Working with industry: Dunkirk's industrial waste heat network (France)

The Urban Community of Dunkirk has been a member of Energy Cities since 1999.

The context: the energy strategy of the Urban Community of Dunkirk

The Urban Community of Dunkirk (CUD - *Communauté Urbaine de Dunkerque*) is composed of 18 municipalities and is home to around 200,000 inhabitants. CUD has been the **granting authority for electricity and gas distribution concessions since 1995** and has made **tackling energy poverty** the priority of its energy policy. In 2004, an **aerial thermography survey campaign** called *"Réflexénergie"* was launched to detect heat losses through roofs. Supported by the Energy Information Centre and a dedicated fund for financing insulation work, installing individual condensing boilers and developing solar energy, the campaign aimed to **tackle climate change and address social issues by reducing energy use**.

Since the adoption of the **Climate Plan in 2009**[1], the industrial waste heat network has doubled in Dunkirk (an additional 140 MW) as the result of an **overall energy strategy** aimed at achieving the "3x20" objective by 2020[2]. This strategy has also been instrumental in developing 60 MW of onshore wind turbines and in installing 1,000 PV and thermal solar roofs.

The origins of the industrial waste heat network

The idea of creating an industrial waste heat network in Dunkirk, a port and industrial city in northern France, and in the neighbouring town of Saint-Pol sur Mer, dates back to the 1970s' **oil price increase**. The economic crisis of the 1980s and its repercussions on the unemployment rate confirmed that **supplying energy at a controlled price** in an area where heating is so important was a precondition to tackling fuel poverty.

In 1982, a sociotechnical survey confirmed that the most cost-efficient solution was recovering waste heat generated at the Usinor plant[3]. Both municipalities joined together to set up SICURD (Dunkirk intercommunity district heating council) in 1983. In 1985, the **agreement between the city of Dunkirk and the steelworks' owner Usinor** (now Arcelor-Mittal[4]) led to the **installation of a 23 MW capture hood at the steelworks** and to the beginning of the construction of a heat network, which went into service one year later.

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[1] The new Local Climate and Energy Plan (PCET in French) was launched on 3rd November 2015.
[2] A 20% reduction in greenhouse gas emissions compared to 1990, a 20% increase in the share of renewable energy and a 20% improvement in energy efficiency by 2020.
[3] Four potential sources were compared: a coal-fired boiler, the recovery of steel production gas from Usinor blast furnaces, the recovery of heat produced by the Gravelines nuclear plant and recovery of Usinor waste heat.
[4] Known as Usinor until February 2002 and Arcelor until June 2006.

The *Compagnie générale de chauffe* (which became Dalkia in 1998 and is now part of the EDF group) was in charge of overseeing operations as part of the concession contract signed with the city council.

The extension of the heat network

At the beginning of the 2000s, the prospect of increased energy demand resulted in a reflexion on the expansion of the network, which had already been upgraded with the addition of three CHP units and **a second 13 MW capture hood** at the steelworks. Although the first network connection owes a lot to the determination of Michel Delebarre, President of SICURD and Mayor of Dunkirk, the second was a joint project.

For SICURD, the objective was to **guarantee a reduced 5% VAT rate in the event of a network extension**. To qualify, 50% of the network heat had to be produced from renewable and recovered sources. For Arcelor-Mittal, installing a hood at the exit of the sinter strands made it possible to **recover process dust** and thus was a solution to meeting clean environmental requirements. The hood installed in 2008 thus integrated environmental considerations.

At around the same time, the City and the Urban Community of Dunkirk developed a **strategic plan aimed at doubling the heat network** (an additional 140 MW)[5].

The feasibility study conducted by Hexa Ingénierie and submitted in 2013 considered population densities and the various heat production sources. It was finally decided that **heat sources should be diversified** and a project for connecting the CVE, the waste-to-energy processing plant also operated by CDU, to the heat network was developed.

As part of this strategic plan and in compliance with the French urban areas' public action modernisation and reinforcement law (the so-called MAPTAM law), **CUD regained authority over the heat network**. The Urban Community is therefore now responsible for overseeing the smooth running of this public service operated by Energie Grand Littoral (a 100% Dalkia subsidiary created to operate the network) and for interacting with stakeholders brought closer by 30 years of positive experience.

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[5] The network extension project dates back to 2010.

The benefits of the Dunkirk industrial waste heat network	
	CARBON NEUTRAL. The energy produced is GHG neutral and avoids emitting 19,000 tonnes of CO_2 per annum.
	LOCAL JOBS. A heat network creates local, non-relocatable jobs (operation, maintenance, outfitting works, etc.).
	COMMERCIAL PERFORMANCE. Waste heat is bought at a low price (between 5 and 10 euros per MWh).
	TACKLING ENERGY POVERTY. Low waste heat prices mean that energy costs are kept under control.
	RENEWABLE ENERGY AND TAX REDUCTIONS. The use of renewable energy makes the heat network eligible to reduced VAT rate and to the ADEME heat fund.
	AIR QUALITY. The capture system installed on the steelworks cooling bed contributes to improving air quality by collecting dust

The dialogue between CUD and the various local stakeholders (waste heat producers and users of the heat network)

Arcelor-Mittal and other industrial plant owners in the Dunkirk area

On a daily basis, the City Council of Dunkirk, and now CUD, the Urban Community Council, do not have much contact with industrial companies[6] as routine relations with Arcelor-Mittal are handled by Energie Grand Littoral (EGL), the company holding the network concession. Their **successful involvement in the waste heat project**, however, is to be put to the credit of both local authorities. At the end of the 1980s, the development of closer relations between Arcelor-Mittal and the President of SICURD, who was also Mayor of Dunkirk, had a lot do to with the personalities involved, but other factors also played a part.

[6] CUD regained control of the heat network only recently, on 1st January 2015. Before that, the network was jointly managed by the city of Dunkirk and SICURD.

In the late 1970s and early 1980s, the Dunkirk area was the stronghold of **powerful environmental associations** which questioned the massive tax incentives offered to polluting industries to encourage them to set up local plants, with no regard for the environment or air quality. Arcelor-Mittal was one of these industries, with its blast furnaces and dark, thick fumes identifying it as a major polluter. In this context, the **steel making company put a lot of efforts into improving its relations with local stakeholders from an environmental point of view**. **Its participation in the heat network may therefore be seen as an expression of goodwill and a way of maintaining good relations with local people**: the political dimension here is undeniable.

Moreover, Arcelor-Mittal (AM) did not invest in the first capture system: it was the concession holder that invested, on behalf of the city council, the owner of the network. As regards the second system, AM and Dalkia paid for half of the investment each. This type of set-up is fairly exceptional: as previously mentioned, Arcelor-Mittal was under pressure from the Regional Environment, Space Planning and Housing Directorate (DREAL) and therefore **extremely keen to take environmental and regulatory measures**.

Whereas the local authority originally started the heat network as a way to **tackle energy poverty**, it is now also part of a **long-term, overall strategy aimed at reducing greenhouse gas emissions and increasing the share of renewable energy in the energy mix** as part of the "3x20" by 2020 objective[7] set out in the Urban Community climate and energy plan (2009). Thanks to the massive use of unavoidable energy, the heat network has turned into a **strategic tool for reaching the 20% renewable energy target[8] by 2020**.

The heat network is fairly unique in that the local authority and Arcelor-Mittal have succeeded in reconciling their operational dynamics and time horizons, aligning their synergies despite different long-term visions. Risks may still exist however with respect to the sustainability of the partnership.

The network extension feasibility study conducted by Hexa Ingénierie in 2012-2013 was spurred by the fact that **almost 70% of the heat network depended on one single industrial company**, AM, which in turn relied heavily on market conditions and international capital. In this context, how could the long-term existence of the network be ensured? The study examined the **diversification potential of diverse heat sources** and identified 13 industrial waste heat sources and potential connections (private homes, industrial parks).

The heat network is such a success that Dalkia has investigated the possibility of connecting other industrial plants to the network. Some surveys have been commissioned by ADEME on a regional level.

Discussions between industrial companies and CUD have been facilitated by the existence of Ecopal, a network of over 200 industries from the Dunkirk area promoting industrial ecology. Created in 2001 on a proposal by Arcelor-Mittal, the association originally aimed at pooling waste management resources. Its attempts at developing tangible synergies

[7] A 20% reduction in greenhouse gas emissions compared to 1990, a 20% increase in the share of renewable energy and a 20% increase in energy efficiency by 2020.
[8] This includes unavoidable energy under the term "renewable and recovered energy".

between industrialists have never truly materialised but its role as network facilitator has contributed to promoting a culture of exchange in the area, with Arcelor-Mittal as the central hub.

In fact, the industry no longer needed to be convinced of the **benefits of the heat network** highlighted by the experiment with Arcelor-Mittal in terms of **additional revenues, environmental performance and corporate image**[9]. In return, the local authority is making good progress in its ambition to tackle fuel poverty[10] and reduce greenhouse gas emissions in its territory.

Several extension scenarios have been envisaged, notably with Rio Tinto Alcan and Ball Packaging. But the waste-to-energy plant already operated by CUD however appears to be the most reliable solution, with no uncertainty as to its future.

The users

Michel Delebarre, the former mayor of Dunkirk, played a key role in the dialogue with the direct customers of the heat network (housing associations like *Partenord Habitat*, public facility managers, etc.). This political figure and former minister promoted a sustainable development approach as a solution to the 1980s' economic and social crisis. By multiplying urban development projects and tackling fuel poverty, his action proved pivotal **in bringing stakeholders together around the industrial waste heat network** and enabled many connections to be made. Today, the heat network supplies heat not only to the city hall, a hospital, a swimming pool and schools, but also to the equivalent of 16,000 social housing units. **The benefits of the heat network are also acknowledged by the elected representatives of neighbouring municipalities** and many of them have expressed their wish to be connected to it.

As part of the network extension project, CUD is also engaged in discussions with other users: public facility managers, social housing landlords and building owners for whom the heat network has clear social benefits. The authority, however, **does not have much contact with private individuals**, who are often not or little aware of the heat network, and even less of the origin of the heat.

Social acceptance of the heat network is not automatic by all. Developers and planners, for example, do not see the economic interest of having their new buildings connected to the network. CUD has several ways of convincing them: thanks to the **ZAC (*zone d'aménagement concerté* – mixed development zone) and to the PLU (*Plan local d'urbanisme* – local urban plan)**[11] it can impose what future urban areas will be served by the heat network. But the authority usually prefers an approach based on discussions and dialogue to convince stakeholders. For urban development projects, the Urban Development Department acts through a local public company: the objective is to step in as early as possible

[9] These benefits should be put into perspective: financial and CO_2 savings are almost nil. At AM, only about 0.3% of unavoidable energy is recovered (survey carried out in 2013). This explains why AM communicates very little on the heat network compared to CUD.
[10] Served by a dense gas network, many inhabitants in the Dunkirk area continue to use fuel oil heating.
[11] One of environmental targets of the CUD local urban plan is the systematic connection of areas earmarked for future development.

by attending meetings and have the heat network integrated in the planning process. On some occasions, like the **Grand Large green district project**, the inter-municipal PLU, which also serves as a housing and urban mobility plan (PLUIHD) can make connection of facilities to the heat network mandatory. For new buildings, political will therefore appears to be a determining factor. But despite this, the network has not been classified as a mandatory network, mainly to preserve good relations with other operators seeking to supply energy in the local area.

The Dunkirk case shows that political determination combined with a motivated energy department with the necessary technical skills and good communication (with relevant success stories) are necessary for meeting the economic, environmental and social interests. **Growing interest in the heat network may certainly be attributed to increased awareness of the benefits of the network, but it is also the result of long-term efforts by the city council and CUD.**

Lessons learnt: is the project replicable?

Reproducing such a network is relatively easy, provided heat sources are easily identifiable and minimum production and consumption densities are available. The difficulty lies in **"making stakeholders' dynamics and time scales coincide"**[12]. The private sector and local authorities, for example, have very different ways of working, including in terms of time horizons: whereas industrialists make plans for the next 5 to 10 years (often reduced to 2 to 3 years nowadays), local authorities may make commitments for up to 25 years. In addition to reconciling different timelines and operational dynamics, local stakeholders must also **have faith in the long-term commitment of other players**. The issue of the long-term viability of an industrial activity may make the local authority be wary as, together with the operator, it bears all the financial risks[13]. In Valenciennes, a heat network project was blocked for this reason.

In all cases, to convince an industrial partner to join a heat network project, even a private one, the local authority must support the project by at least showing an interest in its success. This brings us back to the issue of trust, without which nothing can be done.

The Dunkirk heat network illustrates the need for stakeholders to trust each other, and is also a fine example of the fact that, with the right level of political commitment and communication, not only is it possible to reconcile economic interests, social issues and environmental requirements, but also to get a wide range of stakeholders involved in a common project.

[12] Zélia Hampikian, telephone interview, 28/08/15.
[13] A guarantee fund to secure this aspect is being examined by ADEME.

For further information

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Useful links and information

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