

Application for the Global District Energy Climate Awards - Edition 2011

Poznań District Heating System Operated by Dalkia Poznań SA



April 2011

Location: Poznań, Poland

Manufacturer: Dalkia Poznań Zespół Elektrociepłowni SA
Private Ownership

Distributor and Network Owner:
Dalkia Poznań SA
Private Ownership

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Motivational Letter

During this year's edition of the District Energy Award competition we would like to once again present the district heating system in Poznań. This time, however, we wish to highlight its dynamic development that allows both the city of Poznań and its residents access to an energy-efficient co-generational source of heat and hot water supply, having an additional positive influence on air quality in the city. **The district heating system in Poznań has over 360,000 end users of heat, residents, public institutions, commerce, and industry. From among the awarded categories, the one that fits best the activities carried out in Poznań is the category of developing the existing system and its modernization.** We will pay special attention in this report to the program of **providing heat to historical residential districts of Poznań.** The program, implemented on the initiative of and at the expense of Dalkia, fits perfectly well the comprehensive program of economic and social regeneration of these districts, announced and implemented by the city authorities. For Dalkia the program offers an opportunity to develop a network in a way that is independent of the new investments in the city, which was especially important in the last two years of crisis and halted construction projects. The city for its part will benefit from the **program of constructing and developing the district heating system** in historical residential districts, heated previously by individual heat sources, often operating on hard coal, **by a significant and evident reduction of "low emission"**, or air pollution from sources without monitoring devices cleaning exhausts.

All the activities conducted by Dalkia in Poznań leading to an increased energy efficiency and emission reduction, especially CO₂ emissions, are additionally supported by an array of actions for the benefit of the local community. They range from ecological awareness raising projects organized jointly with the Municipality through support for cultural initiatives, since access to high culture is also one of the elements of support for the regeneration of excluded areas (this time areas of social, and not only economic exclusion).

Thanks to this policy, **Dalkia is able to develop its district heating system in Poznań despite a decreased demand for heat** in existing clients (e.g. as a result of thermal modernization programs). At the same time, cogenerated system heat has become one of the most economically efficient ways of heating apartments and homes. Furthermore, Dalkia's investment, both that aiming at rising the efficiency of equipment and that reducing emissions, make the Poznań district heating system an exemplary product on the market. If we add to this the current work, scheduled to finish in December this year and aiming at the conversion of a coal boiler into a biomass-only boiler generating green energy in the Karolin Combined Heat and Power Plant, we may safely say that **Dalkia in Poznań is one of the pioneers of the transformations that are taking place and will continue to take place in the heat industry of Central and Eastern Europe.**



. Summary

Dalkia in Poznan is presenting development and modernization of the district heating system in Poznan. Special attention in this report is paid to the program of providing heat to historical residential districts of Poznań.

This program has been outstanding and innovative due to:

- the investment has been conducted together with a educational action promoting the system heat for end-users
- Dalkia's investment stays in compliance with City's Revitalisation Program
- Clearance of the "low emission" heat sources and provision of the access to the system heat and system hot water is developing the comfort of life for the citizens
- Thanks to the connection of the existing buildings Dalkia was able to maintain its good development rate, despite of the crisis

Dalkia has faced many challenges:

- conviction of the residents that system heat is a preferred option
- financial effort - nearly 4 Mio. Euro of the investment - from own resources
- extension of the network had to be agreed with many authorities and conducted in the way that makes less possible traffic in the city.

The result of the last 5 years actions is more than satisfactory:

- The quality of the air is better in the city centre - thanks to Dalkia's performance over 100 kT of the low emissions has been avoided
- The investment is profitable, thanks to adequate amount of the new connections
- Dalkia created an access to the system heat for all citizens in the area



Written description

Introduction

The heating system in Poznan is managed by two enterprises: Dalkia Poznań (distributor) and Dalkia Poznan ZEC (producer).

Two companies – one system



- combined heat and power generation (cogeneration)

- System services

- 930.2 MW thermal power
- 275.5 MW electric power

- Technical specifications:

- 3 coal-fired heating units

- BC 50 double heating unit 126 MW,
 - BC100 heating unit 192 MW,
 - BK100 condensation and heating unit 205 MW,

- fuel oil-fired water boilers (309 MW)

- ECI Garbary

- stoker-fired boilers (51.0 MW) fired with coal
 - water boiler (58.0 MW) fired with light oil or gas

- management of the municipal heat distribution network

- heat generation from own (local) sources

- heat distribution network of 483 km

- 4,196 heat distribution substations

- over 12 million sq m of heated building area

- 1/2 of facilities with telemetric systems

- Dalkia covers over 50% of municipal heat demand.

Both companies have a common development policy, common customer's approach and common external communication. Over 750 Dalkia employees is working day by day to assure a secure and continuous heat delivery for the Poznan agglomeration.

The City Of Poznan

Poznań is one of the oldest and largest cities in Poland. It is the historical capital of the Wielkopolska Region, where the Polish State was born 1000 years ago. Today, Poznań is an important centre for trade, services, industry, culture, higher education and science. It is also among the leading Polish cities in terms of its economy.

Poznan is situated midway between Berlin and Warsaw, 160 km from the border with Germany. The city is inhabited by 554 000 people. Poznań is characterised by a highly developed technical infrastructure. There are 228 000 dwellings in the city, more 55% of them are using the heat from Dalkia.



Poznań constitutes a powerful academic and scientific centre. There are 25 higher schools attended by 141 000 students. In 2012 Poznań will be one of the Polish cities hosting the EURO Football Championship on the stadium, that is heated by Dalkia.

Dalkia operates in the most prestigious hotels in Poznań, as well as shopping malls and cultural institutions.

The most important data from system's history:

- 1967 - establishment of the Miejskie Przedsiębiorstwo Energetyki Ciepłej in Poznań. Redevelopment of the Garbary power plant into CHP Plant (EC 1).
- 1969 - Establishment of the first technical emergency unit for citizens
- 1972 - commencement of the Karolin heat and power plant (EC II) construction
- 1975 - connection of EC 1 and EC 2 into one business organization - Zespół Elektrociepłowni Poznań. Putting into use the first heat supply main supplied from the EC 2.
- 1976 - transformation of the MPEC into Wielkopolskie Przedsiębiorstwo Energetyki Ciepłej, which also incorporates the other systems in Wielkopolska.
- End of the 70s - beginning of the system's automation, a pioneer project for both heat and power plants conversion into mutual network in an open system, executed jointly by ZEP and WPEC.
- 1991 - a change in WPEC business organization, establishment of Przedsiębiorstwo Energetyki Ciepłej in Poznań
- 1993 - commercialization of Zespół Elektrociepłowni Poznań, establishment of Zespół Elektrociepłowni Poznańskich SA
- Early 90s - beginning of exchanging 600 hydroelevator heat distribution centers for compact ones (energy-saving) and removing 300 coal boiler houses (emissions' reduction)
- 1997 - commercialization of the PEC and the establishment of Poznańska Energetyka Ciepła SA
- 1998 - launch of the third unit (BK 100) together with modern flue gas desulphurisation system
- May 2002 - privatization, Dalkia Termika takes over 51% of PEC Company S.A. shares
- March 2004 - privatization, consortium of Dalkia Termika and PEC SA take over 85% of Zespół Elektrociepłowni Poznańskich SA shares.

- 2006 - launch of the program “Clean Łazarz District” - inauguration of connecting old residential districts of Poznań to the heating system
- Early 2010 - Dalkia Polska buys off from the City of Poznań the remaining stake of Dalkia Poznań, thus becoming an owner of over 99% of shares
- Mid-2010 - launch of the conversion of a coal boiler in block BC 50 into a biomass-only boiler. The conclusion of the investment envisaged for December 2011

Technical properties of the heat supply.

The elementary heat supply for the Poznań municipal heat distribution system consists of EC 2 Karolin CHP plant, located at ul. Gdyńska 54. The heat is supplied by a network through three heat supply mains. At ul. Marii Panny 2, the heat plant EC 1 Garbary is located, which is connected with EC 2 Karolin via southern supply main. Currently, the heat plant serves as a peak and backup supply.



EC 2 Karolin is a unit heat and power plant with three heating units heated with subbituminous coal - BC50, BC100 and BK100. BK100 unit is able to work in condensation. Capacities of the elementary production units:

The interior of the Karolin CHP Plant engine room

- BC 50 heating duo unit of 126 MW capacity, heated with hard coal, one of the boilers of this unit will be replaced by a BFB unit in December 2011
 - BC100 heating unit of 192 MW capacity, heated with hard coal
 - BK100 heating and condensation unit of 205 MW capacity, heated with hard coal
- The capacity of peak units:

- water boilers 2 x PTWM-180 of total 309 MW capacity, heated with heavy oil (mazut)

Total capacity of the EC 2 amounts to 832 MW.

EC 1 Garbary has the function of peak and emergency supply launched when the temperature stays below 6°C. The following boilers are used for heat production:

- stoker-fired boilers 3xWR23 of total 51.0 MW capacity, heated with hard coal
- water boiler PTWM50 of 58,0 MW capacity, heated with light oil or gas

Total capacity of the EC I amounts to 109.0 MW. The supply has got the water treatment systems to fill the losses of heat carrier of continuous efficiency 140 m³.

Network properties

The heating system provides heat to customers by means of hot water of heating factor temperatures 130/70 °C and pressure up to 1.6 MPa. It supplies the recipients in Poznań, Swarzędz and Koźiegłowy.

The heating network has the radial-annular layout ensuring safety of heat supply in emergency situations.

Until 1995 the network has been constructed with the use of so-called pipe network technology. However, after the aforementioned year the networks are layed-out through preinsulated pipes technology. The total capacity of heat distribution system together with interior systems, amounts to approx. 80,000 m³, with the network being approx. 480 km long.

The maximum flow in the computation conditions amounts to 10,500 t/h. The flow of heating carrier to the farthest recipients amounts to approx. 8-10 hours. The work of the network is programmed and supervised 24 hours a day by the system's operator. Work control is conducted through telemetry system. The system enables remote regulation of the pressure available in the network and total or partial turning off network's sections in the emergency situations. The heat reception is held through exchangeable heat distribution centres, fully automated.

Dalkia in Poznań covers over 55% of the Poznań agglomeration heat demand. Heat is provided to 7083 buildings of total square footage more than 12 000 000

System's heat sale: 7,698 TJ in 2010.

Average age of buildings: EC Garbary - the oldest, approx. 80 years old, buildings modernised for several times and maintained in technical efficiency (confirmed by the state UDT - Office of Technical Inspection examination), EC Karolin - the oldest buildings - approx. 30 years old, the majority is several or a dozen or so years old (as well examined by UDT). The average age of the heat pipes - 21 years (the oldest from 1960), examinations as above.



Data supporting the systems overall energy efficiency.

Energy production system in Poznań operates in cogeneration and partially in trigeneration. Simultaneous heat, electric energy and ice water production enables the use of above 80% of energy contained in fuel (the conventional coal power plants' production efficiency is 40%). Production capacity for 2010 was 80.5 %, while the efficiency of the distribution network (the district heating system) was 87% in 2010.

Data on the consumption of fuels for 2010 are as follows:

In 2010 733,400 tons of coal, 42,500 tons of biomass, heavy oil (mazut) 2,891 tons and 20,674,073 m³ of gas.

We need to bear in mind that both the beginning and end of 2010 were the coldest over the past dozen or so years.

For over four years EC Karolin has been using the biomass, co-incinerated with coal, in the process of energy production. In 2008 EC Karolin co-incinerated approx. 45,000 tons of biomass, which influences lowering the CO₂ emissions. Since mid-2010 Dalkia Poznań ZEC has carried out work on the conversion of the hard coal boiler of block BC50 into a fluid boiler running exclusively on biomass. At present the project is at its construction stage and the biomass boiler will be operational in December 2011. Thanks to this investment, the amount of green energy produced at Karolin CHP will increase over 15%.

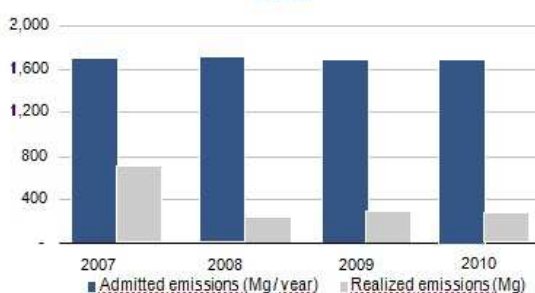
The CO₂ emission stays below assigned limits and norms of emission. The same applies SO₂ and NO_x and dusts.

ENVIRONMENTAL PERFORMANCE

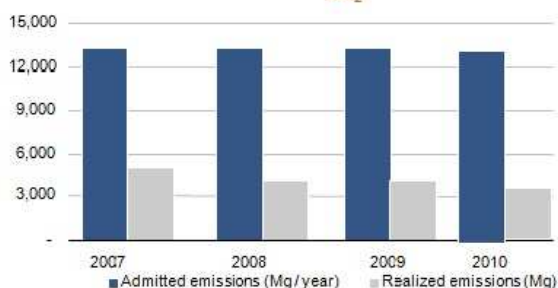
- **Legal requirements**
 - Integrated permit
 - License to EU CO₂ trading scheme
 - License for the use of water
 - License for the treatment of combustion waste
- **Environmental management**
 - ISO 9001 and ISO 14001
- **Laboratories**
 - Accredited chemical and environmental measurement laboratories

GAS EMISSIONS

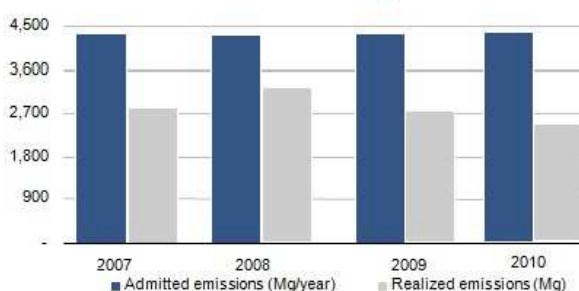
DUST



SO₂



NO₂



Within the last 10 years Dalkia Poznań has closed down all (over 300) of its local coal resources and modernized the existing gas and oil resources and thus enabled almost quadruple reduction of CO₂ emission, and almost complete SO₂, soot and dust reduction.

Owing to the exchange of heat distribution centres from hydroelevator to compact ones (600 heat distribution centres) the use of electric power has decreased from over 14,000 to 9,500 MWh a year.

Full automation of the centres (weather automation) and the exchange of pipes from duct to preinsulated (currently over 25% of the pipelines, annual increase of 2-3%) accounts for a losses decrease in the flow and decrease in the number of breakdowns, which also contributes to more effective use of primary energy.

Both Dalkia companies use an Integrated System of Management based on requirements of the: ISO 9001, ISO 14001, BS-OHSAS 18001 norms. Additionally, Dalkia Poznań operates pursuant to AQAP 110 norm (NATO certificate).

EC Karolin has electro filters of dust extraction efficiency over 99%, the flue gas desulphurisation system, as well as low-emission burners (reduction of nitrogen oxides). The emissions from power plants are monitored online by the appropriate environment protection services at the premises and in controlling institutions (Wojewódzki Inspektorat Ochrony Środowiska). All emission norms are observed, and the Company is fully transparent.



Modern flue gas desulphurisation system is one of many ways of limiting noxious emissions to the environment.

In 2009 hydraulic slag removal and ash removal is no longer in operation. The ash as a by-product of the technological process comes out dry and is fully utilized, by Dalkia's subsidiary, for the purpose of road works and construction materials industry.

Within the distribution management, Dalkia accomplishes a programme of telemetry incorporation of all possible network points. Currently, there are over 4,500 of them, covering all the network and local heat sources. Dalkia also uses modern IT tools: we use specialized GIS software for the purpose of heat network management, and MAXIMO and MONA programmes in order to control managed systems and to prevent breakdowns.



Program of emission reduction in the city through the development of the district heating system

Since 2006 Dalkia has conducted in Poznań a program of providing heat to historical residential districts of the city: Łazarz, Wilda, Jeżyce, and Stare Miasto.

Investment is carried out jointly by both Poznań-based companies: Dalkia Poznań ZEC (65% of the investment) and Dalkia Poznań (35%). Within the project “Clean Energy for Łazarz”, Dalkia Poznań together with Dalkia Poznań ZEC invested in the period 2006 - 2010 an amount of **14,937,756 PLN** in the preparation and installation of heating infrastructure in the district of Łazarz, Wilda nad Jeżyce. In the period 2011 - 2016 we wish to earmark for this purpose 1,200,000 PLN in the district of Łazarz alone. For this purpose Dalkia Poznań has also received subsidies from EU funds.

Within the program, in the period 2006 - 2010 we eliminated 16,221 MW low emission sources (coal-operated boiler rooms and local coal furnaces), and the buildings using these sources were connected to the district heating system and now use system heat and system hot water.

Dalkia's investment moreover contributes to the enhancement of the residents' comfort of living. In Łazarz there was no access to a heat network, while in Jeżyce access was limited. At present 100% of all residents are able to get connected to the heat distribution network in these districts.

The innovativeness of the program consists in a pre-emptive initiative; Dalkia invested in the development of the heat distribution network, offering the interested residents a chance to get connected to it. This was preceded by tests of preliminary interest in access to system heat, but it was the direct involvement of the sales services of Dalkia and the education campaign that the number of new clients in those districts also brought about a positive economic effect.

Another aspect that highlights the exemplary cooperation with the local government is the fact that Dalkia makes investments in areas subject to a municipal Regeneration Program. The program's objective is the enhancement of life quality in districts with decreasing reputation, at risk of social exclusion.

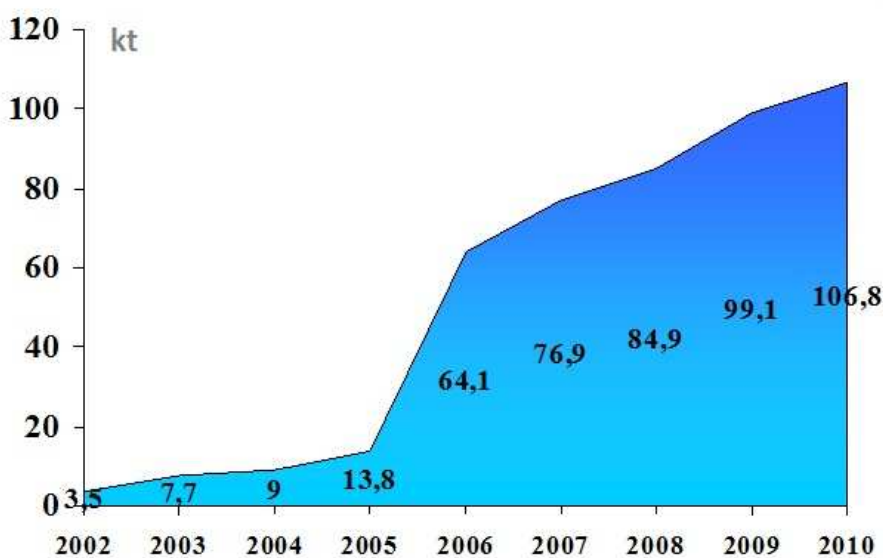
Access to a state-of-the-art and efficient way of heating homes, i.e. cogenerated system heat, is often the first step on the path to improve living standards in those districts.

For the past nine years Dalkia has extended the district heating network in Poznań by 85 kilometres. This is one of the best results across Poland. The new investments went hand in hand with modernization works, first of all the replacement of canal networks into preinsulated ones. This unquestionable development success was achieved by Dalkia despite the trends on the market. According to scientists from the Poznań University of Technology, the demand for heat in individual clients in Poznań has constantly decreased, by close to 30% over the past 10 years. Moreover, Dalkia itself within the project “Green Energy for Poznań” or the campaign “Keep the Heat”, conducted together with the Municipality of Poznań, educates residents of Poznań and persuades them to save energy. Still, Dalkia's involvement in the promotion and progress of system heat make the actual demand for heat from the district heating system has remained at a constant level for a few years. This is possible thanks to the outlays for the

development of the network, parallel to the development of the agglomeration and city investments. Both the conviction of the residents that system heat is a preferred option (heating costs with the use of local hard coal sources have been lower than system heat since they do not include environmental protection costs) and the network extension works in a way that would minimize traffic in the city were the biggest challenges for Dalkia in the entire investment process. The effects of better air quality in Poznań have been recognized and appreciated nationwide. Among others, in recognition of actions carried out together with Dalkia, the City of Poznań received twice the “Leader of Polish Ecology” Award.

AVOIDED LOW EMISSIONS

(emissions from households chimneys)



Dalkia is a member of the System Heat promotion program. This program promotes the heat from municipal networks as the most ecological one (save for Renewable Energies) and, if used in cogeneration, also the most energy-effective heat carrier in the Polish municipal systems. At the same time, Dalkia supports the thermo-modernization program of our customer's buildings, by accepting and planning in advance the expectations of energy reduction ordered by the buildings' owners. In 2010 and 2011 Dalkia and the Municipality of Poznań carried out two editions of the “Keep the Heat” program promoting heat and energy saving activities. Under this program, Dalkia financed and conducted tests with a infrared camera for single-family homes in Poznań, documenting the places where heat “escapes”.



For years, both Dalkia Companies have been supporting and organizing activities for the benefit of local community, and for the improvement of life quality in Poznań. The projects connected with low-emission resources removal, the revitalization of old city districts and education campaigns aimed at the citizens of the city, showed remarkable effects seen in the improvement of the air quality in the city centre.

Dalkia takes pride in being a professional service provider, a partner for municipal authorities and a company actively involved in the life of the local community.