



Electric steam boiler on Chemelot

Opportunities and challenges

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Introduction



Industrial site



60 plants



8000 employees



150 organisations



> 100 nationalities



Centre of Europe



50 km roads



2400 street lights



60 km rails



800 ha surface



800 km overhead lines



150 km sewer pipes



2 in land harbours



rail terminal



1 site permit



7 airports within an hour of car travel time

Brightlands Chemelot Campus



- Chemelot's utility supplier
- Electricity, natural gas, steam, nitrogen, pressurized air, flocculated water, demineralized water, cooling water, caustic soda.
- Owner and operator of the utility grids on Chemelot
- Owned by the four largest companies on Chemelot
- Staff \approx 220 FTE



- Demand = 260 MWe
- Private grid (CDS)
- 600 km cables



- Demand = 12.000 m³/h
- Private grid (CDS)
- 60 km pipes

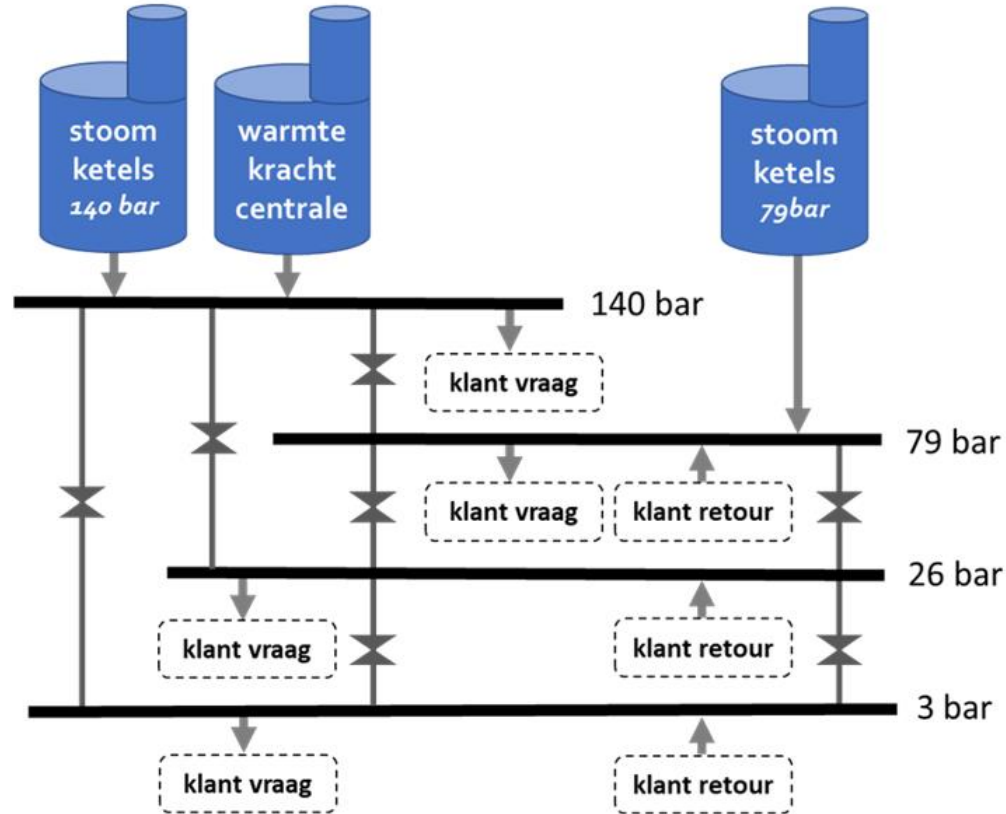


- Demand = 1.900 t/h
- USG supply \approx 800 t/h
- 80 km pipes



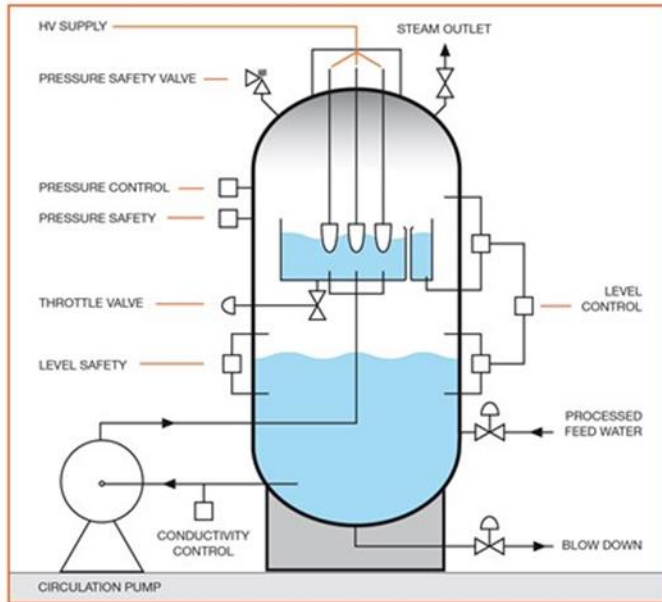
- Demand \approx 5.000 m³/h
- Demiwater \approx 1.700 m³/h
- 120 km pipes

Steam infrastructure on Chemelot



Impression

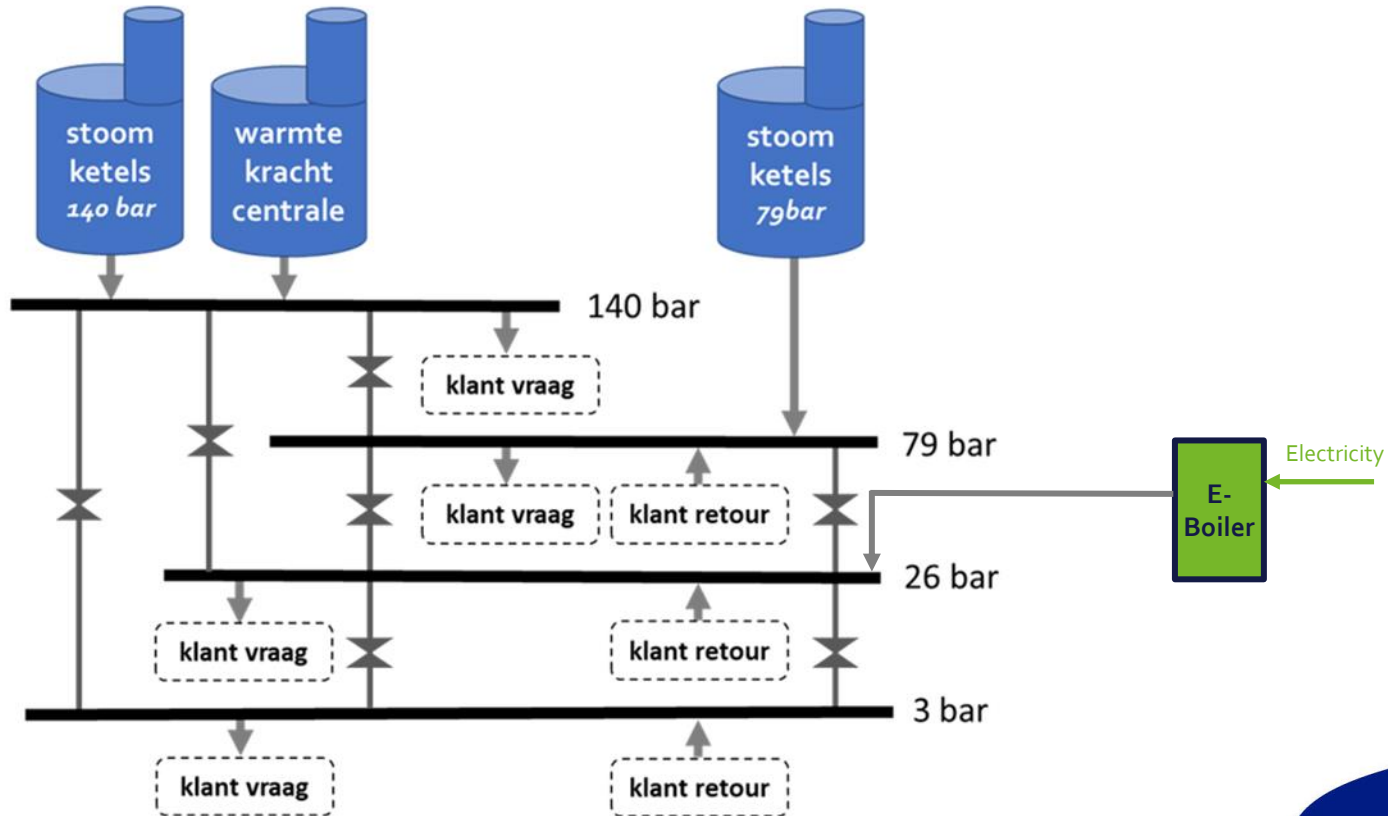
Electric steam boiler - general



Principle diagram of Electrode Boiler Steam generation system.

- Proven and simple technology
- From hot-standby to full capacity < 2 minutes
- From min load to full capacity < 30 seconds
- Pressures up to 85 barg commercially available
- Low maintenance, no wearing of electrodes

Steam infrastructure on Chemelot – with E-boiler



Electric steam boiler – USG case

Drivers

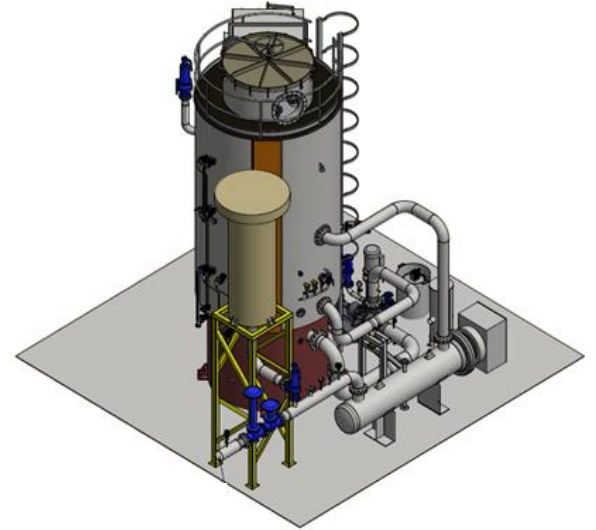
- Reduce natural gas and **scope 1 carbon emission**
- Low electricity prices
- SDE++ subsidy for 2.000 hours/year and 15 years
- Value of flexibility (electricity and steam) and peak steam capacity
- Demonstration project for operations (**hybrid steam generation**)

Installation

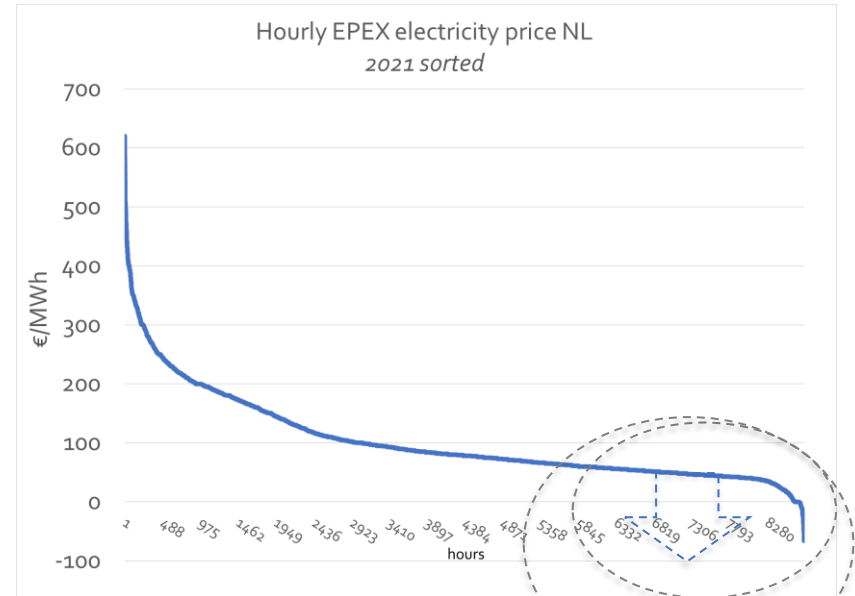
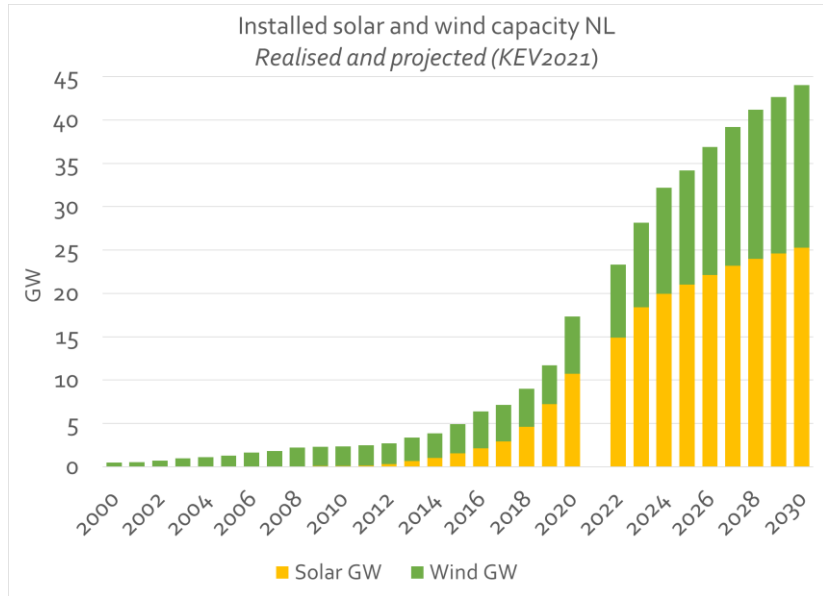
- 20 MWe electric steam boiler + 1,4 MWe electric superheater
- Maximum capacity: 30 t/h 26 bar superheated steam (275 °C)
- Connected to 10 kV

Status and planning

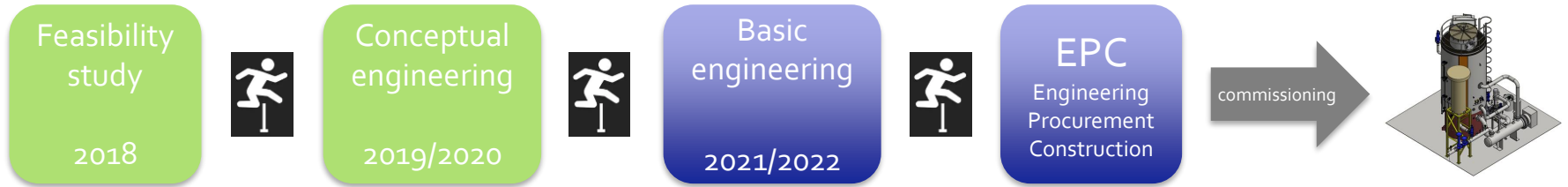
- The investment decision has been made, E-boiler has been purchased, commissioning planned in **Q4-2023**



Electric steam boiler – Future electricity prices



Challenges during feasibility and conceptual engineering



- No subsidy available for E-boilers while value and business case of E-boiler was uncertain.
- USG participated in a successful lobby to extend the SDE++ subsidy for E-boilers. SDE++ lobby was successful, but application requirements don't fit normal processes
 - Issued permits for installation and a financing plan with commitment from financiers are required
 - These permits and commitments are requested in **absence of final investment decision**
- SDE++ was also extended for Carbon Capture & Storage (CCS) significantly reducing the chances of E-boilers.
- SDE++ was boundary condition to start basic engineering. After a long waiting period SDE++ subsidy was finally granted in **June 2021**.

Recent challenges



- Availability and prices of materials (e.g. cables, trafo's)
- Congestion in electricity transport capacity (grid-lock in Limburg & N-Brabant)
- Development of electricity grid tariff
- Escalating energy prices

Take aways electric steam boiler

- Simple and proven technology
- Perfect fit with USG activities
- Double-edged sword
 - ✓ Contribution to power grid stability
 - ✓ Reduction of scope 1 emissions
- First step towards large scale electrification, demand side response and hybridisation.

