CODE2

Cogeneration Observatory and Dissemination Europe

D2.1 CHP Awareness Case Study

BELGIUM

November 2012

Chapter 1: Introduction

For the Western Europe region (Belgium, Luxembourg, Ireland, Netherlands and United Kingdom), Belgium was chosen as the lead country with the current best example of CHP growth. Belgium has seen a steady increase in the installed CHP power in the three regions between 2004 and 2010 (Figure 1).

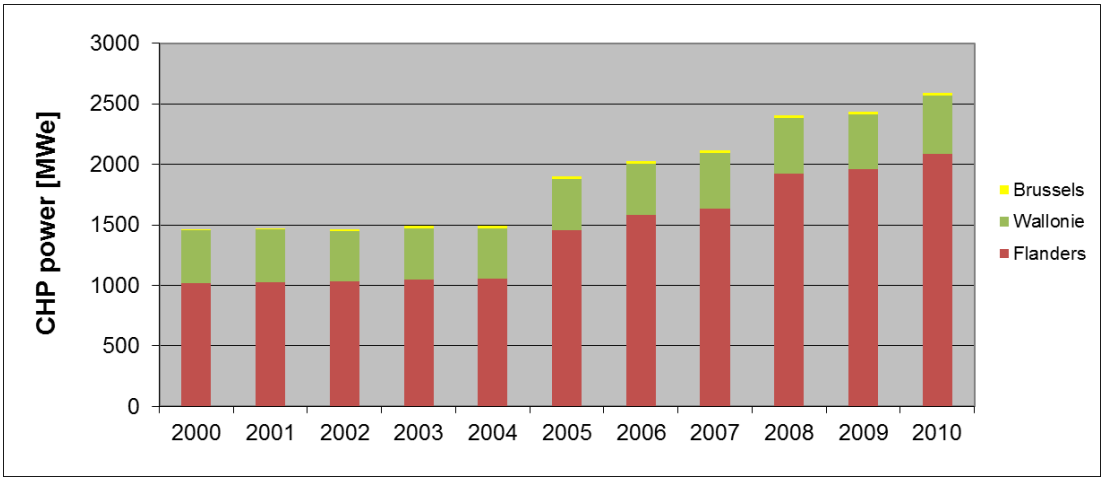


Figure 1: Growth in the CHP sector in Belgium (2000-2010)

Chapter 2: Awareness of CHP in Belgium

Belgium is a federal state with a split political power at three levels: the federal government, the three language communities and the three regions (the Flemish Region, the Walloon Region and the Brussels-Capital Region). Regions have authority in fields that can be broadly associated with their territory. However the different levels each have their own specific responsibilities and each level of government can be involved in scientific research and international relations associated with its powers. As energy is mainly a regional responsibility, many aspects of CHP and CHP awareness will be covered at the regional level. However some aspects are also important on federal or local level.

1. Policy

Laws and decrees regarding energy and CHP

CHP is covered within the regional legislation, keeping in mind the specific geographical and industrial characteristics of each region. Flanders has a significant amount of large industry creating opportunities for large scale CHP, in Brussels the focus is on small scale CHP in SMEs and buildings and in Wallonia Bio CHP is profitable due to the nearby renewable fuel sources. These specific elements are reflected in the regional energy policy. Recent changes in the

energy policy and insecurity regarding the new legislation have however created a sense of uncertainty which makes people reluctant towards new investments at the moment.

Financial support
On the federal level, financial support for investments in CHP is given through a reduction of the taxable profits. On a regional level the operation of CHP is supported through a carefully designed certificate based CHP support system (CHP and green electricity certificates).

2. Sector organisations

Three regional sector organisations close the gap between the CHP sector and the regional government. For more than 10 years the Belgian CHP sector organisations have been sharing their CHP expertise with government, enterprises and other non-governmental organisations active in related areas (renewables, smart grids, district heating, etc). Flanders (COGEN Vlaanderen), Wallonia (COGEN Wallonia) and Brussels (COGEN Sud) each have their own *CHP facilitator* who is responsible for the development of CHP in the region, by sharing expertise and by guiding the government towards a CHP oriented support system. As an example COGEN Vlaanderen is the Regional CHP organisation for Flanders which aims at an active contribution to the development of high-efficiency CHP. It was founded in 2001 and currently has about 200 members. It is a centre of expertise, providing expertise to members through workshops, courses, handbook CHP, CHP roadmap, website, newsletters, messages for members, etc. It is also a meeting place for stakeholders, providing both stakeholder meetings with the CHP sector as recommendations to the government. COGEN Vlaanderen is currently very active in streamlining the discussions between governmental institutions and stakeholders regarding the elaboration of the new legislation.

3. Industry impacts

Experience within the industrial sector
CHP is becoming more and more common in the industrial sector, boosting the confidence of investors. Although it has been recognised in the past that ready-made solutions are not always an option, increasing experience has facilitated the implementation in new projects. In particular, Belgium has some interesting cases where CHP is used in combination with other technologies, such as buffering of heat in PCM, use of electricity in electric cars and using CO_2 from the CHP in greenhouses as fertiliser. The current developments in building standard packages for specific sectors (e.g. carwashes) may increase general awareness.

Networking/coalitions
In Belgium on a regular basis representatives of the different stakeholder groups are gathering to discuss current CHP topics. The scope is to listen to the existing needs in the sector and to actively seek for solutions. They include general as well as specific meetings, e.g. bio-CHP, micro-CHP, legislation, etc. For example, the general CHP discussion board, with elected representatives from about 40 companies or agencies, meets 5 times per year. In 2012 a special temporary discussion board was established for the follow-up of the new legislation and

assembled regularly. Next to the organised stakeholder meetings, a cooperation network exists between the sector organisations and complementary industries (smart grids, renewables, district heating, etc) and organisations covering the of major industries (chemicals, paper, etc and the SMEs. This cooperation assures a fluent information stream and mutual understanding of specific problems or needs, enabling the government to anticipate adequately and to translate these needs into a coherent and supportive legislation.

Guidelines
A CHP roadmap which offers technical and practical support for companies is published every two years. This guideline is being distributed among all stakeholders and covers topics such as a stepwise approach to realise a CHP project, a summary of the legislation and permits, an overview of the different governmental organisations and an overview of all the stakeholders.

Calculation tools
Companies are encouraged to take a first step in investigating the possibilities for CHP through the availability of different calculation tools for pre-feasibility studies and support. These are available on the website of the different CHP sector organisations and soon on the websites of the local governments.

4. Financial sector

Many of the Belgian financial institutions have experience with CHP and are therefore favourable towards giving loans. Some banks have even developed third party financing schemes for CHP projects.

5. Education

Universities/colleges
CHP technology is a part of the educational program of several master programs in energy and engineering in universities and colleges. However, this is not yet common in all programs and it highly depends on the motivation and interest of the teaching staff. When master students choose a thesis subject related to CHP technology they are often supported by the industry or sector organisations.

Symposia
Each year numerous symposia and workshops are organised by different sector organisations. They focus on CHP and related topics end often attract many participants. Sometimes these symposia are organised together with other sectors (renewable, smart grid, etc). E.g. on the CHP introduction day companies and energy professionals who are not yet familiar with CHP, are offered low level presentations and a CHP fair. This event has attracted over more than 500 participants and over 50 companies in the last 3 years.

Other courses

The 'International Course on CHP' is a unique week long course organised at least once a year since 2004. Every edition is attended by about 20 participants who are following lectures cover all aspects of CHP. Other tailor-made presentations are commonly given to interested parties and industries.

6. Research

Universities/colleges
Both fundamental as well as applied research (conceptual design, feasibility studies, etc) is elaborated at universities and colleges. While research topics are launched by these institutions, funding often is based on scholarships with governmental support. In this case the research topics have to be justified and preferably have to fit within the topics of policy notes. This creates a link between governmental policy and research.

Other research institutions
Other regional research institutions are working on CHP, for example the Flemish Institute for Technical Research. Regional CHP organisations are sometimes involved.

SMEs
Although financial support for research programs is available for SMEs, these are underutilised since SMEs are not aware of these support mechanisms.

Data management
The government support system keeps accurate records of the realised CHP installations and their technical data (specifications), which allows for a correct view on the CHP situation. These details are published in the yearly CHP inventory.

Interregional cooperation
Efforts have been made in the past for interregional cooperation in the branch of knowledge transfer for CHPs, through interregional projects (e.g. Interreg project I-dacta about CHP promotion in South West Flanders and Northern France).

7. Local engagement

Many Belgian cities and communities have expressed their engagement towards the 20-20-20 goals, creating new opportunities for CHP in public buildings such as offices, swimming pools, sports centers, hospitals, etc. For example the city of Leuven started the project 'Leuven Climate Neutral', where different companies and organisations are working together to ensure that Leuven emits no more CO2 by 2030. For the theme 'energy' a study has been worked out to assess the feasibility of CHP in Leuven. City councillors have generally obtained awareness towards CHP from study days, trainings or information brochures. On an informal base they try to further disseminate this awareness towards project developers when discussion spatial planning and sustainable building. An example of barrier removal for CHP is the obligation in Flanders for every new building with a surface of at least 1,000 m², to make a feasibility study

examining the possibilities for CHP. As a result awareness is being raised among architects, engineering offices and the building sector.

8. Information of the broader public

The broad public is well informed by CHP organisations and governmental energy departments through numerous channels, such as websites, events and publications. Because of its role in the future of energy generation, CHP has become a hot topic in Belgian news coverage. Articles are being published in specialised scientific literature as well as in more accessible (electronic) newsletters of sector organisations. More recently, the development of micro-CHP has aroused the interest of SME enterprises and even households, boosting public as well as political awareness. Low entry level XL–tools are available on relevant websites and enable interested parties to make a quick pre-feasibility study for their potential project.

Chapter 3: Case studies

1. AB InBev

Main incentives for choosing a CHP

The main stimulus for implementing CHP is the internal policy of the 'Better World Programs', in order to operate more efficiently and maintain quality standards, while considering the environmental impact. In the Leuven brewery energy savings is one of three priorities, next to water-use reduction and reduction in waste transport. With a CHP, greenhouse gas emissions are reduced with a factor 3, energy consumption is reduced with 5-10% and water consumption with 15%. When the former power plant (equipped with steam turbines) had to be replaced, several studies were made to assess the different possibilities. Because of contractual reasons and the environmental impact, gas was chosen as the best option for fuel. At this stage the option of installing a CHP instead of a normal gas turbine was considered. The decision for the investment for a new power plant was based primarily on the adaptation of the steam supply to the energy needs of the brewery. Secondly, AB InBev decided to go for a relocation of the power plant in order to enable the urban development " Twee water"- a high quality residential area close to the city center. Finally, the choice for the technical solution of a gas turbine was based on the energy need of the brewing activities and its ratio electricity/heat demand. As a principle, ABI doesn't intend to generate an electricity surplus to be made available to the grid. The decision for the additional investment of a CHP versus classical low pressure boilers was based on a profitability calculation meeting its profitability requirements. The final decision was based on a financial analysis, which proved that the ROI (return on investment) would be less than 4.5 years. Therefore it was decided that the installation of a CHP is a very profitable investment. The installed CHP has an overall efficiency of 92%.

Main source of awareness

Since AB InBev is a large international company, experience of CHP is available internally. People are already aware of and have already experience with CHP. Availability of technology is

not an issue: moreover it is considered common sense to consider the installation of a CHP in this type of industry. Several installers and producers on the Western European market are offering the appropriate technology. Industries can make their choice based on project offers. There is no lack of technical knowledge and awareness. When questioned what could be improved concerning the procedure, it was suggested to simplify the process. As a company whose core business is not electricity generation, obtaining certificates took a lot of time. Furthermore, some technical details had to be modified during the project to comply to regulatory changes. In general companies as well as consultants struggle with the necessary permits and paperwork. This can lead to unexpected extra costs (e.g. for metering), time delay, uncertainties and therefore extra risks. This could be a barrier for other interested parties.

Cost benefit analysis

The total cost of the investment is about 12 million €. With the use of grants (CHP certificates) of approximately 2 million €/year, the ROI is less than 4.5 years. As explained above, the go/no go decision for a new power plant was based on elements of business continuity, urban developments and environmental commitments. The elements taken into account for the additional investment of a CHP are the following:

- Markets prices (actual and long term prognosis),
- Gas and electricity prices and their spread,
- Incentives and taxes.

These sensitivities have to be incorporated in the financial picture. The financial support (certificates) was crucial in the decision process, without these the investment would probably not have been made. However, one of the decision criteria is the requirement that the installation should still be profitable in global market conditions, i.e. without any incentives. The importance of these sensitivities is higher in this type of industry compared to a power station, where the production of electricity can be abandoned during periods with a negative spread. In an industrial installation, the CHP has to be operational full-time. The core business is to produce beer, not electricity!

Difficulties

More difficult than the installation itself, was the city planning. The CHP installation itself was ordered as a package. During the detailed engineering, the ABI team paid special focus on all elements impacting the neighbourhood and the environment. First a relocation of the installation was necessary in order to free the old industrial area for residential development (Masterplan“ 2-Waters” Leuven). Due to the proximity of this residency, the new building had to be compliant with the actual targets of noise reduction. The noise emission outside the boiler house is less than 35 dBa.

2. Crowne Plaza Hotel Brussels

Main incentives for choosing a CHP

Crowne Plaza hotel in Brussels is part of the Pandox group, which owns 6 hotels in Belgium. Because Pandox group had some previous experience with CHP, experience has been gained and therefore this hotel can serve as a successful example. Because of the success of this

project, Pandox is currently installing CHP other hotels. This success is thanks to a thorough engagement and ongoing effort of the Pandox group to invest time and expertise on energy efficiency. The heating profile of the hotel, showing high potential for energy savings, was therefore the first reason to consider CHP.

The first step was to install a control system for optimising the heating system, which already resulted in 40% energy savings. After several years the financial gains from this optimisation were used for the complete financing of a new CHP. No other internal or external financing was required. It is important to notice that Crowne Plaza first concentrated on minimize the energy demand before sizing the CHP. When the heat demand is brought back to its minimum, a valid idea of the long-term heat demand is obtained. Based on this heat demand, the specifics of the CHP were determined.

Main sources of awareness

The responsible Pandox engineers were already sufficiently aware of CHP and its possibilities before the start of the project. However, for the implementation of the project, external parties were of vital importance for the success of the project. Important information and advice were obtained through third parties such as installers and maintenance contractors. The sophisticated know-how that they possess is complex, and is crucial for the prosperity of the project. Apart from this, the regional CHP facilitator played an important role of delivering all the necessary information.

Cost benefit analysis

The investment cost of this 400 kW CHP was €230.000. The yearly maintenance cost is €17.500 and a fuel cost is €79.000. The yearly savings from electricity production and fuel use is €129.000, based on an electricity price of 98 €/MWh and a gas price of 32 €/MWh. The yearly income from CHP certificates is €49.700. These numbers result in an estimated pay-back time of 2,3 years (calculated 6 months after the start-up of the CHP).

Difficulties

Several difficulties were encountered during the project implementation. Technical difficulties obstructed the installation and operation of the CHP at the beginning. The equipment was installed using a crane, which resulted in 5-10.000 € extra costs. At the start of the project problems with power cuts were encountered. The administration for obtaining the certificates was difficult for a non-expert. Moreover extra unexpected costs had to be made for the necessary measuring equipment for accounting for the certificates. Another issue is the boiler room control in order to optimize the operating hours.

Annexes: Two Case study factsheets on AB-InBev and Crowne Plaza Hotel Brussels

Case study factsheet
Western Europe, BELGIUM

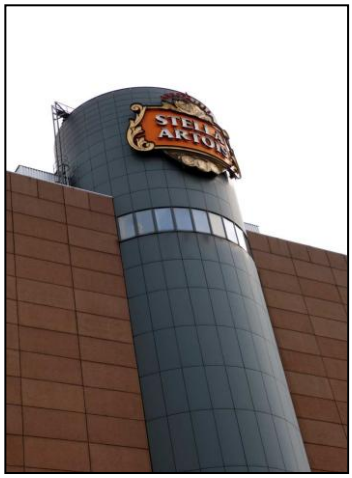
AB InBev

Brewery

Main CHP project indicators

Heat capacity (total)	kW	75 t/h steam 3,5 bar(g)
Electrical capacity (total)	kW	4200
Technology	Steam turbine	
No. of units	3	
Manufacturer	VCE	
Type of Fuel	Natural gas	
Heat: yearly generation	MWh	550000 GJ
Electricity: yearly generation	MWh	25000
Year of construction	2011	
Total investment costs	EUR	approx. 20
Financing	Own founds	
State support	Certificates	
Location	Leuven	

Picture



General description of the case

- Steam generation for the AB InBev brewery in Leuven
- Electricity generation with gas turbine (CHP).
- Boiler water treatment.
- New building compliant with the actual targets of noise reduction.
- Relocation in order to free the old industrial area for residential development (Masterplan "2-Waters" Leuven).

Success factors

Adaptation of steam and electricity capacity to current demand.

Main challenges

The following have been the main challenges:

- Compliance to environmental requirements: noise – emission
- Noise emission outside boiler house: <35 dBa
- Alignment of industrial development with development of city of Leuven

Conclusions

The company AB InBev concluded and made recommendations for new similar projects application in the Belgium.

Case study factsheet
Western Europe, BELGIUM

Crowne Plaza Hotel Brussels

Hotel

Main CHP project indicators

Heat capacity (total)	kW	207
Electrical capacity (total)	kW	140
Technology	Motor engine	
No. of units	1	
Manufacturer	ESS-VIESSMANN	
Type of Fuel	Natural gas	
Heat: yearly generation	MWh	1400
Electricy: yearly generation	MWh	850
Year of construction	2010	
Total investment costs	EUR	230000
Financing	Own founds	
State support	Investment subsidy Certificates Tax reduction	
Location	Brussels, Belgium	

Picture

General description of the case

Crowne Plaza "Le Palace Hotel" in Brussels is part of the PANDOX group and has 350 rooms and an area of 28,000 m². Compared to 2008, the hotel has reduced its 2010 energy consumption by 60% in natural gas and 20% in electricity through the implementation of energy savings actions.

A VIESSMANN - ESS cogeneration unit with an electric power of 140 kW and a heat power of 207 kW was then installed in October 2010. This unit operates 24h/24h from mid-summer season and 16h/24h in summer.

Success factors

A preliminary energy audit leading to a heat needs reduction together with a detailed study including energy online monitoring are the key factors for effective sizing. After commissioning, the key factor is online monitoring creating the opportunity to optimize the unit.

Main barriers

The following have been the main barriers:

- Technical aspects of the installation
- Complex administration of the certificates
- Boiler room control in order to optimize the operating hours

Conclusions

Good controlling strategy for boilers and preliminary heat needs reduction together with a sound detailed study.