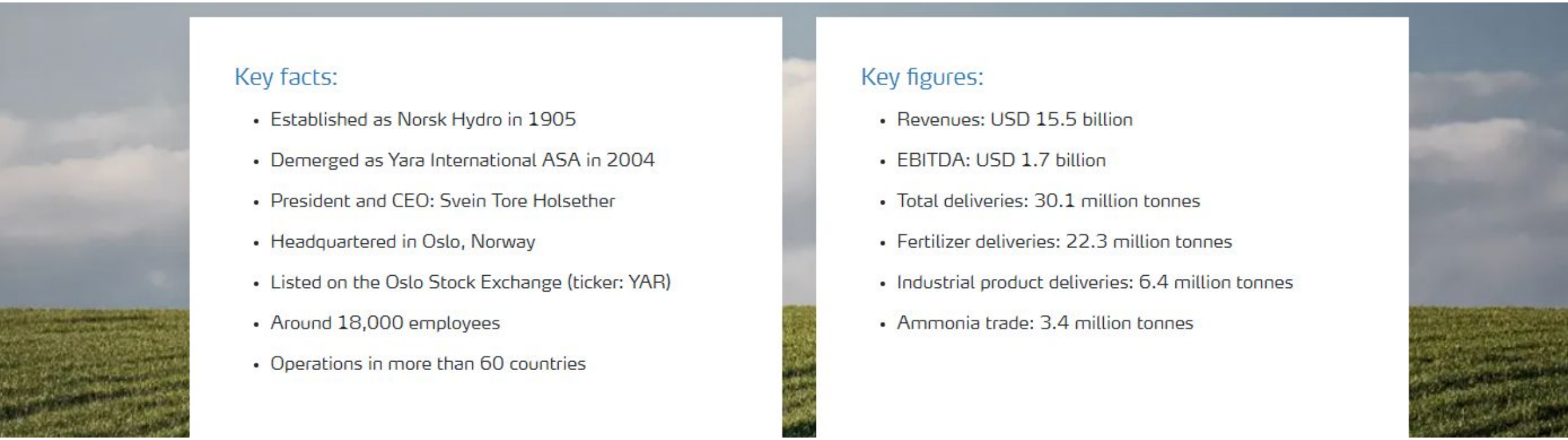
SCR for Gas Turbine Applications



Yara International ASA
Norwegian chemical company



Key facts:

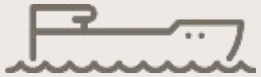
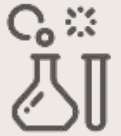
- Established as Norsk Hydro in 1905
- Demerged as Yara International ASA in 2004
- President and CEO: Svein Tore Holsether
- Headquartered in Oslo, Norway
- Listed on the Oslo Stock Exchange (ticker: YAR)
- Around 18,000 employees
- Operations in more than 60 countries

Key figures:

- Revenues: USD 15.5 billion
- EBITDA: USD 1.7 billion
- Total deliveries: 30.1 million tonnes
- Fertilizer deliveries: 22.3 million tonnes
- Industrial product deliveries: 6.4 million tonnes
- Ammonia trade: 3.4 million tonnes

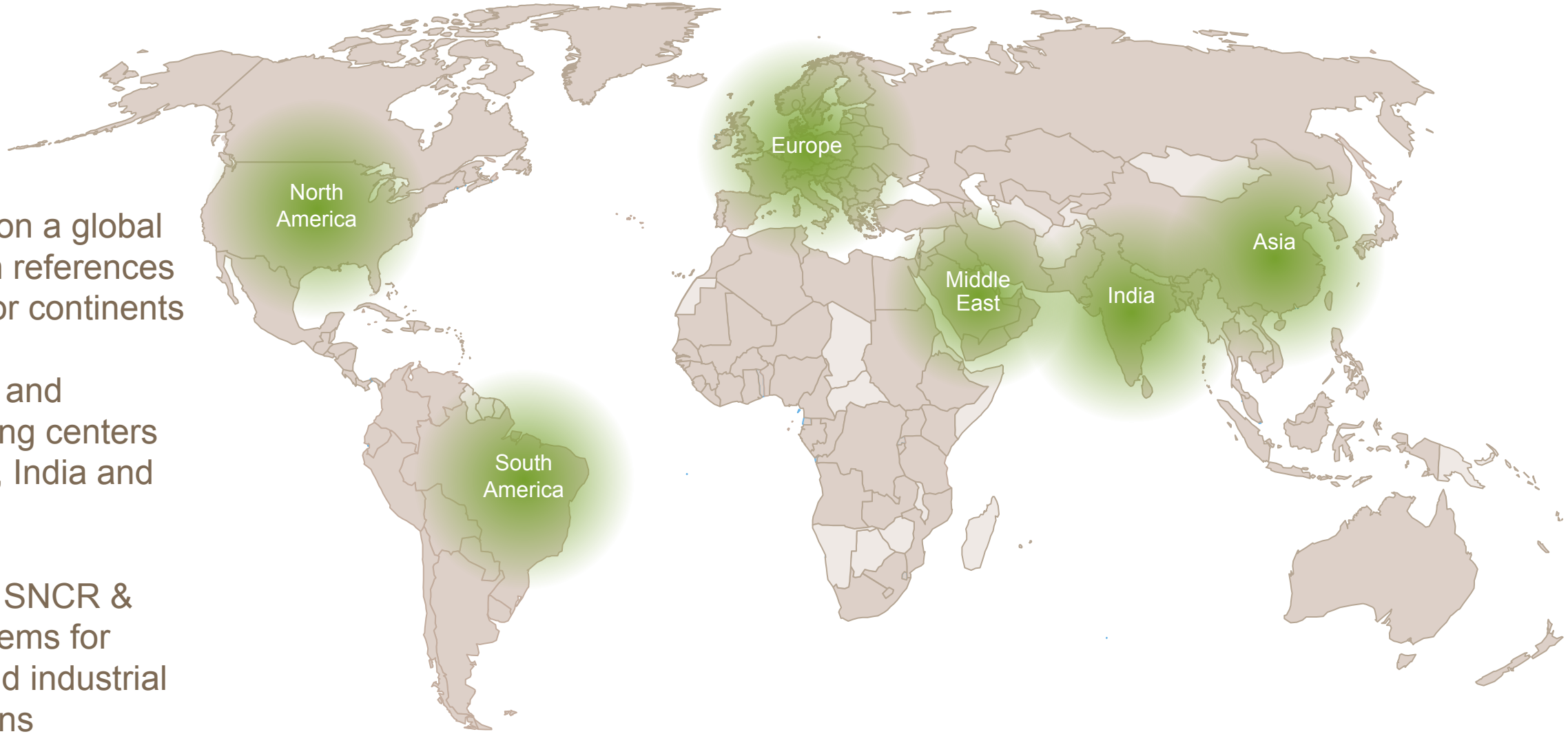
Industrial Business Units based on product offering, operating globally with local presence

Industrial

Mining Applications	Environmental Solutions			Base Chemicals	Industrial Nitrates	Yara Animal Nutrition
						
Technical Ammonium Nitrates		Marine Technology	Automotive & Industrial Reagents	Process Chemicals	Industrial Nitrates Applications	Phosphates Feed Urea Acidifiers

30 years of experience in Environmental solutions

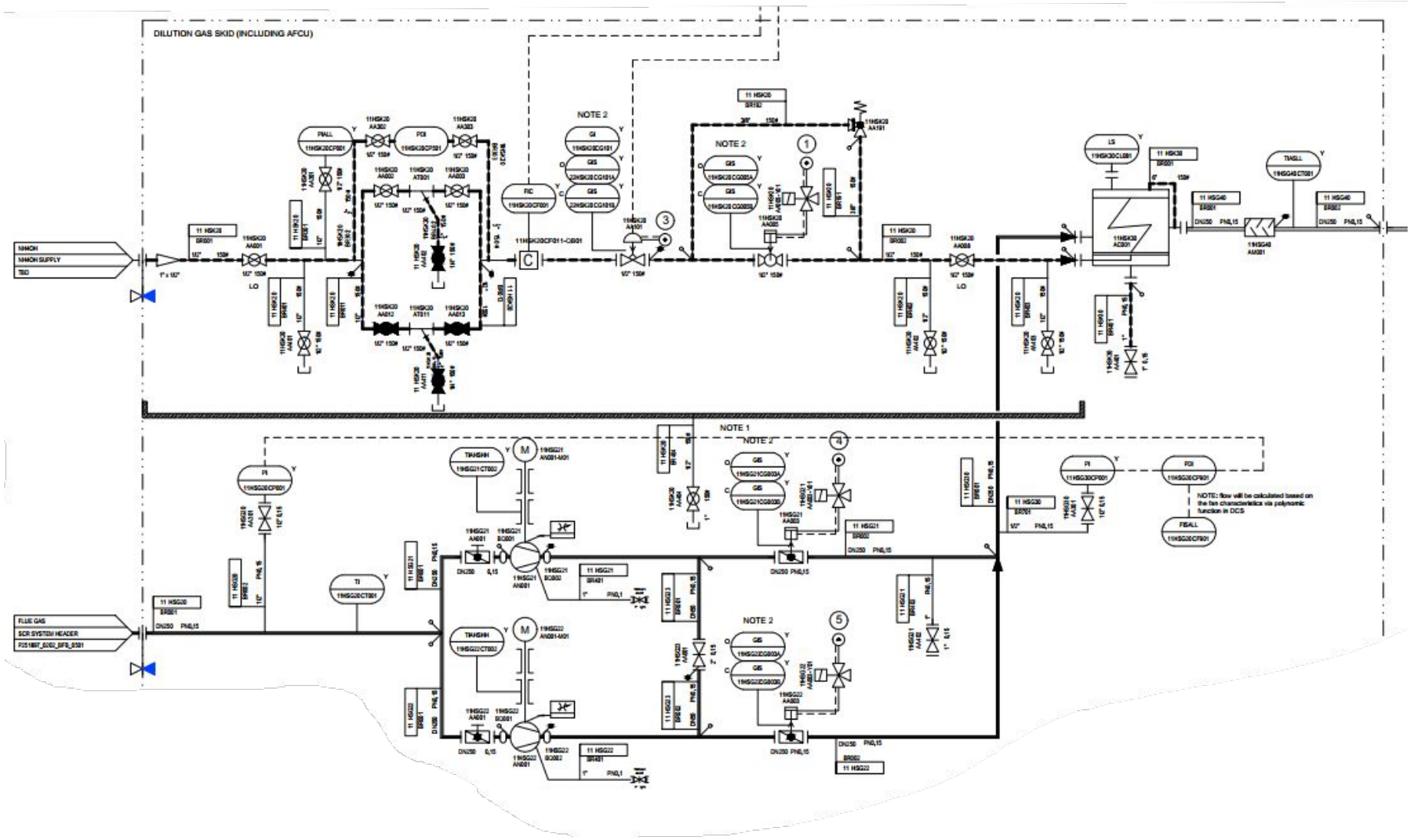
- We work on a global scale with references in all major continents
- Technical and Engineering centers in Austria, India and Taiwan.
- Over 600 SNCR & SCR systems for boilers and industrial applications



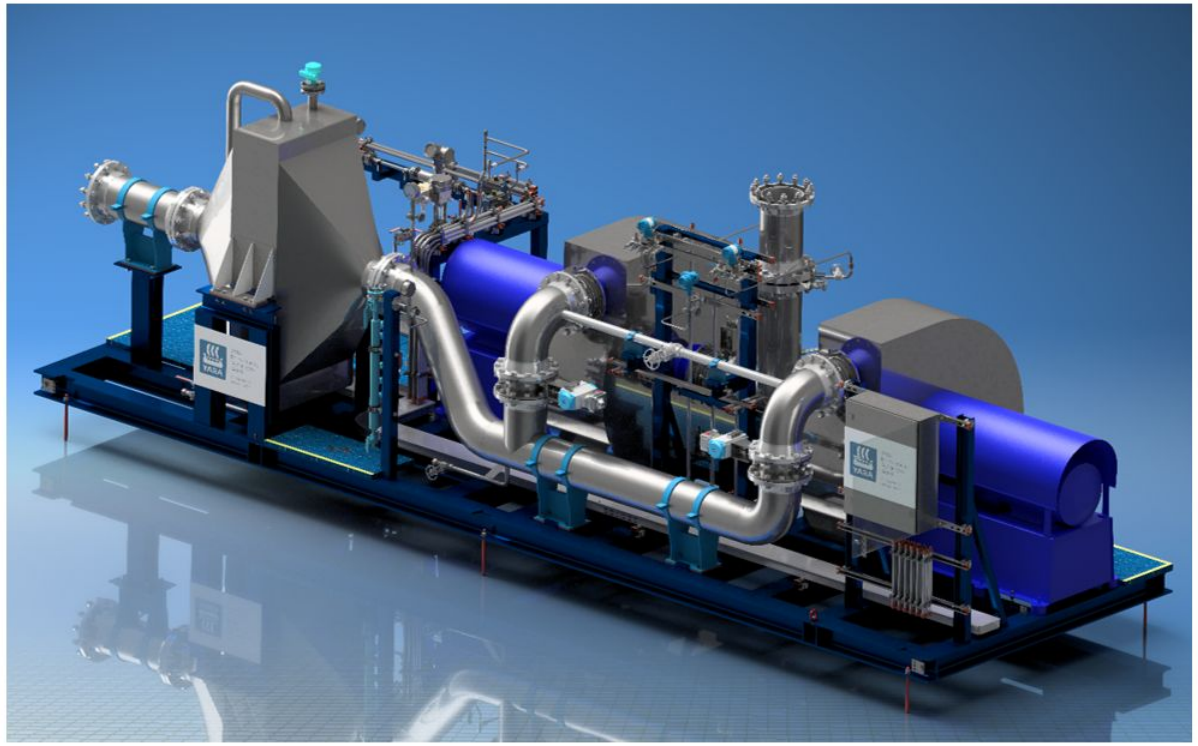
SCR for Gas Turbine Applications

System configuration and Key components

SCR Skid incl. AFCU

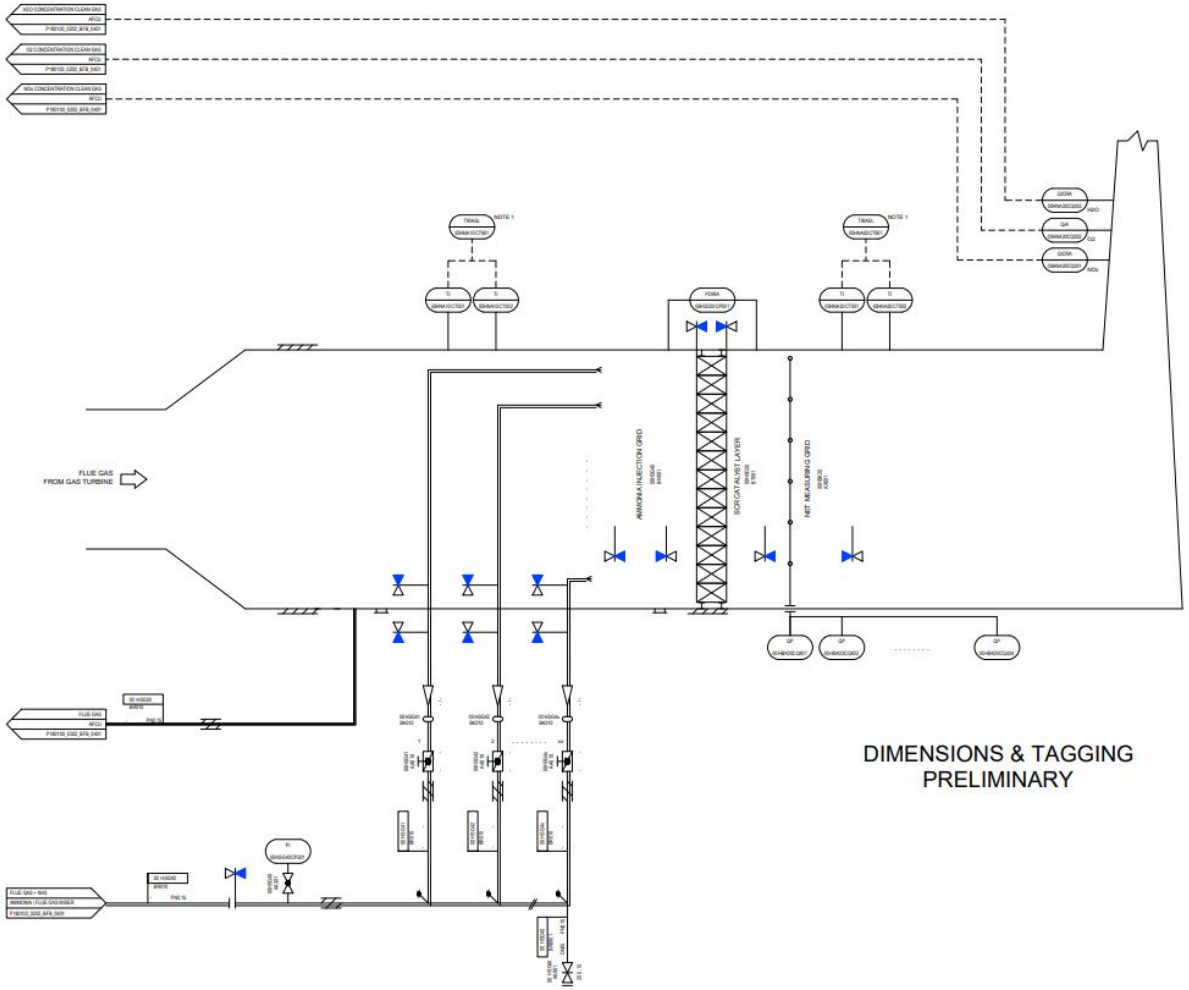


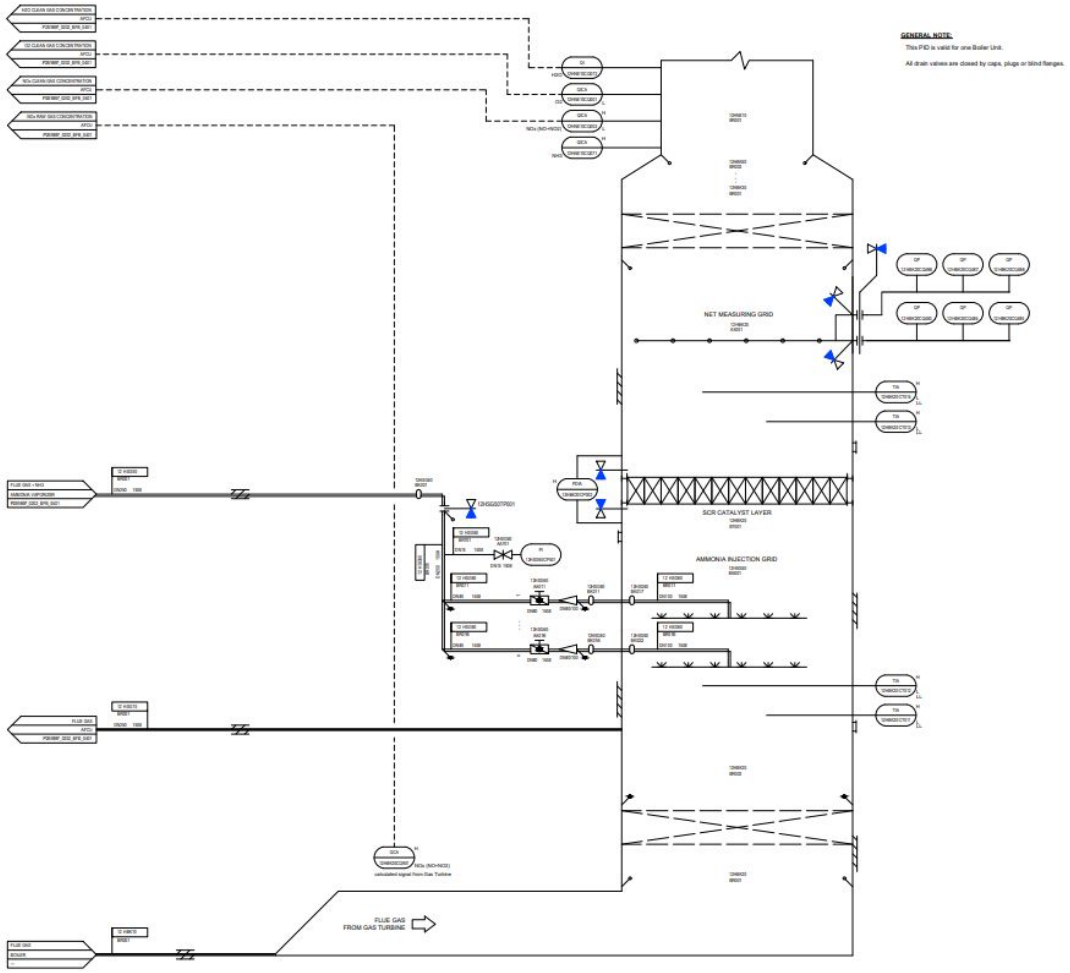
Key components - SCR SKID



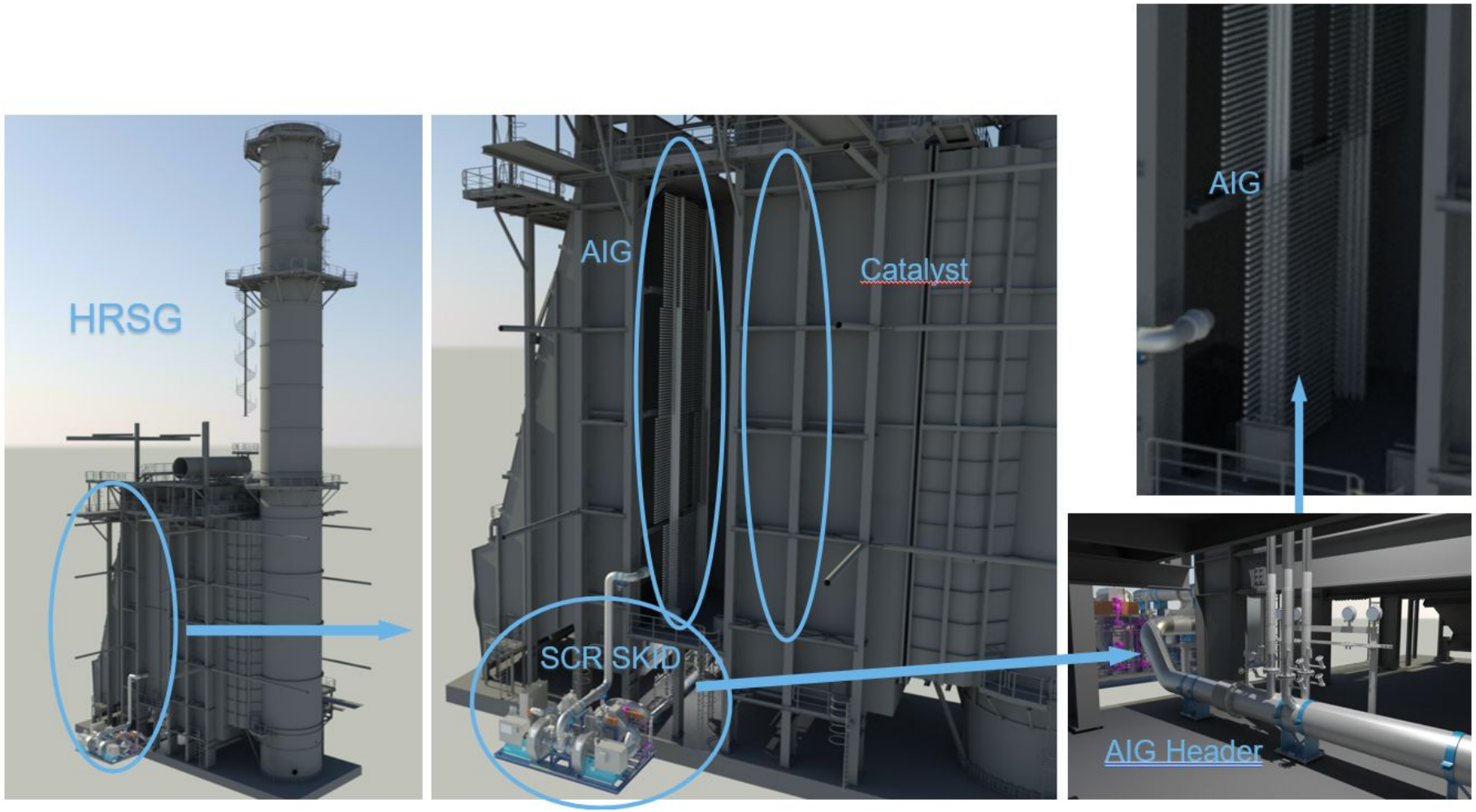
- SCR Skid prefabricated, cabled, insulated and tested in the workshop.
- Standardized equipment in 3 different sizes, based on NH4OH consumption.
- Proven Design, applied in several projects during the last years.
- 2 different types of Vaporizer available
- Entire Skid fits into a 40’ HC Sea Container
- Delivery time of customized solutions 9-12 months.

HRSG – AIG, Catalyst and Support Structure, Net Measuring Grid





Key components - Gas Turbine Applications



Auxillary Systems

- NH4OH Storage (incl. unloading and forwarding skid)
- UREA Storage and handling
- DCS control for our SCR System is standard but PLC system can be offered as well.



SCR HRSG
Greenfield applications - references

Recent SCR HRSG Projects / Greenfield

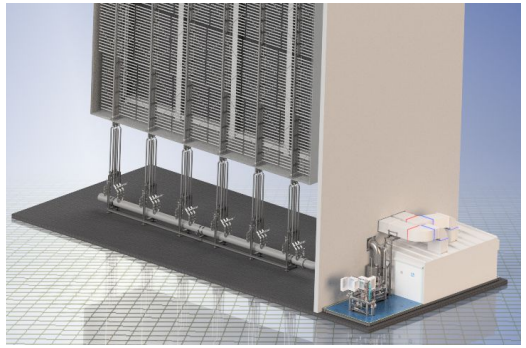
Commissioned:

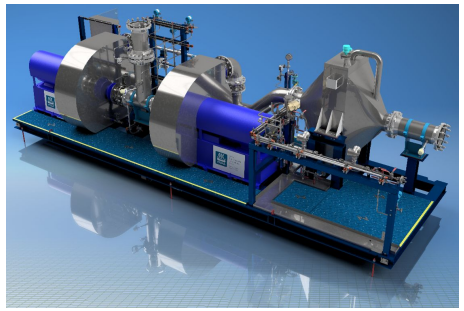
- **17005 SCR Marzahn (**Germany)
- **19001 SCR Keadby** (UK)
- **19003 SCR Wolfsburg** (Germany)
- **19006 SCR Herne** (Germany)
- **21007 SCR Chi Mei** (Taiwan)
- **22001 SCR Komotini** (Greece)
- **22018 SCR Les Awirs** (Belgium)

In execution:

- **20011 SCR Munich South** (Germany)
- **22021 SCR Ostiglia** (Italy)
- **22019 SCR Grudziadz** (Poland)
- **23018 SCR Mainova** (Germany)
- **24006 SCR Adamow** (Poland)
- **25004 SCR Qurayyah** (Saudi Arabia)
- **25012 SCR Kuo Kuang II** (Taiwan)
- **25014 SCR Melnik** (Czech Republic)
- **20015 SCR Grudziadz II** (Poland)
- **20016 SCR Gdansk** (Poland)

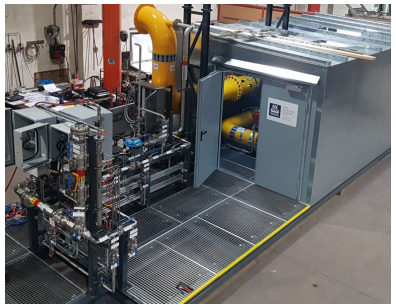












SCR DeNOX for gas turbine SGT-9000HL with HRSG in Greece (Komotini)

PROJECT DESCRIPTION:
• YARA delivered the engineering and the equipment for the SCR DeNOx flue gas cleaning
• including AFCU, AIG and catalyst
• for the gas turbine SGT 9000HL with HRSG

MAIN QUANTITIES:
• Power [MW]: 877
• Inlet NOx [mg/Nm³]: 66
• Outlet NOx [mg/Nm³]: 30
• NH3 Slip [mg/Nm³]: 3

Customer: Thermoilektriki Komotinis &
Siemens Energy - TERNA (EPC)
Construction Period: completed beginning of 2025



SCR DeNOX for gas turbine SGT 9000HL with HRSG in the UK (Keadby)

PROJECT DESCRIPTION:
• YARA delivered the engineering and the equipment for the SCR DeNOx flue gas cleaning
• including AFCU, AIG and catalyst
• for the gas turbine SGT 9000HL with HRSG

MAIN QUANTITIES:
• Power [MW]: 840
• Inlet NOx [ppmvd]: 45
• Outlet NOx [ppmvd]: 22
• NH3 Slip [ppmvd]: 5

Customer: SSE Scottland
Siemens (EPC)
Construction Period: completed 2022



SCR DeNOX for gas turbine SGT 5-2000E in Germany (Berlin Marzan)

PROJECT DESCRIPTION:
• YARA delivered the engineering and the equipment for the SCR DeNOx flue gas
• Including AFCU, AIG and catalyst
• For the gas turbine SGT 5-2000E with HRSG

MAIN QUANTITIES:
• Power [MW]: 275
• Inlet NOx [ppmvd]: 65
• Outlet NOx [ppmvd]: 17
• NH3 Slip [ppmvd]: 2

Customer: Vattenfall
Siemens (EPC)
Construction Period: completed 2020



SCR – HRSG
Brownfield application (retrofit)

SCR Brownfield in Italy (retrofit)

Timeline + Frame conditions

- 2 existing HRSG (~20 years) to be equipped with SCR System. HRSG was initially not designed for SCR retrofit.
- YARA was part of a consortium, whereas YARA was responsible for the technology part, engineering and supply of SCR key equipment and commissioning.
- Project start YARA: 01.03.2023
- Delivery of YARA Equipment to site: 03/2024
- Installation and Commissioning (2 Units in parallel): 04+05/2024
- Performance Test: beginning 06/2024
- **PAC for both SCR Systems: 28.06.2024**

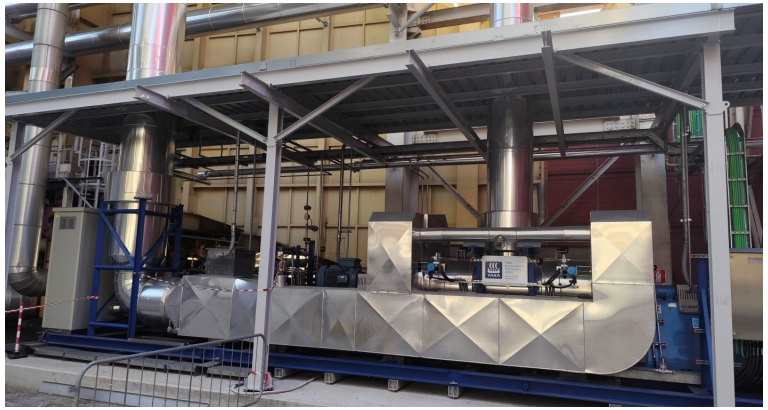
Highlights

- **Project completed in time**
- **High customer satisfaction,** reference letter obtained.
- Works were done under **high safety standards**. **No accidents** during project execution.
- **CO** concentration 1.500mg/Nm³ □ **< 30mg/Nm³**
- **NOx** concentration 40mg/Nm³ □ **< 10mg/Nm³**
- **NH3 slip < 1,7mg/Nm³**



SCR Brownfield- Pictures from installation and commissioning phase












YARA