Hydrogen: A Thermodynamic Reality Check

CEWT | Carbon Recycling Technology (CRT)

System Architecture > Molecule

The Reality

- Billions invested before fundamentals agreed
- Hydrogen treated as fuel and export commodity
- Thermodynamics was never the constraint considered

Gibbs Free Energy Constraint

- Hydrogen = high Gibbs free energy state
- Electrolysis requires energy input ($\Delta G > 0$)
- Use releases energy ($\Delta G < 0$) with losses
- Irreversibility cannot be engineered away

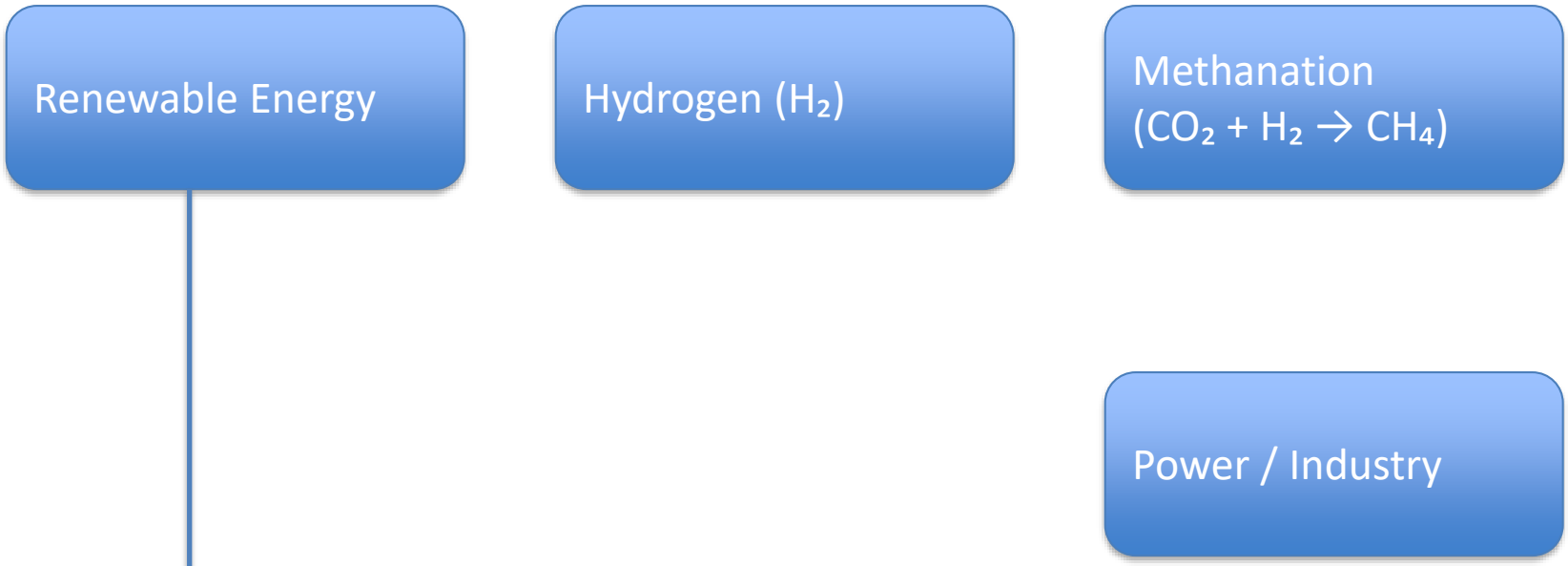
Why Hydrogen Struggles

- Low volumetric energy density
- Compression / liquefaction losses
- Transport penalties
- Carriers add further inefficiencies

The Core Mistake

- Hydrogen forced into roles it is not suited for
- Fuel, commodity, export vector
- Physics supports it as a system molecule

CRT Closed Carbon Loop



CRT Insight

- Hydrogen provides energy input
- Carbon acts as recyclable carrier
- CO_2 is not waste → it is feedstock
- Closed loop eliminates accumulation

System vs Molecule

- Hydrogen fails as standalone fuel
- Hydrogen works inside integrated systems
- Architecture determines efficiency

CEWT Positioning

- From decarbonisation → defossilisation
- From linear emissions → circular carbon
- From fuel thinking → system thinking

Conclusion

- We don’t have a hydrogen problem
- We have a system design problem
- Correct architecture unlocks thermodynamic viability

Carbon → Methane: Energy Upgrade (CRT Insight)

Carbon alone → limited usable energy
Adding hydrogen upgrades carbon → Methane (CH_4)
Nature does this over geological time (natural gas formation)
CRT does this instantly in a closed-loop system