Using REPowerEU at its full potential: the role of hydrogen and direct electrification in displacing fossil gas demand

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How to use renewable electricity to displace the most gas

Gas displaced in BCM per TWh of renewable electricity

- Green H2 for electricity production: 0.07
- Green H2 replacing grey H2: 0.09
- Renewables directly on the grid: 0.17
- Heat pumps to replace gas boilers*: 0.23

*Based on German average household
REPowerEU aims to nearly triple current renewable capacity in the next 8 years.

All newly deployed Wind & PV combined in 2030 will be expected to produce a little over 1000 TWh of electricity per year. That's the equivalent of the current French and German demand combined.
How will the EU choose to use its 1000TWh of renewable electricity?

**Current REPowerEU plans**
- Hydrogen Production: 509 TWh
- Replace gas fired electricity: 510 TWh

**Maximising gas phase-out**
- Heat Pumps: 452 TWh
- Replace gas fired electricity: 566 TWh

**Maximise gas phase-out, while kick-starting H2 market**
- Heat Pumps: 319 TWh
- Replace gas fired electricity: 566 TWh
- Hydrogen Production: 133 TWh
  - Produced with RePowerEU additional capacity
REPowerEU = Still 24 BCM of Russian gas needed
Maximising gas phase-out = No more RU gas + extra 43 BCM avoided

- Russian gas
- Gas saved by grid conversion
- Gas saved by heat pumps

- Heat Pumps: 452 TWh
- Replace gas fired electricity: 566 TWh
Mixed approach = total RU gas phase-out + deployment of H2 economy

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- Heat Pumps 319 TWh
- Hydrogen Production 133 TWh
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Key Conclusions

- Using renewable electricity can reduce gas use substantially if used effectively.

- Direct electrification offers the biggest reduction to gas: heat pumps are particularly effective at displacing gas demand.

- Natural gas cannot be replaced en mass by hydrogen, given the large amount of renewables needed to displace small amounts of gas.

- Relying on hydrogen will leave the EU with more fossil gas in the system.

- A future-proof strategy needs to both drastically reduce our dependence on fossil fuels while also deploying hydrogen in no-regret sectors where other decarbonisation pathways don’t exist.

- Additional electricity deployed for hydrogen production must be dimensioned on the hydrogen targets: RePowerEU foresees 80 GW of capacity for hydrogen production, only enough to produce 2.8 Mt of hydrogen per year, 20% of the proposed RED target.
Get in touch!

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Thank You!
Wind average utilisation – 27%
Solar average utilisation – 11%
80GW of additional RePower EU – 50% Wind, 50% solar
Gas Power (CCGT) efficiency – 60%
H2 electrolysis efficiency - 70%
Grey Hydrogen – 4.5 Nm³ of Natural Gas per kg of hydrogen
Heat Pumps – Assuming an average yearly heat pump consumption per household in Germany of 4993 kWh Schlemminger et al, 2022, Dataset on electrical single-family house and heat pump load profiles in Germany