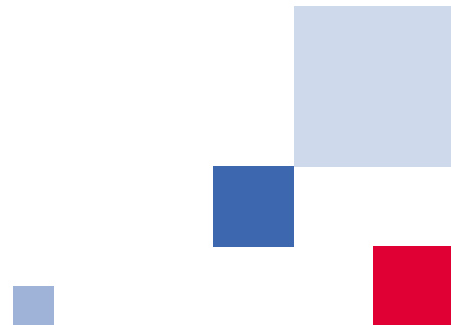


RWE's IGCC CCS Project

Zero-CO₂ Fossil-Fired Power Generation

Karl-Josef Wolf

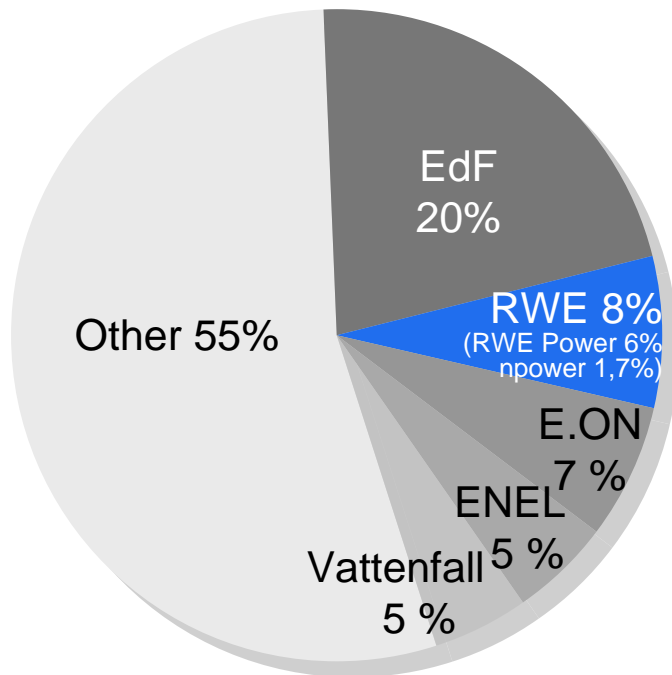
DYNAMIS Workshop, Sep. 5th, Brussels



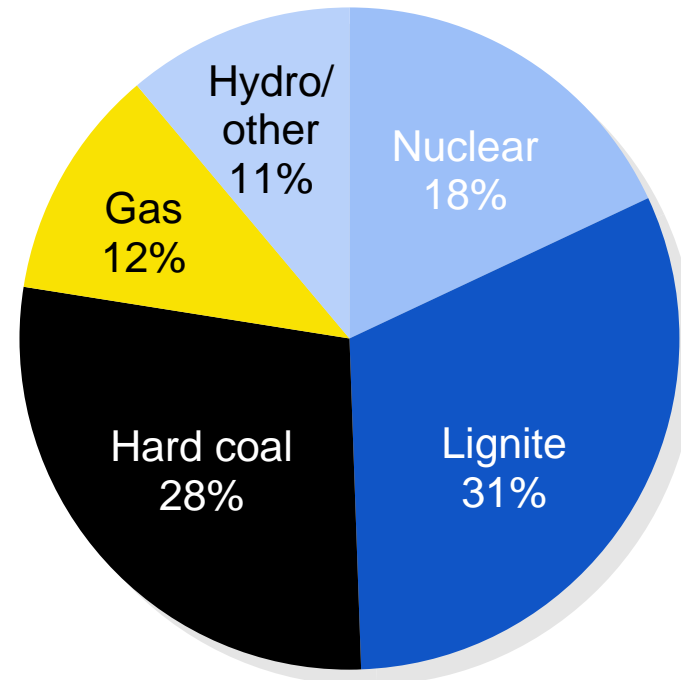
Power Generation of RWE Power



Market shares in European power generation (EU-25)



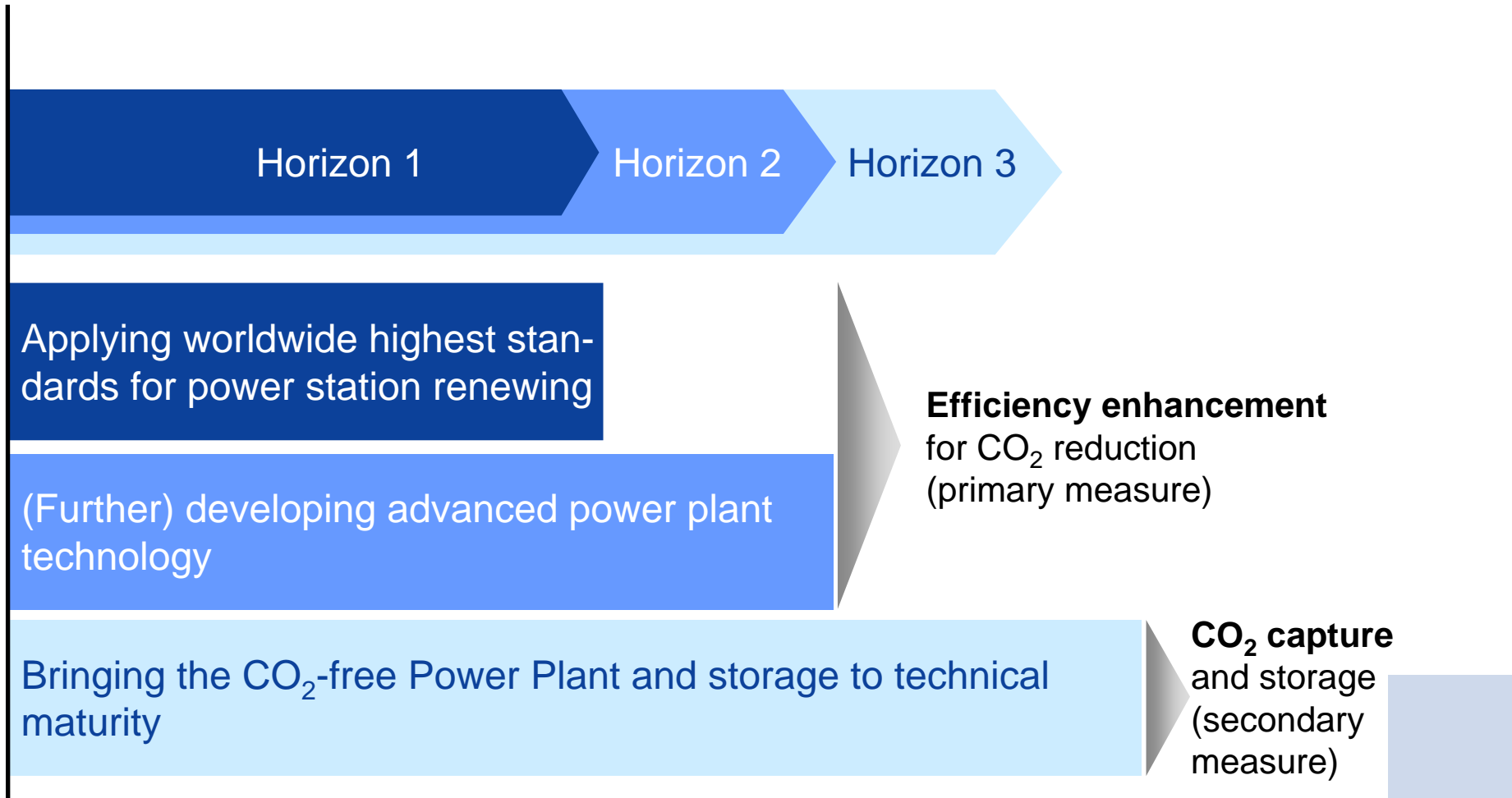
Power generation capacity of RWE Power* (35 GW)



incl. electricity purchased from third parties; *as of 31/12/2004

RWE is No. 2 in Europe with a wide energy mix.

RWE's Clean Coal Power Strategy



Innovation lines of RWE's Clean coal Power Strategy



for today



Efficiency increase via new built power plants recent BoA 2/3, HC Twin Unit

Power Plant Fleet: Permanent Renewal

for tomorrow



WTA-Prototype

700 °C-Test Units

First dried lignite fired PP

700 °C Demo-PP

First CO₂-free IGCC

First Retrofit/ New Building with CO₂-Capture

for the day after tomorrow



New Project:
450 MW ZEIGCC with CO₂-capture

New Project:
Post combustion CO₂-Capture

RWE strengthens its technology leadership and sets trend in zero-CO₂ power plant technology



Decisions dealing with CCS

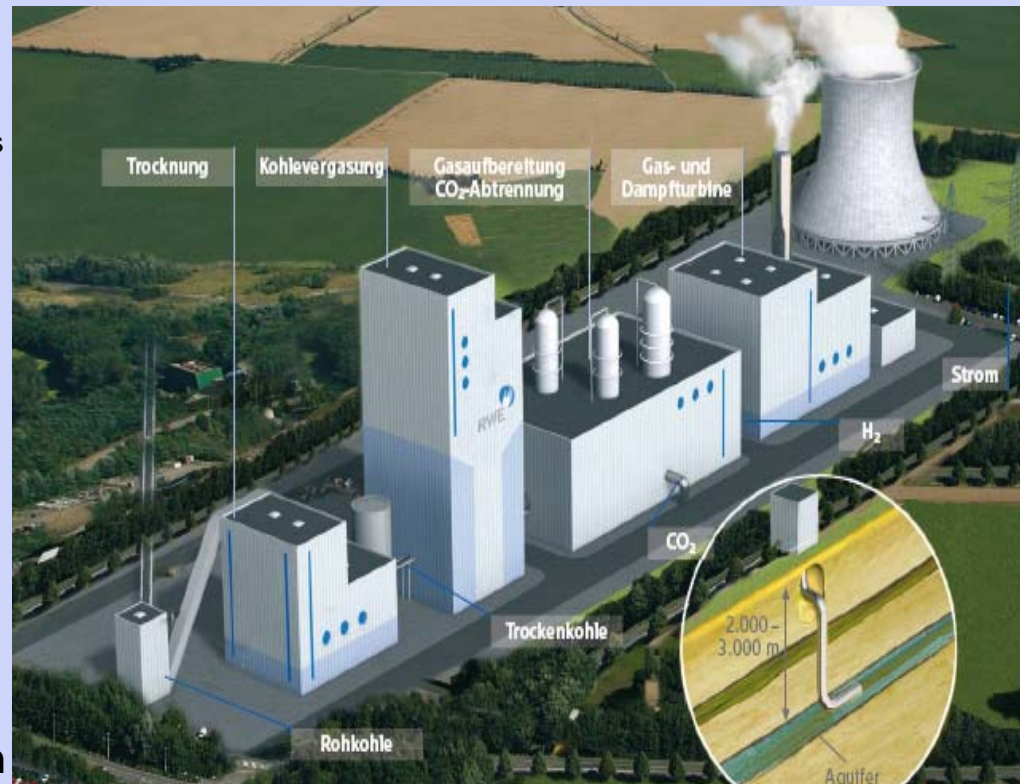
1 RWE Power develops and builds a **zero-CO₂ 450 MW coal-fired power plant** based on IGCC technology incl. CO₂ transport and storage; commissioning is scheduled for 2014.

2 In parallel, RWE will develop the technology of **CO₂ scrubbing** for future advanced coal-fired steam power plants and as a retrofit option for modern installations.

- RWE Power with focus on CO₂ scrubbing for lignite
- RWE npower with feasibility study for a clean coal 1,000 MW hard coal-fired plant in Tilbury and CO₂ scrubbing tests for hard coal.

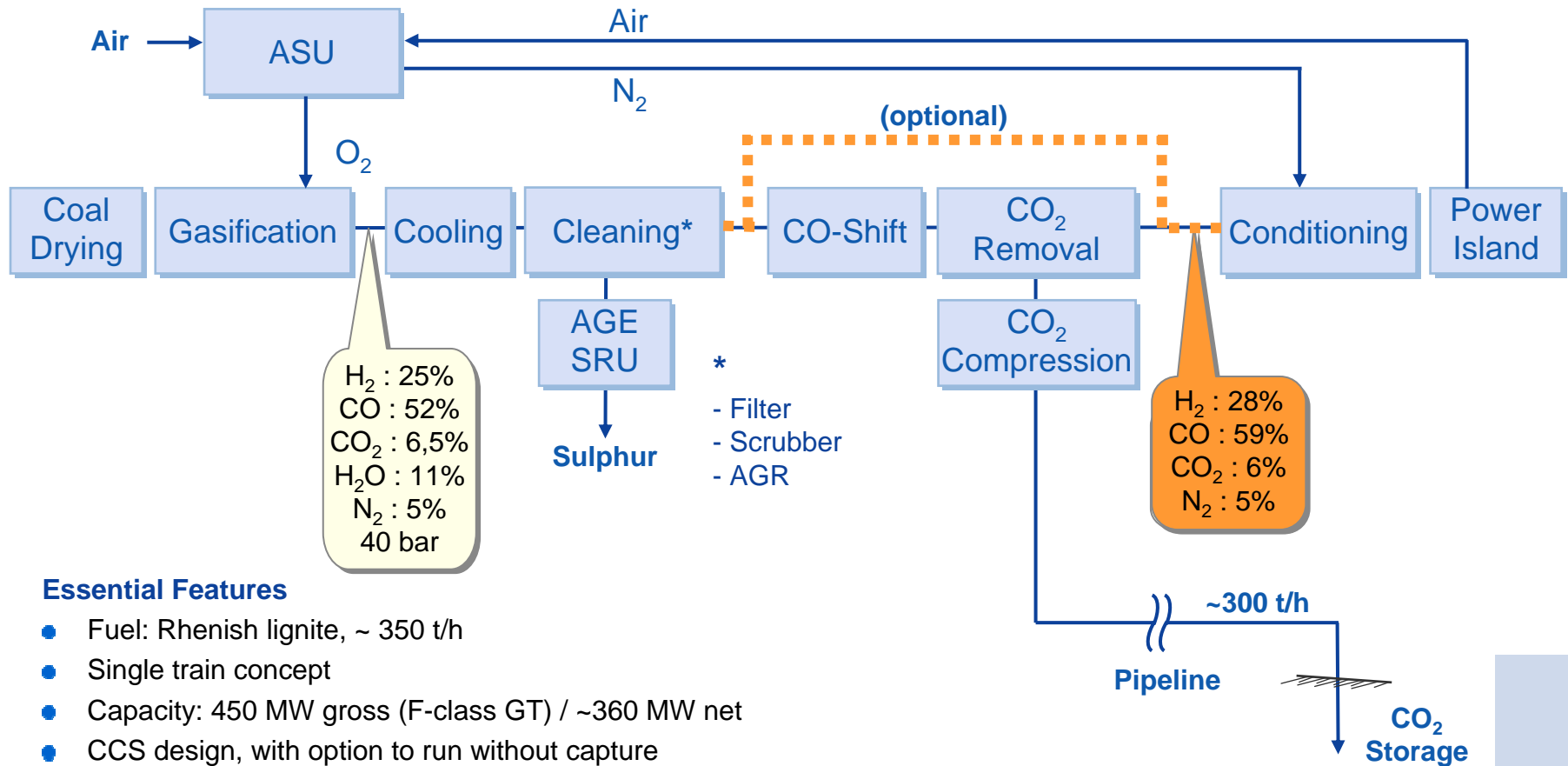
The RWE project of a zero-CO₂ 450 MW coal-fired power plant with CO₂ storage

- Basic technology: IGCC
- El. capacity: 450 MW_{gross}
360 MW_{net}
- Net efficiency: 40 %
- CO₂ storage: 2.3 mill. t/a
- CO₂ storage in depleted gas reservoir or saline aquifer
- Commissioning: 2014
- RWE budget: approx. € 1 billion



RWE's IGCC - CCS Project

Overall concept



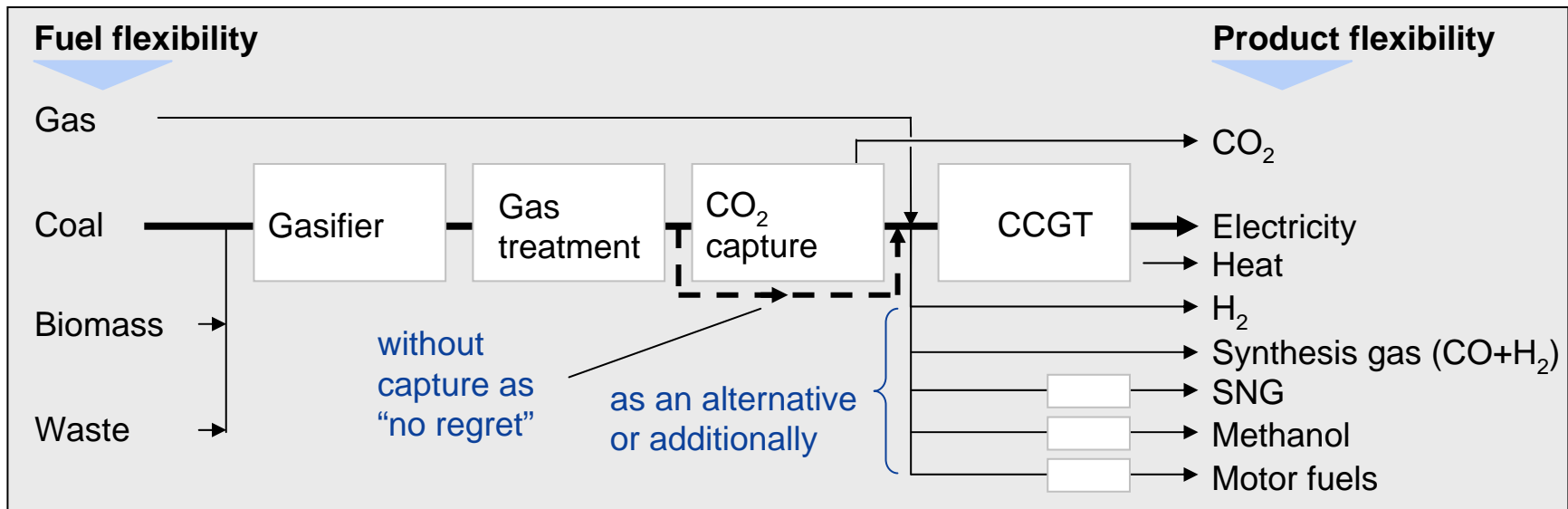
Essential Features

- Fuel: Rhenish lignite, ~ 350 t/h
- Single train concept
- Capacity: 450 MW gross (F-class GT) / ~360 MW net
- CCS design, with option to run without capture
- Gasification: preferably entrained flow technology, HTW as backup option
- Total investment costs including storage : ~ € 1.0 bn

For RWE IGCC is the most attractive Route to the CO₂-free Power Plant

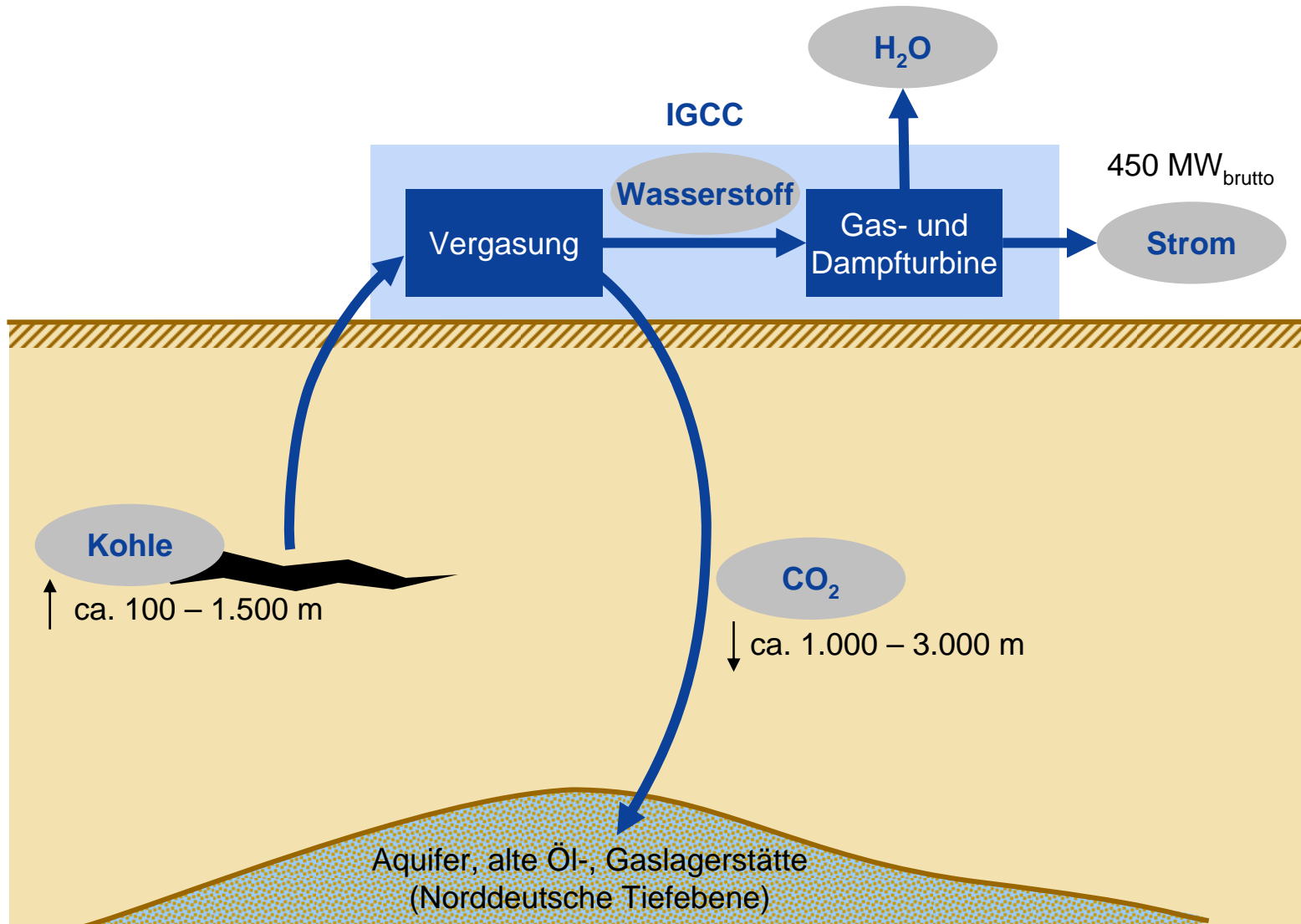


- High Efficiency
- High technical Maturity
- High Product Flexibility



IGCC opens up additional options for portfolio optimization.

CO₂-freies IGCC-Kraftwerk mit CO₂-Speicherung



Development of CO₂ storage site

Tasks and current status of work

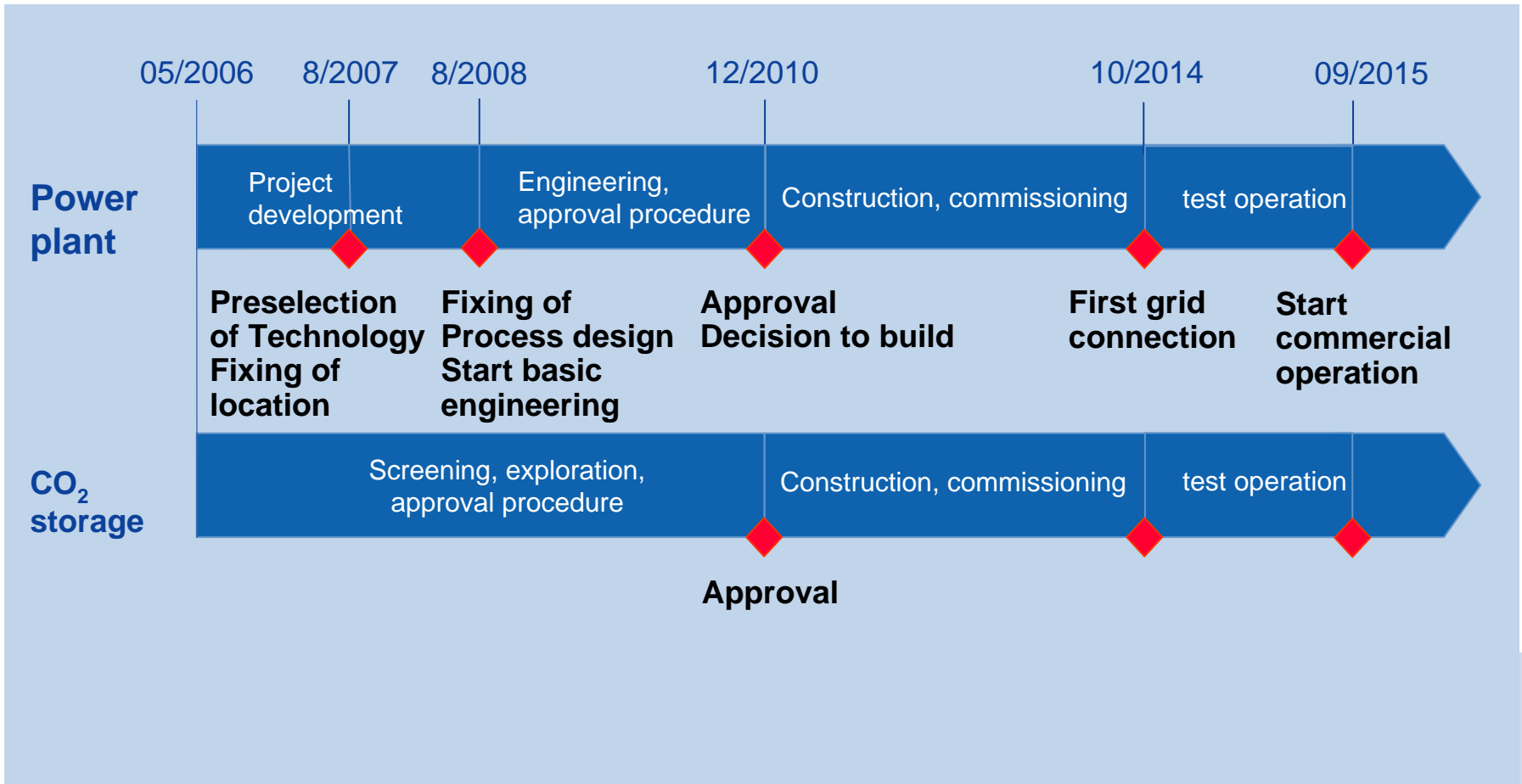
- Phase 1: Selection of storage site (2006-2008)
 - Setting up the storage site portfolio
 - Analysing basic methods for evaluating storage potentials
 - Detailed feasibility study for 2-3 selected sites
- Phase 2: Evaluation of storage sites (2008-2010)
 - 3D seismics of potential storage sites
 - Exploration drilling, formation tests
 - Selection of a storage site, application + approval
- Phase 3: Construction of storage facility (2011-2014)
 - Production drilling
 - Trial operation, if appropriate
 - Surface facilities, pipeline

Research and implementation of CO₂ storage is the critical element of CCS success

- Storage site development is new ground in many aspects. Potential storage sites are depleted gas reservoirs and deep saline aquifers in Germany.
- Technical challenges
 - There are no recognized methods for the identification and suitability evaluation of storage sites and, in particular, their long-term tightness.
 - High uncertainty as regards costs and time needs due to geological imponderabilities.
 - Injection of 2 mill. t CO₂/a would currently be the largest volume world-wide.
- At present, there are no legal bases for CO₂ storage
 - Applicable rule of law is unclear and regulatory framework below the law level is lacking.
 - Fundamental rules are open, e.g. right of access to storage site, liability issue....,
 - Consideration of CCS in the CO₂ regulatory framework required after 2012.
- ⇒
 - Development of storage standards throughout the project by review with power generators, oil and gas industry, politicians and authorities.
 - In-depth work in bodies on national and EU levels.
- Public acceptance must be reached.
 - ⇒
 - Develop a communications and acceptance strategy.
 - Seek division of work between politicians, authorities, companies and NGOs.

RWE's IGCC - CCS Project

Time Schedule



RWE's IGCC - CCS Project



Climate Change is a global problem

- Full scale commercial projects must be brought on track to promote a rapid deployment of Zero Emission technologies.
- RWE has decided to take the leadership and realize a CO₂-free IGCC Power Plant in a commercial scale being commissioned in 2014.
- With focus on the IGCC project RWE Power appreciates any kind of support by R&Ds and integration of national and international projects for those tasks that are not on the critical path.
- As a prerequisite for the deployment of the technology, the missing legal basis for CO₂ Transport and Storage, must be established on national and EU level soon.