





## **Modeling Hydrogen Applications in Combined Cycle** Heat and Power (CHP) Plants

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Introduction

In this work, we study and optimize different options for **using hydrogen in CHP plants**, namely:

- Direct combustion in the **gas turbine**
- Supplementary firing in the heat recovery boiler (**duct burner**)
- Oxy-fuel combustion of hydrogen for direct steam production (see right)

We use a scheduling model to evaluate the optimal economic dispatch and fuel mix of an exemplary plant

- The Oxyfuel Hydrogen Burner (OHB) elevates the temperature level of steam by burning hydrogen and oxygen in steam atmosphere - The OHB can be directly **included in the steam cycle** of a CHP - It provides an additional **possibility for heat input to the steam cycle** Cool Steam H\_





- Hydrogen combustion in the gas turbine is only economically attractive if hydrogen is cheaper than natural gas (including emission costs)
- Retrofitting a CHP with an OHB can increase the profitability of the plant
- Operating a duct burner fueled with hydrogen instead of natural gas is not profitable and its operation results in an increased emission factor of electricity
- An OHB extends the profitable hydrogen use in a CHP plant to cases in which hydrogen is more expensive than natural gas.





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