

# MILFORD HAVEN: ENERGY KINGDOM

# THE FUTURE OF ENERGY

## IN PEMBROKESHIRE RIGHT NOW



Pembrokeshire is making the change to renewable energy.

MILFORD HAVEN:ENERGY KINGDOM shows how clean energy can be stored so it can be used for transport or heating.

The project demonstrates how

**HYDROGEN**

can be used to achieve this.

**H<sub>2</sub>**

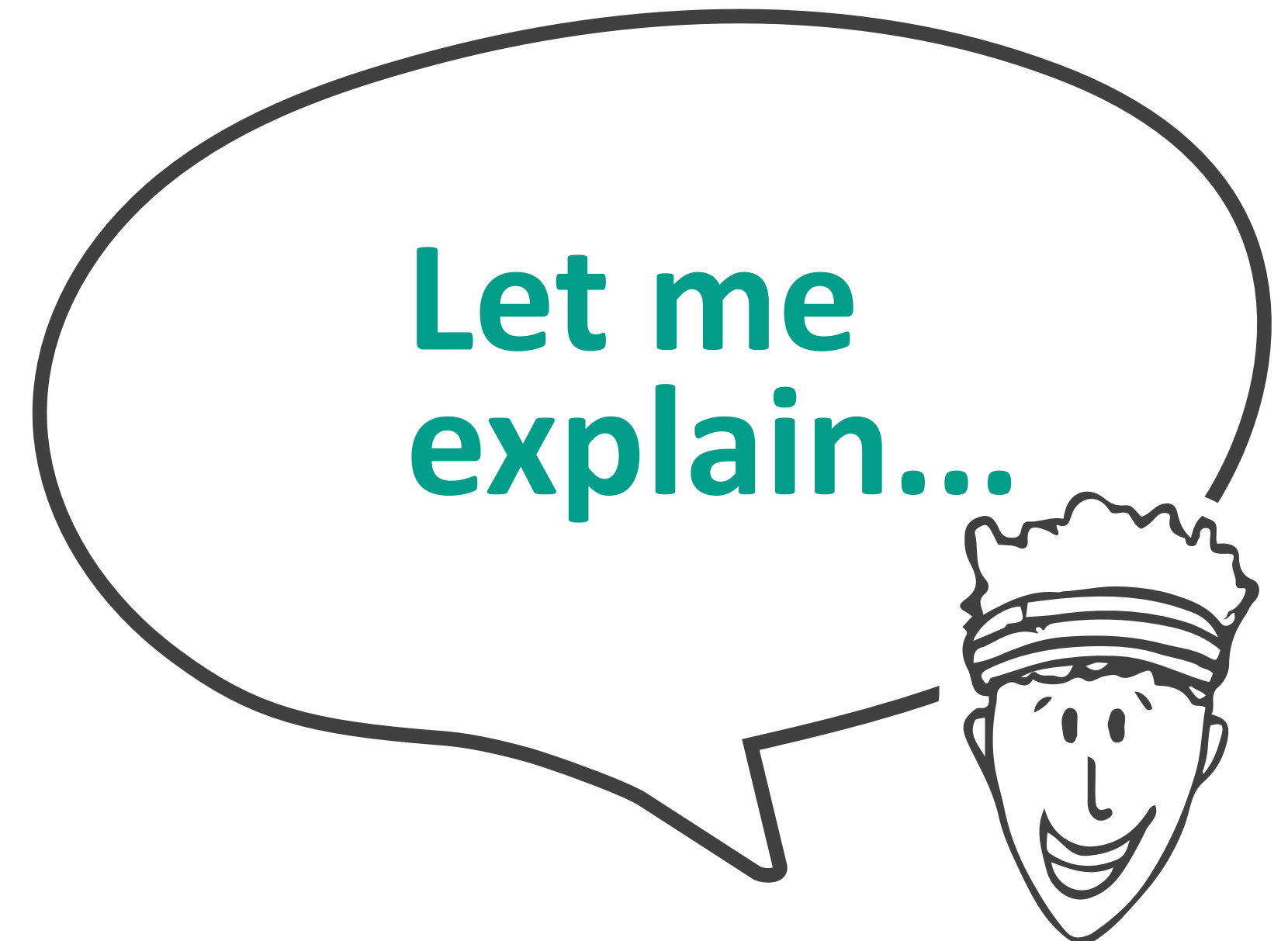
Let's talk about the transport part of the project...



Today I drove  
to school

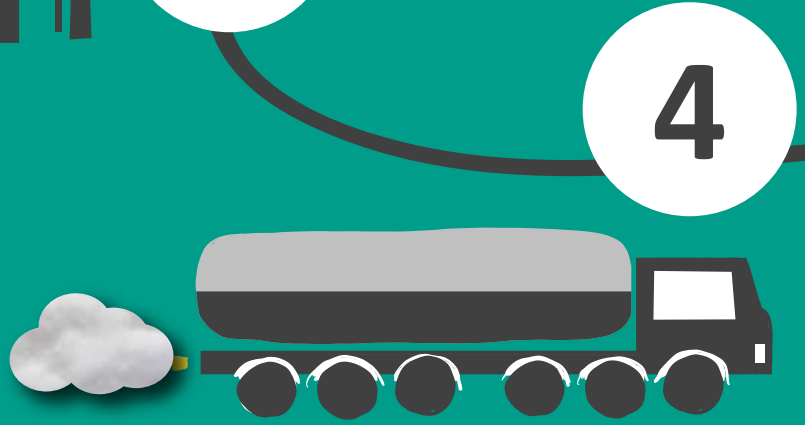
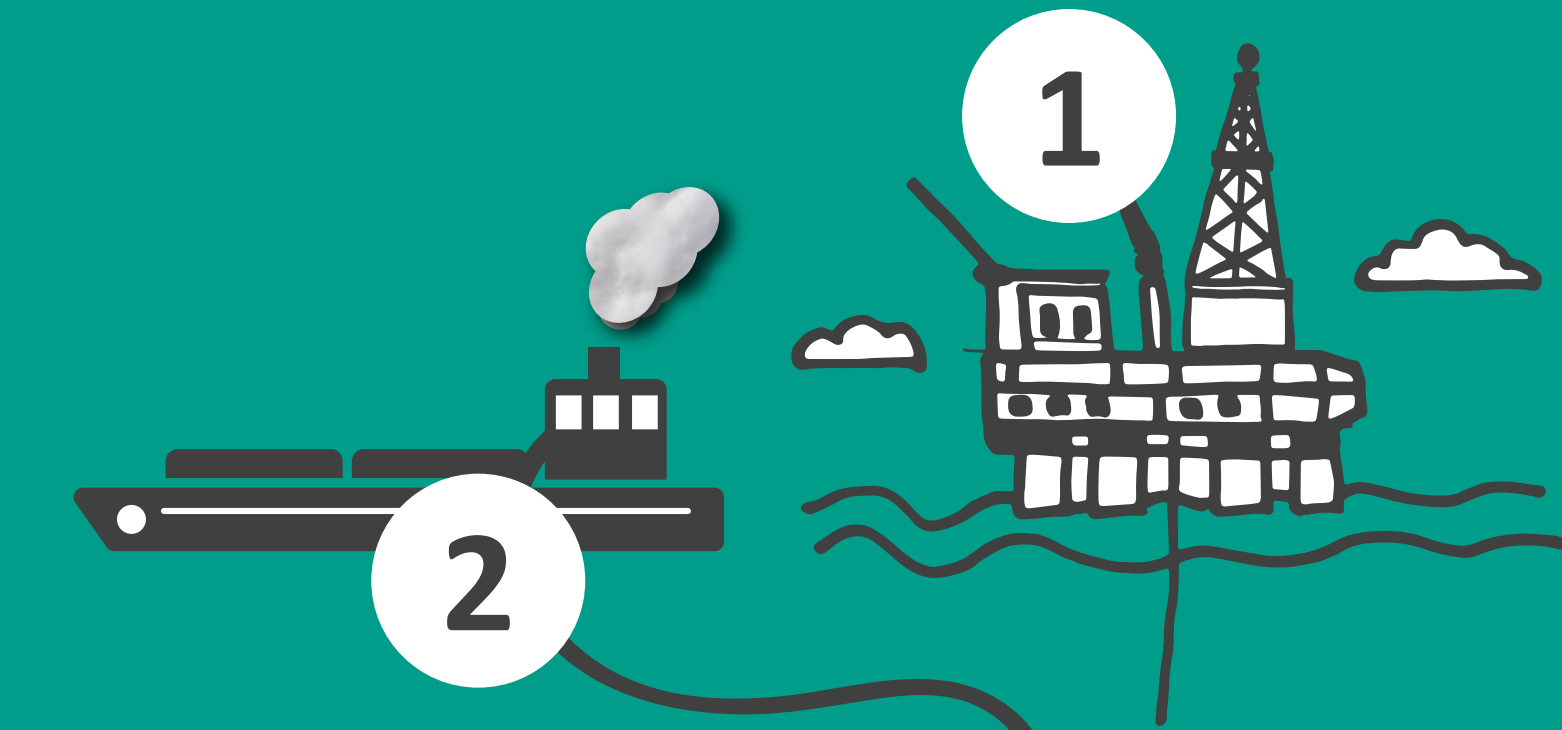


**But what did it take to  
make this happen?**





Most cars still use fossil fuels



Energy in Fuel  
(chemical energy)

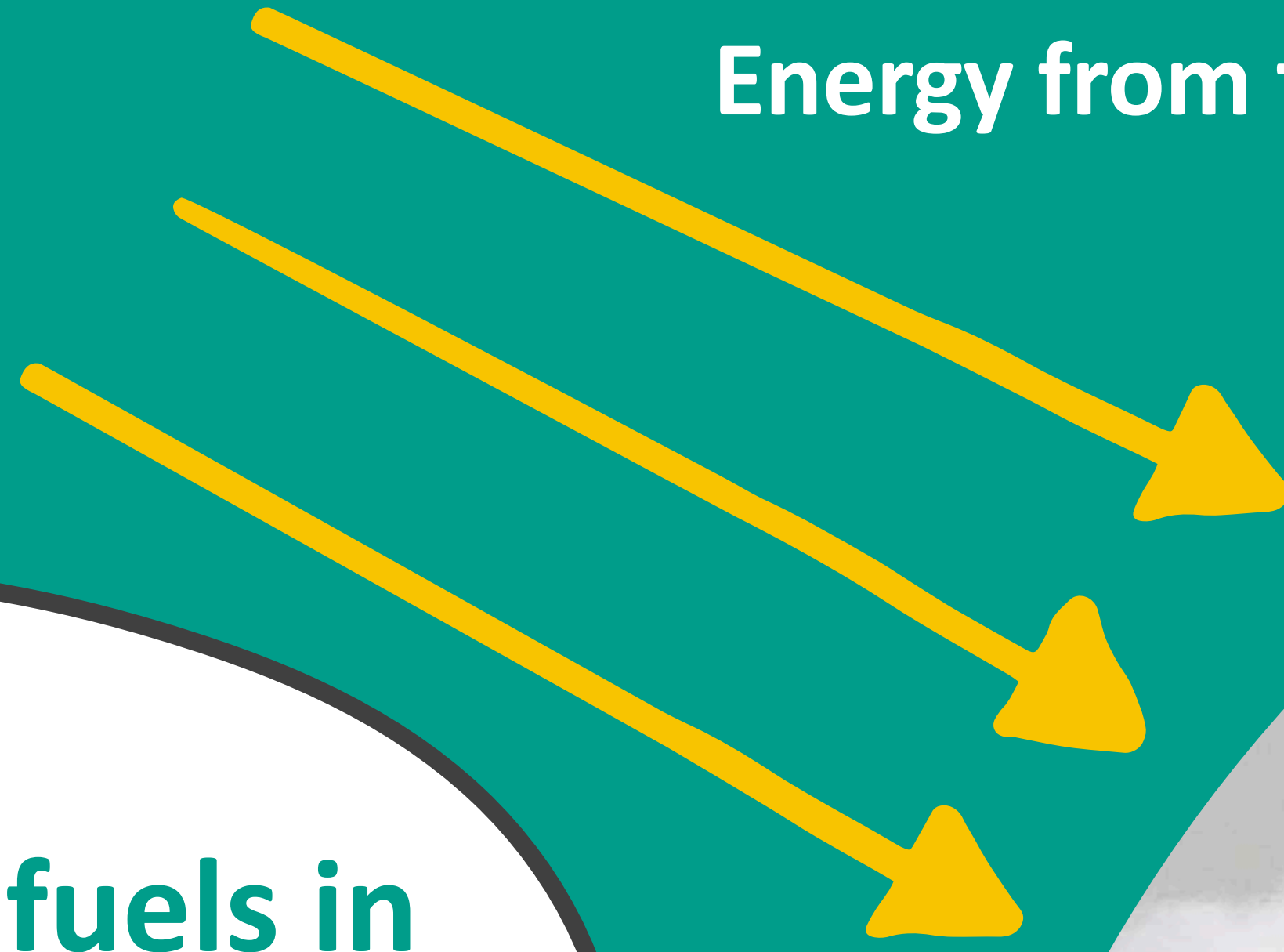
Going Forward  
(Kinetic energy)

**What's the problem  
with fossil fuels?**

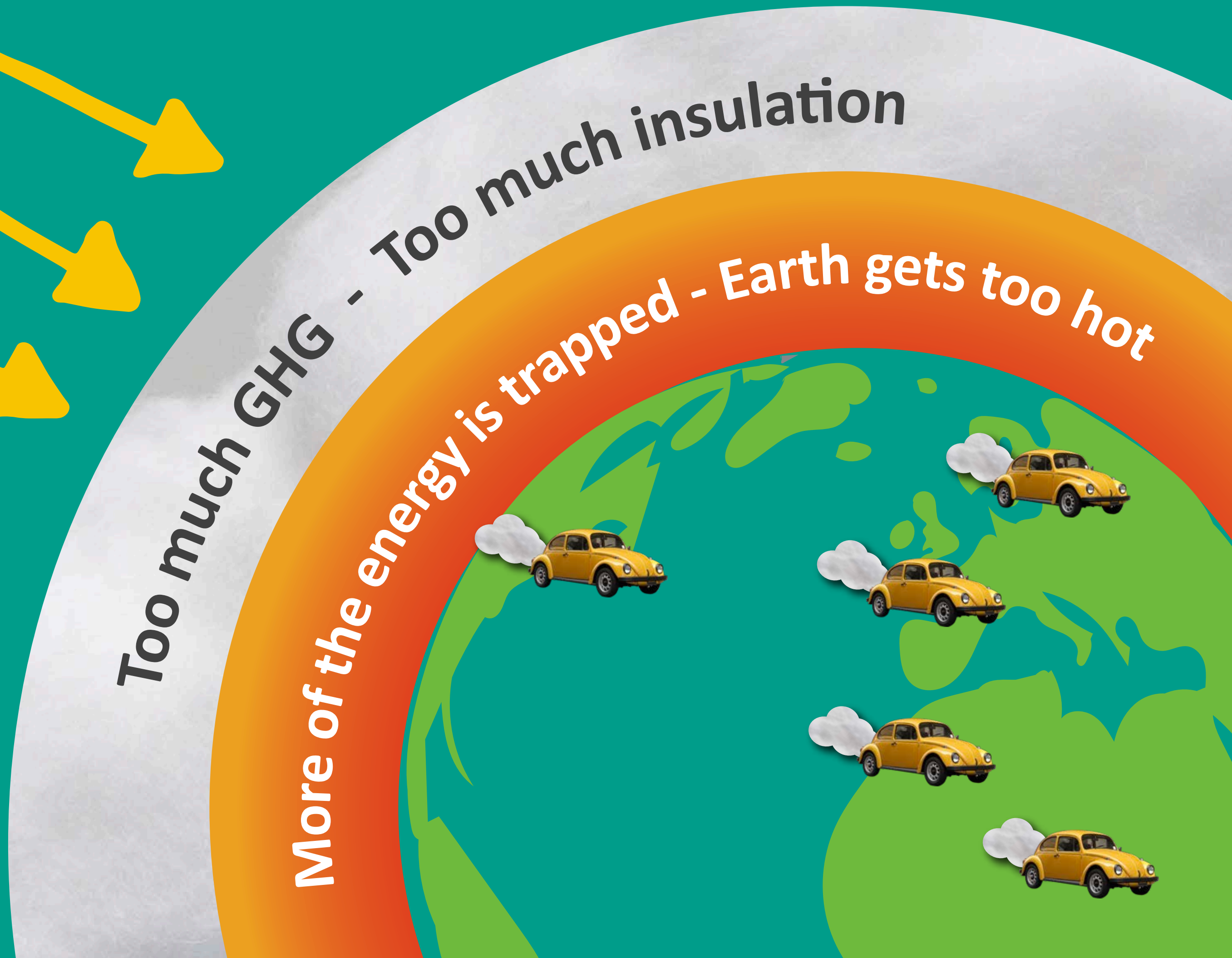




Energy from the sun



Using fossil fuels in cars creates greenhouse gases (GHG)



So, what can  
**WE** do?





Walk



Bike



Scoot



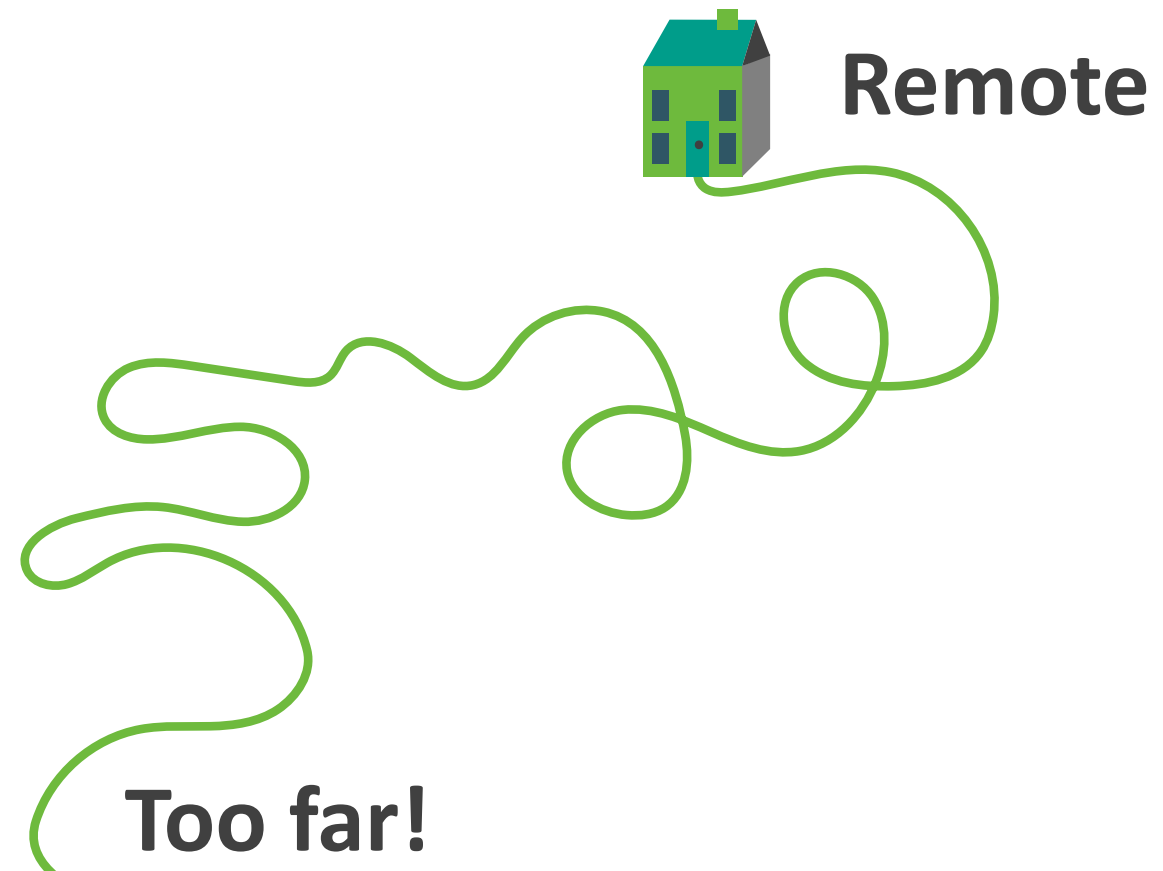
# ACTIVE TRAVEL PUBLIC TRANSPORT

Train

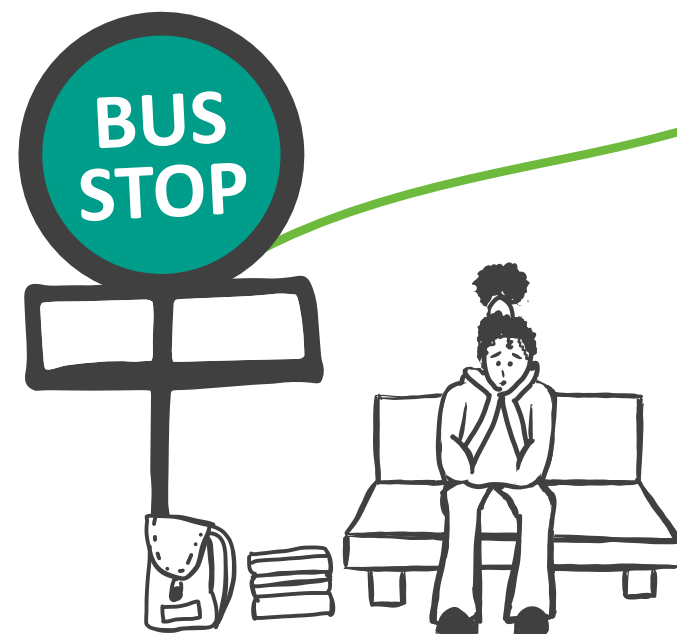
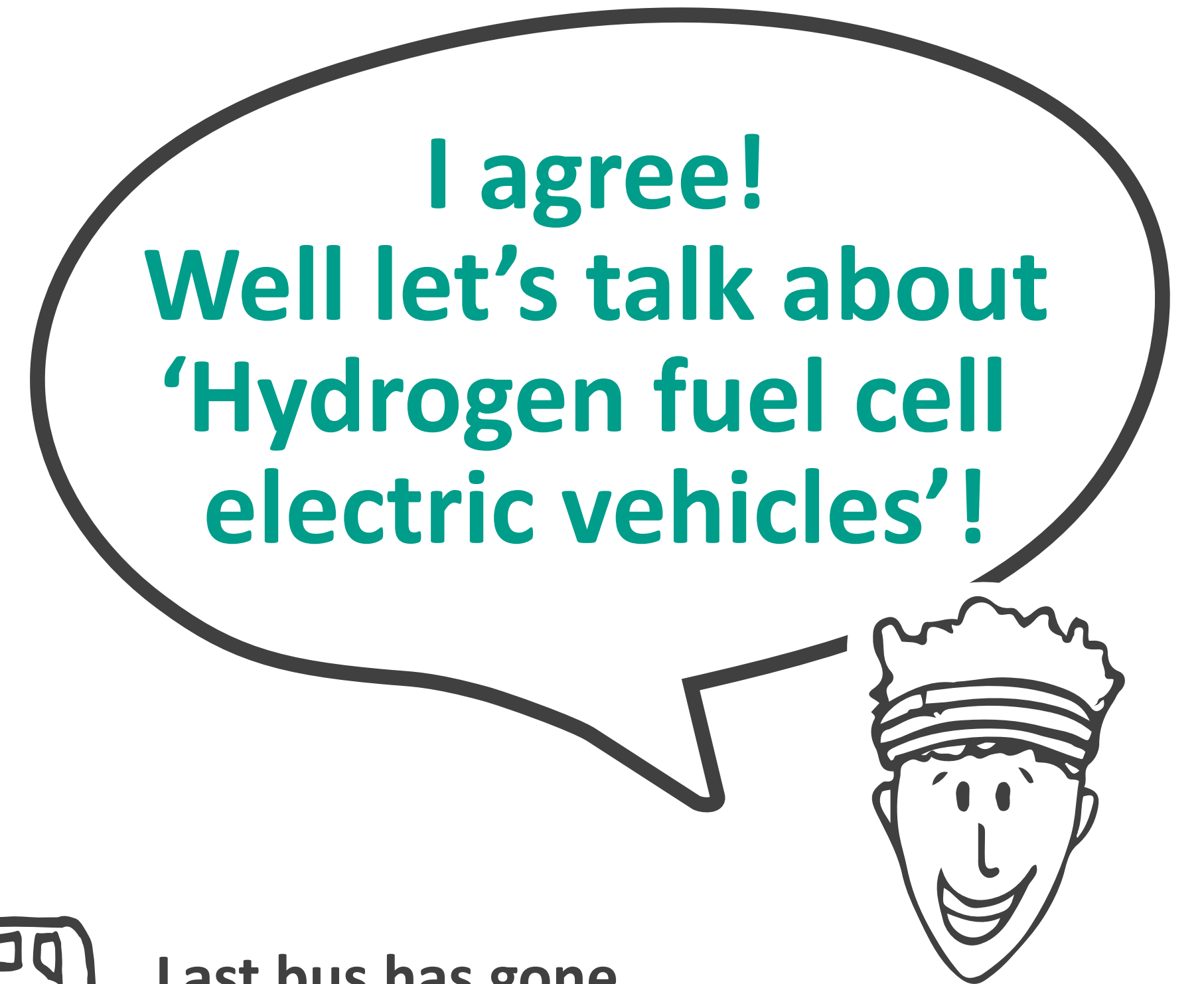


Bus



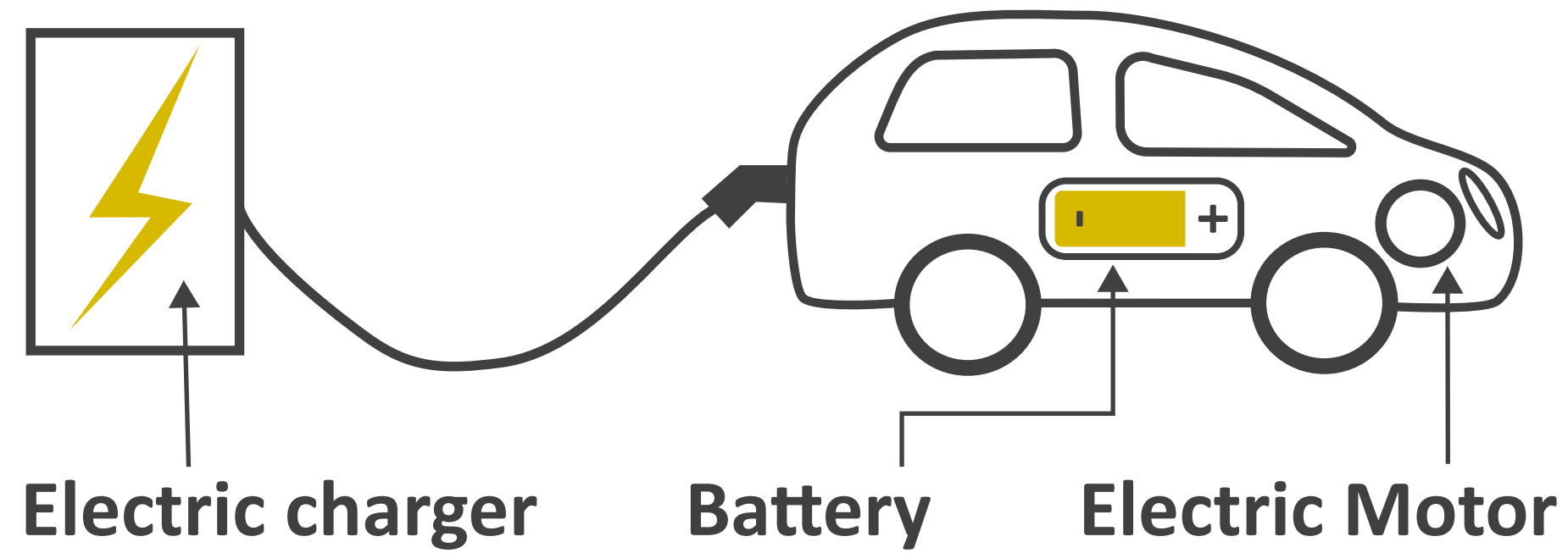


**But sometimes we NEED a car!**

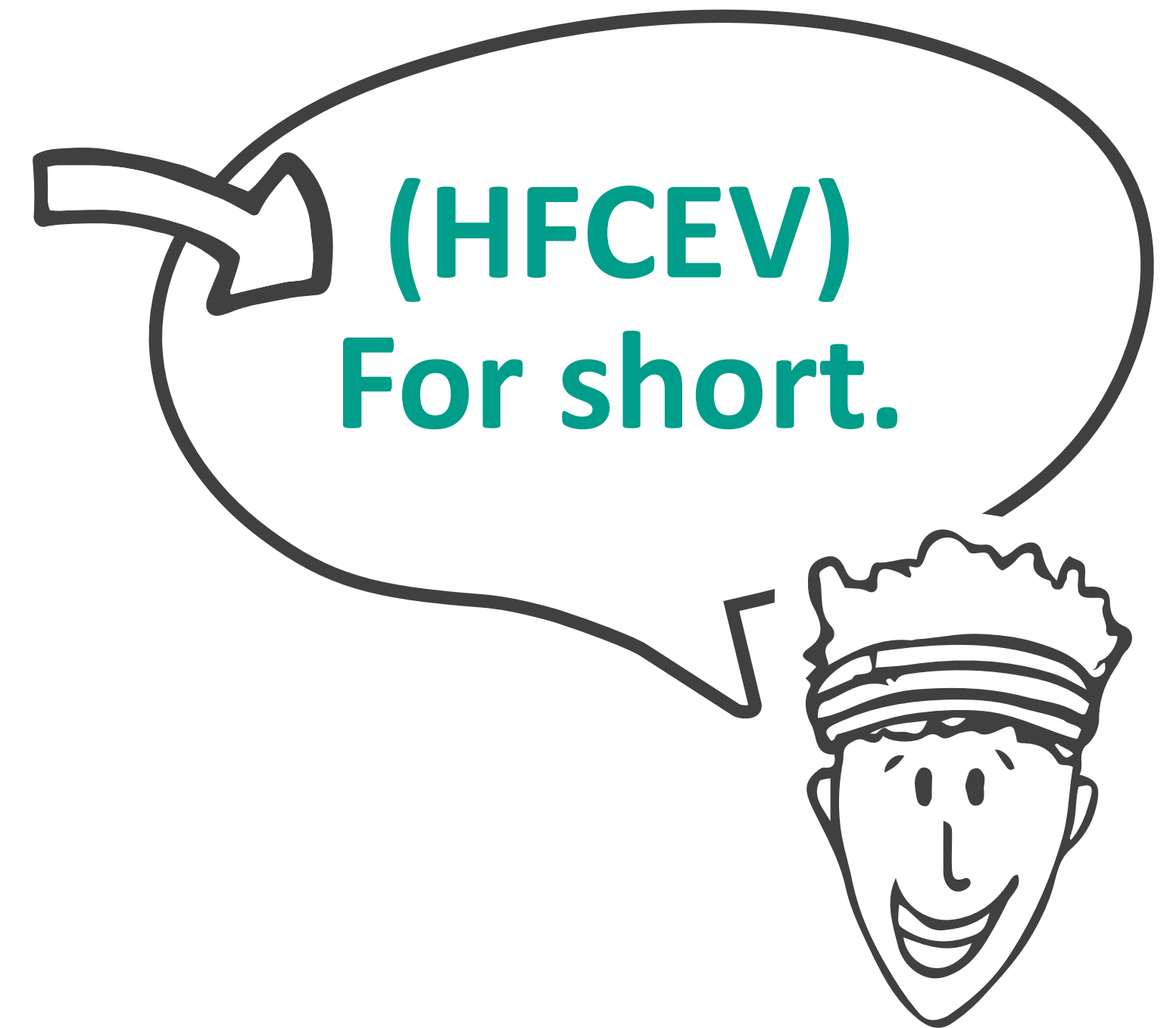
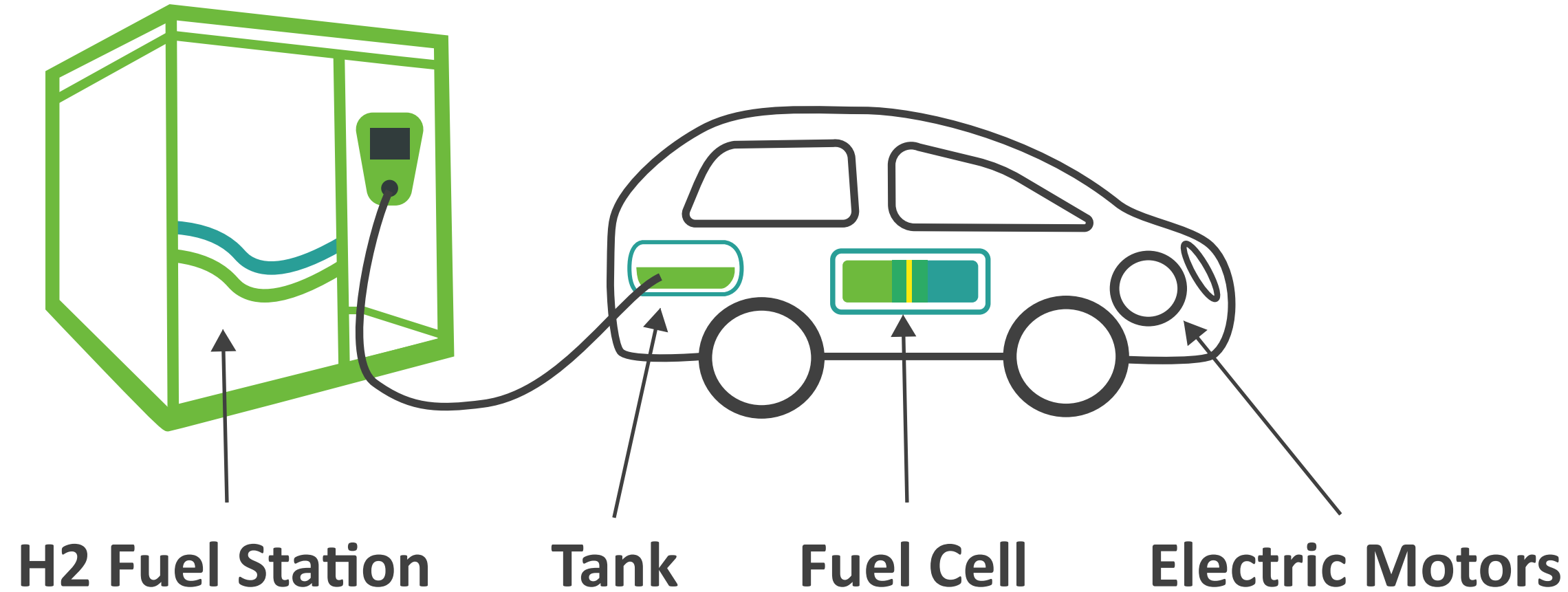


Last bus has gone

# Battery electric vehicles



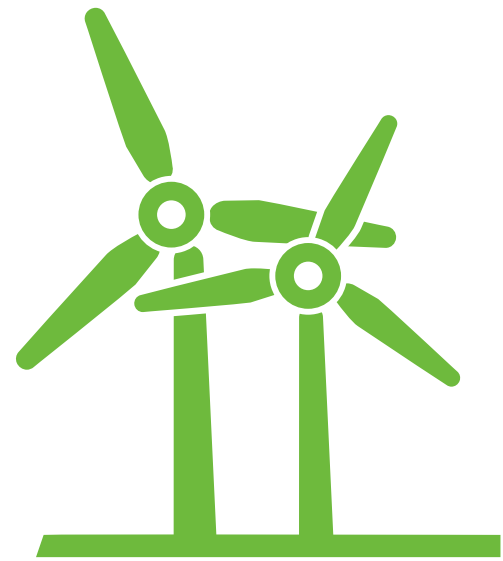
# Hydrogen fuel cell electric vehicles



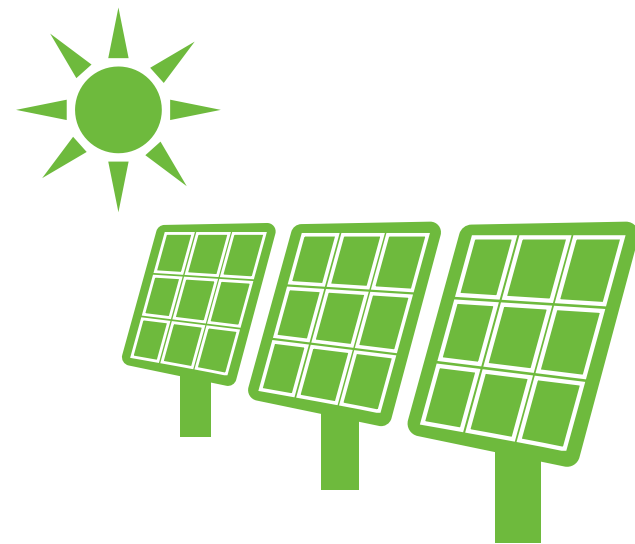
# How do HFCEVs work?

Clean Energy from renewables

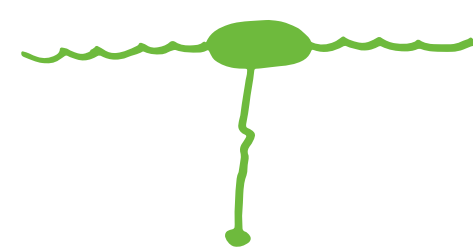
Wind



Solar



Marine

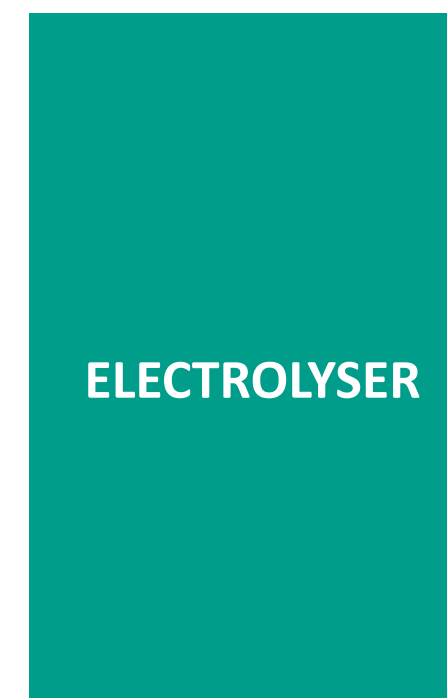


The electrolyser makes hydrogen. This can be stored until it is needed.

Renewable electricity



Water



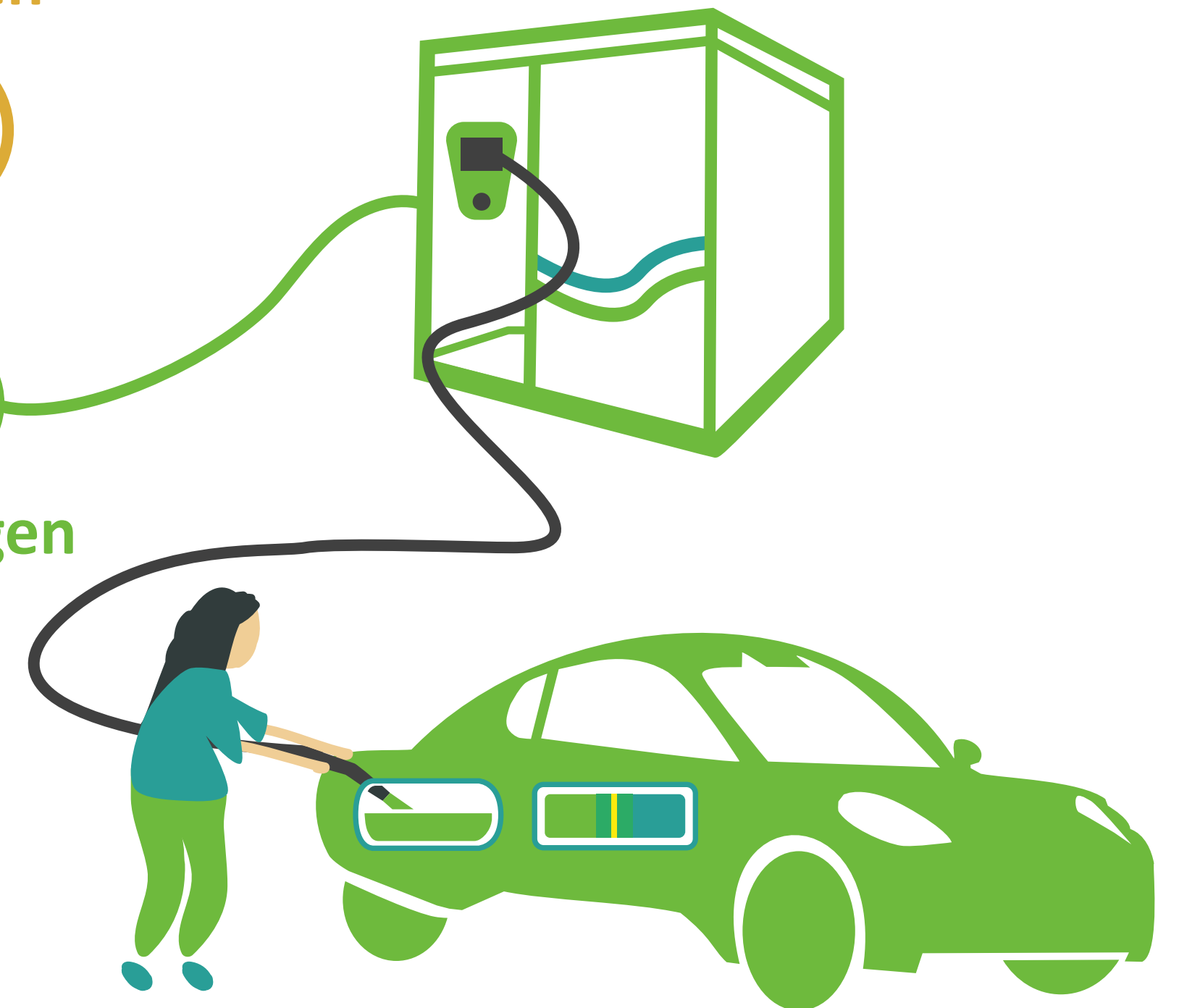
Oxygen



Hydrogen



The fuel cell uses hydrogen to power the car's electric motors





## HFCEVs MEAN:

- ✗ No fossil fuels
- ✗ No extra greenhouse gases
- ✓ Energy on demand



Did you know the  
**MILFORD HAVEN:ENERGY KINGDOM**  
Electrolyser is in Milford Haven?



**What are cars made of?**



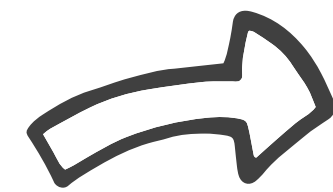
# ALL cars are made of many different materials

Most materials are made from other materials that are dug out of the ground.

This means:



There is a fixed amount of these materials in the world.



Energy is needed to make them which means more GHG.



Some of these materials can be recycled, but the rest end up in landfill.





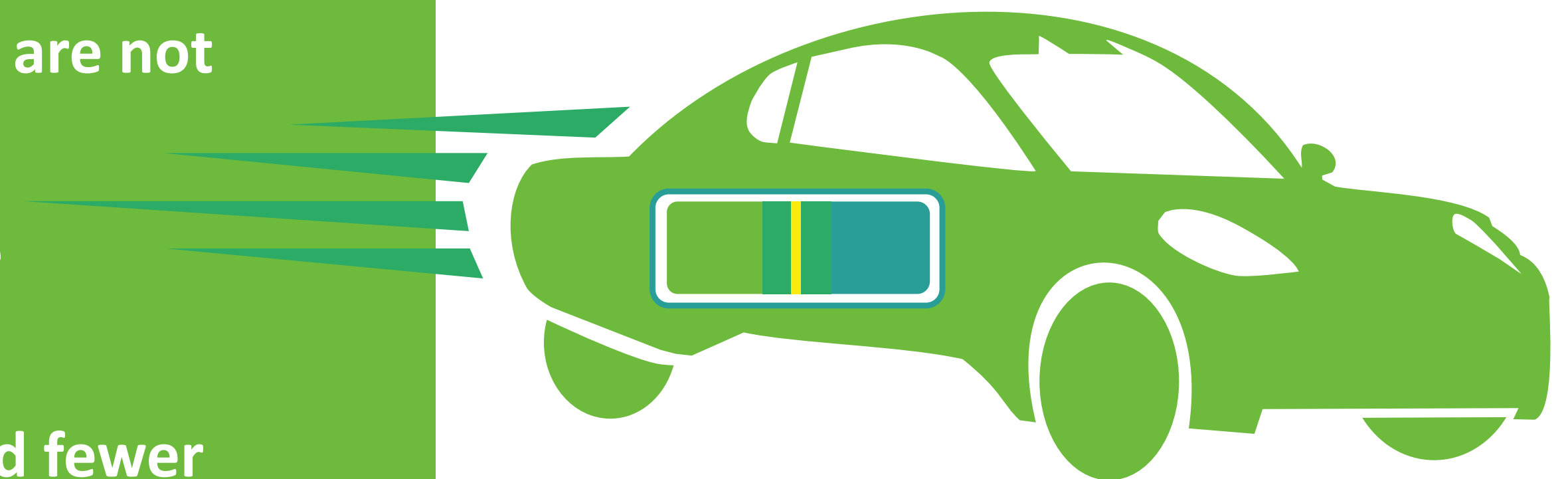
**What's different about the way  
HFCEVs are made?**





## HFCEV engineers plan the best way of making, driving and recycling the HFCEV car.

- ✓ It has the benefits of an electric car without batteries.
- ✓ There are no batteries, this means rare metals are not needed to produce the car.
- ✓ The fuel cell has no moving parts and lasts the lifetime of the car.
- ✓ The electric motors need less maintenance and fewer repairs than a petrol or diesel engine.
- ✓ A computer in the car checks it is in good working order, and repairs are carried out when they are needed.



# MH<sub>2</sub>

ENERGY KINGDOM  
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**MILFORD HAVEN:ENERGY KINGDOM**  
is one way people in Pembrokeshire  
are using science and engineering to  
act on climate change.

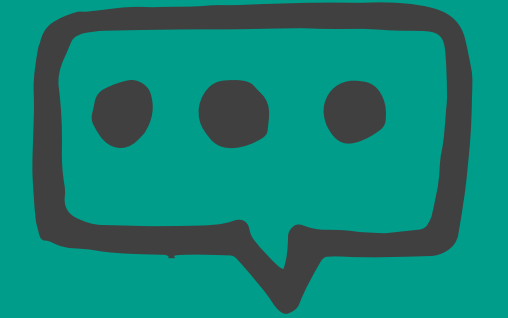


SCIENCE + ENGINEERING = A huge impact on climate change

**What can WE do now to make  
a difference?**



We can all make choices to make our travel more sustainable.



We can influence others to make sustainable travel choices too!







You could become an inventor or engineer to help make a cleaner, greener future.



**We can ALL help to make a  
difference, and it starts...**

**TODAY**





UK Research  
and Innovation

## With thanks to our project partners



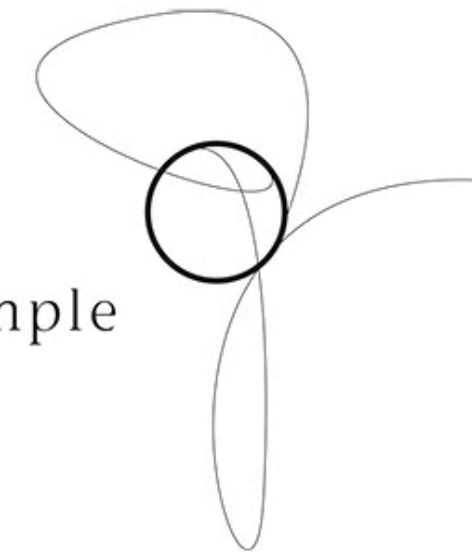
Port of Milford Haven



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riversimple



**ARUP**

