H_2 Readiness
Practical experiences

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H_2 Readiness

Experiences in Vattenfall

- **Retrofit of 3 x 440 MW CCGT**

  Detailed feasibility study (2017-2019, NL)

- **Participation in FlameSheet Burner**

  Development program led by Thomassen Energy (2019-2023)

- **Development new H_2 –Ready GT-CHP**

  Part of investment program for coal phase out (2020-2024, GER)

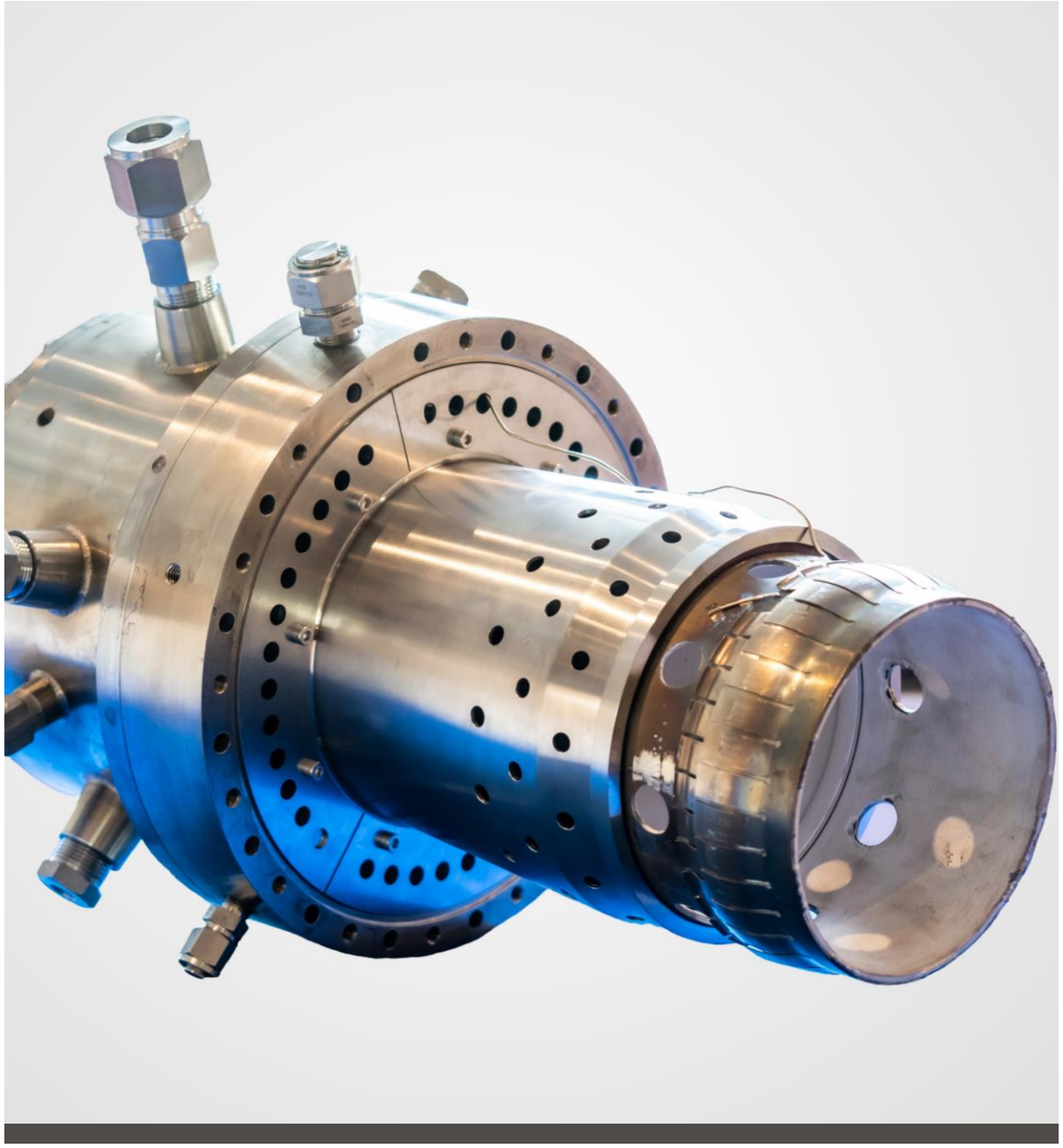
- **Retrofits of CCGT-CHPs in NL (Diemen)**

  Initial feasibility studies (2023-2024, NL – Diemen; 440/260 & 250/180 MW_e/MW_{th})

H_2 Readiness

Core Technology

- **Two step approach:**
  - Co-firing H_2 with NG in existing burners up to XX vol% with limited modification
  - XX..100 vol% with complete burner exchange
- **Technology providers:**
  - GT OEMs
  - Third parties
- **Key characteristics:**
  - Fuel flexibility NG-H_2
  - Emission control (diffusion vs pre-mix)
  - Startup fuel
  - Possibilities are evolving



H_2 Readiness

Hydrogen supply

- **Infrastructure development**
  - Development of infrastructure needs to be synchronized with development or retrofit of plant
  - Storage as part of the infrastructure is key due to demand and supply do not match
- **Hydrogen sourcing:**
  - Types of hydrogen
    - Blue hydrogen
    - Green hydrogen
  - Origination
    - Local production
    - Imports (e.g. ammonia)

H_2 Readiness

Engineering Considerations