



EMCC case studies

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Introduction

In order to meet rising energy demand while also reducing CO₂ emissions and securing the energy supply, a challenging conversion to renewable and other innovative energy sources is needed in the EU. This has made the EU and its Member States launch ambitious policies, goals and initiatives aimed at creating an innovative and much more climate-friendly energy sector. As a result, regional cluster projects and initiatives within the renewables sector have emerged in several European countries in recent years.

One of these cluster projects is the Envicrack cluster in the city of Ostrava in the eastern Czech Republic.

The initiative dates back to 2005 and is dedicated to the development, improvement and implementation of processes and technologies related to pyrolysis.

Put simply, pyrolysis is the process of making fuel out of carbon-rich waste and, in the case of Envicrack, combining the process with heat and power production. According to Envicrack, the successful development of using pyrolysis in the local energy supply chain requires multi-sphere application of the latest research knowledge and practical experience in regional conditions. Hence, a cluster facilitating regional cooperation and experience-sharing among the different stakeholders within the pyrolysis and energy sectors is the natural approach.

By simultaneously addressing sustainable waste management and sustainable and climate-friendly energy production, the Envicrack cluster initiative responds to some fundamental challenges for the Czech Republic as well as for most new EU Member States.

Methodology

The main components of data collection for the case study are desk research and analysis of materials and presentations provided by the cluster as well as the cluster's website. Also, an interview with the cluster's director, Mr Petr Nemeth, has been carried out.

Desk research of relevant articles, reports and websites has added further contextual data to the cluster study.

Context and history: Creation of the cluster

The Envicrack cluster was founded in 2005, mainly on the initiative of the local research and engineering company Arrow Line. At that time, Arrow Line, an SME specialising in shunting devices, was looking for new business possibilities within the complex pyrolysis technology sector, which seems to have a potentially very high added value. There was significant interest in pyrolysis processes in the waste and energy sectors, but many physical, technical and chemical barriers remained in order to improve and implement pyrolysis in praxis; hence, Arrow Line launched the cluster idea aimed at gathering stakeholders along the pyrolysis value chain, from waste collectors to researchers, engineering companies and end users.

In cooperation with the Technical University of Ostrava, a feasibility study for the cluster and its activities of developing and marketing pyrolysis technology was made. In November 2005, on the basis of the feasibility study, the cluster was founded by 17 members, among which are the university and Arrow Line. The cluster's overall strategy was to carry out the development and marketing of pyrolysis technology within a period of two years. Finance was obtained from the Czech Ministry of Industry and Trade, among others.

Energy challenges in the Czech energy sector

Though the foundation of the Envicrack cluster was mainly driven by the commercial interests of an engineering company, it seems that its success and ability to find the needed finances are also partly due to general trends and challenges in the Czech economy and energy sector.

The Czech Republic has undergone a major transformation process during the last 15 years. The country's economy and energy sector have changed from being strictly guided by central planning and intensive government involvement to being driven by market forces, international competition and choices made by producers and consumers. In 2004, the country joined the European Union together with its neighbouring countries, Hungary, Poland and Slovakia.

The Czech Republic has performed well, thus making a rather successful transformation to a market economy. As an EU member, it has achieved strong growth rates in recent years. However, the increased growth together with EU requirements to lower CO₂ emissions and increase the renewables' share of energy production also posed some major challenges for the Czech energy sector.

Due to domestic coal production, coal has traditionally been the main energy source for electricity and heat production in the Czech Republic, and though the share of coal in primary energy production has fallen considerably since 1991, it still reaches 47%. Renewable energy does not play a major role in Czech energy production, accounting for only 4% in 2004, but the Czech government has stated the ambitious goal of increasing the renewables' share of primary energy production to 8% by 2010. Also, as a commitment under the Kyoto Protocol, the country must lower its CO₂ emissions by 8% below the 1990 level by 2012 (Eurostat, 2007; IEA, 2005).

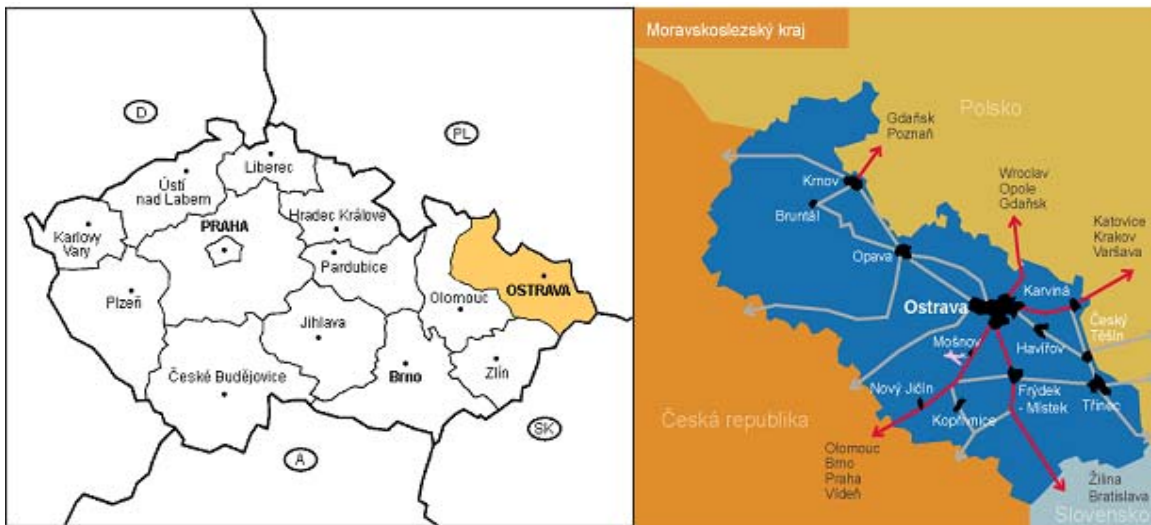
The majority of renewable electricity comes from hydro power plants, but the hydro potential has been largely exploited or is limited due to environmental issues. The most promising sources to meet the targets of increasing renewables include wind, biomass and waste-to-energy. In 2005, the Czech government introduced an electricity purchase obligation for renewables and CHP (combined heat and power). The law also guarantees minimum prices in 15 years and support for electricity produced from biomass and through co-firing of biomass.

The Envicrack cluster initiative of focusing on using waste and dry biomass in CHP production seems to respond well to both the challenges of the Czech energy sector as well as government strategies and policies. Further, the cluster also addresses the challenge of sustainable waste management. Strong economic growth has generated increasing amounts of waste; however, most of it goes into landfills in the Czech Republic and only limited recycling is taking place. The problem of waste management is a key challenge in many of the new Member States, but of course, it also remains a problem for the rest of the EU (EU2004.ie, 2004; Env.cz, 2007); hence, the development of effective and sustainable pyrolysis processes should be of interest for all EU countries.

Cluster policies of the Moravian-Silesian region

The city of Ostrava, where the Envicrack cluster is located, is the capital of the Moravian-Silesian region. Home to more than 1.2 million inhabitants, the region is situated in the north-eastern part of the Czech Republic, with Slovakia to the east and Poland to the north.

Figure 1: The Moravian-Silesian region



Source: dynamicregion.cz

Moravia-Silesia is well known by its long-term industrial tradition, which started in the mid-eighteenth century. In the communist era, it was developed into a heavy industrialised region called the ‘Steel Heart of the Country’. Since the fall of communism, heavy industries such as steel production and coal mining have declined and the region has suffered from high unemployment rates.

In the 1990s, economic reforms and the restructuring of the regional industry began. Today, the region’s economy benefits from its location on the borders of Poland and Slovakia. Moreover, coal mining and metallurgy are decreasing in favour of new industrial sectors with higher added value, such as engineering, automotive industry, electrotechnics, the chemical and pharmaceutical industry and information and communication technologies. During the last five years, international companies have deemed the Moravian-Silesian region to be an attractive location for their new activities and investments.

The Moravian-Silesian region has been proactive in developing contemporary industry policies and is, among others, regarded as the cluster initiative leader in the Czech Republic. The cluster concept is one of the pillars of its regional industry and innovation strategy, and the region hosts many other cluster organisations besides Envicrack. In 2002, a pilot study on industrial groupings was carried out. The study proved that clustering can help to overcome the region’s industry restructuring challenges. In 2003, the first Czech cluster organisation was established in Ostrava – the Moravian-Silesian engineering cluster. Several of the current cluster organisations have been partly funded by the region’s budget.

Among the new Member States, the Czech Republic was the first to include the Cluster Programme of the EU Structural Funds Operation Programme Enterprise and Industry. The programme’s intermediary body, CzechInvest, launched a cluster building campaign in 2004, giving clusters broad awareness. The Cluster Programme is also included in the current programming period (2007 to 2013).

Besides these regional and national cluster programmes, the Regional Development Agency of Ostrava is also carrying out a regional cluster network initiative. The aim of the initiative is to provide clusters in the Moravian-Silesian region with information, consulting, education, marketing and other services and to facilitate their relations with other clusters in the region as well as clusters abroad (Clusterforum.org, 2007; Wikipedia.org, 2007).

Next to the cluster-friendly policies of the regional authorities, the contemporary Moravian-Silesian region possesses several characteristics and infrastructures advantageous for the cluster of Envicrack as well as other clusters within the sectors of engineering, chemistry and industrial research:

- a skilled industrial labour force at a cost significantly less than that of Western Europe;
- strong familiarity with traditional industries (steel industry, mechanical engineering, chemistry);
- research and development facilities and institutions (information technology, biotechnology and advanced materials);
- three universities: Technical University Ostrava, University of Ostrava and Silesian University Opava;
- industrial zones, science-technological parks and business incubators;
- high density of infrastructure;
- high concentration of large cities and towns;
- total regional population of over 1.2 million;
- advantageous location between Poland and Slovakia;
- transit region – multimodal corridor north to south and a hub of road and railroad transport;
- a large, modern, international airport with the potential for growth.

Envicrack – Czech cluster of renewable energy sources

The Envicrack cluster is an open syndicate of companies with the legal format of a cooperative. It consists of 25 companies, one university and two private research institutions. In just a few years, the cluster has grown considerably from its 17 founding members to its current 28 members. According to Petr Nemeth, director of the cluster, new companies keep showing up at the cluster's meetings.

The cluster secretariat resides in the Technological Park of Ostrava, a business and research park founded by regional and local authorities in cooperation with two universities. The secretariat employs three persons -- one researcher, one assistant, and one director. The annual turnover is 93.000 Euros, of which, 75% comes from public funding.

Currently, much of the public funding is related to the time-limited pyrolysis project, the pillar of the foundation of the cluster. This means that the cluster will have to raise new funds when the project is concluded in mid-2008. The funding for the pyrolysis project mainly comes from EU Structural Funds via the Czech Ministry of Industry and Trade.

Table 1: *Facts Envicrack Cluster*

Associated companies	25 (of these, 23 are SMEs)
Associated universities	1
Associated private research institutions	2
Employment within the cluster	689
Total export of cluster companies	€87,524
Staff in cluster organisation	3
Income/turnover of the cluster organisation	€93,000
Membership fee annual	€150

Source: *Envicrack 2007*

Members and key players

As mentioned earlier, the founder and main driving force behind the cluster initiative is the Arrow Line company, an engineering and research SME. Other members include companies that operate along the pyrolysis value chain; moreover, two of the region's biggest waste management companies have joined the cluster. Currently, companies active within other areas of renewable energy, such as thermal solar technology, have begun to join the cluster.

Though expressing his gratitude for having big companies among the members, Petr Nemeth emphasises that the SMEs are the most actively engaged in the cluster activities. According to Petr, this is probably due to the SMEs' greater need for the services and cooperation possibilities provided within the cluster.

The Technical University is also a key player in the cluster due to its research expertise and laboratory facilities. The research carried out within the cluster, and in particular in connection with the pyrolysis project, is very demanding.

Strategy and organisation

At the very beginning, the main strategic goal of the Envicrack cluster was the development of pyrolysis technology, but since more members operating within other areas of renewable energy have joined the cluster, new opportunities for cooperation, common activities and joint projects have been created. Hence, the strategy of the cluster has been broadened and today consists of two objectives:

1. The development of pyrolysis technology in the field of utilising assorted waste and dry biomass for electricity and heat production.
2. Strengthening the competitiveness of members.

The director carries out the daily management of the cluster, but the general assembly is the cluster's highest authority, since it elects the board. The board consists of two people – a president and a vice-president. Their tasks are mostly official in character.

Activities and cluster synergies

Currently, the cluster's main activity is the pyrolysis development project. The project is divided into three phases, which are also closely connected to the foundation and development of the cluster.

The first phase consisted of the aforementioned feasibility study, which was also used as the basis for the cluster establishment.

The second phase, which is currently being concluded, is the research and development phase, where the actual pyrolysis technology is being developed. A prototype of a pyrolysis-processing unit has been successfully produced and is now being tested. The next and last phase will focus on marketing the technology.

The cluster is also helping other members with minor projects related to waste recycling and other sources of renewable energy.



The pyrolysis project

Currently, Envicrack's main activity is the pyrolysis project aimed at developing technology to utilise waste and dry biomass in electricity and heat production. Pyrolysis is the chemical decomposition of organic waste and dry biomass by heating without oxygen or any other reagents.

Source: *Envicrack, 2007*

Other, more general activities and synergies of the cluster aimed at improving members' competitiveness include the following.

- Common laboratory devices and facilities.
- Training activities and HR development: a joint skills training programme regarding pyrolysis processing is being prepared and a course on innovation, marketing, communication and strategy is being offered;
- Joint PR and marketing activities: the cluster has, among others, produced a DVD presenting the competencies of the cluster and its members. Also, a conference about pyrolysis technology for processing assorted waste and producing electricity and warmth is under preparation.
- Educational programme and materials for teaching environmental issues to pupils between 13 and 15 years of age.
- Benchmark studies of innovation performance and efficiency.
- Sharing know-how and experience at members' meetings.
- Information system for cluster members, including the coordination of common projects and joint procurement possibilities.

Challenges and future activities

A general challenge for the Envicrack cluster is raising the needed funding for its projects and activities. According to Petr Nemeth, finding venture capital is extremely hard for the cluster and its members, since the capital needed is for state-of-the-art research; thus, it implies great risks for investors. A large percentage of the external funding is tied up in the pyrolysis project, which is slated for conclusion in 2008. At the moment, the cluster is looking for new co-finance possibilities within the EU INTERREG programme. The 7th Framework Programme for Research and Development (FP7) is also being considered as a possibility. However, the cluster does not have the expertise in administrating large EU projects, an obstacle they are trying to solve at the moment by looking for potential partners to create a consortium.

When the pyrolysis development phase has ended, the next big activity will be to market the new technology. Petr Nemeth is convinced that the cluster will be engaged in marketing pyrolysis technology in the next five years. At present, the cluster is carrying out a feasibility study of the project's commercial possibilities, and so far, the technology seems to be in great demand.

Recruiting new members may also come into renewed focus. Currently, the cluster secretariat is fully occupied in carrying out the launched projects and activities; hence, recruiting new members is not a priority. When the demanding pyrolysis project is concluded, more resources could be spent on finding new members and identifying new activities.

Summary

In spite of being a young cluster, Envicrack already seems to be relatively consolidated with an increasing number of members, several tangible activities and a joint development project showing promising results. The success of the cluster seems to be a fertile combination of advantageous regional framework conditions, cluster-friendly policies at both national and regional level and a strong initiative and engagement from local SMEs. Also, the cluster's core activities have addressed the key challenges of waste management and the transition to renewable energy sources. These challenges are prevalent in all EU countries, but particularly within many of the new Member States.

At the moment, the cluster is in a decisive period concerning its future. The main project of the cluster – the development of pyrolysis technology – is coming to an end, and its worth will now be evaluated as the technology enters the market. Further, new funding will be needed to initiate new R&D projects and joint activities.

Learning perspectives

For Petr Nemeth, the most important learning perspective so far is the importance of finding the needed resources to initiate tangible common projects and activities at early stage of the cluster building process. This makes the advantages of joining the cluster clear for the sometimes reluctant companies and keeps them engaged in the clustering process.

Being a cluster dominated by SMEs, Mr Nemeth particularly emphasises joint projects and activities within the following three areas:

- large R&D projects;
- joint marketing and PR;
- common laboratory facilities.

Another learning perspective refers to the importance of public funding in the success of cluster initiatives – even though the cluster, as is the case with Envicrack, is initiated and driven by private companies. The reason for this is that cluster projects often require expensive R&D activities. These activities imply a great risk in terms of potential payback of investments; hence, from the standpoint of the SMEs, these risky activities are not attractive enough to finance by external venture capital.

Contact details

ENVICRACK Renewable Energy Cluster
Druzstvo ENVICRACK
Technologická 372/2
708 00 Ostrava – Pustkovec
Czech Republic
Web: <http://www.envicrack.cz>
Director: Petr Nemeth
Email: Petr.nemeth@envicrack.cz
Phone: +420 774 286 615

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