

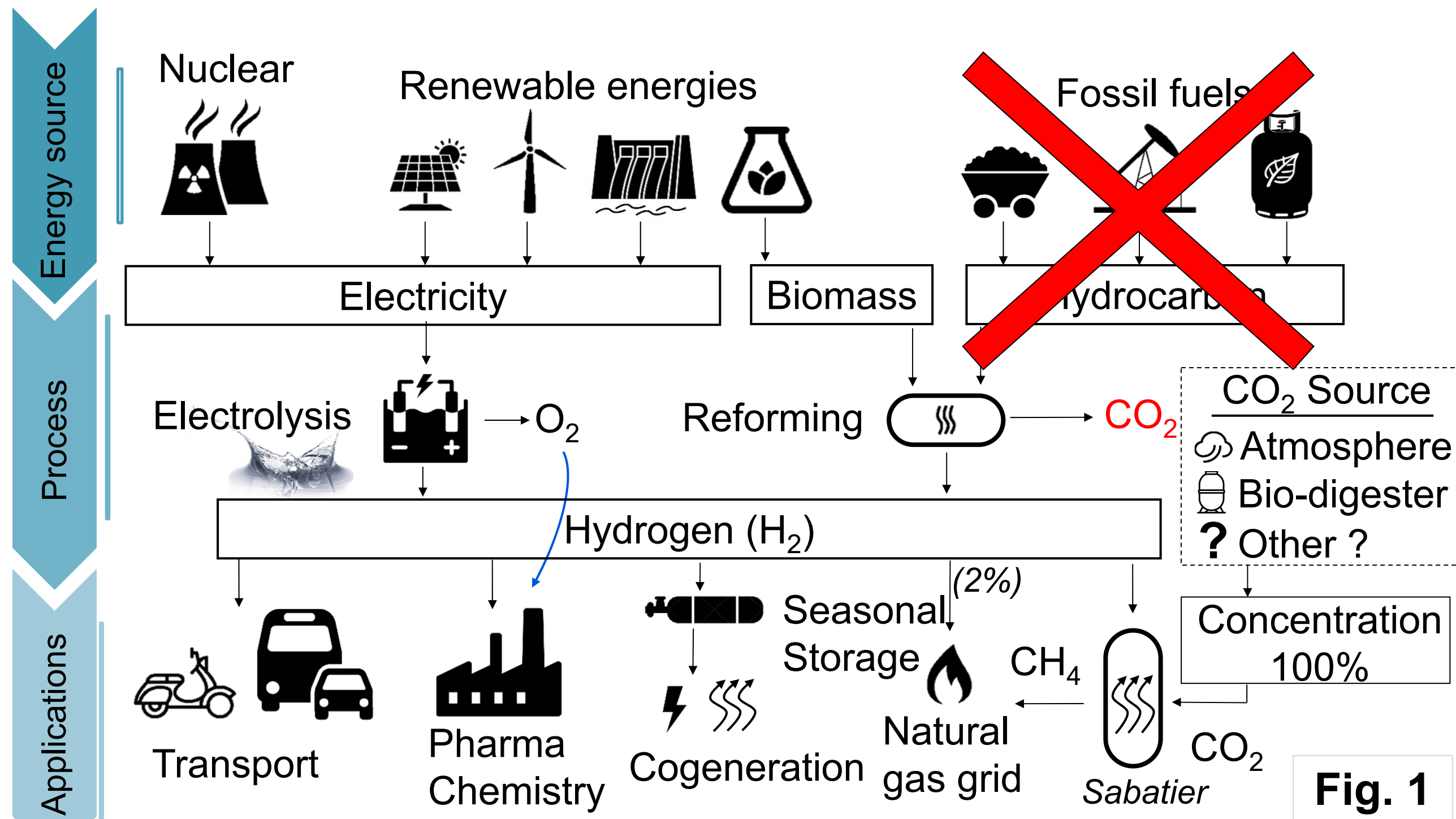
Utilisation of solar **hydrogen** for mobility

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GREEN HYDROGEN FOR CARBON NEUTRALITY



Hydrogen extraction process and different areas of use

Small scale mobility application :

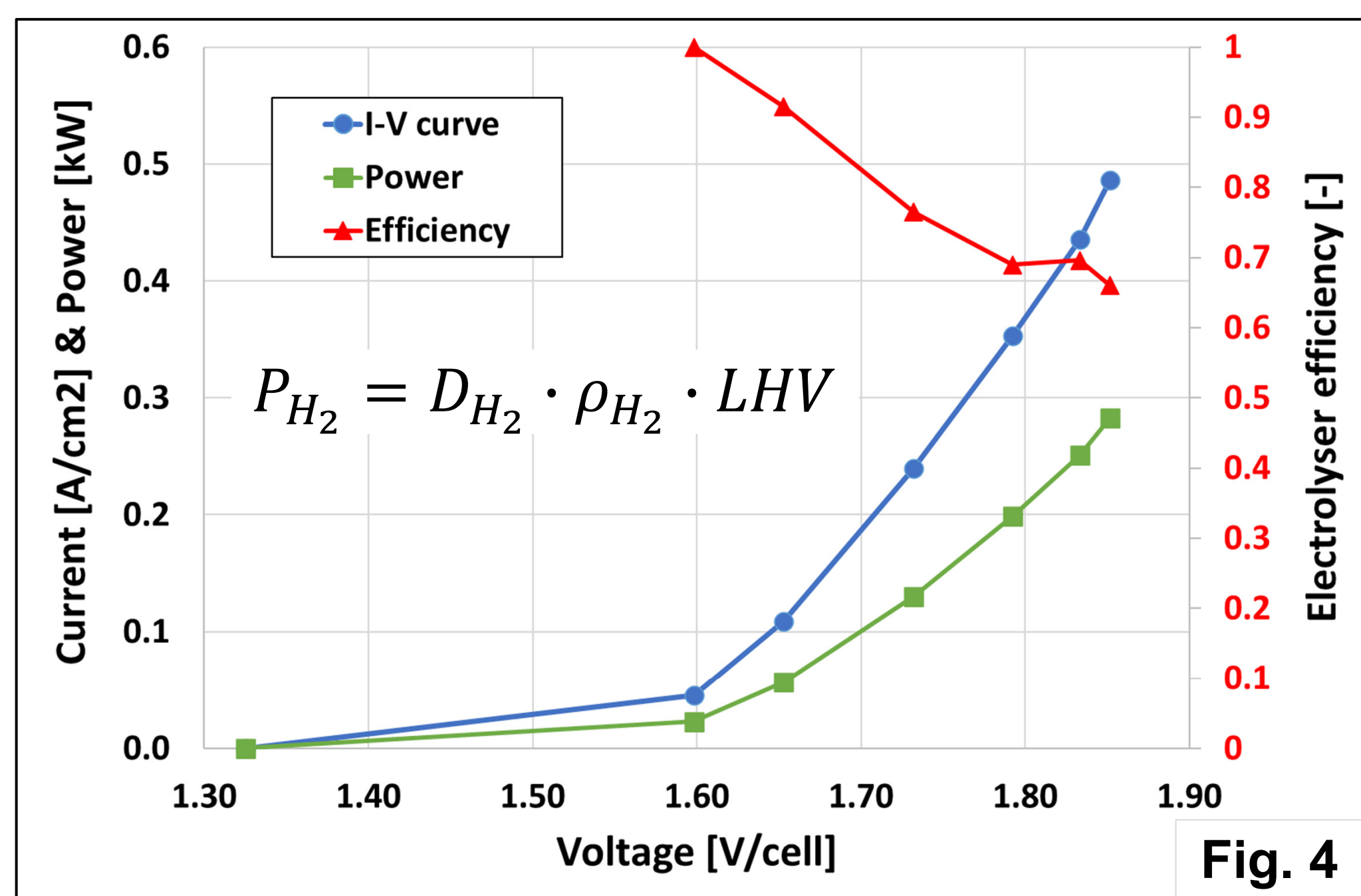
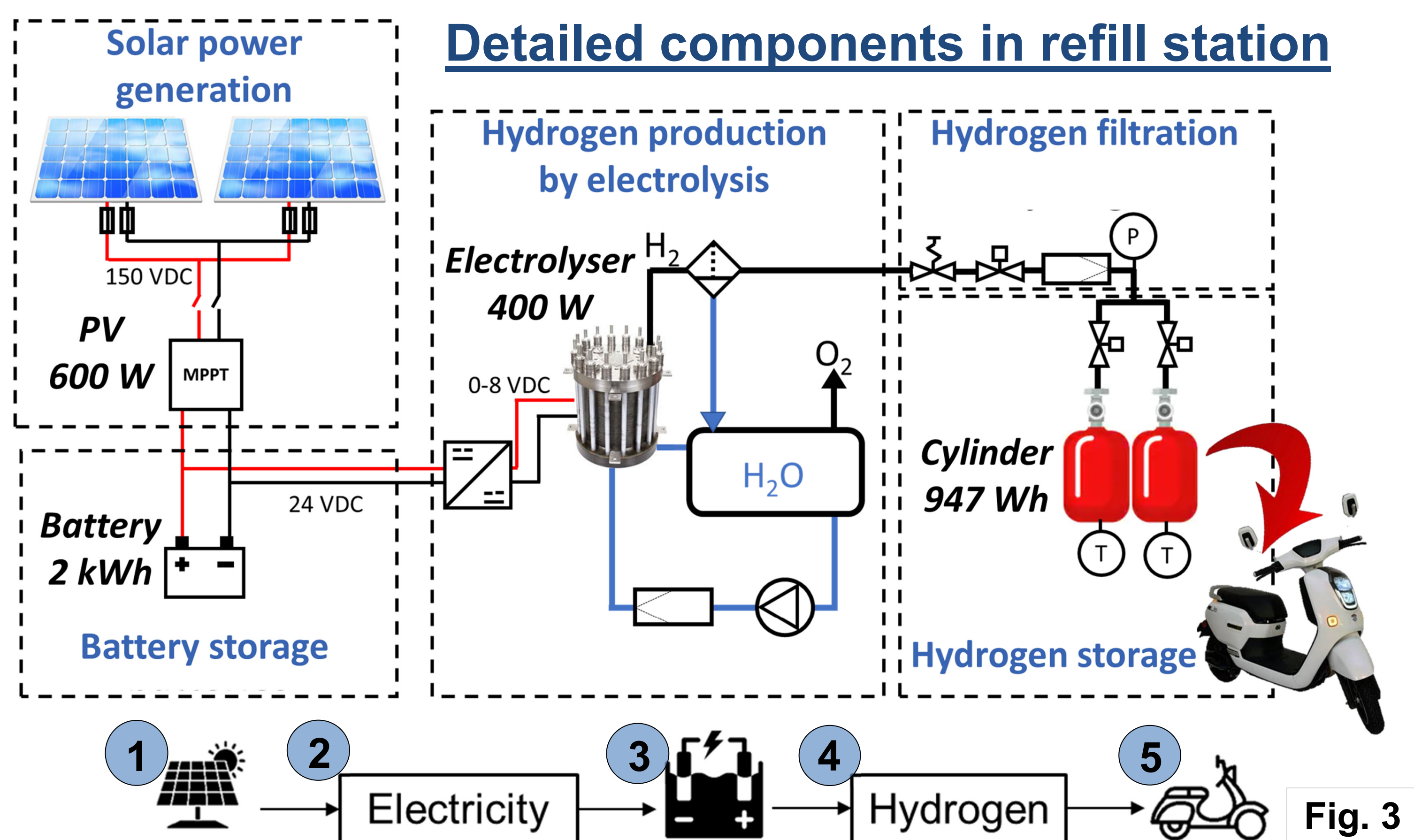
- **Green** hydrogen produced by PV power
- Store **green** hydrogen at low pressure (~10 bar) with metal hydrides
- Convert a gasoline vehicle (scooter) to run on **green** hydrogen



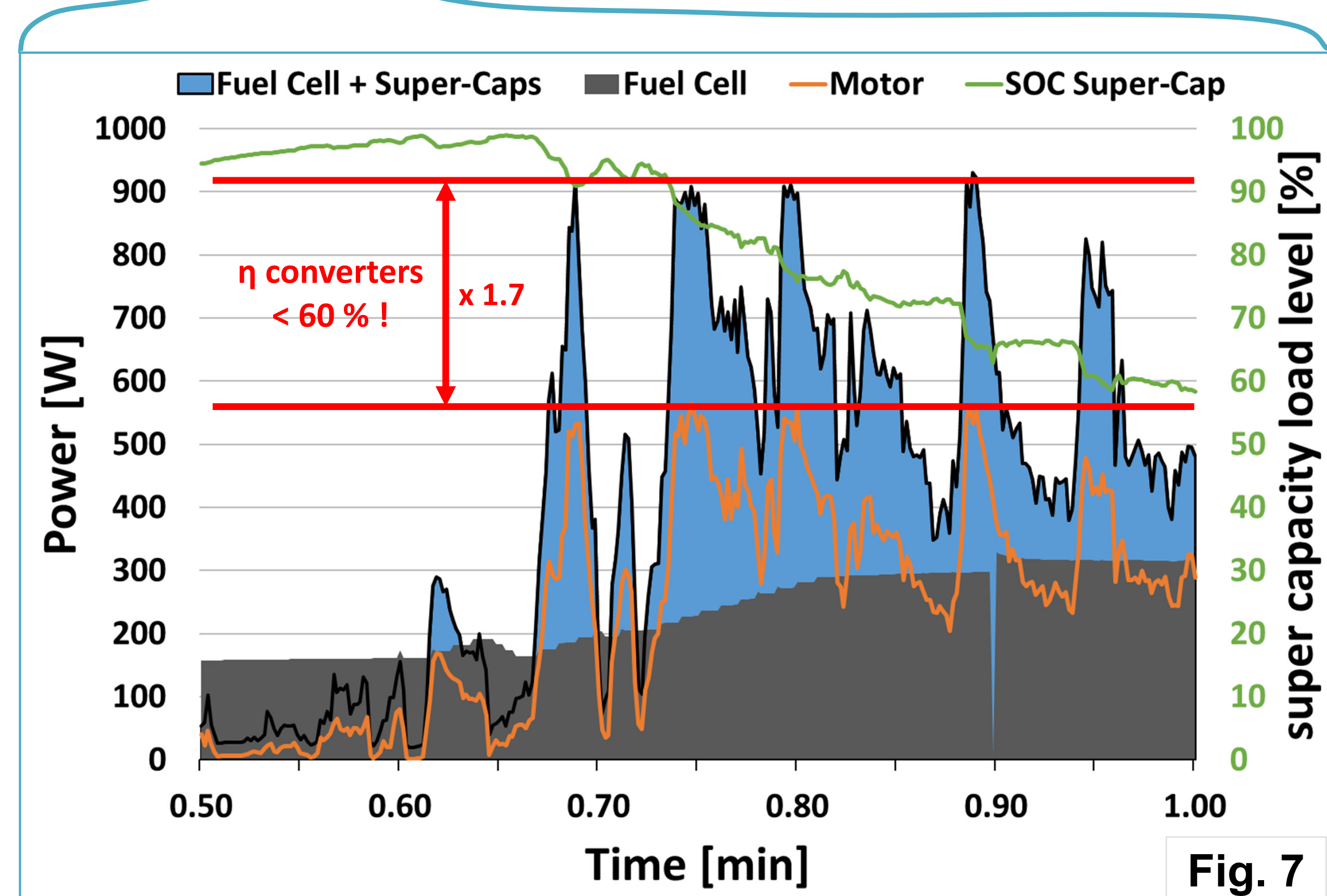
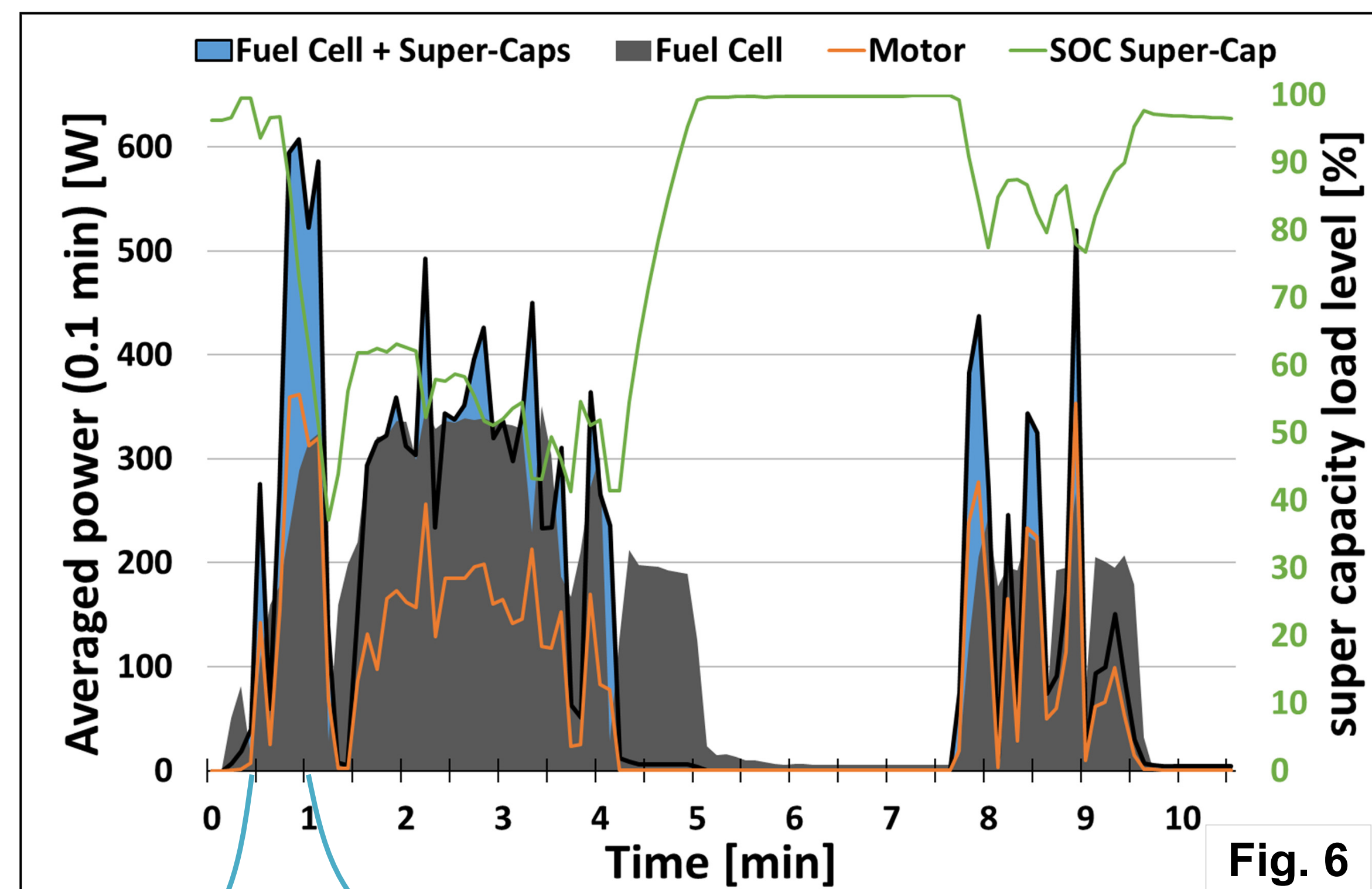
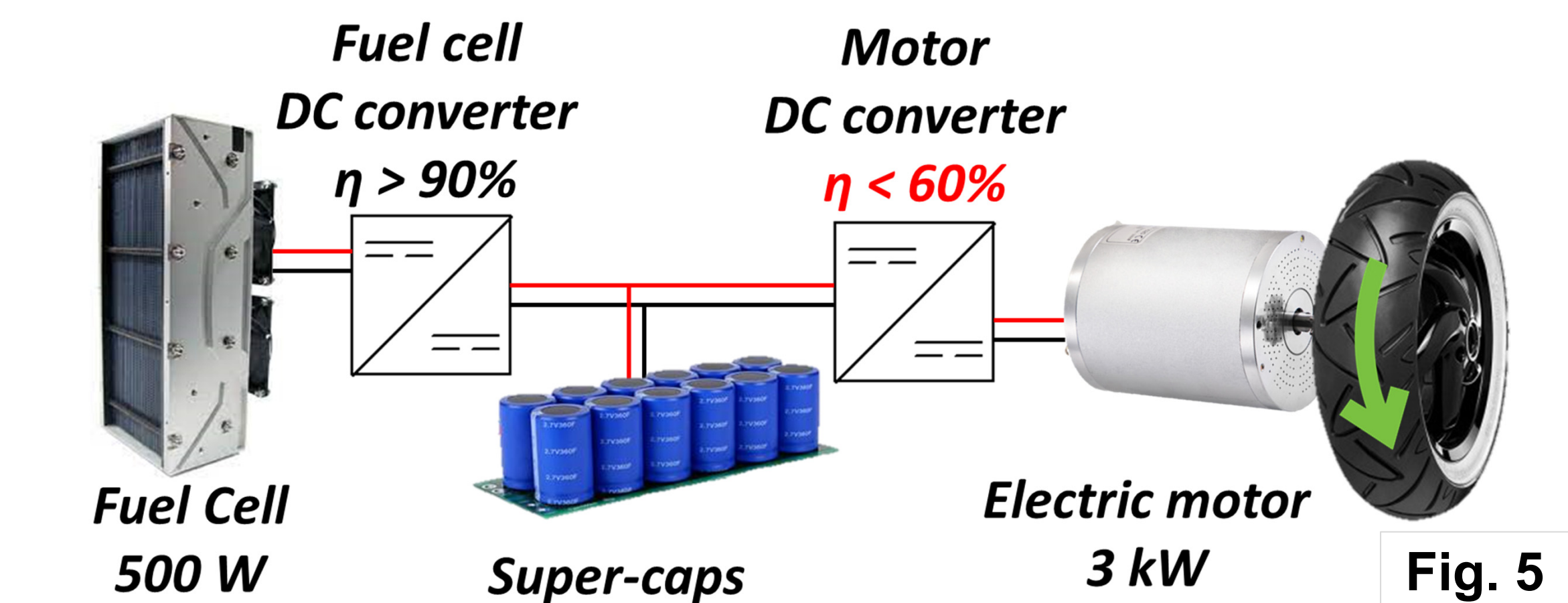
Fig. 2

Using **hydrogen** to transmit solar energy to the wheels of a converted scooter

H₂ FROM THE SUN TO WHEELS



Main components in the scooter



RESULTS

- H₂ refill time :
Estimated : 3h
Measured : 5h
 - Range with 2 bottles : 22 km
 - Max speed : 25 km/h
 - Cost : 15-20 kCHF
 - Time to exchange 2 cylinders in scooter : 5 min
- Measured efficiency :**
- | | |
|----------------------------------|----------|
| Electrolyser (refill station) | : 67 % |
| Fuel cell DC converter (scooter) | : > 90 % |
| Motor DC converter (scooter) | : < 60 % |

CONCLUSION

1. Real H₂ refill time is limited by the metal hydrides.
2. At present, motor converter is the weakest element of energy chain.
3. Averaged over 0.1 minutes, the fuel cell appears to be sufficient to power the engine. (figure 6)
4. Super-caps are essential to provide the power peaks. (figure 7)

PROSPECTIVE DEVELOPMENTS

1. Replace motor DC converter for better efficiency.
2. Use high-pressure storage to avoid dependence on limiting metal hydride flows.
3. Increase the power of the fuel cell (0.5 -> 3kW) to improve the speed and acceleration of the scooter.
4. More measure : power, range, T-behaviour.