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ariema

WHY HYDROGEN?

Hydrogen is a chemical element with just **one proton and one electron**. It is the most common element in the universe, making up 75% of its mass. However, hydrogen is almost always found as part of another compound and must be **separated to store energy**.

Hydrogen is considered an **energy carrier** because it stores energy created previously elsewhere. Hydrogen's energy conversion rate through **fuel cells** is up to three times more **efficient** than conventional engines.
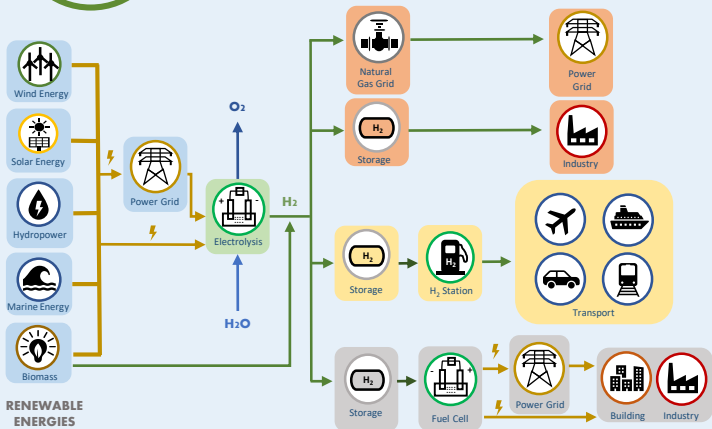
An electrolyser with 85% output that produces 10 Nm^3 per hour consumes 35.29 kW ($10 \cdot 3.00/0.85$) of power and 8.091 kg of water per hour ($10 \cdot 0.0899 \cdot (18/2)$).

A 10kW fuel cell with total output of 45% consumes 7.40 Nm^3 per hour of H_2 ($10 \cdot 0.333/0.45$) or 0.667 kg/hour of H_2 ($10 \cdot 0.030/0.45$) and produces 6.00 kg of water per hour ($0.667 \cdot (18/2)$).

HYDROGEN IN NUMBERS

1. Density	0.0899 kg/Nm³ (gas) 0.0708 kg/l (liquid)
2. Heating value – higher	120 MJ/kg
Heating value – lower	141.86 MJ/kg
3. Explotion limits	4.0 – 75.0 % (concentration of H_2 in air)
4. Detonation limits	18.3 – 59.0 % (concentration of H_2 in air)
5. Specific heat capacity	Cp=14.199 KJ / (kg · K) Cv=10.074 KJ (kg · K)
6. Difusion cofficient	0.61 cm²/s

Compressibility factor

Pressure (Bar)	1	50	100	150	200	250	300	350
Compression factor	1	1.032	1.065	1.089	1.132	1.166	1.201	1.236

Pressure (Bar)	400	500	600	700	800	900	1000
Cmpression factor	1.272	1.344	1.416	1.489	1.560	1.632	1.702

Equivalents

Mass H_2 (kg)	↔	H_2 gas (Nm³)	↔	H_2 liquid[1] (litres)	↔	Energy[2] (M)	↔	Energy[2] (kW·h)
1	=	11.12	=	14.12	=	120	=	33.33
0.0899	=	1	=	1.270	=	10.8	=	3.00
0.0708	=	0.788	=	1	=	8.495	=	2.359
0.00833	=	0.0926	=	0.1177	=	1	=	0.278
0.0300	=	0.333	=	0.424	=	3.6	=	1

1 Hydrogen is liquid at atmospheric pressure of less than 20.39 K
2 Based on lower calorific value