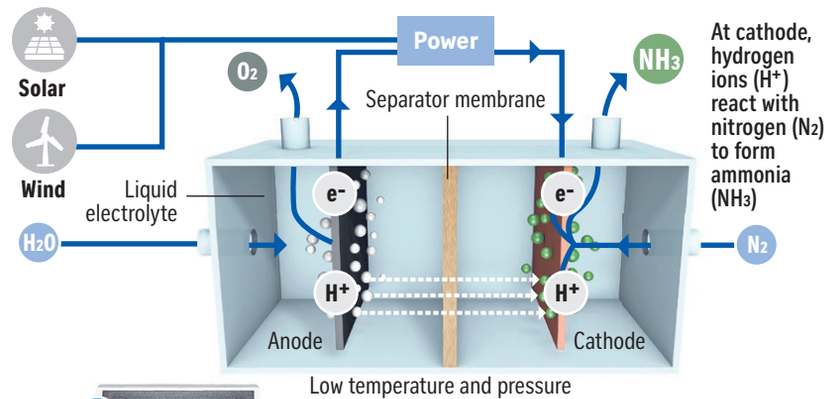
Capturing wind and solar energy

Two Australian mega projects aim to send solar and wind power captured in Australia to Singapore. One would use a giant undersea cable network and the other would ship ammonia, produced from green hydrogen, by sea.

Renewable energy
Low-cost clean energy 24/7, allowing the projects to run processing equipment day and night, maximising their usage.

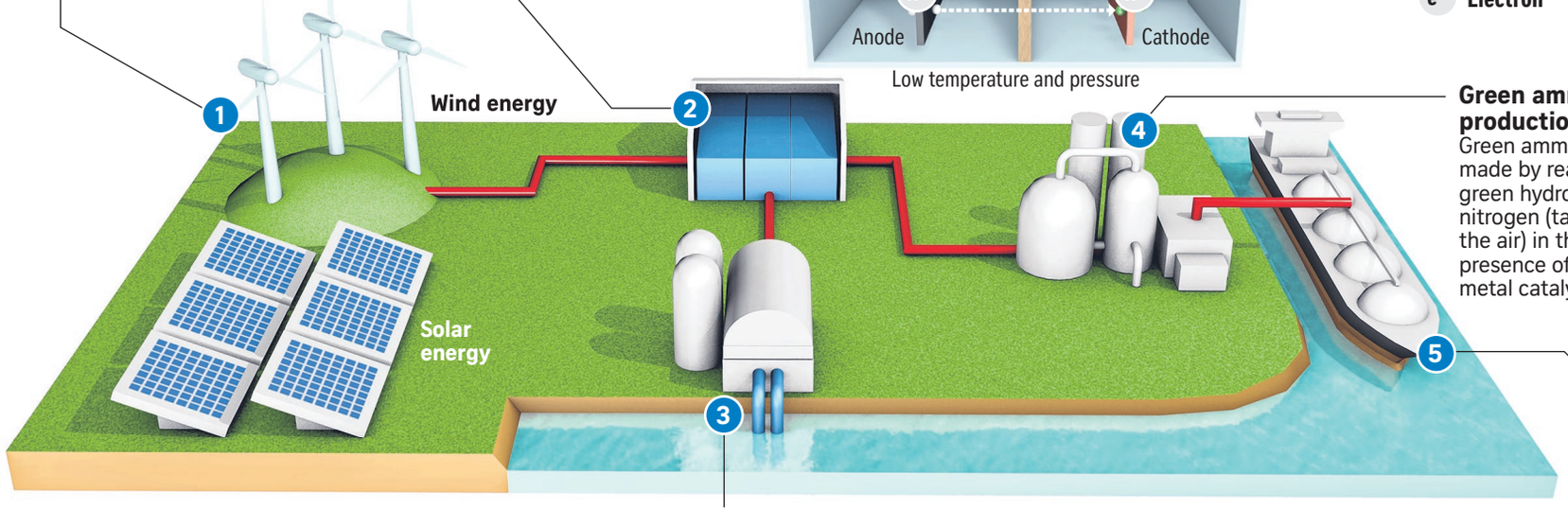
Electrolysis
Electrolysis works by mixing water with an electrolyte, running an electric current through the mixture, and capturing the separated hydrogen and oxygen at the cathode and anode, respectively.

HOW TO MAKE GREEN AMMONIA



At cathode, hydrogen ions (H^+) react with nitrogen (N_2) to form ammonia (NH_3)

- NH_3 Ammonia
- O_2 Oxygen
- H_2O Water
- N_2 Nitrogen
- H^+ Hydrogen ion
- e^- Electron



Green ammonia production
Green ammonia is made by reacting green hydrogen with nitrogen (taken from the air) in the presence of heat and metal catalysts.

Seawater desalination
- To extract hydrogen from seawater, it must first be desalinated.
- Reverse osmosis technology is used.
- It has low environmental impact.

Export to markets
Green ammonia is transported at negative 33 deg C. Location is coastal, so transport vessels can be easily filled at ports or via small footprint offshore loading towers.

The Australia-Asean Power Link

Total cost of project
US$16b
(S$21.7 billion)

Total area
12,000ha

10GW Total generation capacity

Length of high-voltage direct current (HVDC) cables to Singapore
3,800km

20% Amount of Singapore's electricity supply the project could meet

AREH

Cost of project, to be built in phases
US$36b

Area
6,500 sq km
(about 9 times the size of Singapore)

Total power generation capacity
26GW

Number of wind turbines
1,600

Area of solar panels
78 sq km

GREEN AMMONIA

- Plans are to use it as a fuel in ships, locomotives and power stations.
- Key ingredient to make fertilisers.
- Hydrogen stored in the ammonia can also be extracted (dehydrogenation) to be used as a fuel for industry, transport (heavy vehicles such as trucks), heat and power generation.

Sources: ASIAN RENEWABLE ENERGY HUB, SUN CABLE, INTERCONTINENTAL ENERGY STRAITS TIMES GRAPHICS: LEE HUP KHENG, LIM KAILI