Polish CCS Demonstration Plant fully integrated into new unit 858 MW in Belchatow Power Plant (EBSA)
Technical specification of CCS Installation

- Post-combustion technology based on “advanced amine process”
- 1.8 million tonne of CO₂ captured and stored per annum, 235 tph
- Capture rate 90%
- Amount of flue gas corresponds to 260 MWe
- CCP heat consumption: 2.2 GJ/tone CO₂ (30,1 MWe)
- Gross capacity of 858 MW Power Plant with CCP: ~827.9 MWe
- CCP energy consumption: ~40.0 MWe
- Anticipated new power plant efficiency without CCP: ~41.7%
- Anticipated new power plant efficiency with CCP (with vapour to amine regeneration, without CCP equipment demands): ~39.8 %
- Transport of compressed CO₂ in supercritical conditions using pipeline to storage site within 60-140 km
- Storage at deep saline aquifers
- **Investment cost:** 2.3 bln PLN (approx. 767 mln USD)
Three potential storage structures

- **Budziszewice** – Structure in distance of 60 km
- **Lutomiersk-Tuszyn** – Located between 45 and 60 km in north of Belchatow Power Plant
- **Wojszyce** – Maximize chance of finding suitable storage site for CO$_2$, an area further north about 115 km from Belchatow has been screened for potential structures seems most promising
Entire CCS Project Schedule

- **Capture installation**
  - Building permit validation: 22 Feb 2010 - completed
  - Completion of Capture Ready modifications: Jun 2010 - partially completed
  - Mechanical completion: December 2013 - to be confirmed following selection of CCP contractor

- **Transport**
  - Building permit: Aug 2013
  - Construction completion: Nov 2014

- **Storage**
  - Storage site selection - 1st half of 2011
  - Permit application and storage site construction start up: Dec 2012
  - Construction completion: Dec 2014
  - Injection permit: Dec 2014

- **Optimization process completion and CCS final acceptance - Dec 2015**
  - We still believe it is possible to meet this deadline for entire CCS value chain completion.
CCS – Partners of Belchatow Power Plant

- **Capture island**
  - *Alstom Group* – Partner in development of „advanced amine” technology
  - *Dow Chemical* – Supplier of a selected solvent to capture CO₂ from industrial flue gas stream

- **Integration – „Capture ready”**
  - *Alstom Group*

- **Transport**
  - *Gazoprojekt* – Feasibility Study
  - Contractor for engineering and construction – to be selected

- **Geology**
  - *Polish Geological Institute (PIG) and Schlumberger* – Support during first appraisal phase
  - Additional subcontractors – PBG Ltd, Geofizyka Toruń, Sp z o.o., PRWiG
Critical tasks

- Completion of geological work (phase I) and storage site selection - I half of 2011
- Completion of capture component FEED study to move to contracting phase
- Setting forth procedures for further evaluation of CCS components
- Public awareness campaign
CCS Project benefits

- Development of CCS Project including full chain of components: capture, transport and safe geological CO₂ storage
- Storage site and transportation pipeline of CCS Installation set standard model for other large CO₂ Emitters in Poland
- Implementation of demonstration scale CCS Installation and advanced status facilities enables widespread commercialization for large scale fossil fuel power generation unit
- This clean coal technology will give necessary boost to similar projects within Poland and Europe
- Realization of CCS Project provides local employment in economic crisis and develops CCS skills and knowledge within Poland and Europe
CCS financial structure

- **Grants:**

- **Financial Sources Under Consideration**
  - NER 300
  - Norwegian Financing Mechanism
  - Polish-US Cooperation Funds
  - European Investment Bank
  - European Bank for Reconstruction and Development
  - Domestic sources
  - Other (Australian Funds)

- **Own funds**
CCS Project risks

- Technology is not mature yet, risk of scaling up from pilot to industrial level,
- Project is not commercially viable - Necessity of optimal project financial structure concept
- Legal risk – implementation of CO₂ storage Directive into Polish Law
- Power net efficiency reduction caused by CO₂ capture process
- Possibility of lack of public acceptance for CCS, and particularly concerning CO₂ transport and geological storage especially on Lutomiersk – Tusznyn area, additionally amplified by some local environmental NGO’s
Current Project Status and Plans

- **Capture**
  - modification to unit’s flue gas system and main cooling water system (capture ready) – completed
  - FEED phase – 90% advanced
  - contracting structure of CCP – almost agreed
  - design and construction of pipeline steam extraction – under ordering
- **Transport**
  - feasibility study done and depicted three routes included in Lodz Voivodeship Zoning Master Plan
  - turn key contractor would be selected after storage site selection
  - preparatory permitting activities would start asap.
- **Storage**
  - 2D seismic work, drilling tests, gravimetric and non-conventional research have been performed within area of two structures (2,000 km²)
  - modelling and site selection in 2011 and further development of storage component afterwards through selected site characterisation and storage site localisation and necessary permitting
Another EEPR Projects

- **Jaenschwalde**, Vattenfall, Germany, *oxyfuel + post combustion*, probably onshore (180 mln EUR)

- **Porto-Tolle**, Enel, Italy, *post combustion, offshore* (100 mio EUR)

- **Rotterdam**, E.ON + Electrabel, Netherlands, *post combustion, offshore* – (180 mio EUR)

- **Compostilla**, Endesa, Spain, *oxyfuel*, probably onshore (180 mln EUR)

- **Hatfield**, Powerfuel Power, UK, *IGCC, offshore*, (180 mln EUR)
Thank you for your attention

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