

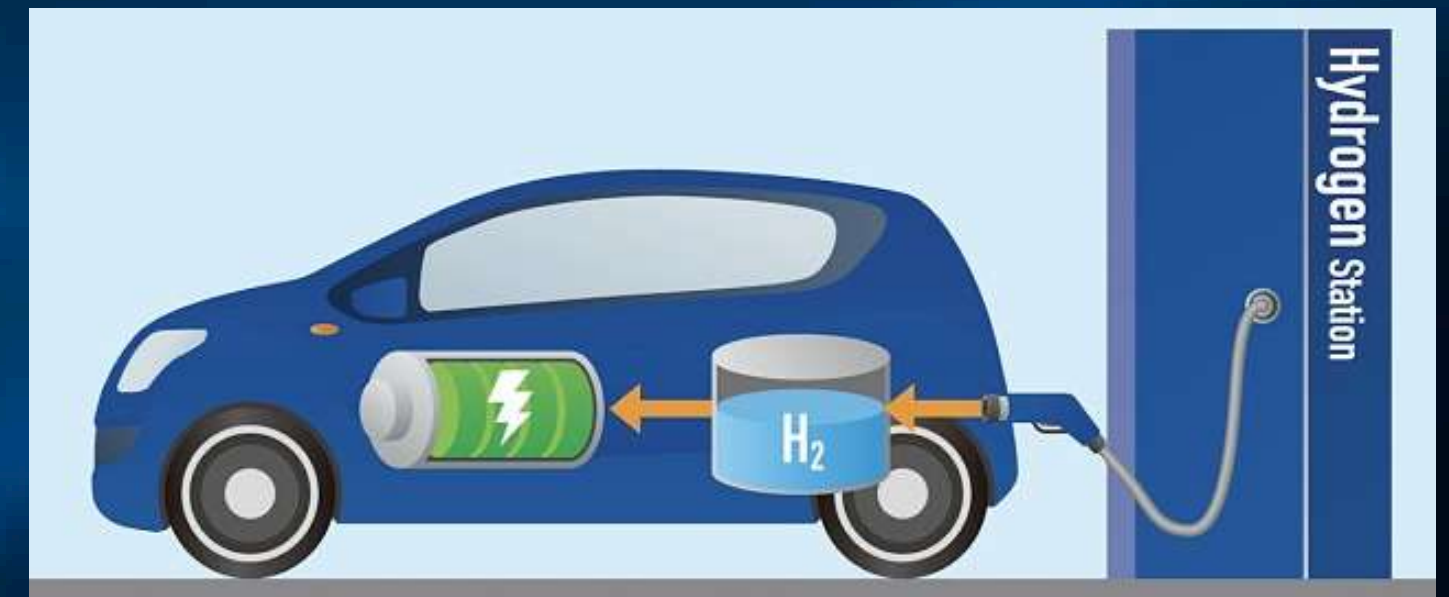
Water Splitting Sustainable Hydrogen Production Beyond Platinum

Hydrogen – The Fuel cell of the Future

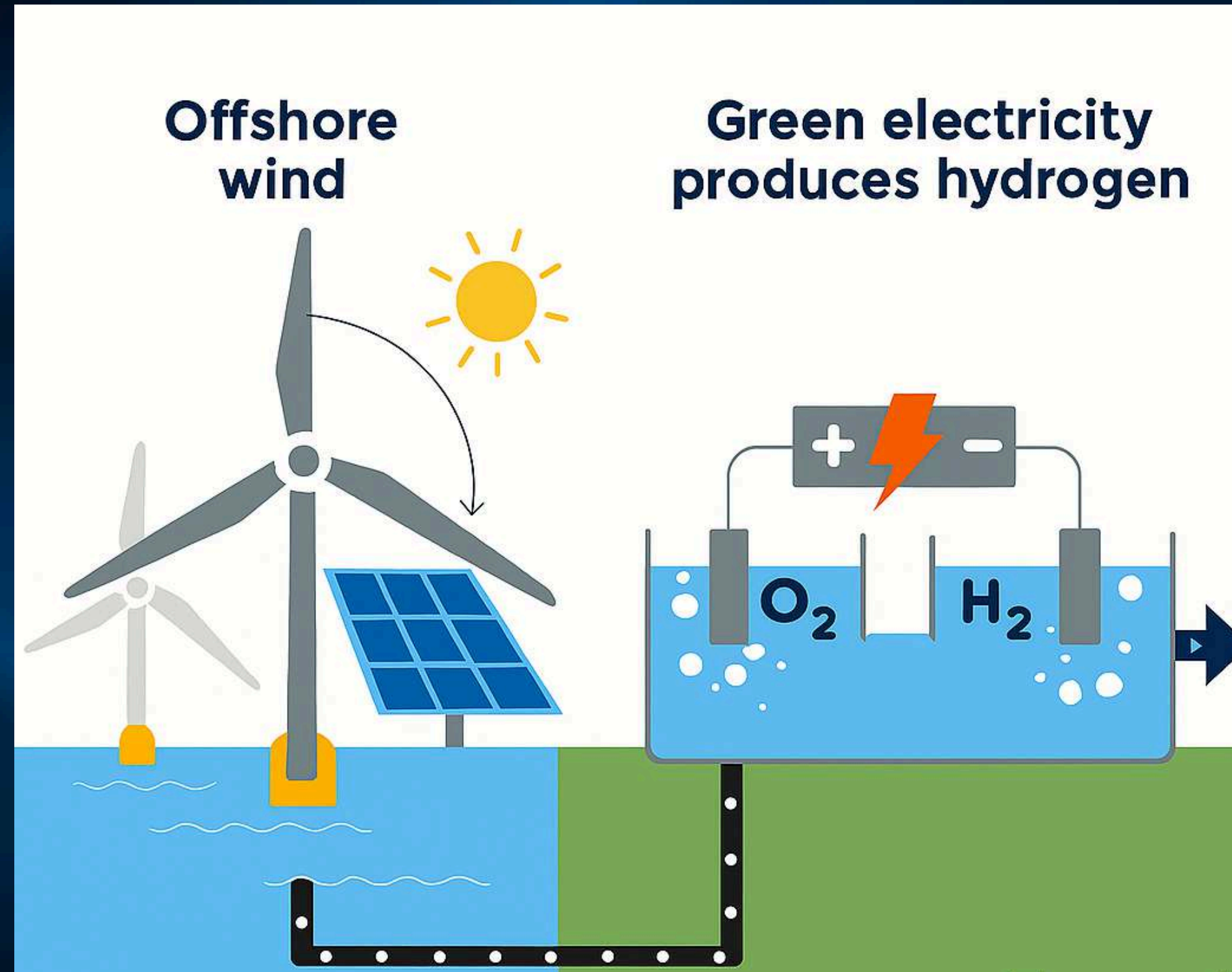
**Hydrogen powers life!
Leaves only water
behind**

**Clean energy
for everything.
No smoke.
Just water**

**Your city,
Your car,
Your world,
Powered by H₂**



Water Splitting using Electrolysis



Current Catalyst for Water Splitting (Platinum)

Benefits:

- High catalytic activity
- High Platinum's conductivity
- Chemical stability

With 1 gram of platinum catalyst (running for 24 hours):
You can produce ~1.8 kg of hydrogen
That hydrogen contains ~60 kWh of energy

What can that power?
A car for about 400 km
A typical house for 2 full days

Drawbacks:

- High cost, Pt's market price (~\$1 450/oz)
- Scarcity, tiny crustal abundance (~0.005 ppm)

1 gram of platinum costs
 $1450 \text{ USD} / 28.35 \text{ g} = 51.15 \text{ USD/g}$

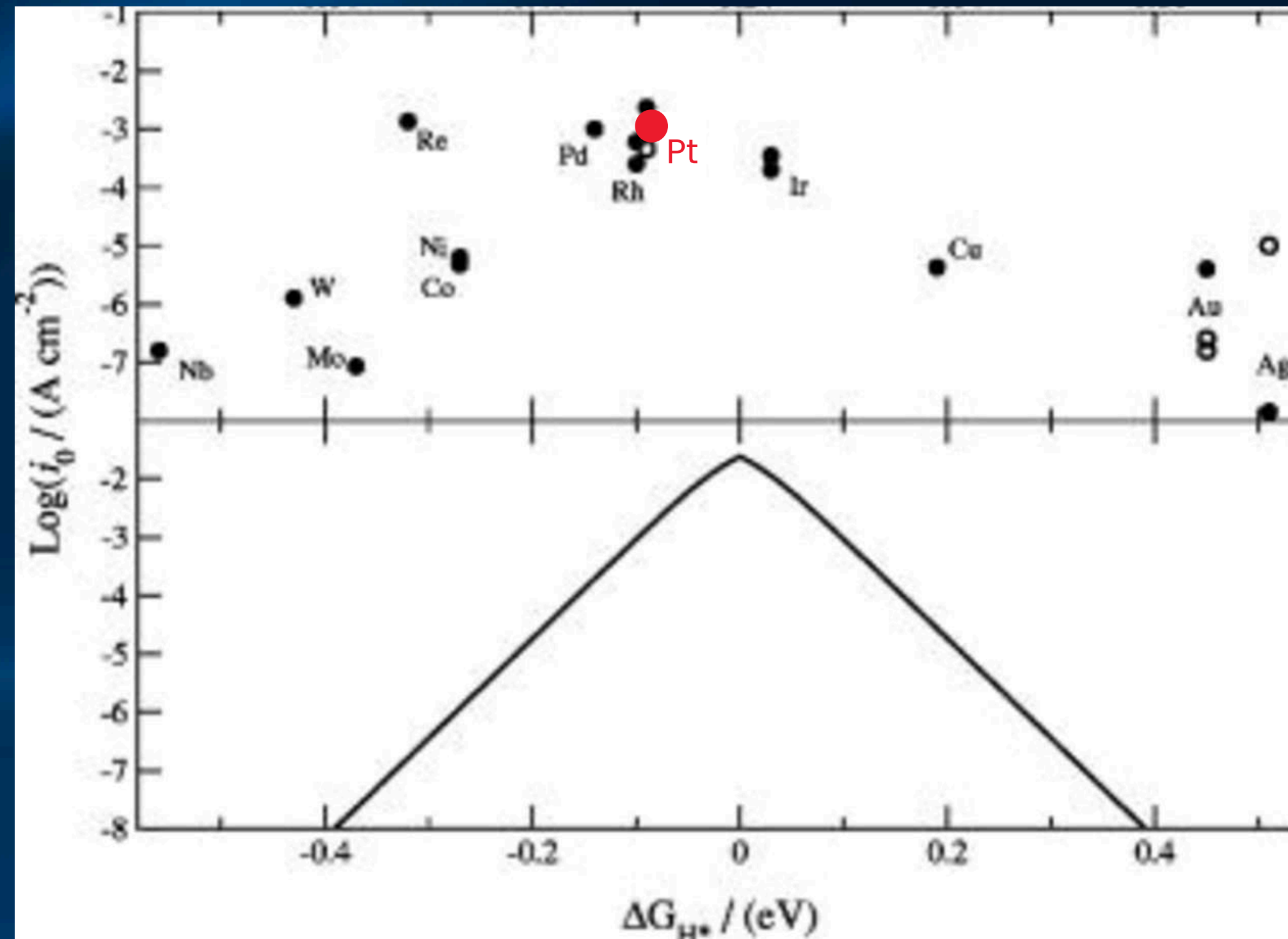
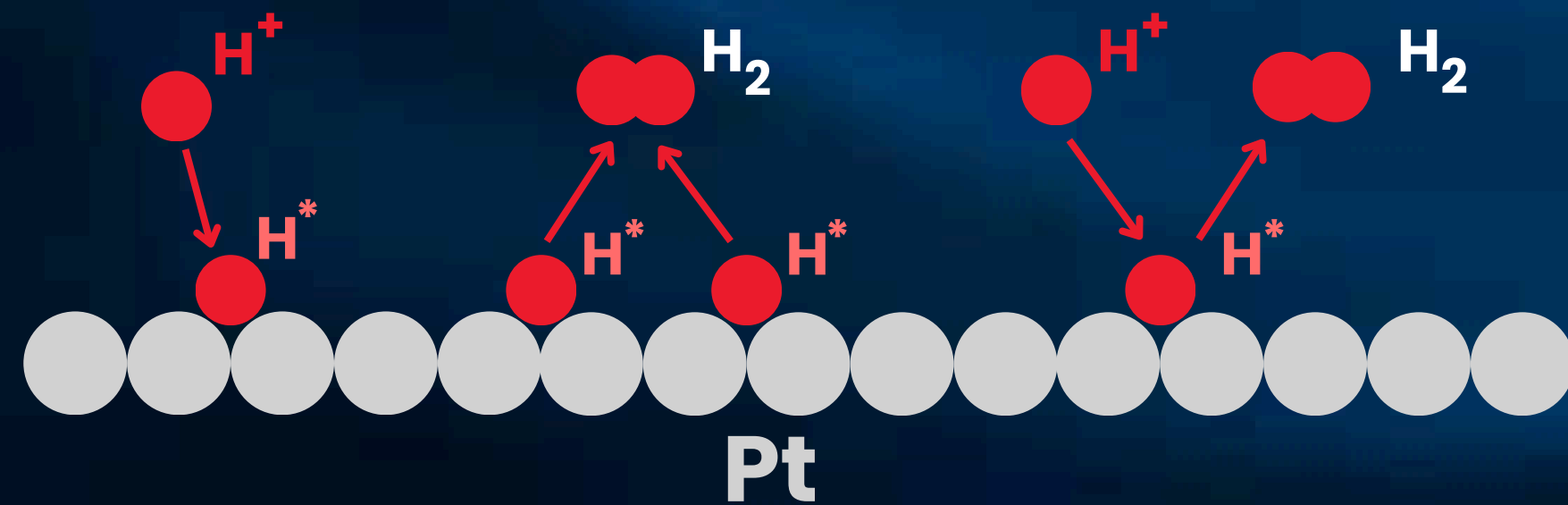


Learning from Platinum

$$\Delta G_{H^*} \sim 0$$

$$VQE \rightarrow \Delta G_{H^*}$$

initial screening



Proposed Framework



Time to Solution for 50 atoms:

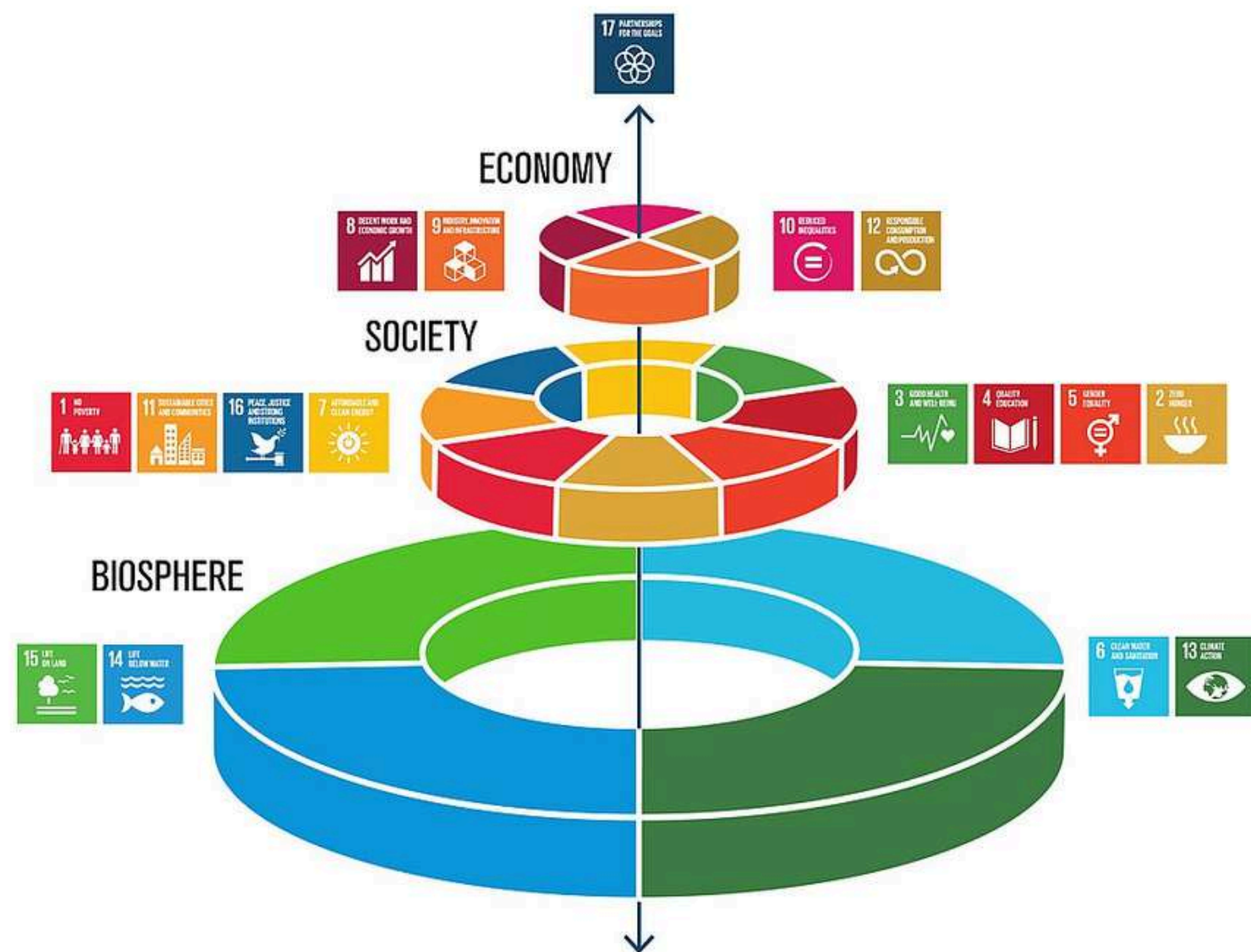
DFT: ~2 Weeks

VQE: ~3 Day

Quantum Resource Estimation:

~100 – 1000 Qubits

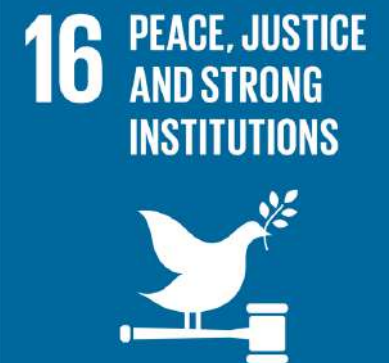
Sustainable Development Goals alignment



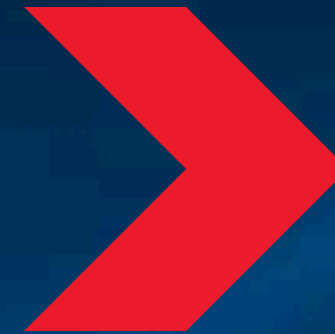
13.2.2
Total greenhouse gas emissions per year



16.1
Significantly reduce all forms of violence and related death rates everywhere



1.4
ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources



7.b
upgrade technology for supplying modern and sustainable energy



