

1MW = 1000kW

With a 4-chambered electrolysis unit working at 70% efficiency there would be 700kW available for useful NaOH production.

1MWhr = 3,600,000 kJ

3,600,000 kJ/hr * 70% efficiency = 2,520,000 kJ

NaOH_(aq) standard enthalpy is -469.15 kJ/mol

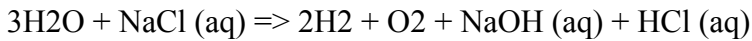
HCL_(aq) standard enthalpy is -167.46 kJ/mol

H₂O standard enthalpy is -285.84 kJ/mol

NaCl_(aq) standard enthalpy is -407.00 kJ/mol

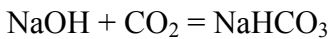
H₂ & O₂ standard enthalpy is 0 kJ/mol

The full reaction for the 4-Chamber Electrolysis unit is:



the enthalpy change (kJ/mol) is $2(0) + (0) + -469.15 + -167.46 -3(-285.84) -(-407) = +627.91$ kJ/mol

With the enthalpy change being +627.91 kJ/mol and kJ power efficiency being 2,520,000 kJ /627.91 kJ/mol = 4013.31 moles being produced of NaOH, HCl, and O₂, and twice that number moles of H₂ per MWhr at 70% efficiency.



With complete conversion of NaOH into NaHCO₃ there will also be 4013 mol/hr of CO₂ being absorbed from the atmosphere per hour, or 96,312 mol/day at a power of 1MW input into the 4-Chamber Electrolysis unit running at 70% efficiency.

CO₂ Molar mass = 44.01 g mol⁻¹

4013 mol/hr * 44 gm/mole = 176, 572 gm/hr or 176.572 kg/hr

176.572 kg/hr * 24 hr = 4237 kg/day or 4.237MT/day

4.237 MT/day * 365 days/year = 1546 MT/year of CO₂ absorbed from the atmosphere with 1MW of electricity moving through the 4-chambered electrolysis unit running at 70% efficiency.

NOTE: at 80% efficiency of one MegaWatt (MW) electricity moving through the 4-chambered electrolysis unit the above numbers will increase by ~10%; with ~1700 MT/year of CO₂ being absorbed from the atmosphere.

To put this in perspective, the United States Environmental Protective Agency (EPA) states:

"The average *emission* rates in the United States from *coal-fired* generation are: 2,249 lbs/MW-hr of carbon dioxide."

- This emission rate of ~ 1000kg/MW-hour of CO₂ from coal-fired generation, when compared to the 4-Chambered Electrolysis system where ~176 kg/MW-hour of CO₂ is being absorbed from the atmosphere at 70% efficiency or ~193 kg/MW-hour of CO₂ being absorbed at 80% efficiency .

- So running all day, each MegaWatt (MW) consumed of sustainable energy used to power the 4-Chambered Electrolysis system would absorb about 4-5 hours worth of the CO₂ produced from each MW of a coal-fired generation system, or about 17-20% of the CO₂ produced from a coal generation facility. Because most coal generation facilities have a baseload rating of at least ~300MW, the point is that ~300 metric tonnes of CO₂ are currently released per hour from each of these coal generation facilities.

- For a natural gas generation system the sustainable energy used to power the 4-Chambered Electrolysis system would absorb about 15 hours worth of the CO₂ produced from a natural gas generation system.

- Obviously, the 4-Chambered Electrolysis system must use either sustainable energy or energy that would otherwise be wasted, such as natural gas flaring at oil wells, and coal-fired generation must be phased out as soon as is possible.