PGE Górnictwo i Energetyka Konwencjonalna S.A.

The Bełchatów CCS Project

3rd Conference on CCS

Warsaw, 29.10.2015

Górnictwo i Energetyka Konwencjonalna S.A.

Presentation outline

1. Introduction
2. Vision - The Bełchatów CCS project
3. Barriers

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Introduction

In 2009 PGE Elektrownia Bełchatów S.A. initiated works aiming at construction of a demonstration CCS installation.

Later on, as a result of the Consolidation Programme of the PGE Group, the works were continued by PGE Górnictwo i Energetyka Konwencjonalna SA (PGE GiEK SA).

It was intended to build an installation which would be integrated with the 858 MW unit which, since September 2011, is in operation in PGE GiEK SA Oddział Elektrownia Bełchatów (Bełchatów Power Plant).

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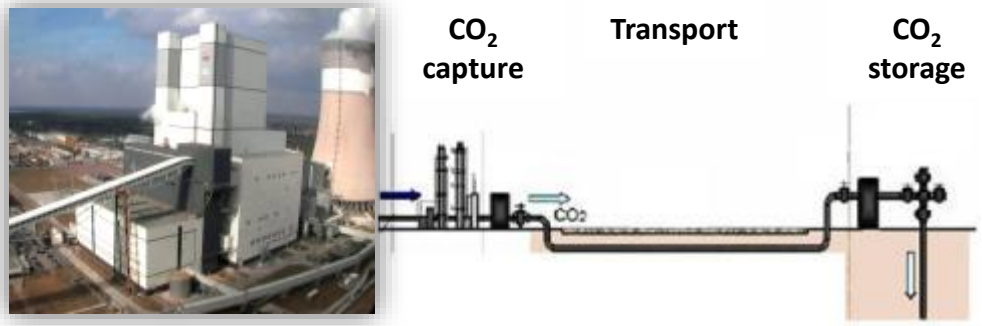
Vision

The CCS components

The Bełchatów CCS Project comprised the following key components:

- The power unit with the gross capacity of 858 MWe
- Carbon Capture Plant & Integration: an integrated post-combustion Carbon Capture Plant (CCP) with a capacity of 260MWe. The CCP to utilize an Advanced Amine Process technology with a CO_2 capture efficiency of at least 85%. This component includes the modifications necessary to the Power Plant, to make it capture-ready.
- CO_2 Transportation: this component includes a Ø300 pipeline of a length c.a. 140 km running across 16 communes and associated infrastructure to transport the CO_2 captured and compressed by the CCP to the storage site.
- CO_2 storage: this includes the injection of pressurized CO_2 into a deep saline aquifer for permanent storage.



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Vision

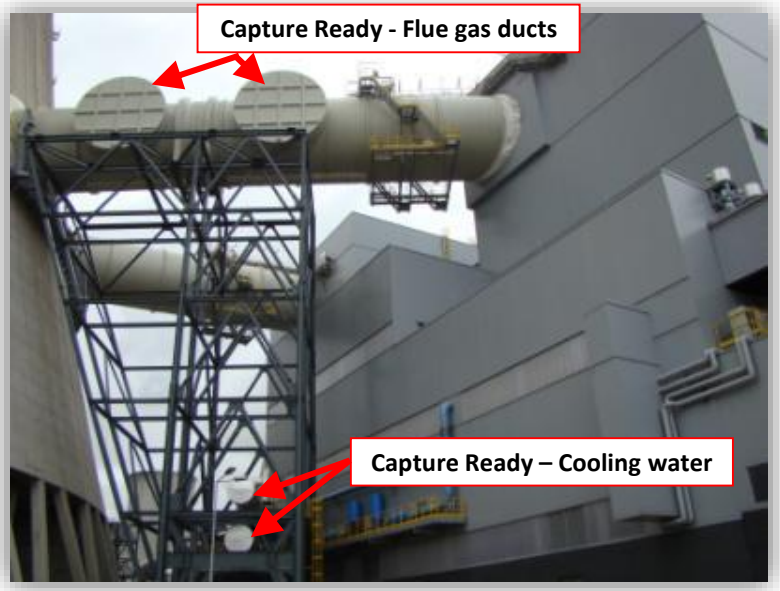
The CCS components

The 858 MW Unit

The new 858 MWe power generation unit was originally not designed to be "Capture Ready". This means that some modifications to the unit needed to be implemented in the course of its construction to ensure an integration of the CCP.

The key modifications included:

- Re-engineering and re-location of the equipment from the area identified for the CCP
- Tie-in for off-take and return of cooling water required for the CCP
- Tie-in for off-take and return of flue gas to the main flue gas ducts



The scope of work was completed in October 2010

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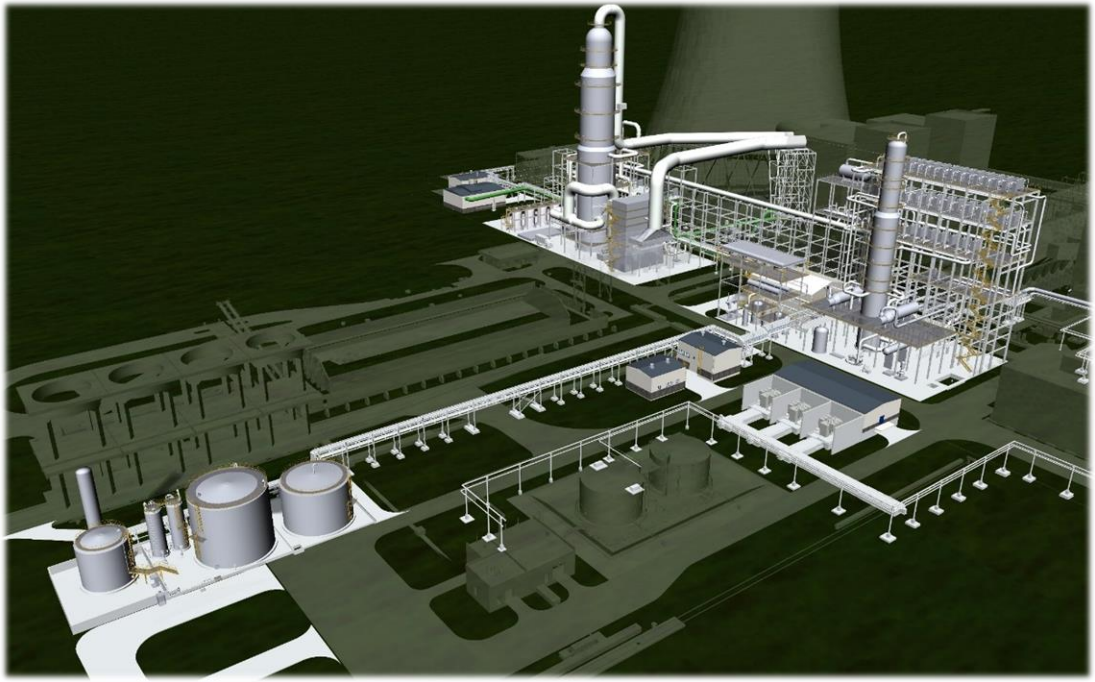
Vision

The CCS components

Capture

In the field of solutions concerning the CO_2 capture technology, the „post-combustion" option based on advanced amines has been chosen.
A comprehensive FEED study has been prepared for the selected option in the years 2009-2011. The documentation allows to start up detailed engineering, procurement and construction within CCP.

Environmental Decision as well as Building Permit obtained.



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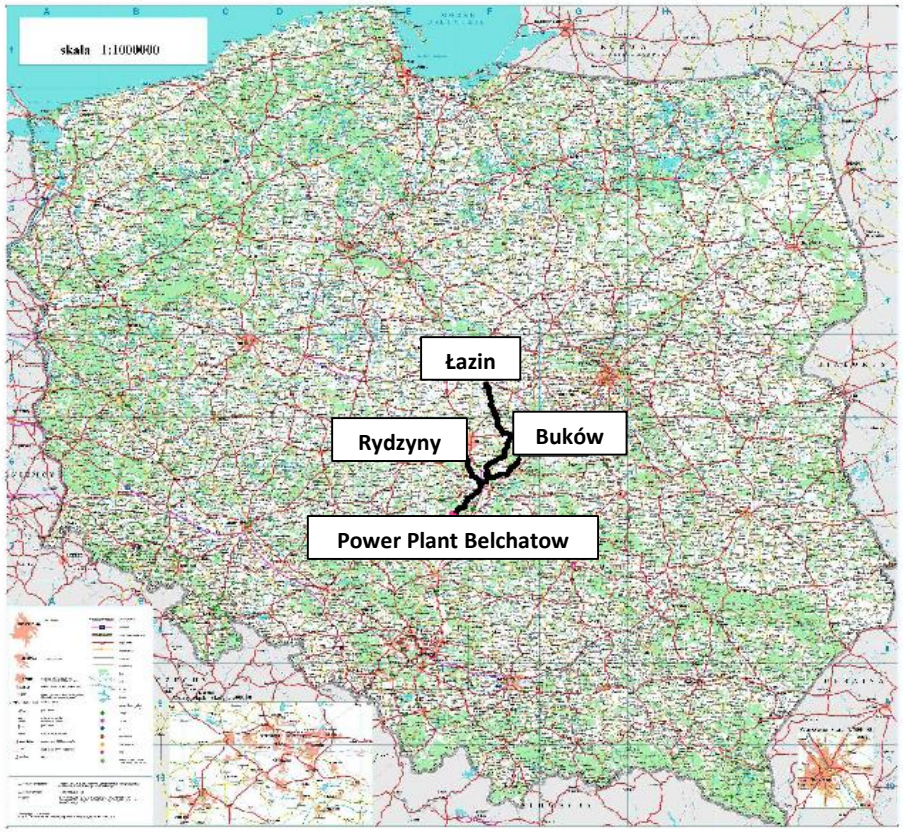
Vision

The CCS components

Transport

In 2009 three geological structures were identified in the Łódzkie Voivodeship for potential storage of the CO_2 leaving the CCP, i.e.: (1) Lutomiersk-Tuszyn-Pabianice-Bełchatów, (2) Budziszewice and (3) Wojszyce.
As a result of the feasibility study for the transport component completed in 2009, routing for three pipelines to the three considered storage sites was preliminarily determined.



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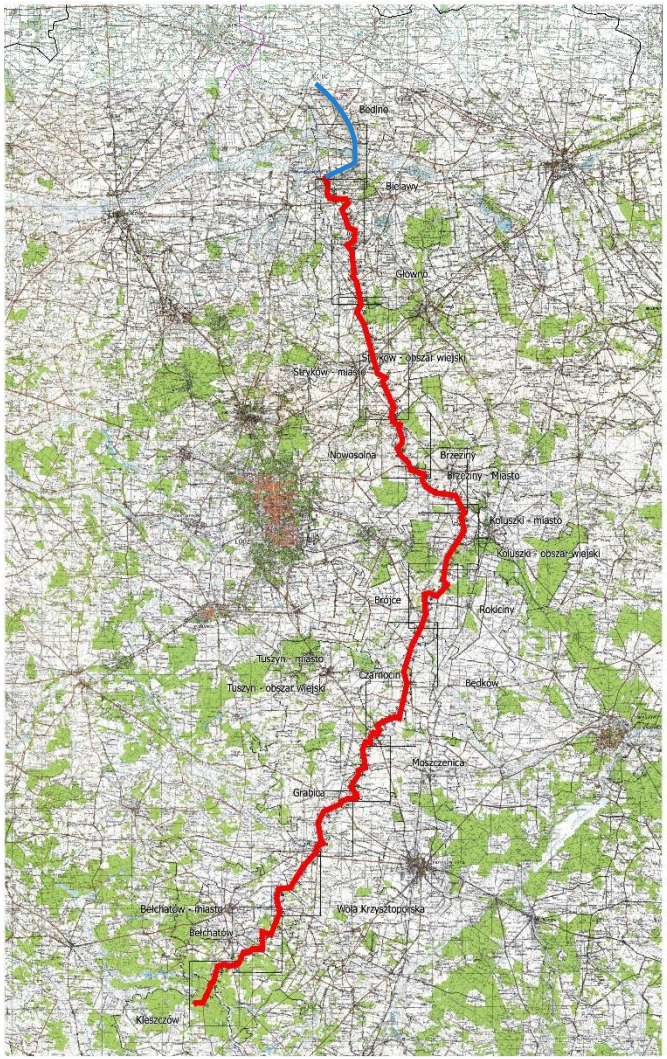
Vision

The CCS components

Transport

Following comprehensive geological works, analyses and examinations carried out in 2009-2011 and based on the experts' recommendation Wojszyce structure (north part of Łódzkie Voivodeship) was selected at the beginning of 2012 as most appropriate from geological point of view for continuation of geological works. The above mentioned storage site selection enabled commencement of preparatory works in the transport component in June 2012. The works regard the CO_2 pipeline routing determination, inclusion of the routing in the Local Plan for Spatial Development of relevant communes, preparation of the environmental impact assessment report, obtainment of the environmental decision and preparation of elements of the terms of reference for the public tendering process for selection of the pipeline construction contractor.



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Vision

The CCS components

Storage

In 2009 three geological structures were identified in the Łódzkie Voivodeship for potential storage of the CO_2 leaving the CCP, i.e.: (1) Lutomiersk-Tuszyn-Pabianice-Bełchatów, (2) Budziszewice and (3) Wojszyce.

As a result of Phase I of the storage component works, i.e. **Site Selection** including comprehensive geological works, analyses and examinations carried out in 2009-2011 period and based on experts' recommendation included in sites ranking report, Wojszyce structure was selected in February 2012 for the Phase II i.e. „Site Characterization".

Works within Phase I
2D seismic, drilling tests, gravimetric pictures and non-conventional research for both Lutomiersk – Tuszyn (up to Bełchatów) and Wojszyce. Data acquisition process was finished at the end of 2010. Further - data interpretation and modelling process for both mentioned structures as well as the evaluation of existing data for Budziszewice (archive data).

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Vision

The CCS components

the 4th component

The strategic impact of public understanding and acceptance of the CCS concept was always considered substantial in the Bełchatów CCS Project.
Outreach activities particularly concerning CO_2 transport and geological storage:

- From September 2009 PGE GiEK SA organized several meetings and the workshops with authorities from regional and local level;
- From September 2009 to the end of August 2010 outreach team provided the external public engagement campaign according to I Phase of the storage component development for communities, where geological examination and tests were ongoing;
- 2010/2011 social groups characterization done by an external PR company;
- Twenty five briefing meetings dated from March 1st to 19th, 2012 have been held in the community offices of the local authority representatives (Mayors, Town-Mayors or President) in Łódzkie Voivodeship. The aim of the meetings was to inform about the continuation of geological survey during the next, II Phase of the storage component implementation within the area of Wojszyce structure and also about the intention to carry out preparatory work for CO_2 transportation pipeline from Bełchatów Power Plant (where CCP will be placed) to Wojszyce area;
- PGE GiEK SA have been conducting an informative campaign concerning the preparatory work for CO_2 transportation pipeline in 16 of the Communities in Łódzkie Voivodeship.

During the meetings the local authorities and inhabitants showed their interest in the topic of Bełchatów CCS Project.

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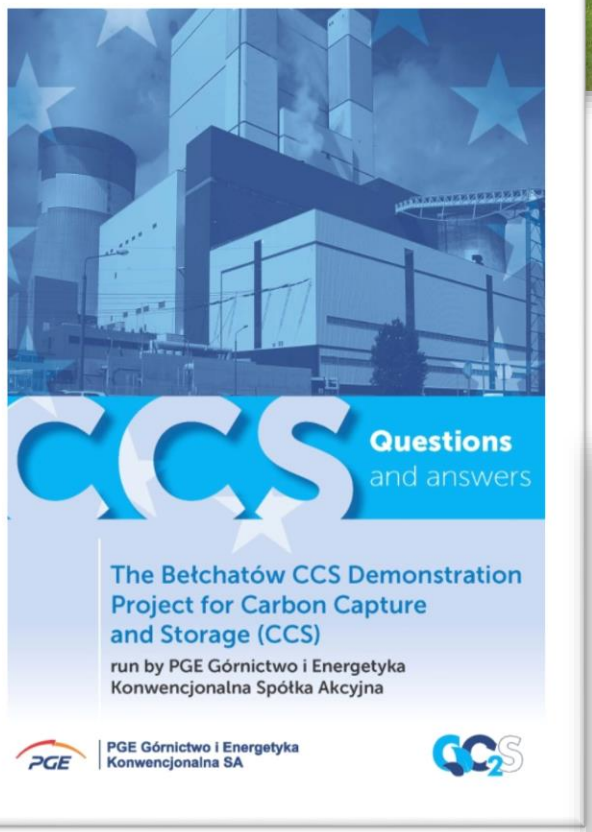
Vision

The CCS components

the 4th component



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Vision

The CCS components

Funding

Given the demonstration character of the CCS Project, PGE GiEK SA sought as much non-refundable support as possible. The following sources of financing were expected to provide the basis for funding the CCS Project:

- European Energy Plan for Recovery (EEPR) – grant agreement was signed on 5th May 2010.
- Emissions Trading Scheme „NER300" Programme – the application was submitted on 9th February 2011
- Norwegian Financial Mechanism (NFM) – Memorandum of Understanding was signed on 10th June 2011
- Work has been advanced together with the Polish Government in order to develop a domestic CCS installation operating loss support program

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Vision

the end

In the beginning of 2013 a decision was made to close the project.

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Barriers

Reasons to resign from the project

- Problems with assurance of funding
- Legal risks: delayed implementation of the directive CCS into Polish law, the act on the transportation corridors not enacted and an obligation to apply the PPL (public procurement low) during the contracting process
- Public acceptance for geological and geophysical works carried out in the storage component area, therein also for the underground CO_2 storage in general, as well as lack of public acceptance for CO_2 pipeline routing
- The CO_2 pipeline not qualified as a public purpose investment pursuant to the regulations what significantly complicated discussion with communes
- Problems with selection of the Coordinator of Phase II of the storage component – cancellation of the first tender proceeding, only one offer submitted within the second round reflecting lack of interest of the oil&gas sector companies in the risky CCS area vs. the quick benefits from the shale gas business
- Numerous technological risks

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Thank you