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FCH2-JU PROJECT

high efficiency
electrochemical system
for energy

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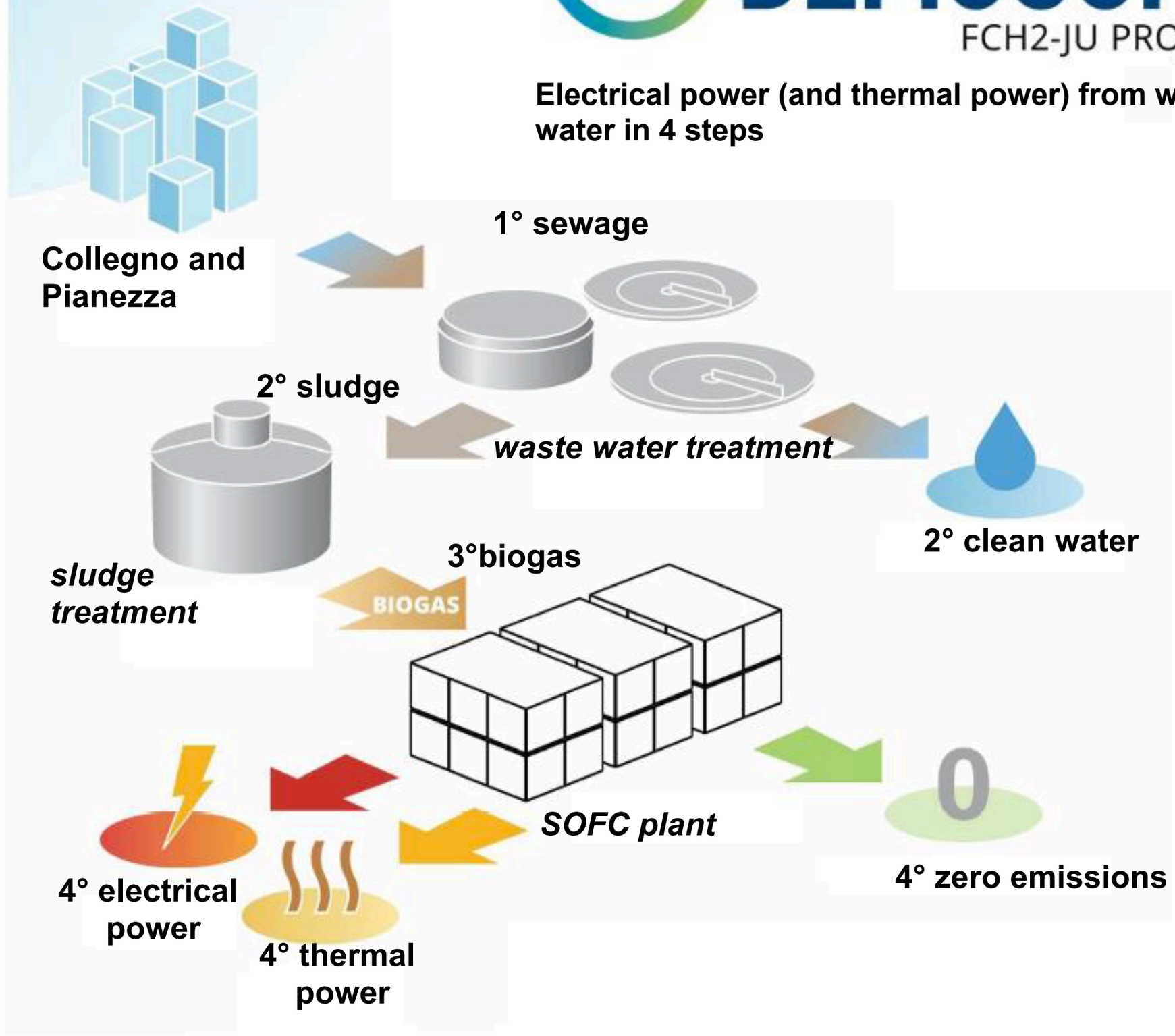
Electrical power (and thermal power) from waste water in 4 steps



SOURCE: steps | Synergies of Thermo-chemical and Electro-chemical Power Systems

Fuel Cells

- Devices that produce **electricity** from **chemical energy**

- like batteries there is a **POSITIVE POLE** and a **NEGATIVE POLE; potential difference** (electric voltage) is created by internal chemical reactions

- these reactions, called **oxidation-reduction reactions,** transform chemical energy directly into electrical power with no need of combustion

- no 100% efficiency due to **heat loss**

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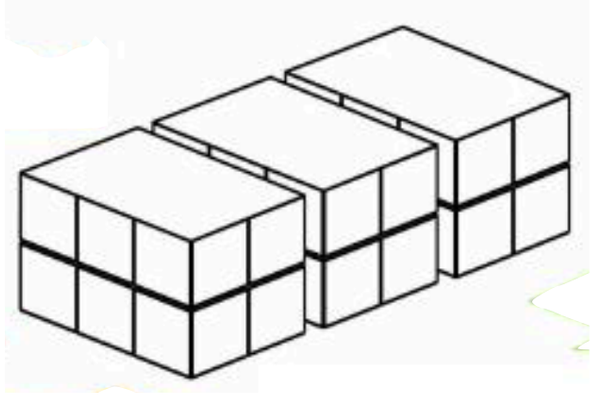
Cells and batteries: which are the differences?

- Reagents are contained inside the battery. When they run out, battery doesn’t work anymore

- System only exchanges **energy** with the environment



- Reagents are externally provided in a liquid or gas form

- System exchanges **energy** and **mass**

- Fuel cell needs to be constantly powered to operate

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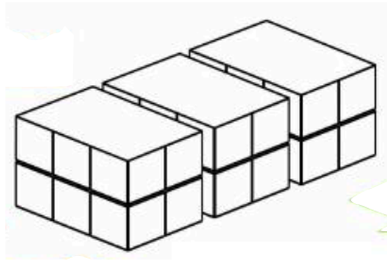
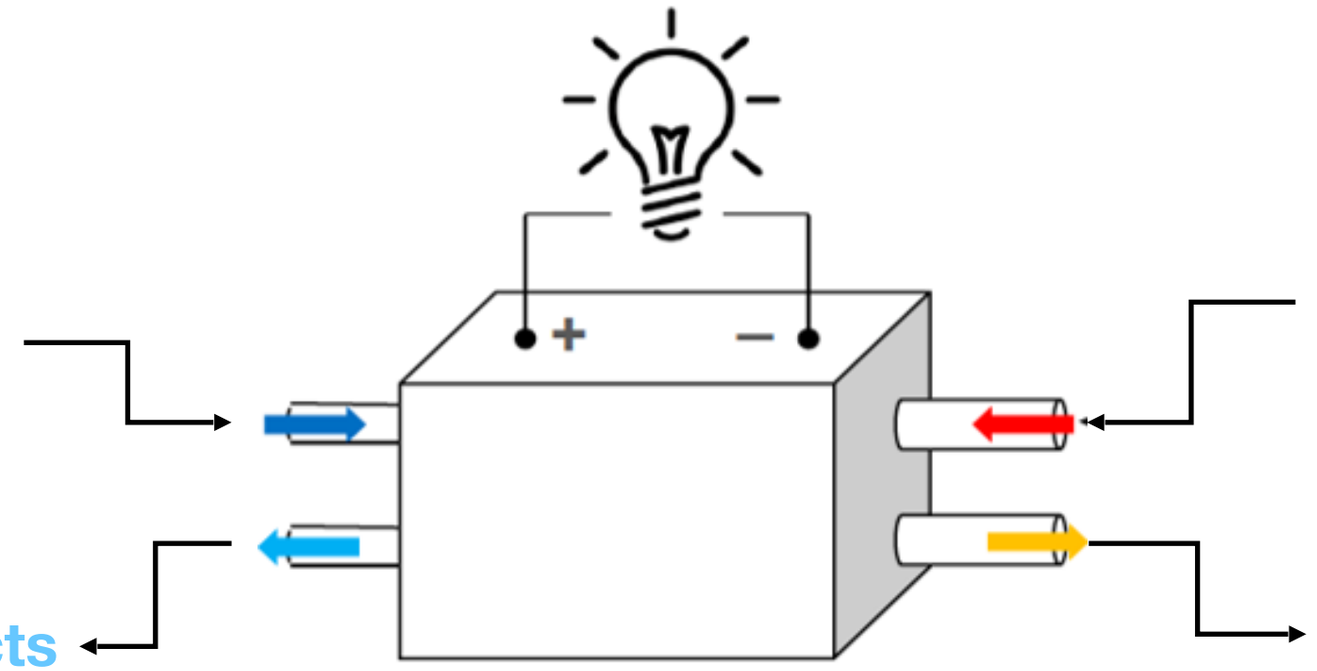
Cells' fuels



How does a fuel cell operate?

Oxydant
Oxygen
(ambient air)



«Fuel»
Hydrogen
Methane
Biogas
Synthesis gas
Hydrocarbons
Alcohols

Reaction products
(residual oxygen)

Reaction products
Water
Carbon dioxide

SOURCE: steps | Synergies of Thermo-chemical and Electro-chemical Power Systems

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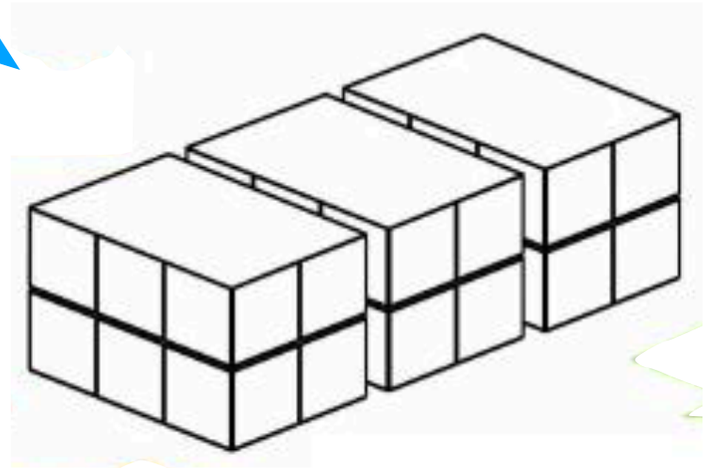
Summing up:

They are voltage sources, as well as batteries

To work they need:
- an oxidizing agent
- a fuel



There are different types of fuel

They transform chemical energy directly into electrical power (and thermal power) with no combustion

We should constantly fed cell from the outside

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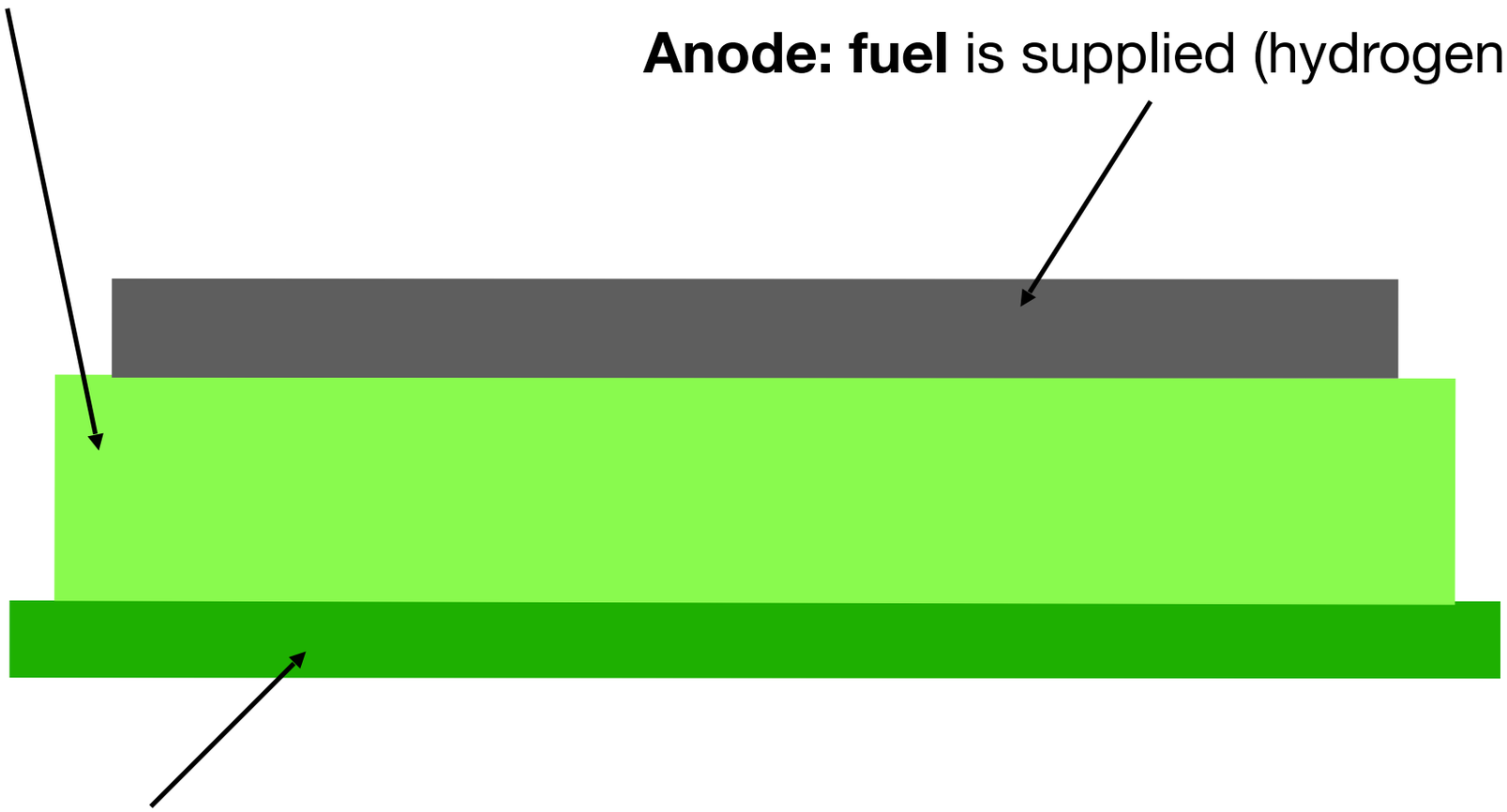
How do they work?

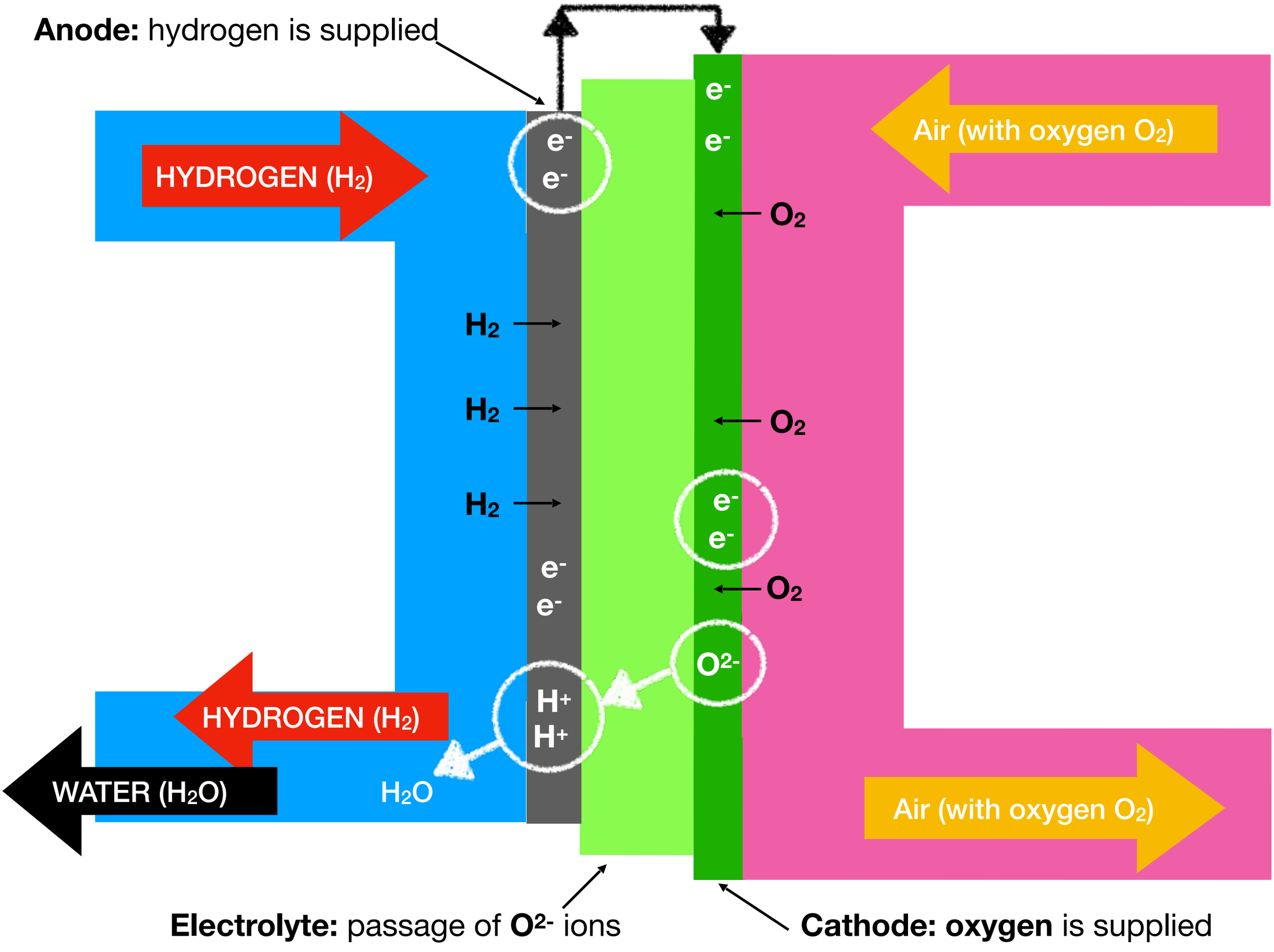
Electrolyte: it transports only oxygen ions, there's no passage of gas or electrons

Anode: fuel is supplied (hydrogen or biogas)



Cathode: oxygen in the air is supplied

Anode: hydrogen is supplied



Electrolyte: passage of O^{2-} ions

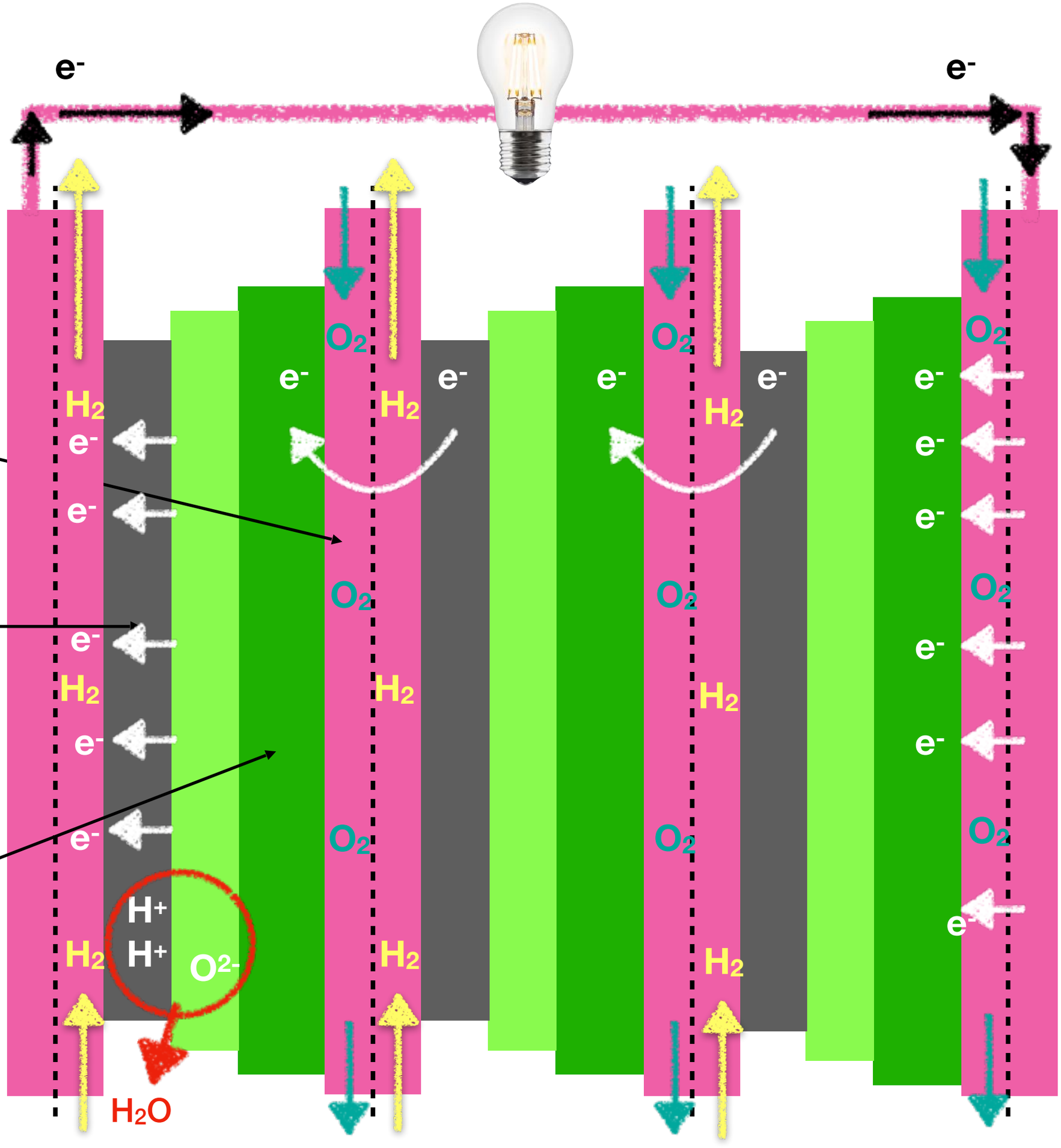
Cathode: oxygen is supplied

SOFC stack…

Separating plate: it separates two cells. It allows **electrons and gases (H_2 e O_2)** to pass and collects **water produced**

Anode: hydrogen is supplied

Cathode: oxygen is supplied



Build up an Aluminium-Air battery

2030 AGENDA

SOURCE: www.globalgoals.org

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