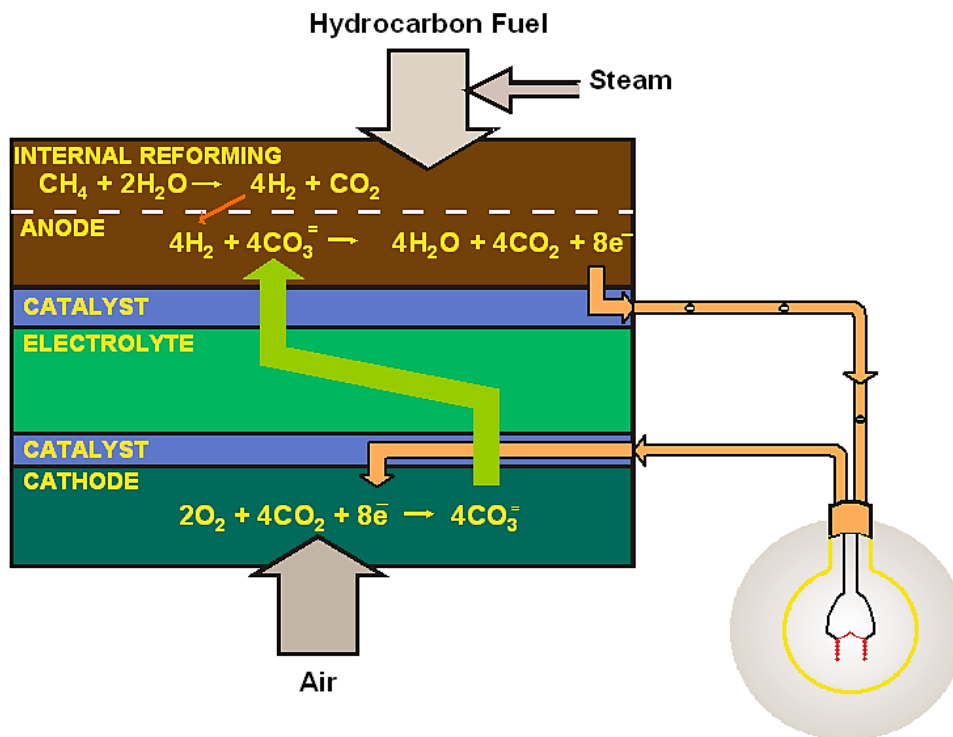




# *Carbon Capture with Molten Carbonate Fuel Cell Powerplants*

ARB CCS Workshop

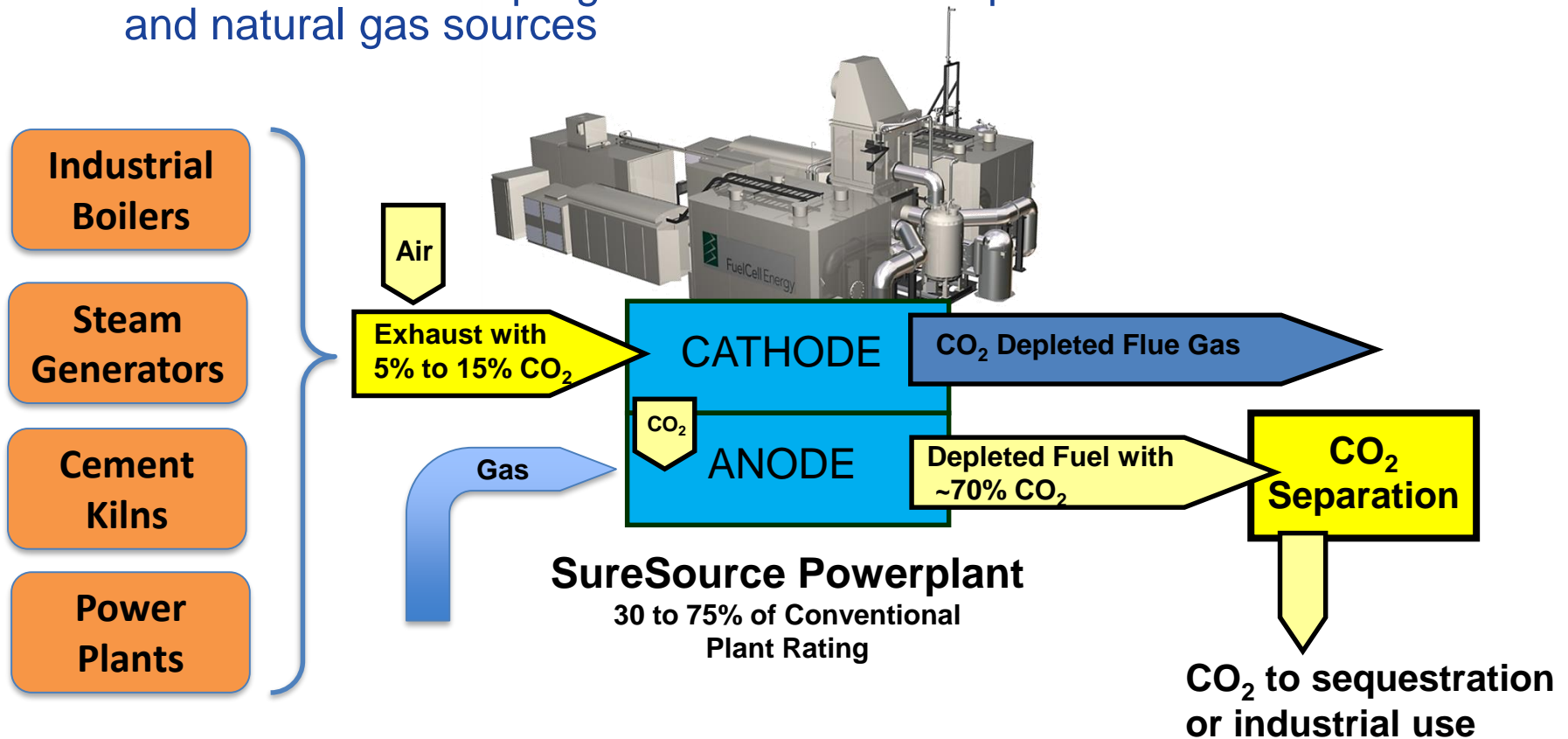
May 8, 2017



- MCFC Chemistry involves transfer of  $CO_2$  from cathode to anode
- This attribute enables effective  $CO_2$  separation with existing MCFC stack technology
- $CO_2$  concentrated in anode gas allows for easy capture and use or sequestration

***SureSource Carbon Capture uses the same electrochemical process that has generated over 6 billion kWh worldwide***

- Carbonate electrochemical process transfers CO<sub>2</sub> from Air Electrode (Cathode) to Fuel Electrode (Anode)
- CO<sub>2</sub> is easily separated from anode exhaust gas since it is no longer diluted with air
- Two demonstration programs focused on capture from coal sources and natural gas sources



Multiple co-products: Power, NO<sub>x</sub> reduction and excess H<sub>2</sub>O

- CO<sub>2</sub> Capture scale:
  - Base system size captures CO<sub>2</sub> from 40 – 65 MMBtu/hr boiler flue gas
    - 50 – 90 tonnes/day
  - Capture rate: controllable 5% to 90%
- Power Output (~1 MW to >2 MW)
  - CO<sub>2</sub> purified to >99% and processed to 1450 psi ready for delivery/injection
- Minimizes NO<sub>x</sub>
  - Flue gas NO<sub>x</sub> reduced by 70%
- Excess water
  - Available for site processes



**Carbonate Fuel Cell  
Powerplant**

***Regulations, tariffs and permitting need to account for CO<sub>2</sub> Capture with these additional environmental benefits***

## CO<sub>2</sub> Captured but not Ideally Located Needs to be Included

- Smaller CO<sub>2</sub> sources must be included
  - Annual emissions and multiple sites add up

## CO<sub>2</sub> Utilization Needs to be Included in Addition to Sequestration and EOR

- Captured CO<sub>2</sub> potentially displaces other, more polluting sources of industrial CO<sub>2</sub>
  - Significantly reduces delivery distances if local flue gas resources tapped

## Water utilization and NO<sub>x</sub> reduction

- Produced excess water recirculation eases stress on local water supply
- 70% NO<sub>x</sub> reduction improves local air quality
  - Reduces emissions not adding chemical pollution
- Energy produced can improve economics
  - Limiting operations (curtailment/export) significantly reduces CO<sub>2</sub> capture and NO<sub>x</sub> reduction (additional payback mechanisms)

***Avoid situation where a cluster of sites are prevented from reductions, due to remoteness from CO<sub>2</sub> injection sites***