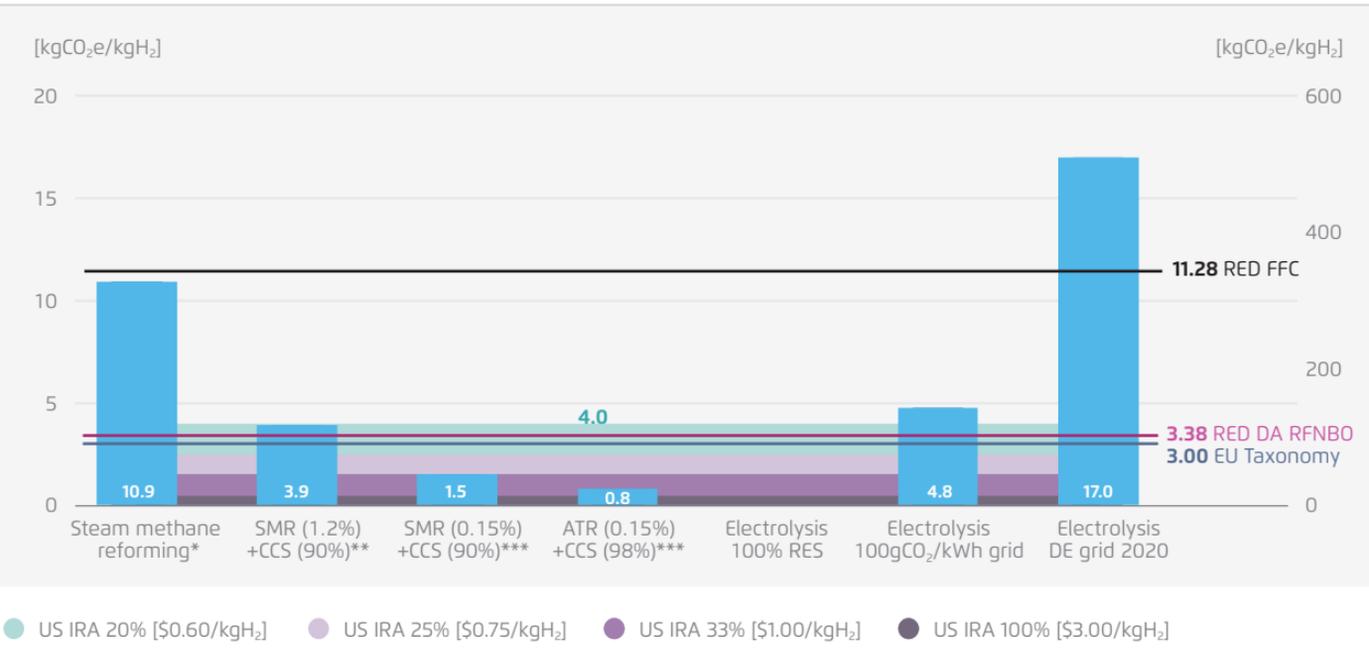


Carbon footprints (right axis) and emissions thresholds (left axis) of hydrogen production pathways and standards

→ Fig. 19



Agora Industry (2024), based on data from the Energy Transitions Commission (2021): *Making the hydrogen economy possible – Accelerating clean hydrogen in an electrified economy*; the European Commission's Joint Research Centre (JRC). Note: Electrolysis pathways excl. equipment manufacturing emissions. Electrolysis efficiency 70%. For comparison, the carbon intensity of the German power grid in 2020 was 356g CO₂e/kWh [JRC]; ATR: autothermal reforming, CCS: carbon capture and storage, DE: Germany, RED: EU's Renewable Energy Directive, RED DA RFNBO: RED Delegated Act on Renewable fuels of non-biological origin, RED FFC: RED fossil fuel comparator, RES: renewable energy sources, LHV: lower heating value; United States' Clean hydrogen production standards (CHPS): 4.0 kg CO₂e/kgH₂ – credit: 20% of \$3/kgH₂ when between 2.5 and 4 kg; 2.5 kg CO₂e/kgH₂ – credit: 25% of \$3/kgH₂ when between 1.5 and 2.5 kg; 1.5 kg CO₂e/kgH₂ – credit: 33.4% of \$3/kgH₂ when between 0.45 and 1.5 kg; 0.45 kg CO₂e/kgH₂ – credit: 100% of \$3/kgH₂ when below 0.45 kg. *CertifHy state-of-the-art SMR benchmark lifecycle emissions. **1.2% leakage rate (e.g. Russian gas, 5 000 km transport) [ETC 2021]. ***0.15% leakage rate (e.g. Norwegian gas, 1 700km transport) [ETC 2021].