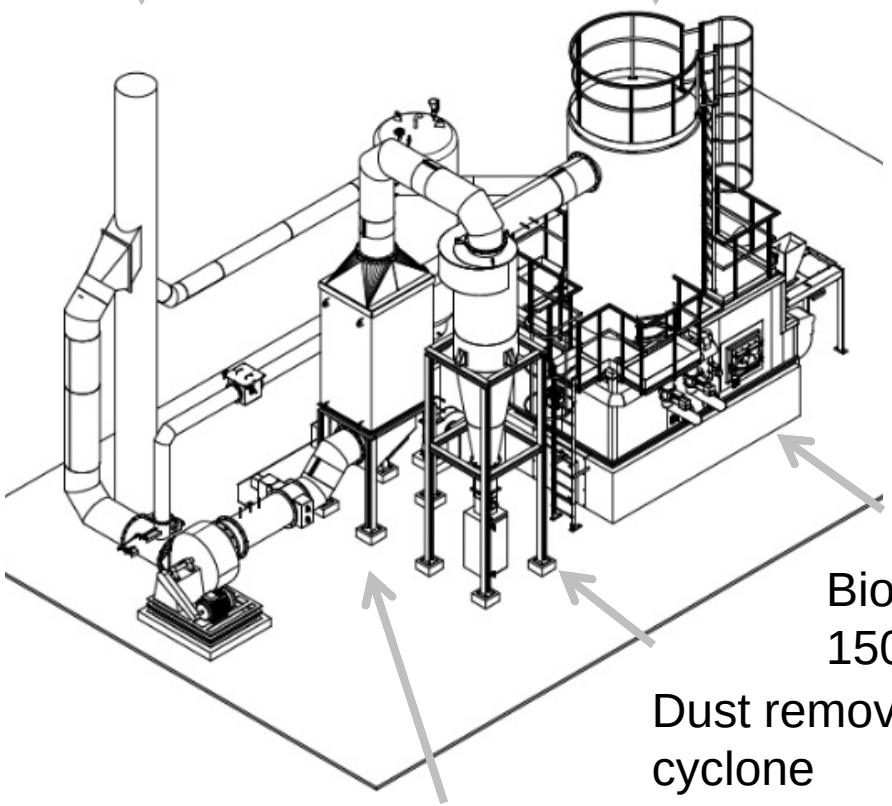
Biomass boiler and ORC-cogenerator

Exhaust chimney

HX:
flue gas / thermal oil

Pellet silos
3 x 25 m3

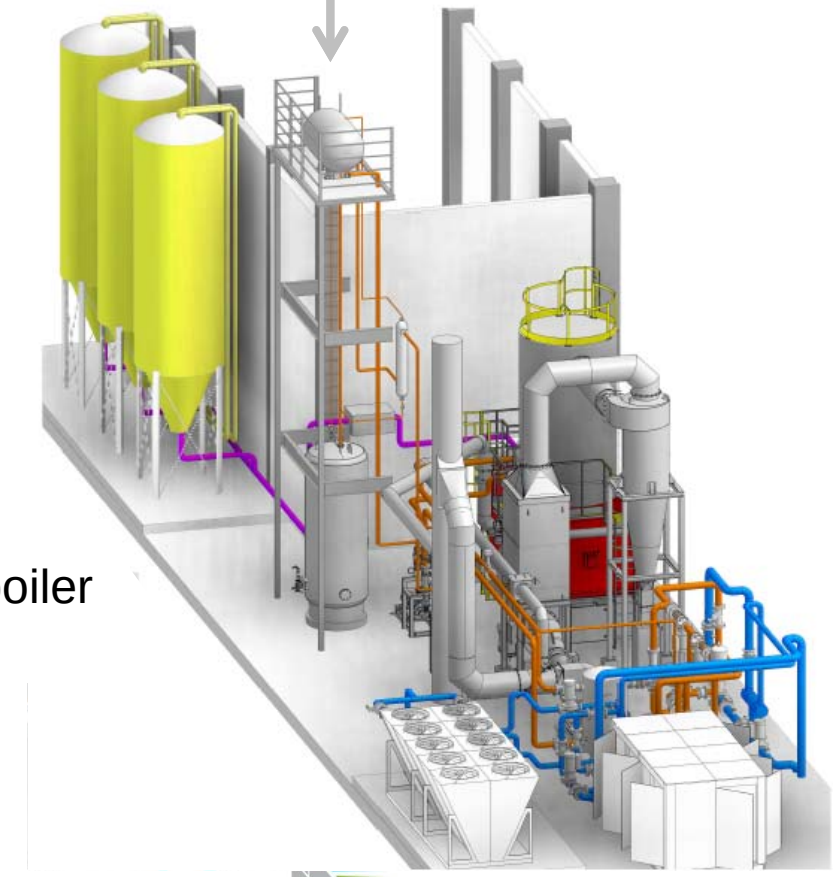
Expansion tank



Biomass boiler
1500 kW

Dust removal
cyclone

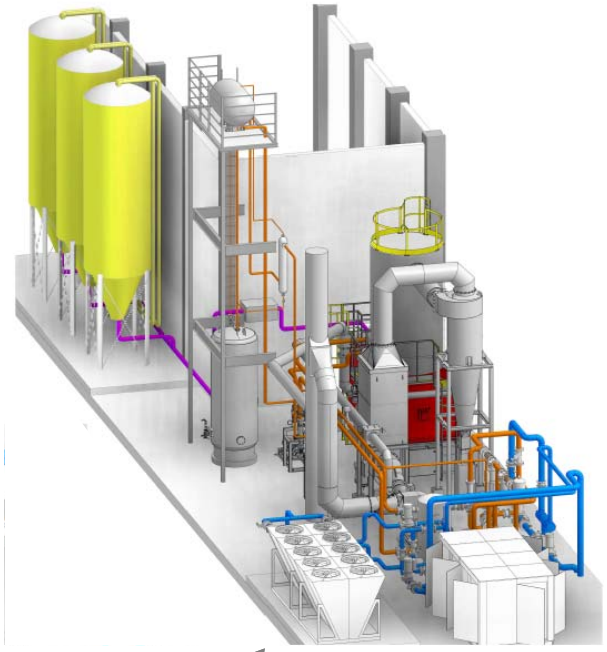
HX : preheating of
secondary combustion air



Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Biomass boiler and ORC-cogenerator



Cooling tower

ORC Unit

HX
1500 kW

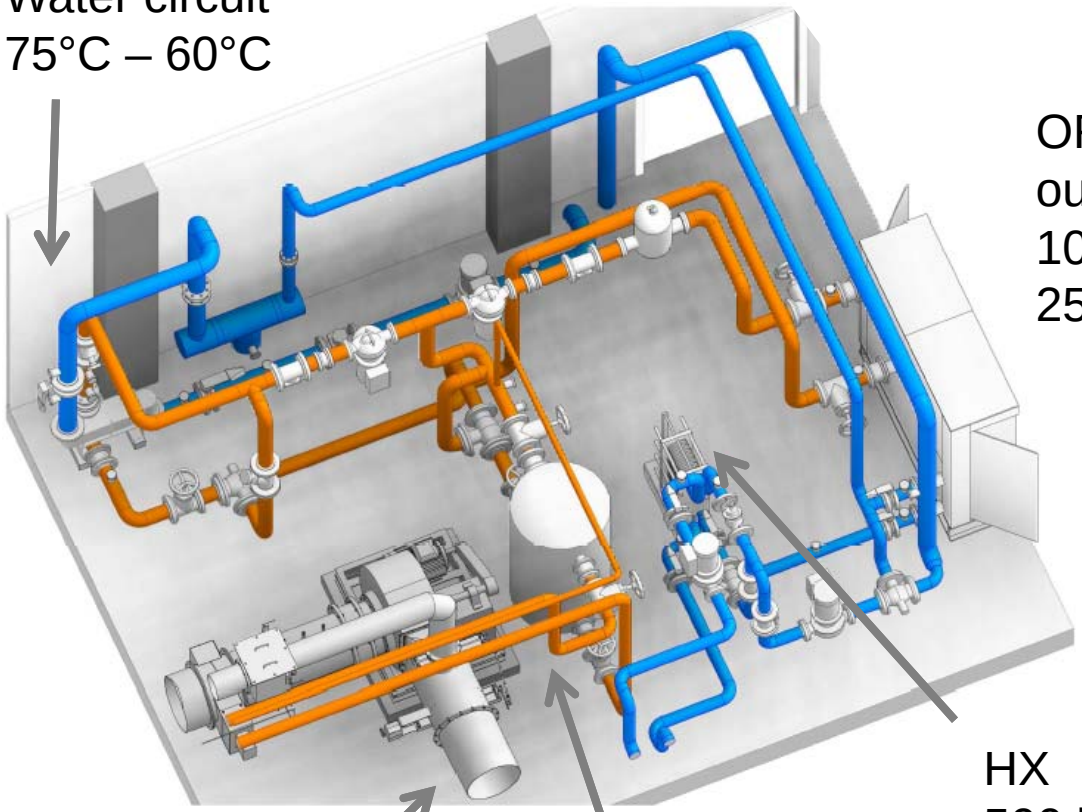
Water circuit
75°C – 60°C

Thermal oil circuit
260°C – 150°C
3 to 1 bar

ORC
Input :
500 kW$_{th}$

ORC
output
100 kW$_{el}$
250 kW$_{th}$

ORC
Water
supply
60°C



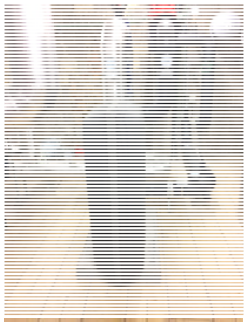
HX
500 kW

Exhaust chimney

Oil tank 1000 l

Cooling tower

HX
500 kW



ORC Unit

500 kW

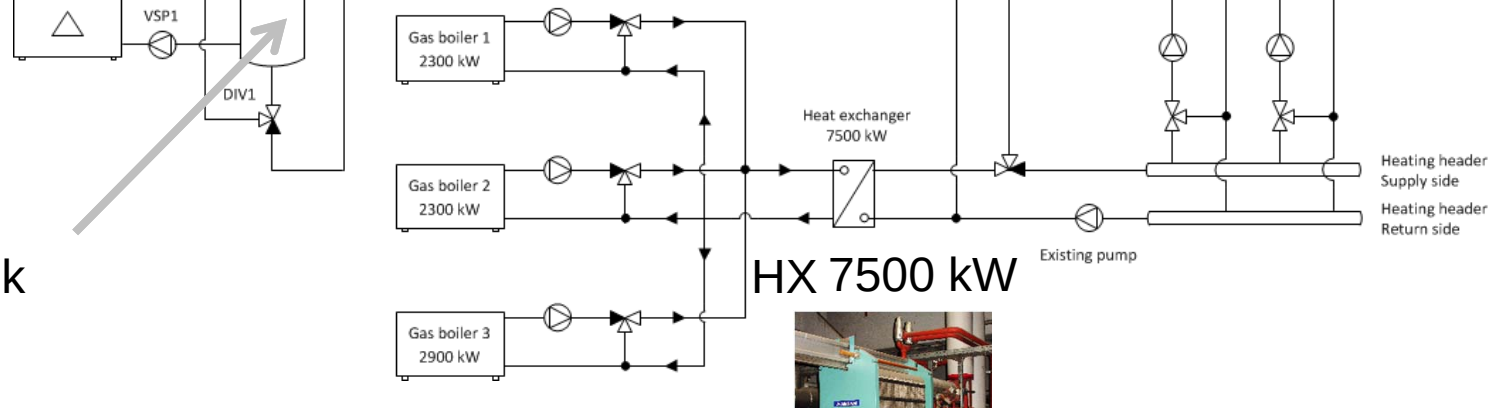
Boiler
1500 kW

500 kW$_{th}$ → 100 kW$_{el}$
250 kW$_{th}$

HX 1500 kW

Oil tank
1000 l

HX 7500 kW



Biomass boiler and ORC-cogenerator

Some pictures – June 2016 to Decembre 2017

June 2016 – New heating room

October 2016 – Delivery of the ORC-module from partner "RANK"

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Biomass boiler and ORC-cogenerator

Some pictures – June 2016 to Decembre 2017

January 2017 – Assembly of the biomass boiler

January 2017 – Delivery on site of the exchanger thermal oil

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Biomass boiler and ORC-cogenerator

Some pictures – June 2016 to Decembre 2017

March 2017 – Storage of pellets in 3 silos

April 2017 – Chimney extractor and storage tank for thermal oil

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Biomass boiler and ORC-cogenerator

Some pictures – June 2016 to Decembre 2017

June 2017 – Assembly of hydraulics pipings

June 2017 – Hydraulics pipings

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Biomass boiler and ORC-cogenerator

Some pictures – June 2016 to Decembre 2017

August 2017 – Expansion joints between old and new heating rooms

September 2017 – Insulation

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Final results – Passive technologies

Energy for heating of our building **in 2013**

Consumption Natural Gas : 5.243 MWh/year (441.000 m³/year)

Observed Degree-Days : 2.138 DD/year (climate hardness data)

Normalized consumption : **4.664 MWh during year 2013**

Energy for heating of our building **in 2017**

Consumption Natural Gas : 3.794 MWh/year (315.000 m³/year)

Observed Degree-Days : 1.787 DD/year (climate hardness data)

Normalized consumption : **4.038 MWh during year 2017**

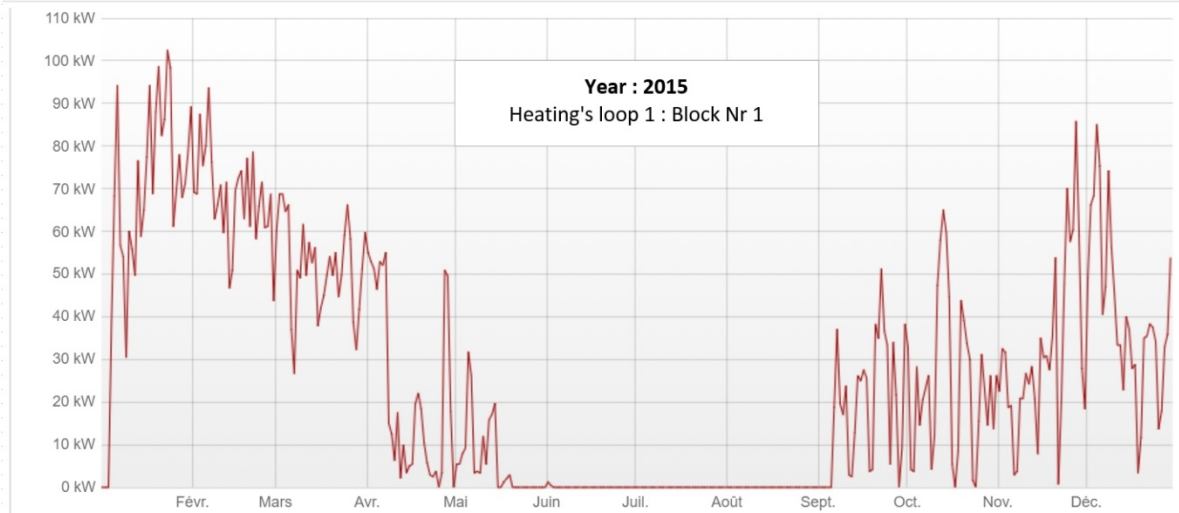
DECREASE OF GLOBAL CONSUMPTION : - 13,5 %

Province de Liège

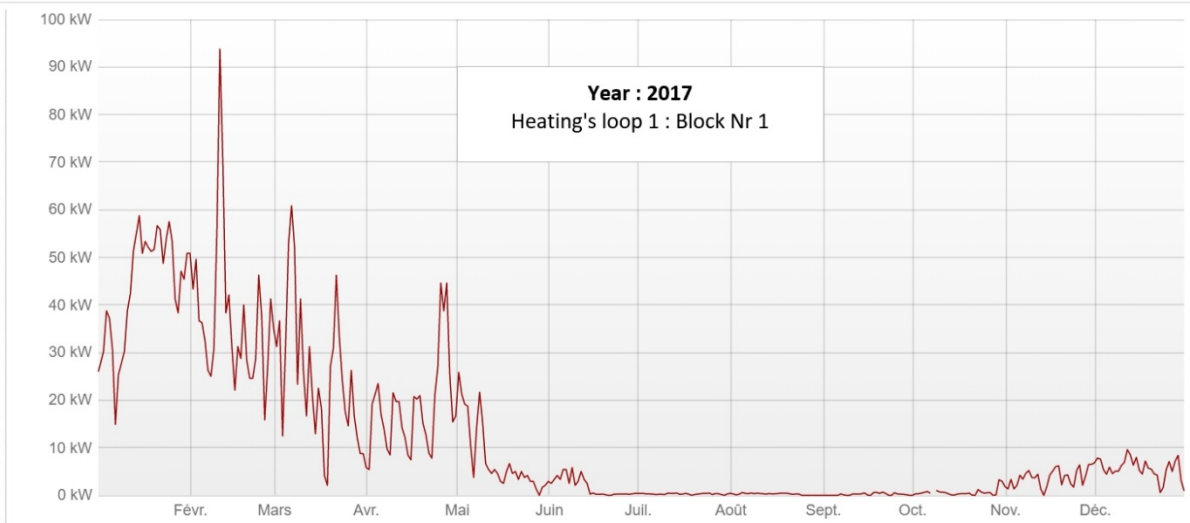
BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Final results – Passive technologies

Block Nr 1 : Pre-monitoring (2015)



Block Nr 1 : Post-monitoring (2017)



Renovation works in Block Nr 1 :

January 2016 until March 2017

After the first year :

DECREASE OF CONSUMPTION IN BLOCK 1 : - 56,4 %

BRICKER

ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Final results expected - active technologies

Energy for heating of our building

Consumption Natural Gas : 3.794 MWh/year (2017)

Partially replaced by : 1.500 MWh/year of pellets (300 tons)

=> Saving of : 376,5 Tons CO2/year

Energy for electricity in our building

Consumption Electricity : 466.536 kWh/year (2017)

Partially replaced by : 280.000 kWh/year (by ORC-cogenerator)

=> Saving of : 133,3 Tons CO2/year

Province de Liège

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Further information:
BRICKER Project

http://www.bricker-project.com/

Thank you!