KEDZIERZYN PROJECT

Polygeneration Power Plant with CO_2 capture and storage

KEDZIERZYN PROJECT

1. The first Zero-Emission Energy-Carbochemical Complex in the world
2. Pilot project for the most polluted region of Poland – Upper Silesia
3. Planned construction of CO_2 transport pipeline – solving the problem of lack of suitable storage places in Upper Silesia
4. The first in Europe attempt at applying chemical sequestration
5. A chance for the development of the Polish carbochemical sector
6. The project is recognised and supported in EU

Introduction:
ZAK-PKE consortium

Południowy Koncern Energetyczny S.A.
(Southern Energy Concern Joint-Stock Comp.)

ZAK - Spółka Akcyjna
(ZAK - Joint-Stock Comp.)

PROJECT PARTNERS

ZAK S.A.

1. One of the largest:
   - *manufacturers of chemical products in Poland and Europe*
   - *domestic exporters*
   - *business entities in the Opole region*
2. The company is committed to ecology
3. Takes part in the global programme 'Responsible Care'

PKE S.A. (TAURON Group)

1. The second largest electric energy manufacturer in Poland
2. Over 14% share in the national installed generating capacity (4.9 GWe)
3. Over 16% share in heat production on the local market (2.4 GWt)

ZAK – PKE

In 2007 the two Companies started a joint venture, the main aim of which is the implementation of KEDZIERZYN PROJECT – POLYGENERATION POWER PLANT WITH CCS

PKE Today

Power Plant Halemba

P_{el} = 200,0 MW

P_q = 58,0 MW_t

Power Plant Łagisza

P_{el} = 1060,0 MW

P_q = 335,2 MW_t

Power Plant Blachownia

P_{el} = 165,0 MW

P_q = 174,0 MW_t

Power Plant Jaworzno III

P_{el} = 1535,0 MW

P_q = 371,6 MW_t

Power Plant Łaziska

P_{el} = 1155,0 MW

P_q = 196,0 MW_t

Power Plant Siersza

P_{el} = 786,0 MW

P_q = 63,5 MW_t

CHP Plant Katowice

P_{el} = 135,5 MW

P_q = 459,4 MW_t

CHP Plant Bielsko Biała

P_{el} = 136,2 MW

P_q = 447,0 MW_t

Tauron Group

Tauron Group – the highest value
of retail energy sales in Poland
in 2007 and 2008

ca 4 million clients

17% of Poland's territory

5.6 GW installed capacity

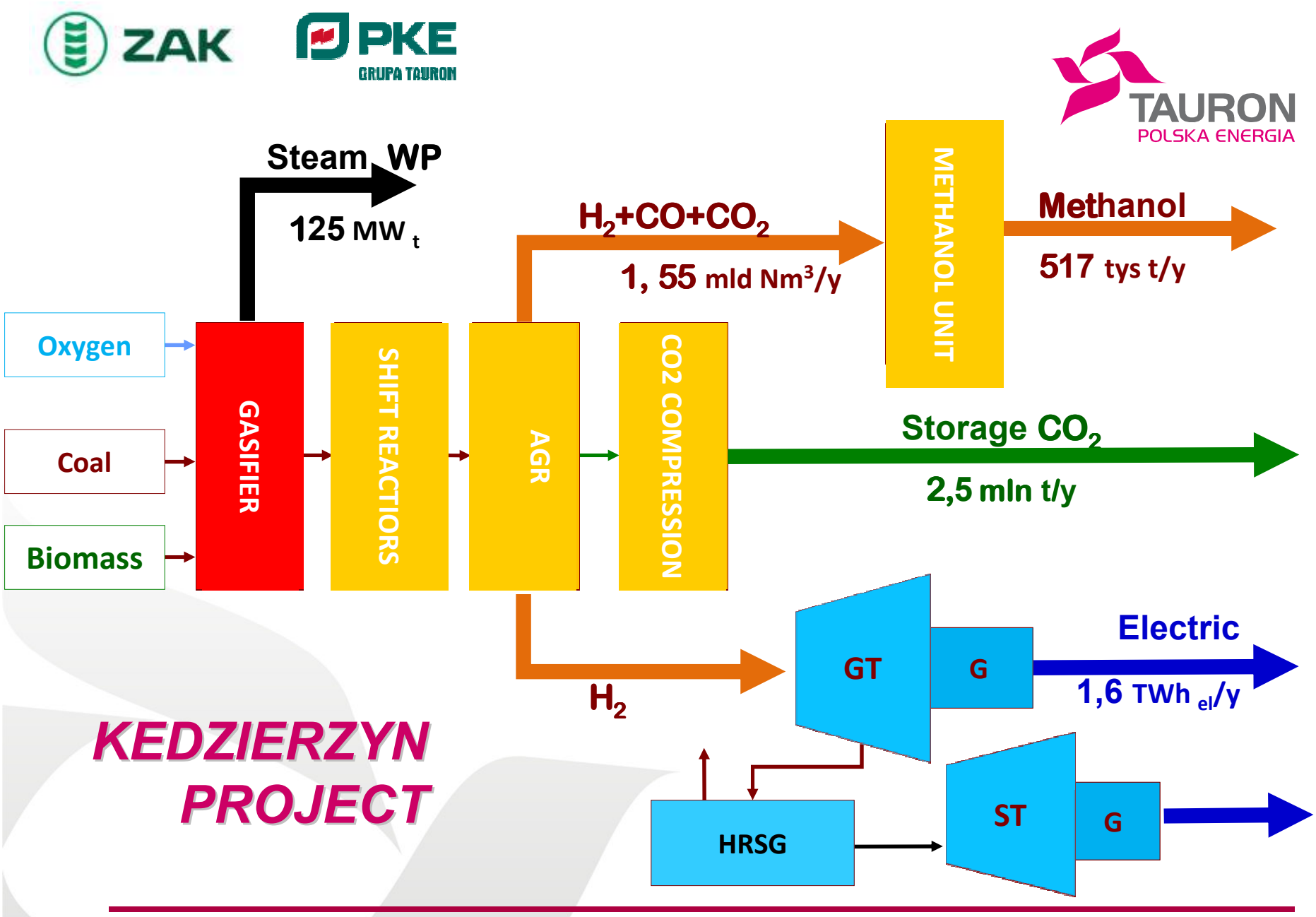
94 companies linked by capital

28 800 employees

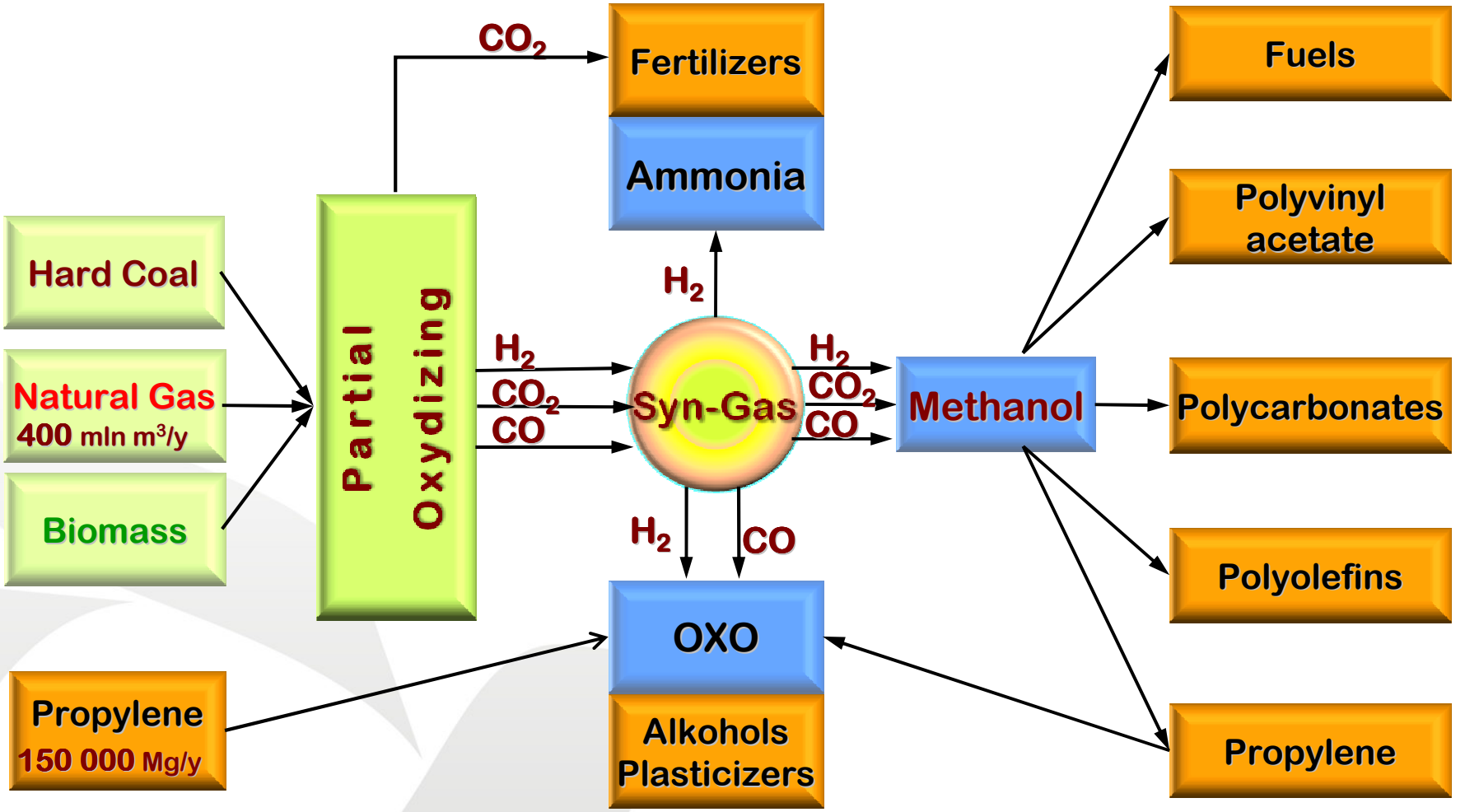
* Data as of 2009

KEDZIERZYN PROJECT

- Installed electric power : **300 MW_e**
- Pull-out thermal power : **125 MW_t**
- Methanol production : **517 000** t/y
- Gross electric energy production : **2,4 TWh/y**
- Captured CO_2 : **2,5 mln** t/y
- Reduction of CO_2 emission : **90** %
- Fuel consumption (coal) : **1,6** mln t/y

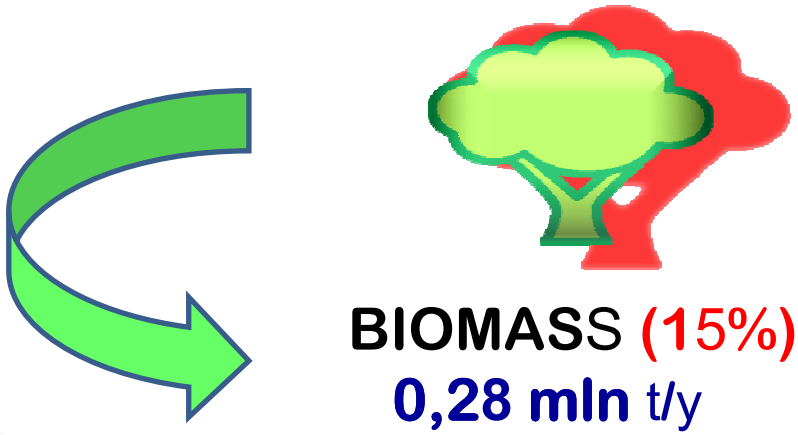

Steam WP
125 MW t
H2+CO+CO2
1, 55 mld Nm3/y
METHANOL UNIT
Methanol
517 tys t/y
Oxygen
Coal
Biomass
GASIFIER
SHIFT REACTIORS
AGR
CO2 COMPRESSION
Storage CO2
2,5 mln t/y
H2
GT
G
Electric
1,6 TWh el/y
HRSG
ST
G
KEDZIERZYN
PROJECT

PROJEKT KEDZIERZYN - Chemical Sequestration



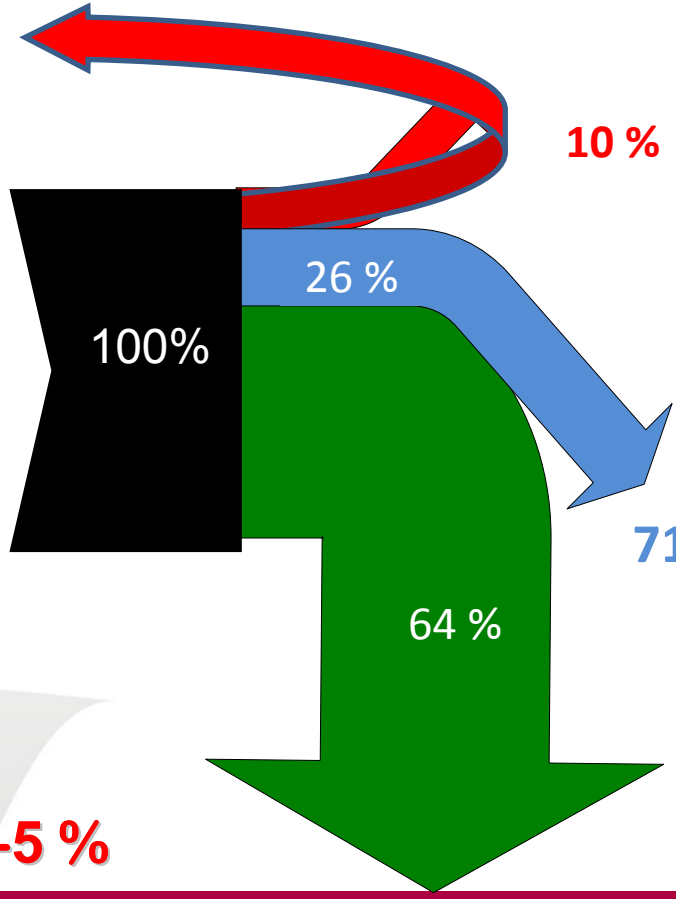
KEDZIERZYN PROJECT

An example of an environmentally-friendly power plant



BIOMASS (15%)
0,28 mln t/y

COAL
1,6 mln t/y



710 000 t CO_2/y
(methanol)

90 %

CO_2 emission
10% - 15% (biomass) = -5 %

2 500 000 t CO_2/y

CARRIED OUT WORKS

1. The conception of combined management of heat, electric energy and gas for the needs of PKE S.A. Blachownia Power Plant and ZAK S.A.

Stage I W-632_1 - December 2007
Stage I IGCC-W-632_2 - January 2008
Stage II W-632_3 - October 2008
Stage III W-632_4_1 Updated IGCC variant – November 2008

2. Comparative indicator analysis of two variants of rebuilding the production capacity in PKE S.A. Blachownia Power Plant X-2802 - March 2008

3. Pre-Feasibility Study for KEDZIERZYN PROJECT – Polygeneration Power Plant with CCS - February 2009 – Energoprojekt

4. Feasibility Study – PIG-AGH Consortium for CO2 transport and underground storage for KEDZIERZYN PROJECT - December 2009

5. Feasibility Study – GAZOPROJEKT on CO2 preparation and transport for KEDZIERZYN PROJECT – Polygeneration Power Plant – December 2009

6. **Feasibility Study for Kedzierzyn Polygeneration Power Plant with CCS – FOSTER WHEELER ITALIANA, February 2010**

WORKS IN PROGRESS

1. Commissioning the preparation of "Road Map" for the KĘDZIERZYN Project (FLUOR S.A.):
   - *presentation of Action Schedule for formal and legal, technical, financial and organisational actions*
   - *specifying estimate expenditures of identified actions*

2. The Contract with FOSTER WHEELER Italiana for:
   - *selecting the Gasification Island Licensor and Gas Turbine Vendor*
   - *working out Incremental Costs for CCS for Kedzierzyn Project*

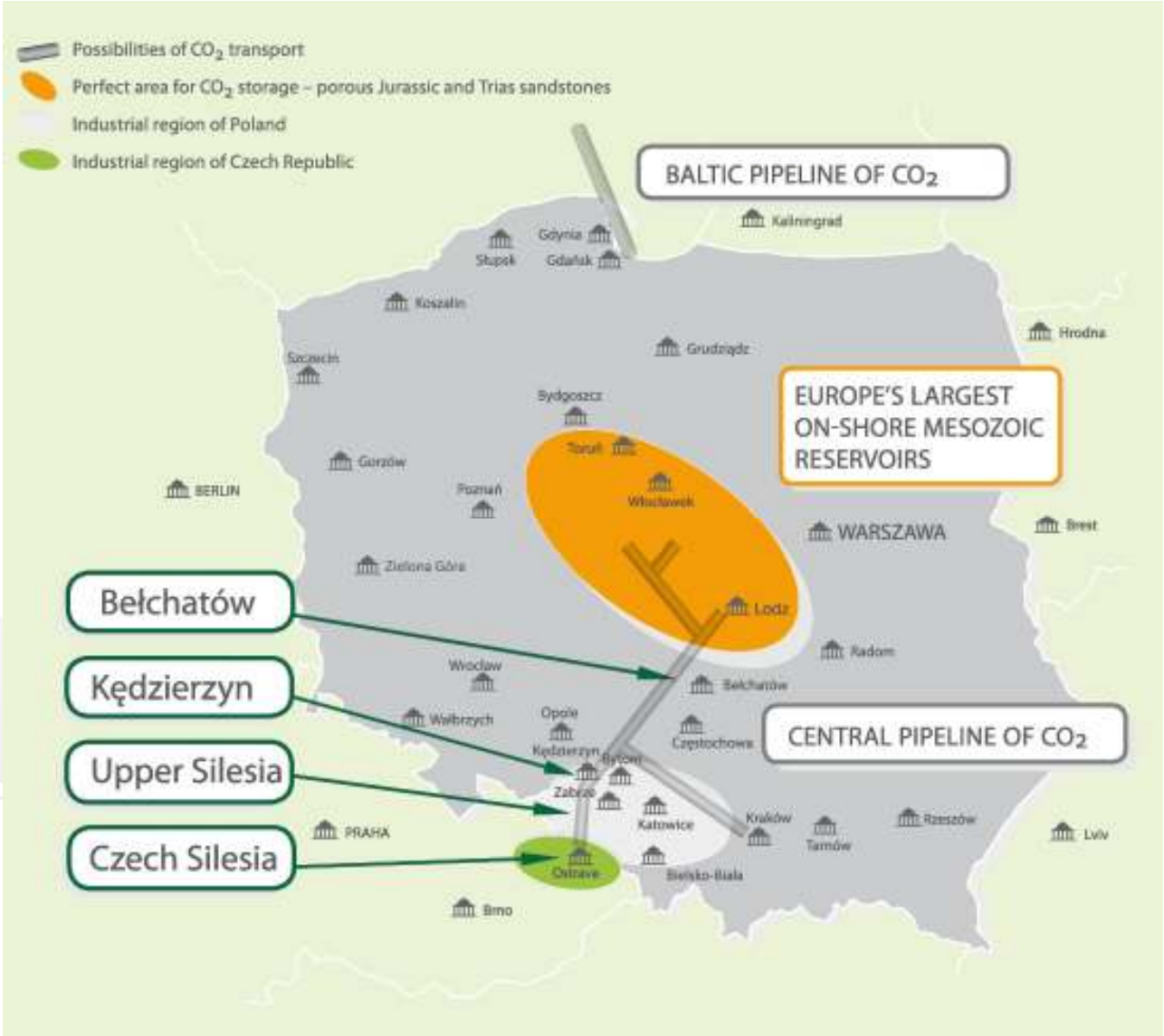
3. Preparing Request for Proposal (RFP) for:
   - *carrying out PRE FEED*
   - *preparing TOR for ITB*

4. selection and engagement of PMC with the assistance of a consultant

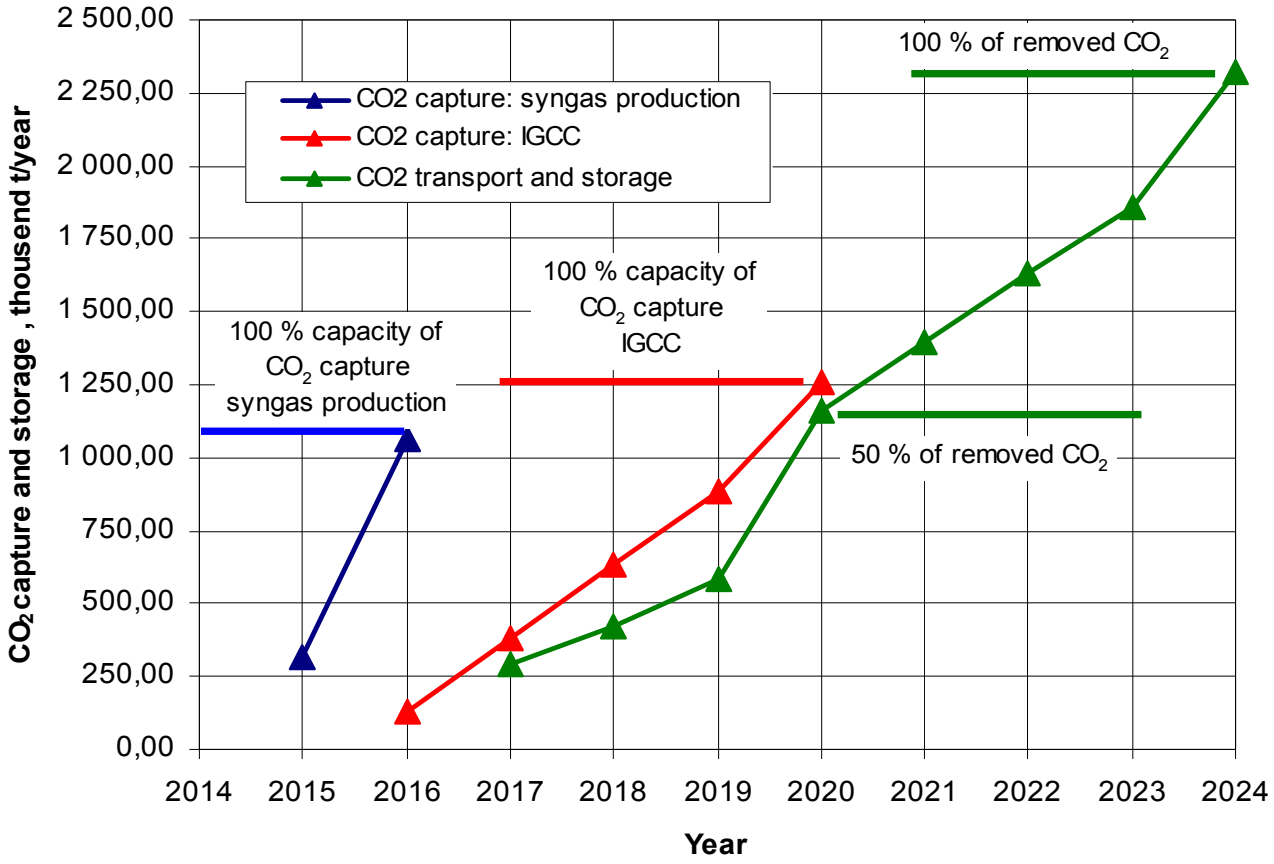
KEDZIERZYN PROJECT

Why is relevant?

- A Demo Project for one of the **most polluted and CO_2 emitting areas in EU** - Upper Silesia region with no storage capabilities
- Combing power and carbo-chemical production as well as demonstrating 8 **unique technologies** – double CO_2 full value chain
- Close collaboration within the **Central European CO_2 Cluster** (joint aquifer sequestration site in Central Poland, common CO_2 infrastructure, international cooperation, other industry involvement)
- Thanks to it's innovative solutions and co-firing of biomass, the project will be **totally environment-friendly** with **-5% net negative carbon effect**
- Model solution for **security of energy supply** for countries having coal deposits and dependence on natural gas imports


Possibilities of CO_2 transport
Perfect area for CO_2 storage – porous Jurassic and Trias sandstones
Industrial region of Poland
Industrial region of Czech Republic
BALTIC PIPELINE OF CO_2
EUROPE'S LARGEST ON-SHORE MESOZOIC RESERVOIRS
CENTRAL PIPELINE OF CO_2
Bełchatów
Kędzierzyn
Upper Silesia
Czech Silesia
Kaliningrad
Gdynia
Gdańsk
Słupsk
Koszalin
Grudziądz
Hrodna
Szczecin
Bydgoszcz
Toruń
Gorzów
BERLIN
Poznań
Włocławek
WARSZAWA
Brest
Zielona Góra
Lodz
Radom
Wroclaw
Bełchatów
Wałbrzych
Opole
Kędzierzyn
Częstochowa
Bytom
Zabrze
Katowice
Kraków
Tarnów
Rzeszów
Lviv
PRAHA
Ostrava
Bielsko-Biała
Brno

CO_2 CAPTURE AND STORAGE SCHEDULE



Schedule of Kedzierzyn Project

Name	Start date	Stop date
Starting date	2008-12-31	
Pre-Feasibility Study	2008-12-31	2008-12-31
Feasibility Study	2009-07-06	2010-03-30
Financing	2011-01-01	2011-12-31
FEED	2011-10-01	2011-12-31
Implementation	2011-10-01	2015-06-30
Start-up	2014-10-01	2015-06-30
Start-up CCS	2015-07-01	2015-12-31
Storage CO2	2013-01-01	2015-12-31
Completion date		2015-12-31
PROJECT	2008-12-31	2015-12-31

ZAK

PKE
GRUPA TAURON

TAURON
POLSKA ENERGIA

KEDZIERZYN PROJECT

Thank you for your attention