



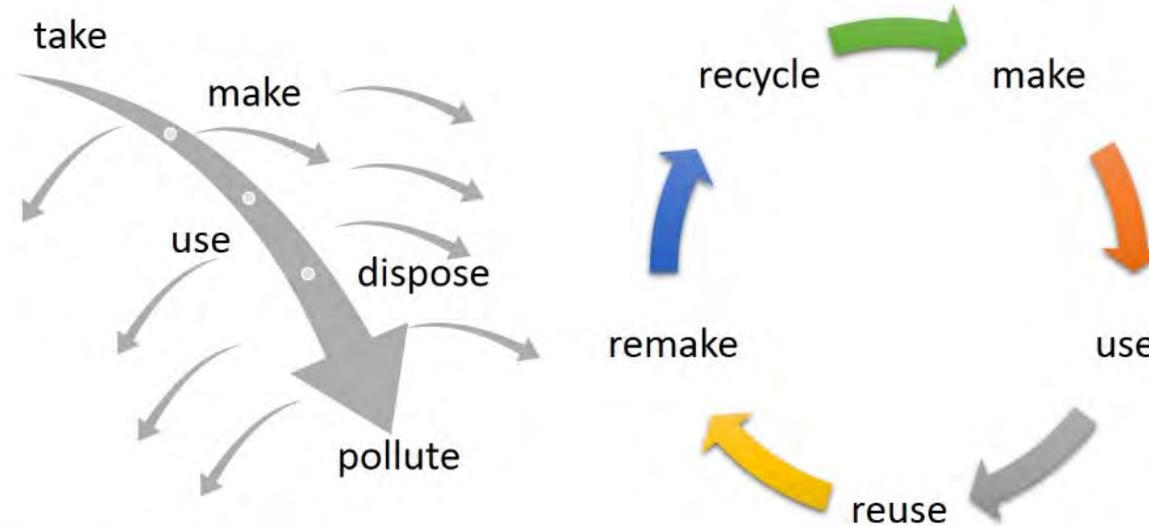
Circular Carbon Economy

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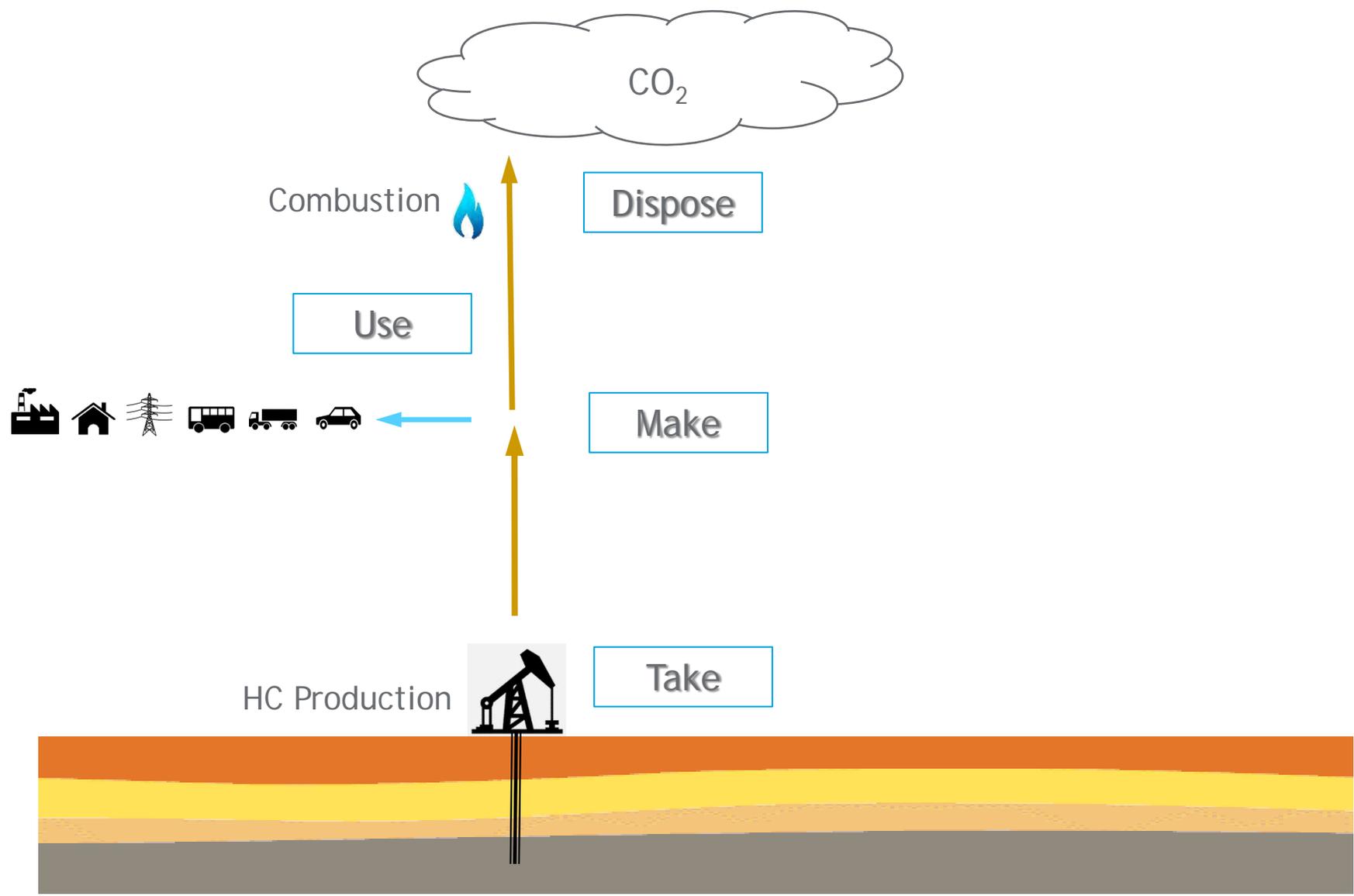
Circular Economy

An economic system aimed at eliminating waste and the continual use of resources. It is an alternative economy that takes into consideration the reuse, recovery and recycling of products and materials.



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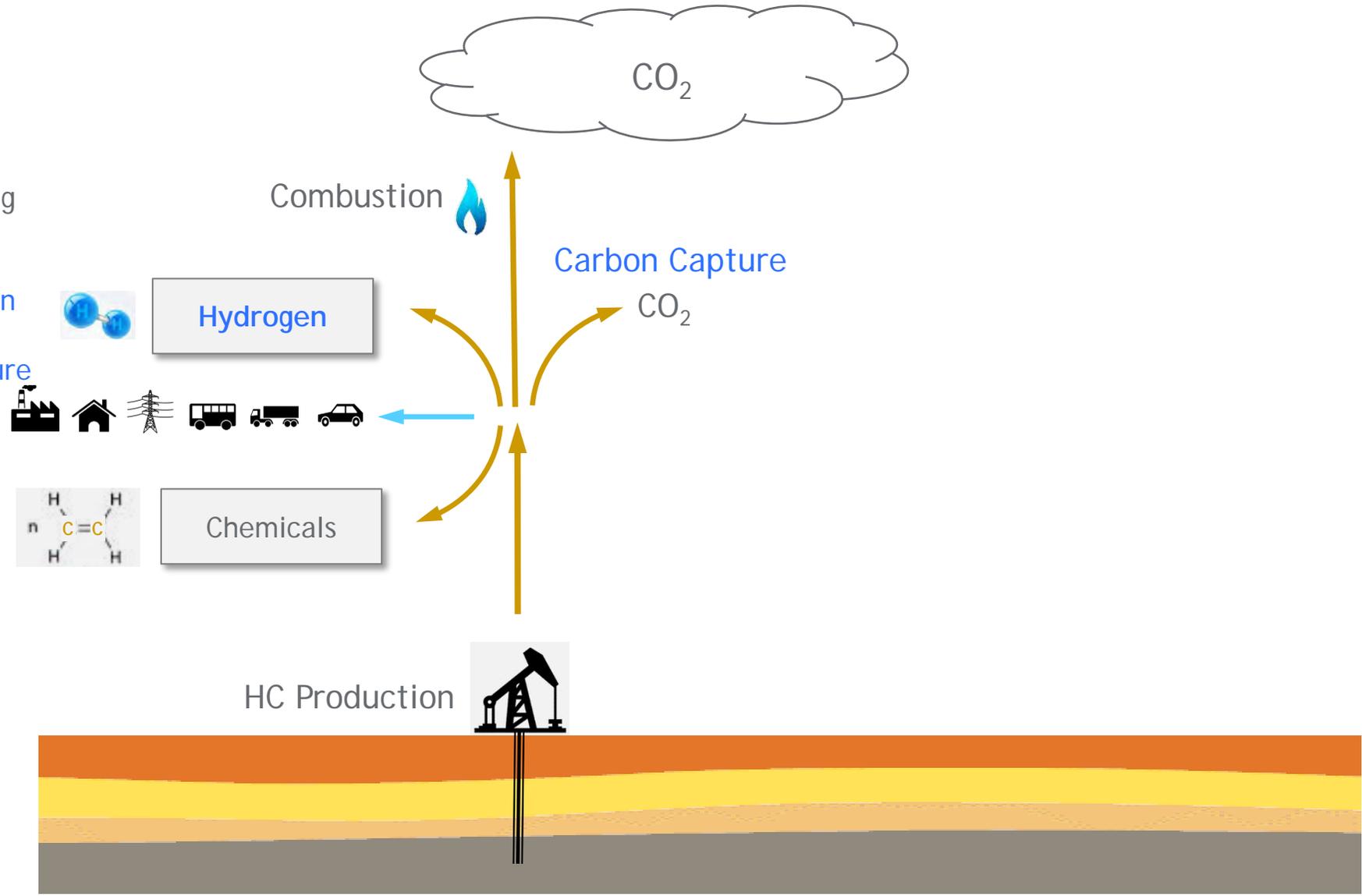
Linear Carbon Economy



Circular Carbon Economy Framework

Reduce

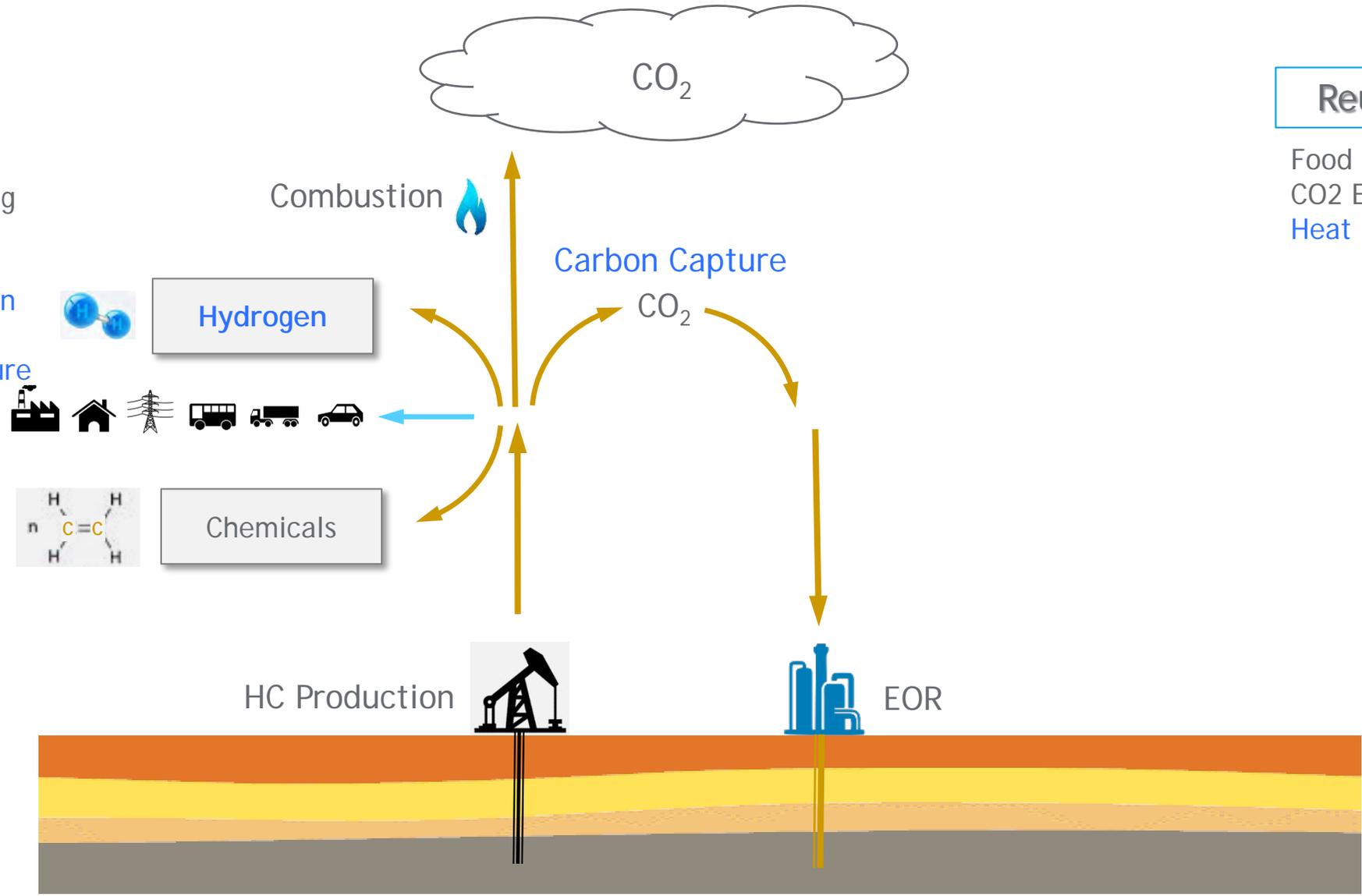
- Efficiency
- Fuel Switching
- Renewables
- Nuclear
- Blue Hydrogen
- Ammonia
- Carbon Capture



Circular Carbon Economy Framework

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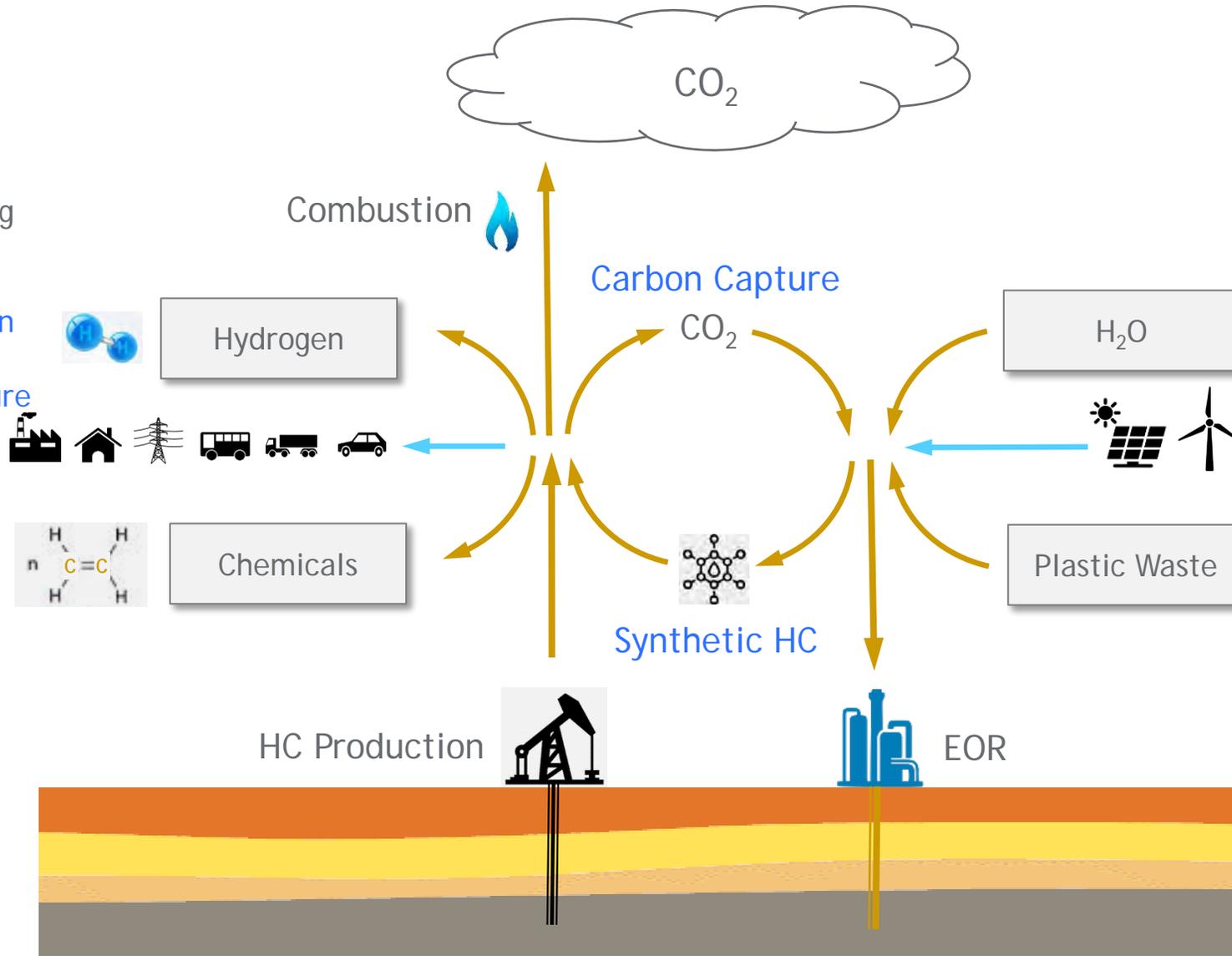
Reuse

- Food
- CO₂ Enhanced Oil Recovery
- Heat & Power (sCO₂)

Circular Carbon Economy Framework

Reduce

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Re-use

- Food
- CO₂ Enhanced Oil Recovery
- Heat & Power (sCO₂)

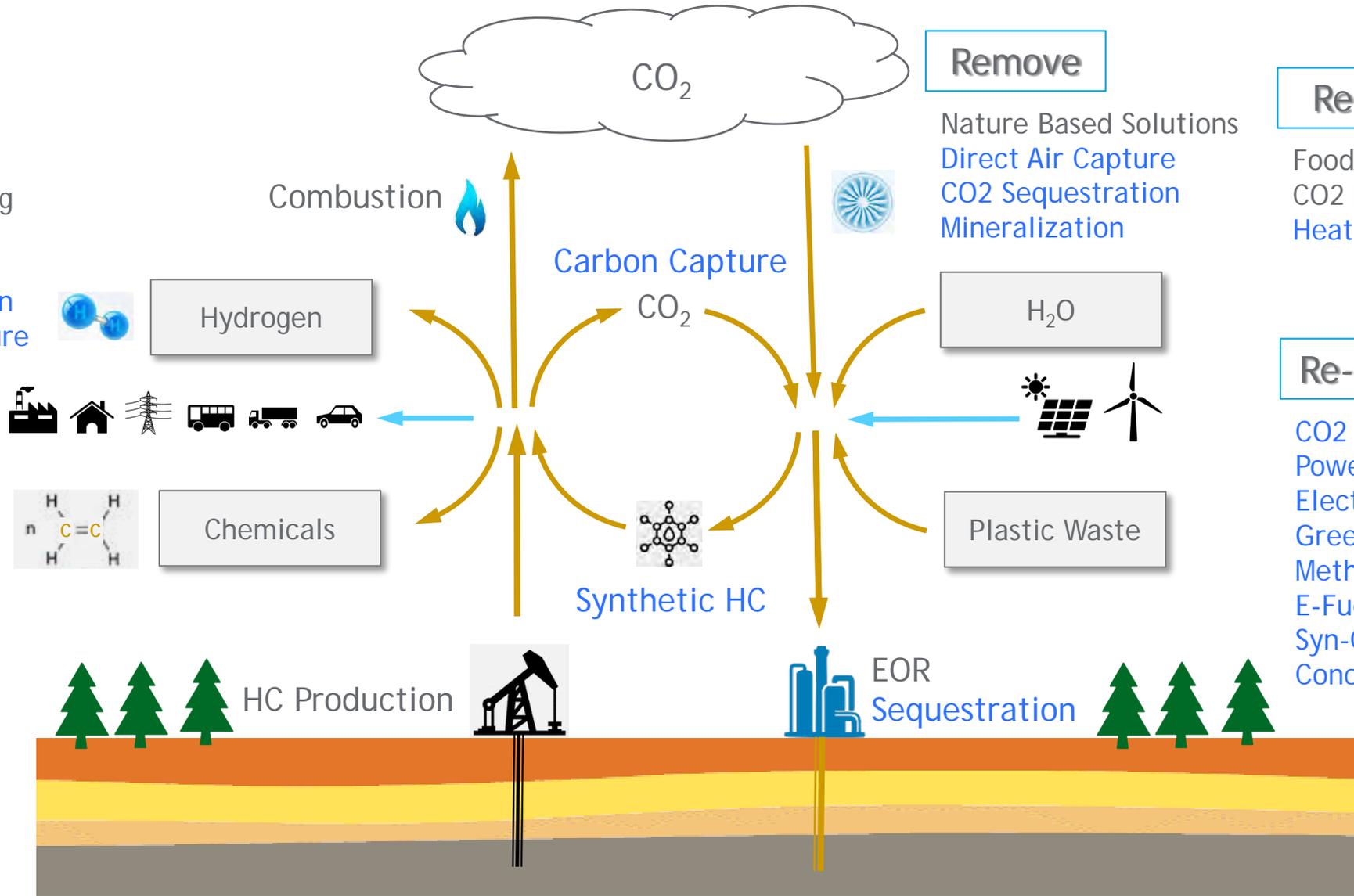
Re-cycle

- CO₂ Reforming
- Power to X
- Electrolysis/Electrochemistry
- Green Hydrogen
- Methanol/Urea/Ammonia
- E-Fuels/Syn-Fuels
- Syn-Chemicals
- Concrete

Circular Carbon Economy Framework

Reduce

Efficiency
 Fuel Switching
 Renewables
 Nuclear
 Blue Hydrogen
 Carbon Capture



Remove

Nature Based Solutions
 Direct Air Capture
 CO₂ Sequestration
 Mineralization

Re-use

Food
 CO₂ Enhanced Oil Recovery
 Heat & Power (sCO₂)

Re-cycle

CO₂ Reforming
 Power to X
 Electrolysis/Electrochemistry
 Green Hydrogen
 Methanol/Urea/Ammonia
 E-Fuels/Syn-Fuels
 Syn-Chemicals
 Concrete

4Rs definitions for circular carbon economy

Reduce

All options that reduce the amount of CO₂ entering the atmosphere

- Energy Efficiency
- Fuel switching
- Renewables
- Nuclear power
- CO₂ capture from (mobile and stationary sources)

Reuse

Using CO₂ without changing its molecular form (CO₂ is not chemically reacted)

- CO₂-Enhanced oil recovery
- Super-critical CO₂ applications (power)
- CO₂-Enhanced water recovery

Recycle

Chemically Transforming CO₂ into new products (with renewable energy)

- Synthetic fuels
- Biofuels
- Fertilizers and urea
- Methanol and chemicals
- Polymers
- Concrete (CO₂ chemically reacted)

Remove

Removal of CO₂ from the atmosphere

- Natural sinks (e.g., afforestation, soil and oceans)
- Bio-energy with CCS (BECCS)
- Direct Air Capture with Storage (DACs)
- Sequestration

Why do we need a circular carbon economy?

Complex energy system with constraining interdependencies

Scale of existing system - substitution will take technology, capital, and time

Challenging sectors - Heat, Industry, Aviation, ...

CCE offers a holistic framework for efficient policymaking with Life Cycle Analysis as the basis

Allows maximum utilization of existing investments and infrastructure

Addresses the emissions challenge in hard to decarbonize sectors directly and economically

Thank you