Green Hydrogen Production Via Steam Methane Reforming

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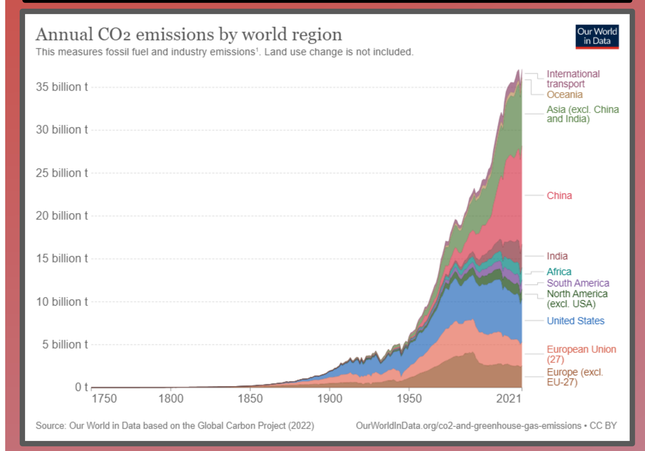
1. Motivation

- The imminent climate crisis demands changing our energy infrastructure
- Green Hydrogen produces energy with no carbon emissions, easy to store/transport

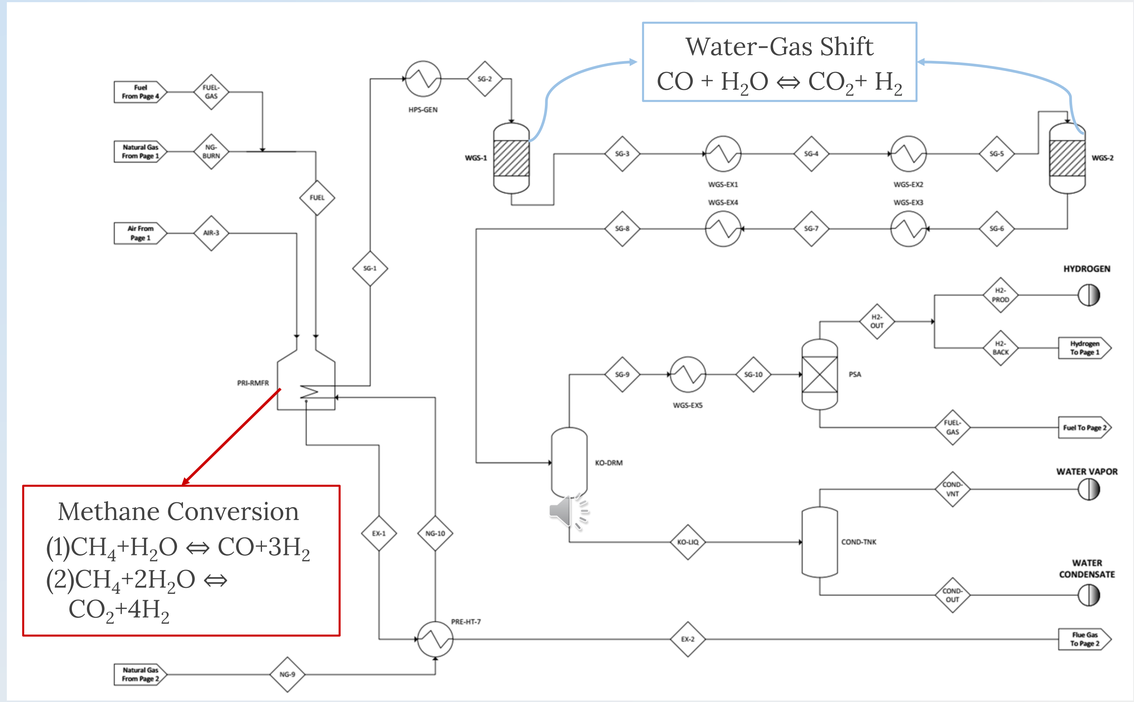


2. Project Goals/Capacity

- Develop a Green Hydrogen production facility capable of producing 8.5 kT/yr H2
- Maximize production efficiency. Minimize cost, carbon footprint

4. SMR Process Design

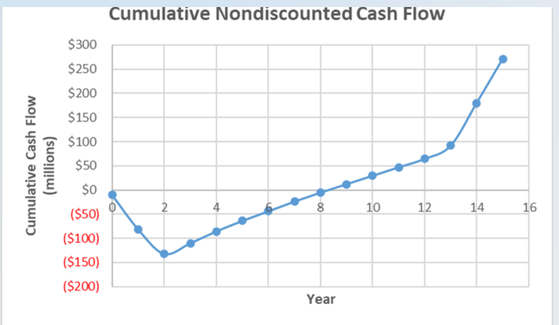
- Natural gas feed is combined with recycled H_2 product and preheated for desulfurization
- Natural gas stream is mixed with steam to attain a 3:1 steam-to-Carbon ratio for Reformer



- Air and a fuel mixture combust providing heat for endothermic methane conversion
  - Flue gas effluent provides heat for heat exchanger network preheating reformer feeds
- Reformed Syngas effluent passes through shift reactors to increase H_2 conversion
- PSA separates 99.9% pure H_2 final product

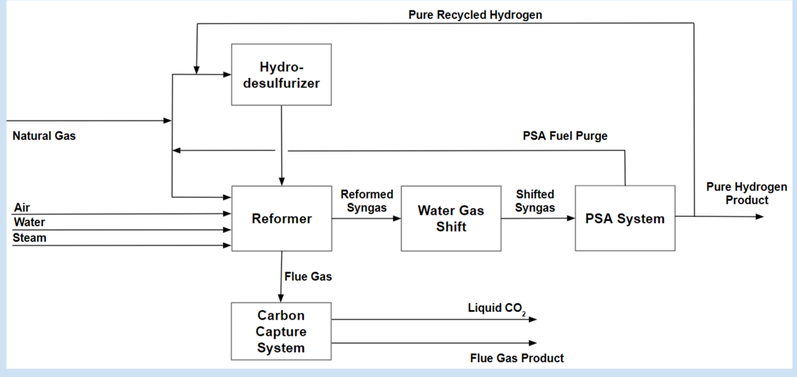
6. Economic Analysis

Non-Discounted Values		Discounted Values	
CCP:	+$271.33 Million	**NPV:**	+$121.87 Million
CCR:	2.06	**NPW:**	1.04
ROROI:	25.33%	**DCFROR:**	1300000%
		Discount Rate:	10%

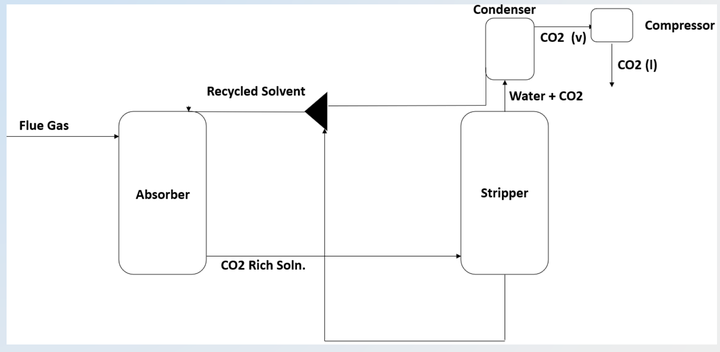


	Cost Summary
Capital Cost	$80,000,000 (-25%) $107,000,000 $134,000,000 (+25%)
Cost Manufacturing Without Depreciation	Min: $28,000,000/yr Median: $49,000,000/yr Max: $138,000,000/yr
Total Revenue (Hydrogen and Carbon Dioxide Product)	$71,000,000/yr

3. Block Flow Diagram



5. Carbon Capture



MEA Based, 90% + Capture Efficiency, located at flue gas stream

7. CO_2 Emissions

Value	Tons/yr Produced	Tons/yr Captured	Tons/yr Uncaptured
Mass	87000	79000	8000
Percent	100	90.3	9.7

8. Results/Findings

- This SMR plant design would serve as a viable basis for Green Hydrogen production
- Requires adjustments based on the goals of the plant, depending on desired carbon capture goals, production levels