

Gasdagarna 2021

Vätgas i industriella gasturbiner

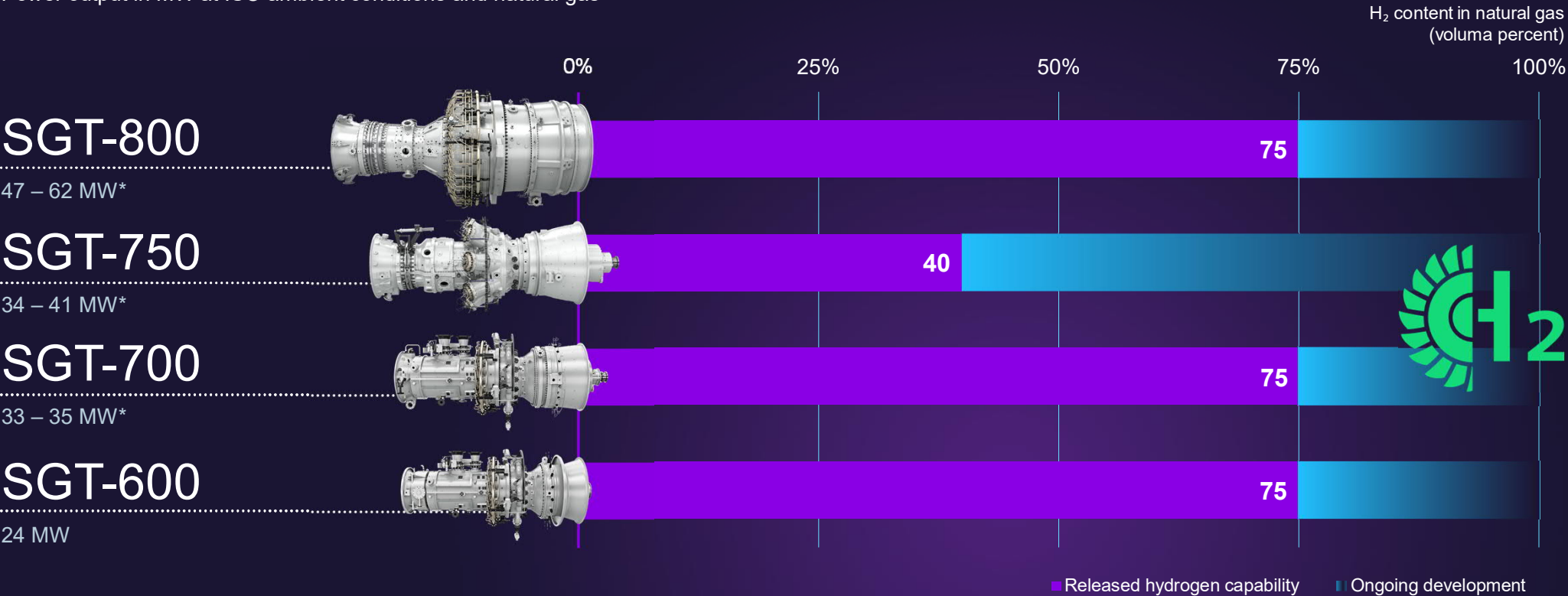
Jenny Larfeldt



Hydrogen capability in Siemens Energy medium size gas turbines

All turbines equipped with DLE burner technology

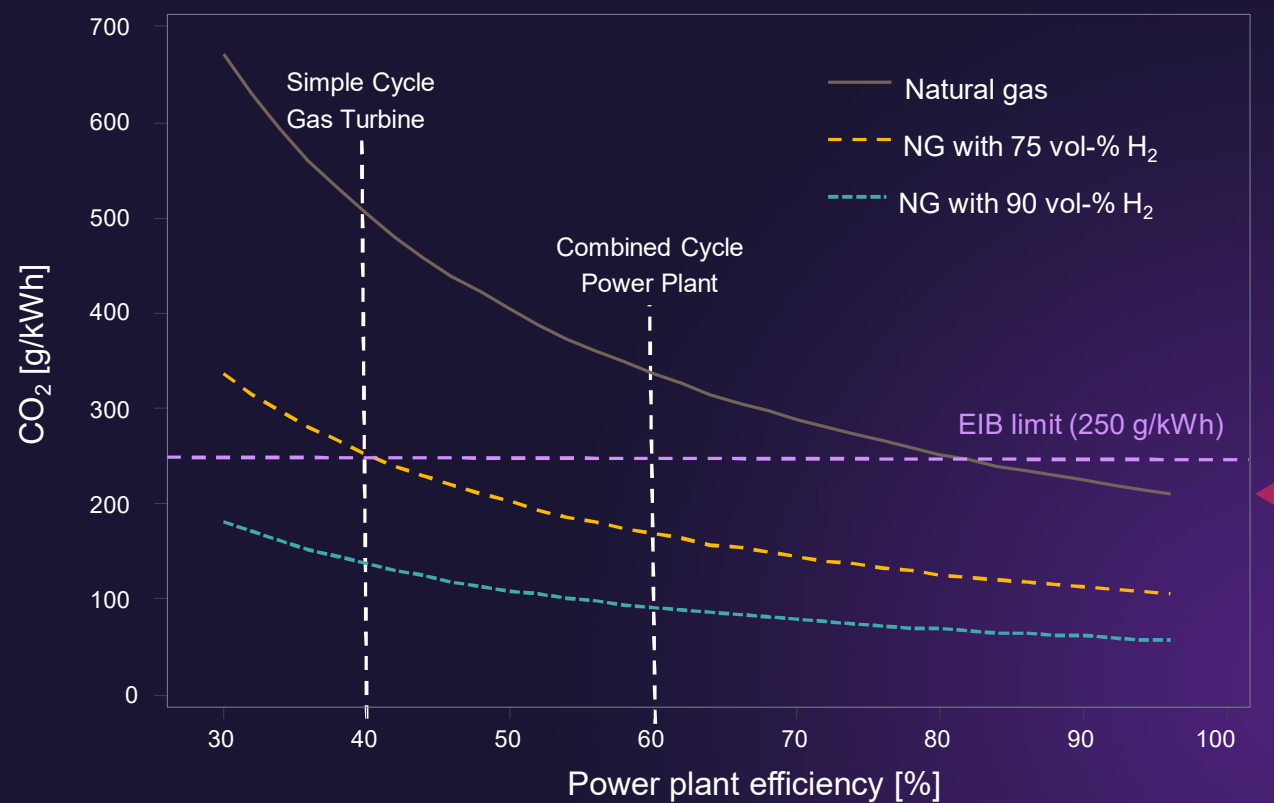
Power output in MW at ISO ambient conditions and natural gas



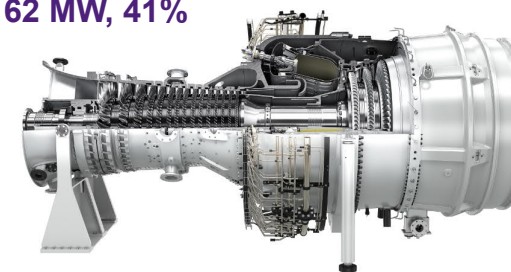
*The performance may be reduced based on H₂ concentration, emissions requirement and power rating

2021-04-20

Why Hydrogen?



Simple cycle power generation
62 MW, 41%



Combined cycle power generation
180 MW, >60 %

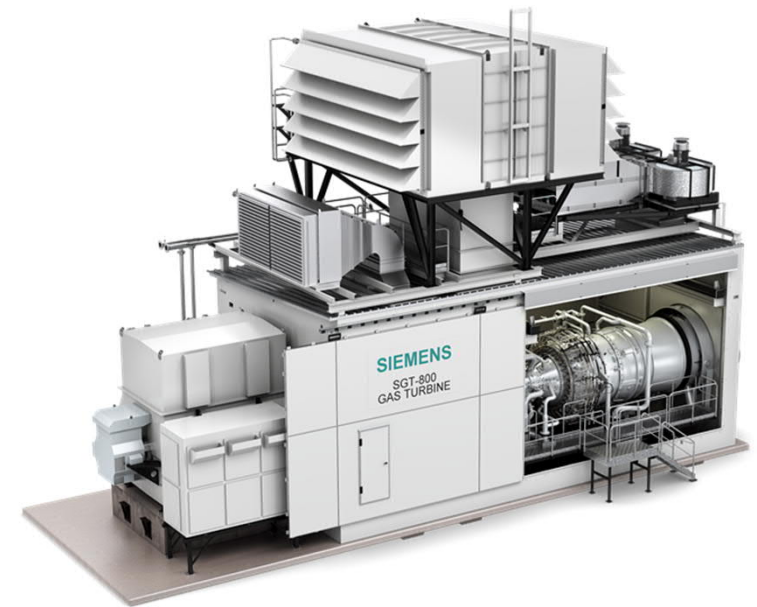
Hydrogen in gas turbines

Examples of installation adaptations to consider

Examples of installation adaptations to consider	5-15%	15-30%	30-75%
Burner flash-back supervision	✓	✓	✓
Burner flash-back control			✓
Adjusted burner design ¹		✓	✓
Ignition fuel & central gas/purge air system		✓	✓
Enclosure gas detection system	✓	✓	✓
Enclosure fire detection system		✓	✓
ATEX/CFD-considerations & ventilation adjustment	✓	✓	✓
Gas fuel system (material, valves etc.)		✓	✓
Additional monitoring		✓	✓

Logics, procedures & approvals:

- **Operation and control:** Updated settings in the control system and modified start-up sequence. Adjustment of operation including turbine inlet temperature may be required depending on fuel constituents including level of H₂ and emission requirements
- **Additional approvals and certificates** from authorities may be required to get operating permission (customer scope)

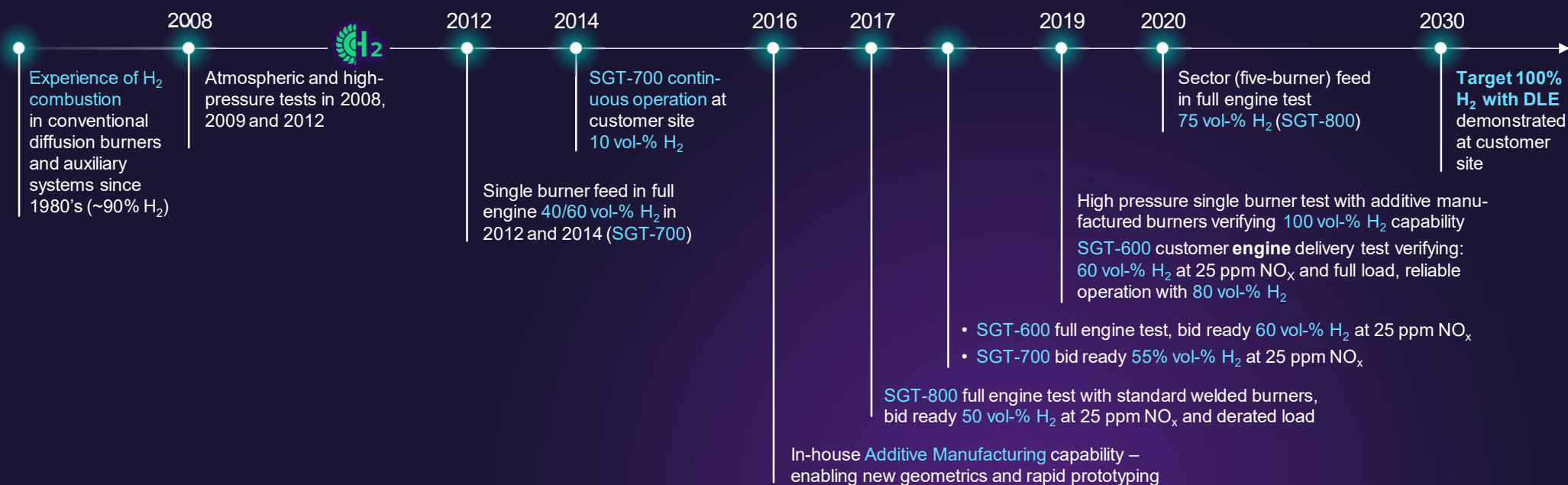


Siemens Energy can provide solutions both for new units and existing fleet

¹ For older installed SGT-600/700 units, the combustion chamber might need to be updated
2021-05-27

Hydrogen roadmap

Continuous development and experience across the fleet



3rd generation dry low emissions (DLE) burner used in SGT-600, SGT-700 and SGT-800



Hydrogen test at the Siemens Energy test facility, Finspong Sweden





60% Hydrogen at 25ppm NO_x

Customer: Braskem

Country: Brazil

Hydrogen reference project Braskem, Brazil

Challenge



- Use of hydrogen as fuel gas to reduce use of natural gas, up to 60% not exceeding 25 ppm NO_x
- Reduced need for external grid supply
- High availability and reliability
- Low cost for O&M

Technology



2x SGT-600 PG with 3rd generation DLE system for up to 60% H₂ co-firing at 25 ppm NO_x

Solution



- Advanced Additive manufactured burners capable for 100% H₂
- Complete plant delivery, Siemens Energy will build, own and operate the CHP, HRSG and gas compressor
- O&M contract based on delivery of steam and power

Benefits



- Fuel cost savings
- Operation on high levels of hydrogen in DLE, no need for water injection
- Lowest emissions using the latest DLE combustion system and control system <25 ppm NO_x
- Predictable operation and maintenance cost
- Tailor made flexible solutions in all important aspects

<https://gasturbineworld.com/working-toward-100-percent-hydrogen/>

Zero Emission Hydrogen Turbine Center

The zero emission demonstrator plant at the gas turbine test facility in Finspång, Sweden

- Utilizes **excess power from turbine test runs** to produce hydrogen in an **electrolyzer**
- **Solar panels** for continuous hydrogen production
- A **micro grid** together with **batteries for backup**
- Utilize the produced hydrogen as turbine fuel for upcoming turbine tests to **reduce our own LNG consumption** and provide **inhouse testing of 3D-printed hydrogen burners**

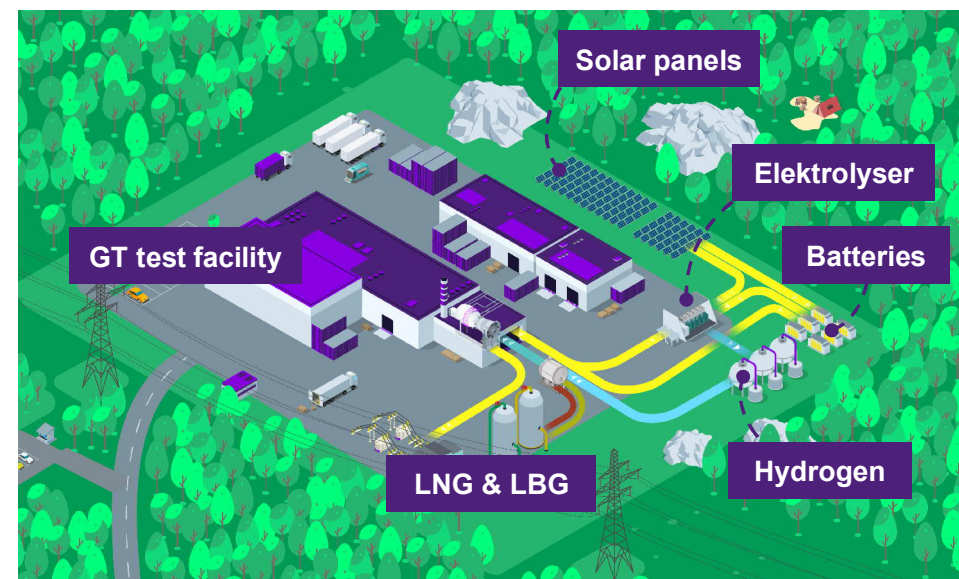
Three year project with funding from EU

- **Operation starts in 2021**
- Supports Siemens Energys efforts in achieving
 - **100% hydrogen ready gas turbines by 2030**
 - **climate neutral own operations by 2030**
 - **green electricity 100% of own power consumption by 2023**
- Funded by the six partners and EU project **ERA-Net Smart Energy Systems** program through the **Swedish Energy Agency**

2021-04-20

>> zehtc.org

The future energy system on display



SIEMENS
energy

CHALMERS
UNIVERSITY OF TECHNOLOGY



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



LÄNSSTYRELSEN
ÖSTERGÖTLAND

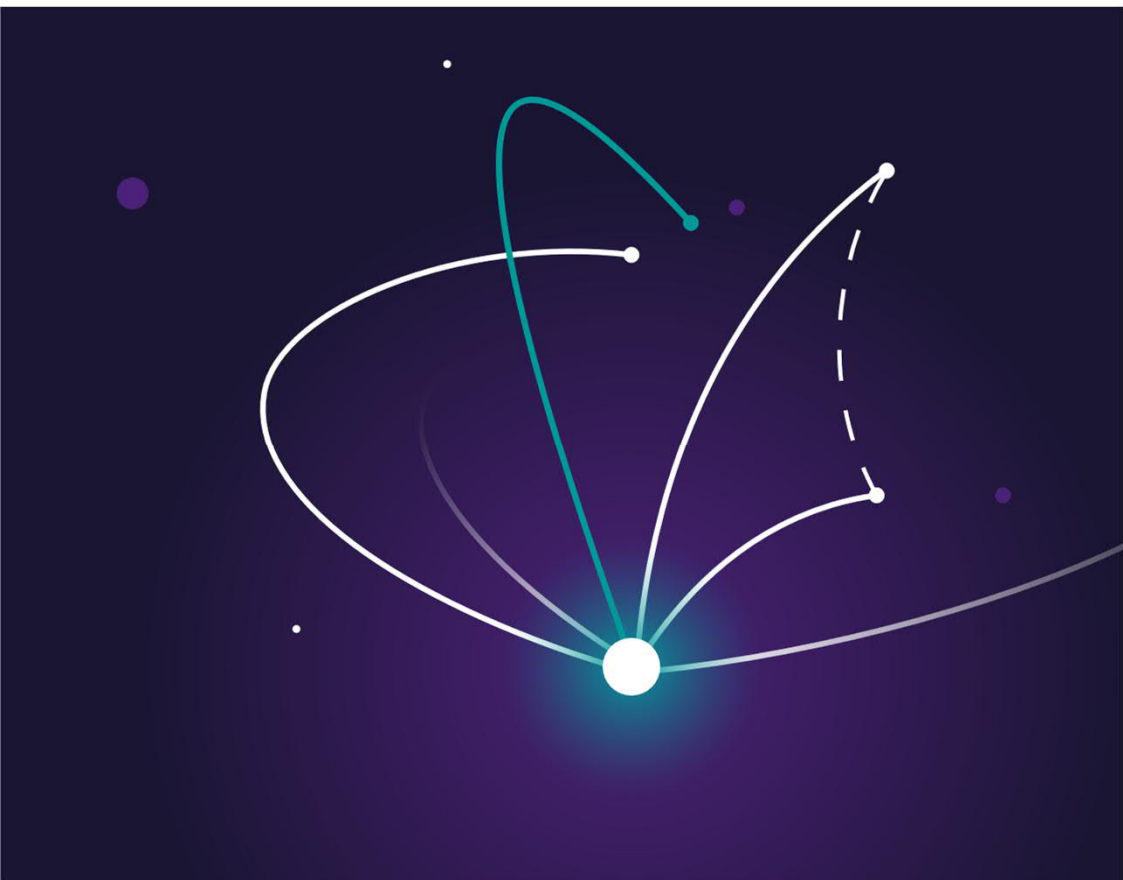


FINSPÅNG

THE LINDE GROUP

Decarbonization MGT SE AB 7
Restricted © Siemens Energy, 2021

Thank you



Prof. Jenny Larfeldt

Siemens Energy AB

SE G IGT R&D

Slottsvaegen 2-6

SE-612 83 Finspang, Sweden

Tel.: +46 122 82789

Fax: +46 122 81349

Mobile: +46 70 1801447

<mailto:jenny.larfeldt@siemens-energy.com>

[siemens-energy.com](https://www.siemens-energy.com)

<https://www.linkedin.com/in/jenny-larfeldt-0b825a44/>