

# Siemens Post-Combustion CO<sub>2</sub> Capture Technology

for combined cycle and steam power plant applications

Answers for energy.

**SIEMENS**



## Siemens technology for post-combustion CO<sub>2</sub> capture

### Development of post-combustion CO<sub>2</sub> capture process

To achieve the global CO<sub>2</sub> emission reduction targets, several measures need to be taken simultaneously:

- Increase efficiency of fossil power plants
- Develop CCS<sup>1)</sup> technology with low energy demand
- Offer capture-ready and retrofit solutions for power plants

Siemens develops a proprietary post-combustion capture process that is designed for both new steam power plants and retrofit of existing power plants with a CO<sub>2</sub> capture plant. The Siemens CO<sub>2</sub> capture process features several significant advantages compared to the common MEA<sup>2)</sup> process and will be optimally integrated in the power plant.

<sup>1)</sup> Carbon Capture and Storage

<sup>2)</sup> Monoethanolamine

For retrofit solutions, Siemens develops capture-ready design for power plants that enables or facilitates later integration of a CO<sub>2</sub> capture plant.

Siemens Reference Steam Power Plants are offered in capture-ready design with different options to consider project-specific requirements.

The whole chain from process and model development to engineering and construction is mastered through the synergies with Siemens chemical engineering know-how at Hoechst Industrial Park. Moreover, Siemens Energy runs a fully-automated lab plant for CO<sub>2</sub> capture there.



# In-house competencies for steam power plants with CO<sub>2</sub> capture

Siemens can provide technology along the whole process chain from power generation to flue gas cleaning and CO<sub>2</sub> scrubbing as well as CO<sub>2</sub> compression for pipeline transport.

Therefore, Siemens is an ideal partner for the implementation of power plant solutions with CCS.

Examples of Siemens in-house technology applicable for steam power plants with CO<sub>2</sub> capture:

## Reference Power Plants



### SSP5-6000

#### Data (without CSS):

Gross plant output	600 MW
Efficiency	46% *
Steam turbine	SST5-6000
Generator	SGen5-3000W

### BENSON® once-through boiler (tower type):

- HP 285 bar/600 °C
- IP 60 bar/620 °C
- LP 5.5 bar/269 °C

\* depending on ambient conditions

## Environmental Systems & Services



### Air pollution control systems:

- Flue gas desulfurization
- Electrostatic precipitators
- Fabric filters

### Advanced burner technologies:

- NO<sub>x</sub> and ancillary products

### Parts and Service:

- Replacement parts
- Inspections
- Upgrade service
- Boiler service

## Chemical processes and CO<sub>2</sub> capture technologies



### Field of work:

Simulation, evaluation, development and optimization of chemical processes for power plants – focus on CO<sub>2</sub> capture.

### Software and tools:

- Comprehensive chemical databases
- Established forefront process simulation and design tools

### Laboratory:

- Small pilot plant for CO<sub>2</sub> capture
- Equipment for measurement of physical properties of substances

### Pilot plant:

- Pilot plant at E.ON's coal-fired power plant Staudinger, operated by Siemens since 2009

## CO<sub>2</sub> compression solutions



### CO<sub>2</sub> compressor details

Volume flow:	52,500 m <sup>3</sup> /h
Suction pressure:	1.05 bar
Discharge pressure:	61.55 bar
Suction temperature:	20.8 °C
Compressor type:	STC-GV

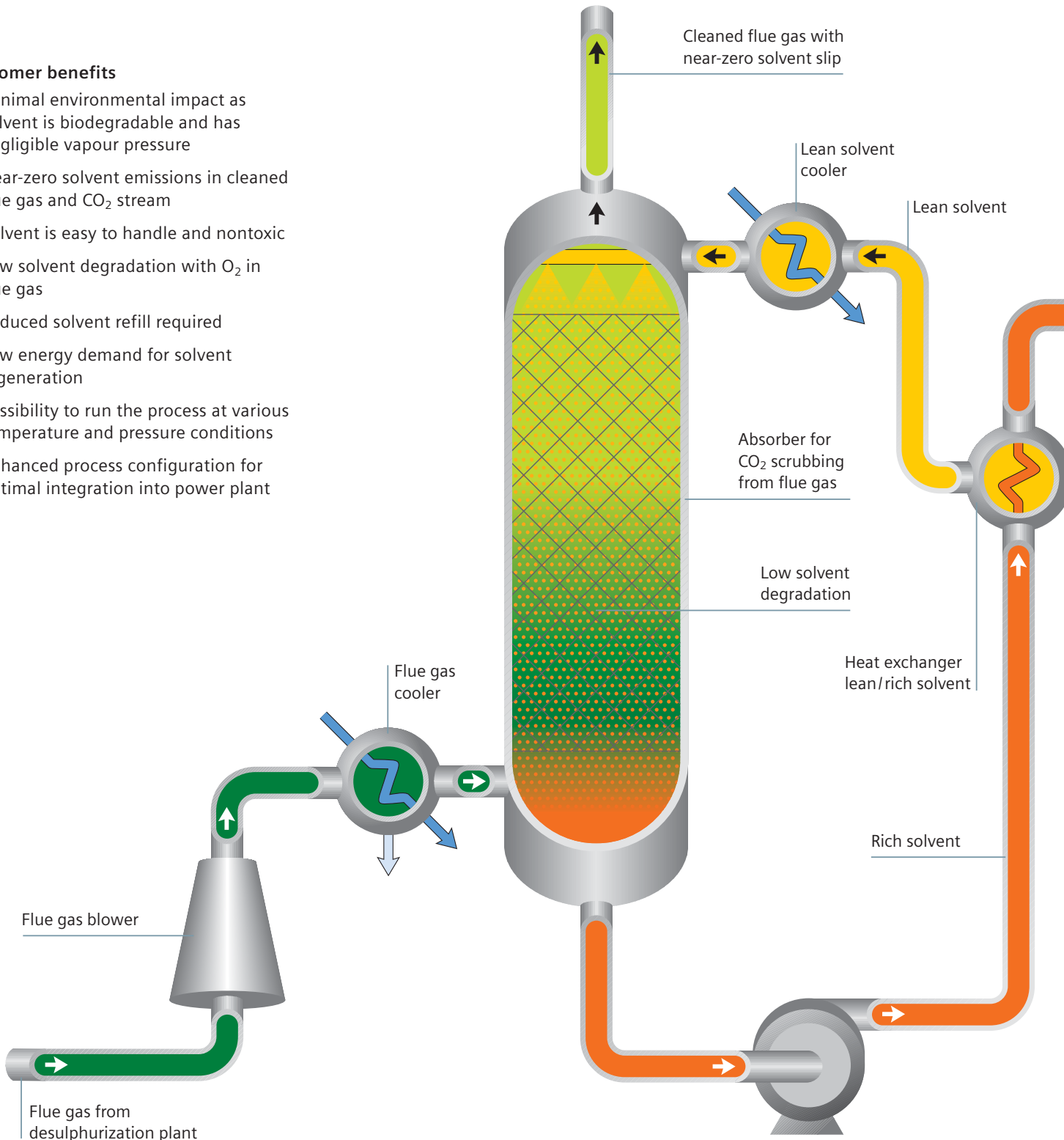
Driver:	Electric motor (12 MW)
Start of operation:	April 2008
Compressor type:	Radial
Reference projects:	Ningxia, China Snohvit/Hammerfest, Norway

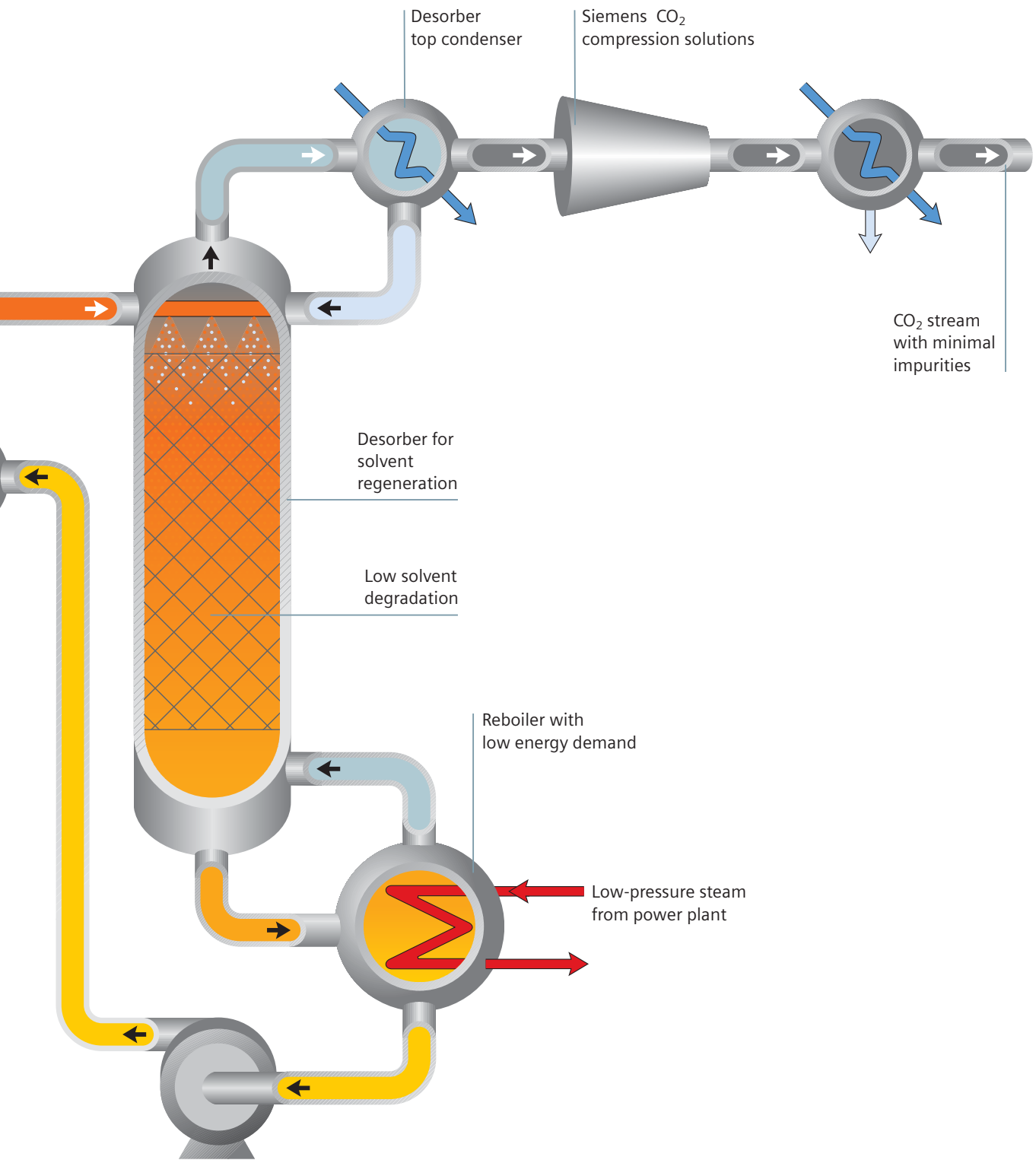
# Major advantages of the Siemens post-combustion CO<sub>2</sub> capture process

Low environmental impact and reduced auxiliary energy need through use of aminoacid salt solution and optimized process set-up

## Customer benefits

- Minimal environmental impact as solvent is biodegradable and has negligible vapour pressure
- Near-zero solvent emissions in cleaned flue gas and CO<sub>2</sub> stream
- Solvent is easy to handle and nontoxic
- Low solvent degradation with O<sub>2</sub> in flue gas
- Reduced solvent refill required
- Low energy demand for solvent regeneration
- Possibility to run the process at various temperature and pressure conditions
- Enhanced process configuration for optimal integration into power plant





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