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State of the Art of CCS in the Czech Republic

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Starting points of CCS research

- **First step – 2004**

- 2004-2005 project CASTOR (EU-FP6) - study
- **2005 the first CCS study for Ministry of the Environment of the Czech Republic**
- 2006-2008 project EU GeoCapacity (EU-FP6) – Potential Storage capacity for CO_2 storage - study
- 2006-2010 project CO_2NET EAST (EU-FP6) – the extension of CCS to Central and Eastern Europe - study
- **2009-2012 project TIP (Ministry of Industry and Trade) – the first research project about capture and storage CO_2 after fossil fuel combustion**

Research of CO_2 capture

- 2012-2016 „Research of oxyfuel combustion in stationary fluidized bed boiler for CCS technology“ – project TACR-ALFA no. TA03020312
- 2013-2017 „ Low-emission energy system with CO_2 capture“ - project TACR-ALFA no. TA04020005
- 2015 – 2017 „Research of high temperature CO2 sorption from flue gas using carbonate loop“ – project Norway Grant no. NF-CZ08-OV-1-005-2015
- 2015 – 2016 „Study of CCS pilot technologies for coal fired power plants in the Czech Republic“ - project Norway Grant no. NF-CZ08-OV-1-003-2015
- 2017-2019 „Research of NO_x reduction in flue gas within the oxyfuel combustion CCS technology“ – project TACR - Epsilon no. TH02030149

Research of CO_2 storage

- 2008-2010 "Possibilities of geosvesting CO_2 in deep mines" - project of the Czech Mining Authority implemented by VŠB-TUO.
- 2009-2010 TOGEOS - EEA project and Norwegian grants 2004-2009, co-ordinated by CGS and IRIS
- 2013-2015 "Development and optimization of methodologies for the research of CO_2 barriers as one of the basic ways of reducing greenhouse gases in the atmosphere" - TACR project, led by ÚJV Řež, plc.
- 2016-2020 ENOS (Enabling onshore CO_2 storage) - the Horizon 2020 project, the continuation of some of the works of REPP-CO_2

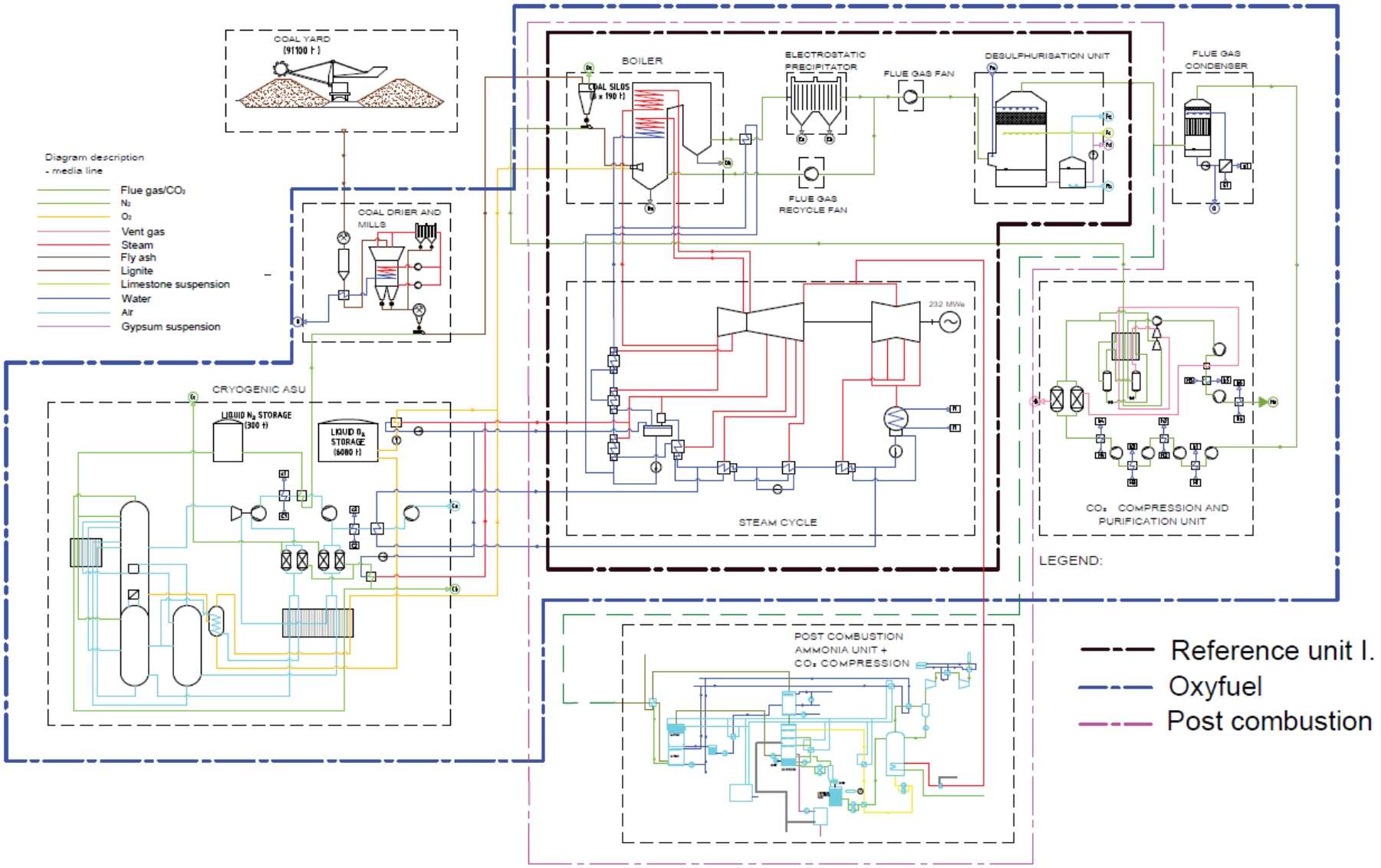
Research of CO_2 capture, storage and transport

- **2011–2015 „Research and development of methods and technologies of CO_2 capture from flue gas and design of a technical solution for conditions in the Czech Republic“ – project TACR-ALFA no. TA02020205**

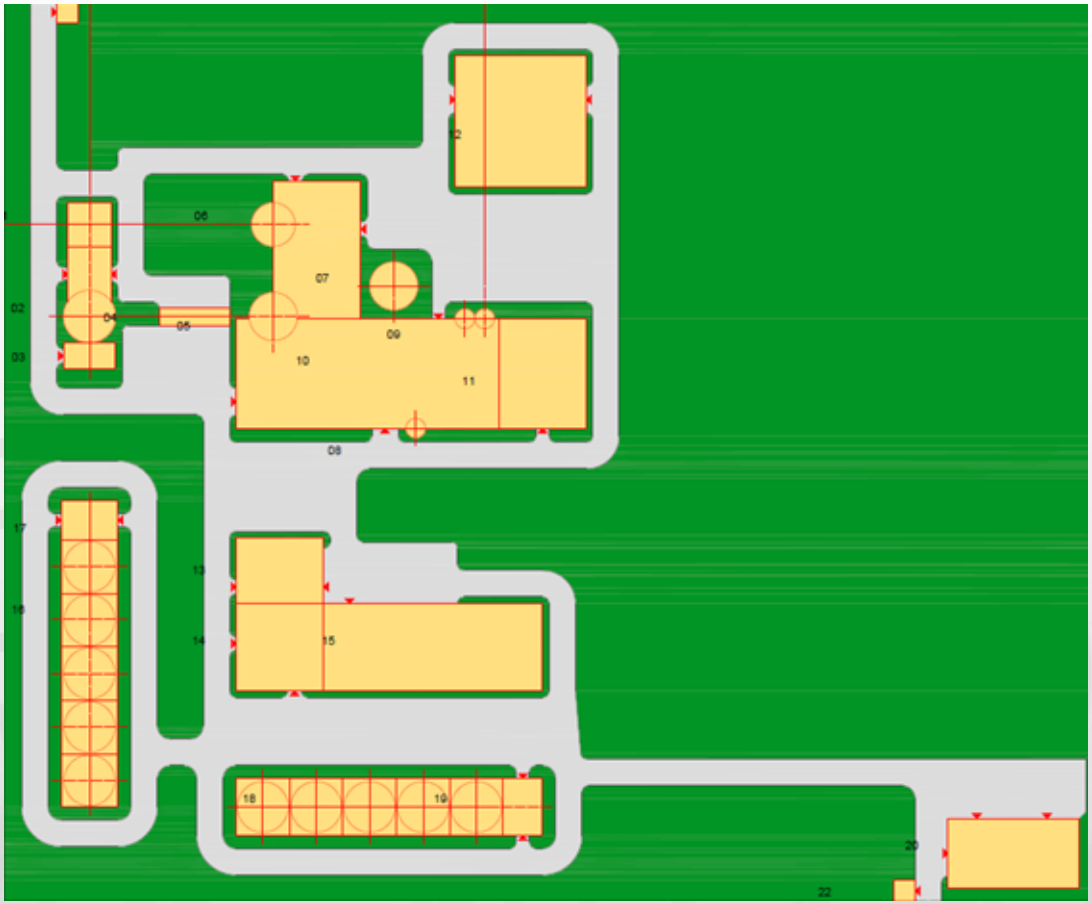
TIP no.FR-TI1/379 – 2009 – 2012

- Technologies – post combustion and Oxy fuel combustion
- Integration to Power plant combustion domestic fuel – lignite - power output = 250 MWe
- Analytic tools and methodological procedures for CO_2 storage

Research of CO_2 capture, storage and transport

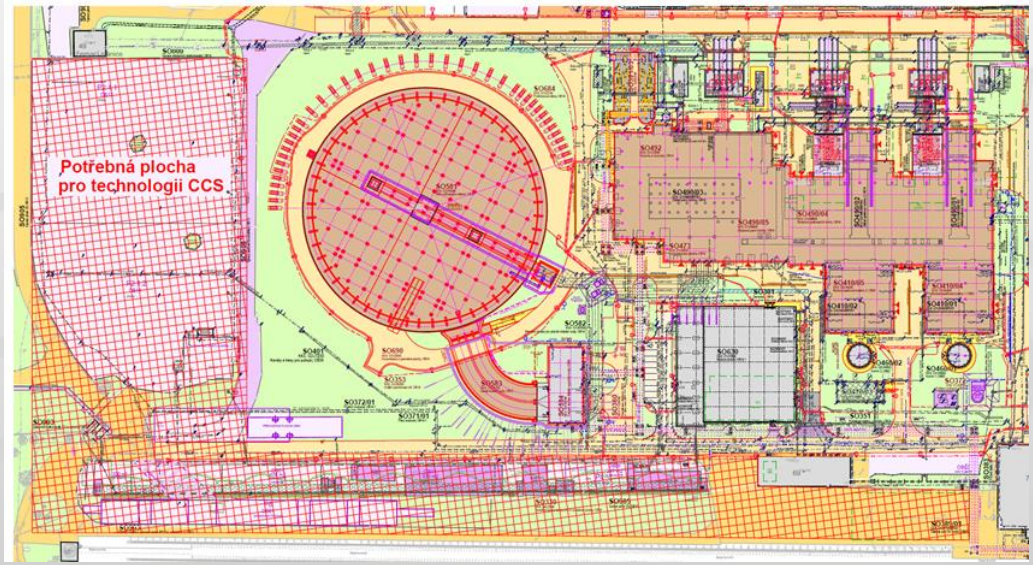


Research of CO_2 capture, storage and transport



CCS for industry

- 2007-2008 Inventory of potential underground storage sites for CO_2 in the neighbourhood of the ArcelorMittal plant in Ostrava / Czech Republic – pro ArcelorMittal
- 2011 Study of Condition Assessment for CCS – CEZ group – Prunerov II – Power plant - lignite
- 2013 Expert assessment of the conditions the capture and storage of CO_2 in a "source 880 MWe CCGT Power Plant in Počerady"– CEZ Group



CCS aplication in Czech republic

- CCS recently does no belong to main priorities of energy and climate policy in the Czech Republic
- The update of the State Energy Policy permits the possible role of CCS after 2040 and recommends to carry out research into geological CO_2 storage.
- Support for Science and Research project – program MPO TIP, TACR
- **The new impulse – Norway Grants 2009-2014 - Program CZ08 (CCS) science and research**

Norway Grants 2009-2014

Open call launched 31/03/2014

4 projects approved

- 2 focusing on CO_2 capture and transport
- 1 focusing on CO_2 storage
- 1 on education and awareness raising

Project period 1/2015 – 4/2017

Norway Grants 2009-2014

Successful projects:

Research of high temperature CO_2 sorption from flue gas using carbonate loop (UCT Prague)

Study of CCS pilot technologies for coal fired power plants in the Czech Republic (CTU Prague)

Preparation of a Research Pilot Project on CO_2 Geological Storage in the Czech Republic (CGS)

Carbon Capture & Storage – Sharing Knowledge and Experience (Masaryk University Brno)

Phase behaviour in CCS systems (Academic of science of Czech Republic) – CZ09

Norway Grants 2009-2014

Project title:

Study of CCS pilot technologies for coal fired power plants in the Czech Republic

Coordinator:

Czech Technical University in Prague (Faculty of Mechanical Engineering)

Partners: ÚJV Řež, plc, SINTEF Energy Research

Main objectives:

Design and techno-economic analysis of the pre-combustion technology integrated into a coal power plant in the Czech Republic.Global techno-economic assessment of three basic types of CCS technologies (oxyfuel, post-combustion, pre-combustion) applicable in Czech conditions

Norway Grants 2009-2014

Project title:

Carbon Capture & Storage – Sharing Knowledge and Experience

Coordinator: Masaryk University Brno

Partner: Norges Teknisk-Naturvitenskapelige Universitet (NTNU)

Main objectives: increase knowledge about CCS technology (public administration, decision makers, general/professional public) + increase of international cooperation in CCS

Main activities: information seminars for above mentioned target groups, lectures for all educational levels, thematic exhibitions, information videos and prints, study visits into the countries using CCS (Norway, USA)

Next phases of research

Project title:

Bio-CCS/U: „Research center for low-carbon energy technologies“

Partner:

Czech technical university in Prague (4 institutes - 2 faculties), Brno University of Technology (2 institutes of 1 faculty), VŠB-Technical university of Ostrava (Enet center) a The Institute of Thermomechanics the Academy of Sciences of the Czech Republic

Project duration: 1/2018-12/2022

New project

Research activities in project:

The research will be specifically focused on **oxyfuel combustion** of various sorts of **biomass in a fluidized bed**, which turns out to be one of the most promising technology, and on its complete technological chain, including production of oxygen.

Second major research task is **oxy-gasification of biomass** and the third key task is **utilization of the captured CO_2** to produce liquid fuels.

In the project will be carried out associated research tasks – preparation of biomass for the oxyfuel combustion and gasification processes, separation of condensable gases from final CO_2, process modelling and process characterization with datamining.

Research facilities

Fluidized bed boiler - 500 kW – oxy fuel combustion (CTU)

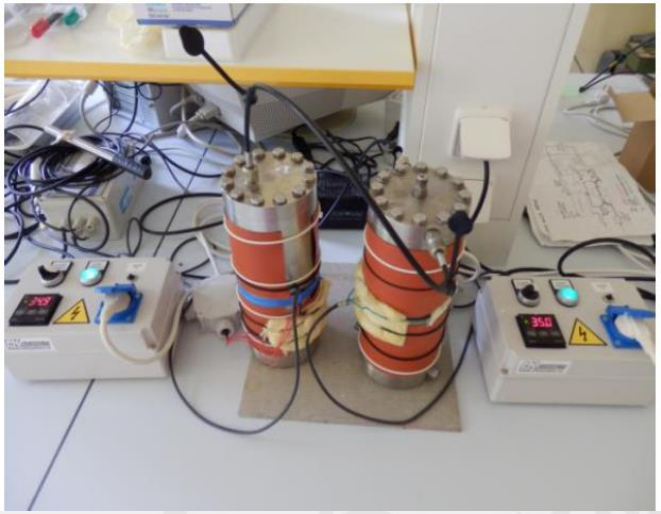


Photo of the apparatus used for long-term static experiments - REPP-CO_2 (UJV, CGS)

Experimental unit for high temperature CO_2 sorption (UCT)

Research facilities

Experimental unit – Ca-looping (UJV)

Experimental unit – sorption – Active carbon

Next future

Research activities in project:

Possible additional funding opportunities:

- next round of Norway Grants – 2014 – 2021
  - KAPPA program
  - Technology Agency of the Czech Republic (program operator)
  - Project period 2019-2024
- European funds (Horizon 2020, SET Plan)
- Innovation Fund

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Thank you for your attention

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