

# H<sub>2</sub> Deployment in Centralised Power Generation An Economic Case Study

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## Agenda

- Focus on one scenario: OCGT plant, peaking load
- Sensitivity to future CO<sub>2</sub> and H<sub>2</sub> prices
- Open questions



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## Scope

Evaluation of the technical feasibility and economics of hydrogen utilisation for large-scale, centralised power generation to deliver a business case to ETN Hydrogen WG members and inform EC hydrogen strategies

### **LCOE** evaluation – main assumptions

	GT Type	GT Output (MWe)	Configuration	<b>Operating Regime</b>	Annual Op. Hou
ſ	Small	20	OCGT	Peak	1000
	Small	20	СНР	Base	6000
	Large	300	OCGT	Peak	1000
	Large	300	CCGT	Base	6000

### **Parameters considered**

### **Technical parameters**

- Plant size (small large) and plant configuration (OCGT CCGT) ٠
- Nominal power after upgrading (depending on the H<sub>2</sub> content) •
- Plant efficiency (varying with the H<sub>2</sub> content)
- Equivalent operating hours (EOH): peak load vs base load

#### **Economic parameters**

- Upgrading cost ٠
- Natural gas (NG) purchasing cost
- Hydrogen (H<sub>2</sub>) purchasing cost

Operating Regime Annual Op. Hours

CO<sub>2</sub> taxation cost





There is a value of  $CO_2$  price for which the use of  $H_2$  has a positive effect on the LCOE compared to the Base (100% NG) case

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### 20MW OCGT plant – peak load – Preliminary results

NG price 20€/MWh **H2 price 1.5€/kg** EOH @ 1000hr







For lower H<sub>2</sub> price (1.5 $\notin$ /kg), the break-even point moves towards lower CO<sub>2</sub> price value (150 $\notin$ /ton)

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### 20MW OCGT plant – peak load

Break-even point at different H<sub>2</sub> price









## Sensitivity Analysis – 20MW OCGT Plant – peak load

LCOE as function of the  $H_2$  price and  $H_2$  vol% for different CO<sub>2</sub> prices



The red line represents the LCOE value for the base case (100% NG)

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## **Open questions**

## 2030 & 2050 targets

- Considered H<sub>2</sub> price: 1.5-2€/kg
  CO<sub>2</sub> price: 150-225€/ton
  - Are they aligned with the industry projections?
- Considered hydrogen shares by volume : 0% 30% 50% 70% 100%
  - Are these all considered realistic cases ?
  - Are these all expected to be workable cases in OCGT and CCGT?
  - What is the timescale considered between hydrogen blending and 100% hydrogen operation?



## Thank you



Don't hesitate to contact the ETN Office (<u>vm@etn.global</u>) if you would like to join the ETN Hydrogen Working Group or the support group regularly invited to review the work of the ETN Young Engineers Committee sub-group