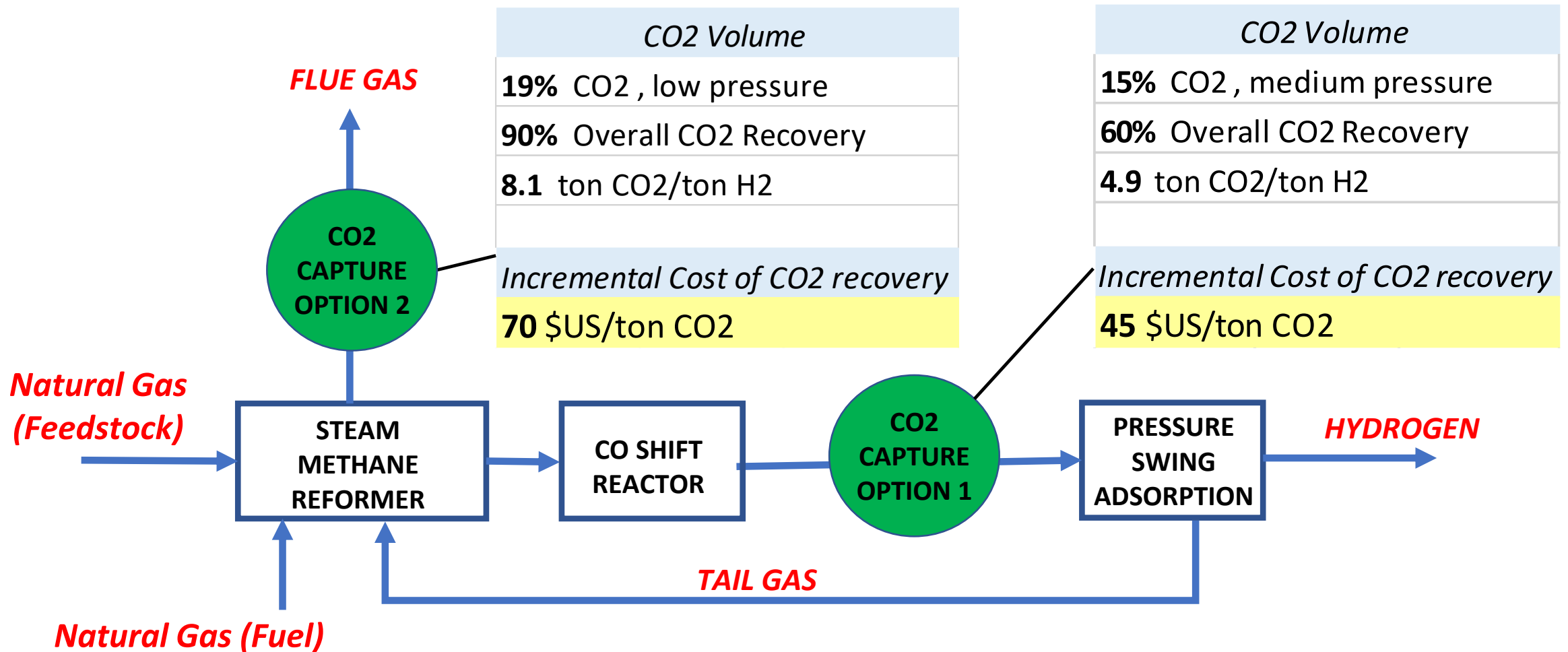


# CO2 CAPTURE OPTIONS IN SMR HYDROGEN PLANT (“BLUE H2”)



Note: CO2 Capture Options 1 and 2 above are separate and mutually exclusive.

Both options include cost of compression of CO2 to 2175 psig

Volume and cost estimates derived from Collodi, Chemical Engineering Transactions, vol 19

# FIVE REGIONAL ATTRIBUTES TO SUPPORT CO<sub>2</sub> CAPTURE /STRG

## 1. Critical Mass of CO<sub>2</sub> Supply



Clusters of large emitters (industrial, refining/chemicals, power generation)

## 4. Regulatory Framework

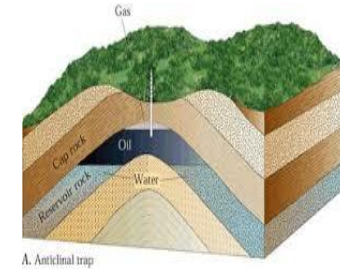


- i. Defined price on carbon emissions, offsets, or tax credits
- ii. Established process for government permitting and oversight of gas injection into geological reservoirs

## 3. CO<sub>2</sub> Transportation Infrastructure



## 2. Proximate Geology



Depleted oil reservoirs and/or deep aquifers, suitable for long term secure CO<sub>2</sub> disposition

## 5. Workforce/Services



Skilled workforce and service equipment (e.g. regional oil and gas industry)

# CO2 PIPELINES – FREQUENTLY *UNASKED* QUESTIONS ANSWERED

- CO2 most efficiently transported in high pressure, **dense phase** (supercritical) “liquid”
- This pressure requires a special (non-standard) design pipe thickness. Generally not efficient or feasible to repurpose typical oil or gas pipelines for CO2.
- Pipelines have a dramatic economy of scale wrt to **diameter and capacity** (cost  $\propto$  radius, hydraulic capacity  $\propto$  radius<sup>2</sup>). This creates a strong economic rationale to aggregate volume (supply and demand clusters, common locations)
- For a given pipe diameter (capacity), the pipeline capital cost and/or resulting transport toll is directly proportional to the length. (minimal economy of scale for *distance*)
- Most existing industrial-scale CO2 pipelines are 50-300 miles in length. Approximate rule of thumb for transport cost in this range would be \$10-\$20 / ton.
- By comparison, H2 plant CO2 capture costs (\$45-\$70 from previous slide) are multiples higher than transport. (transport cost is usually **not** the main hurdle to CCS from H2)