

MILFORD HAVEN:ENERGY KINGDOM

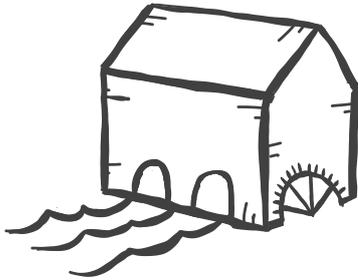
THE FUTURE OF ENERGY

IN PEMBROKESHIRE RIGHT NOW



Pembrokeshire - a county of energy!

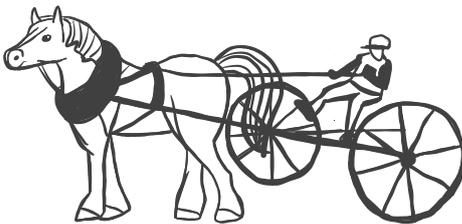
Pembrokeshire's energy history reaches back before the time of coal, through the age of oil, now looking forward to a renewable future.



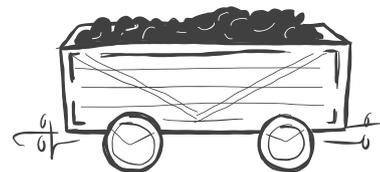
From the 1600s Carew Tidal Mill used energy from the movement of the tides to turn wheat into flour.



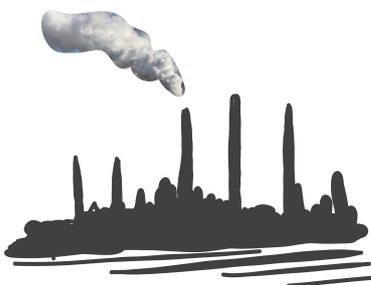
Water and windmills were at one time a common sight around Pembrokeshire to mill wheat into flour.



Horses were used for transport. Their fuel was hay and oats grown on the farms.



The Pembrokeshire coal seam stretches from Amroth to Newgale. Pembrokeshire coal was of the highest quality!



From the 1960s to the present-day, oil and gas have been an important industry in the county.

1600's

1960's

Present Day



Pembrokeshire is taking its place in a future powered by renewable energy.

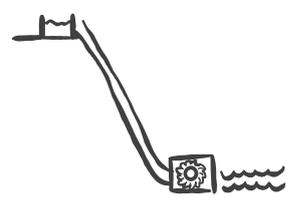
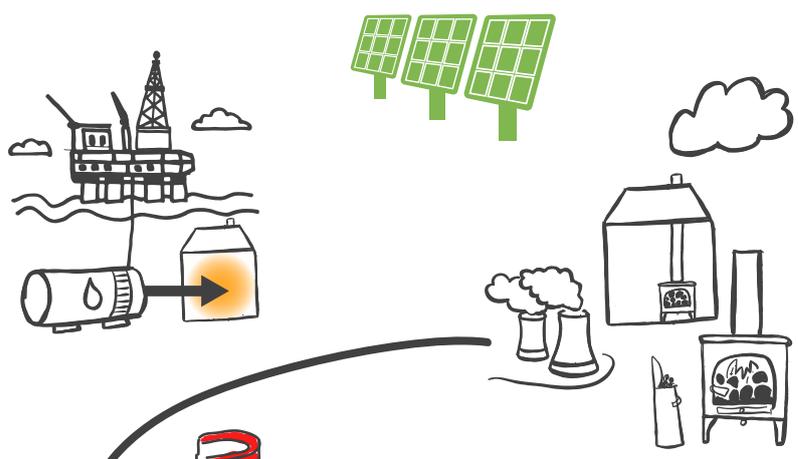
Why renewables?

- ✓ Renewables will help the county and UK meet their targets to tackle climate change.
- ✓ Renewables provide clean energy to meet our needs.
- ✓ Pembrokeshire is a great location for wind, sun and marine energy.



1

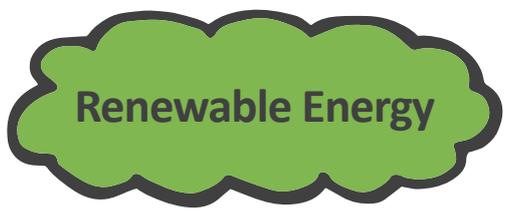
Match the picture to the name.



2

Sort the names to the type.

Coal Wind Solar Hydro Oil Gas Petrol Diesel

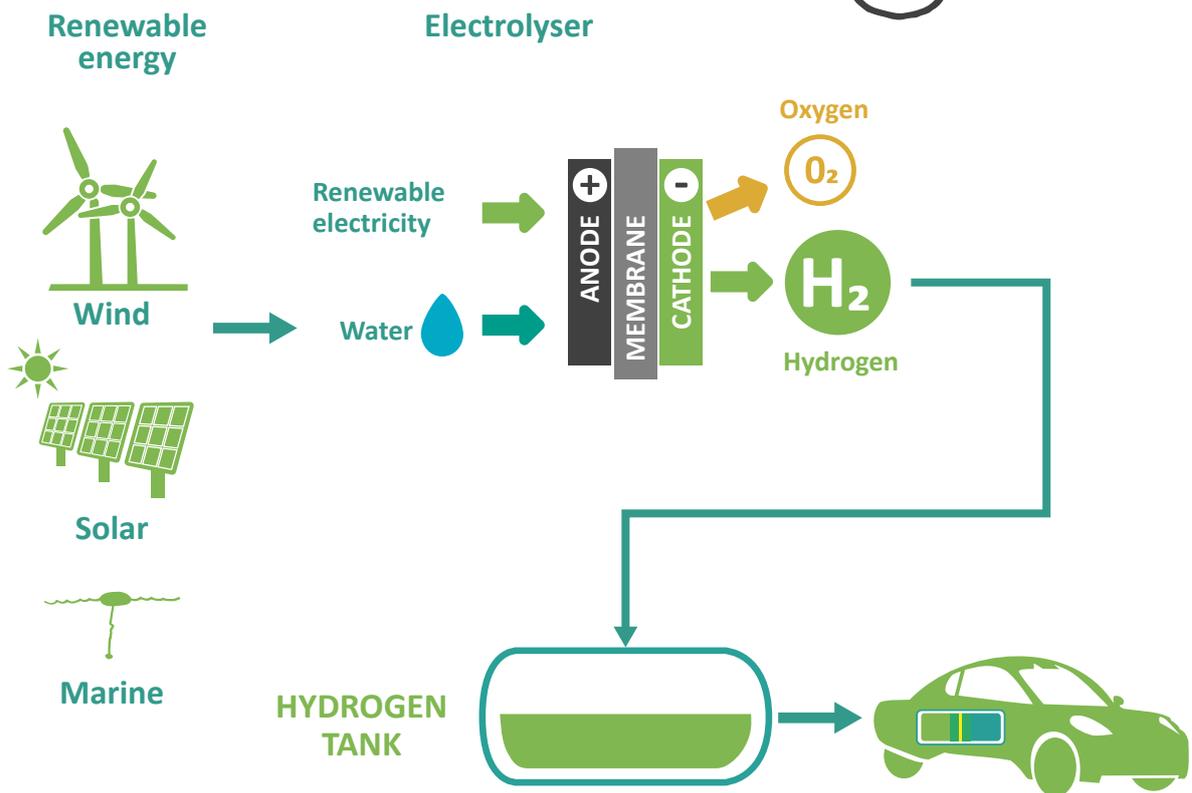


Energy when we need it

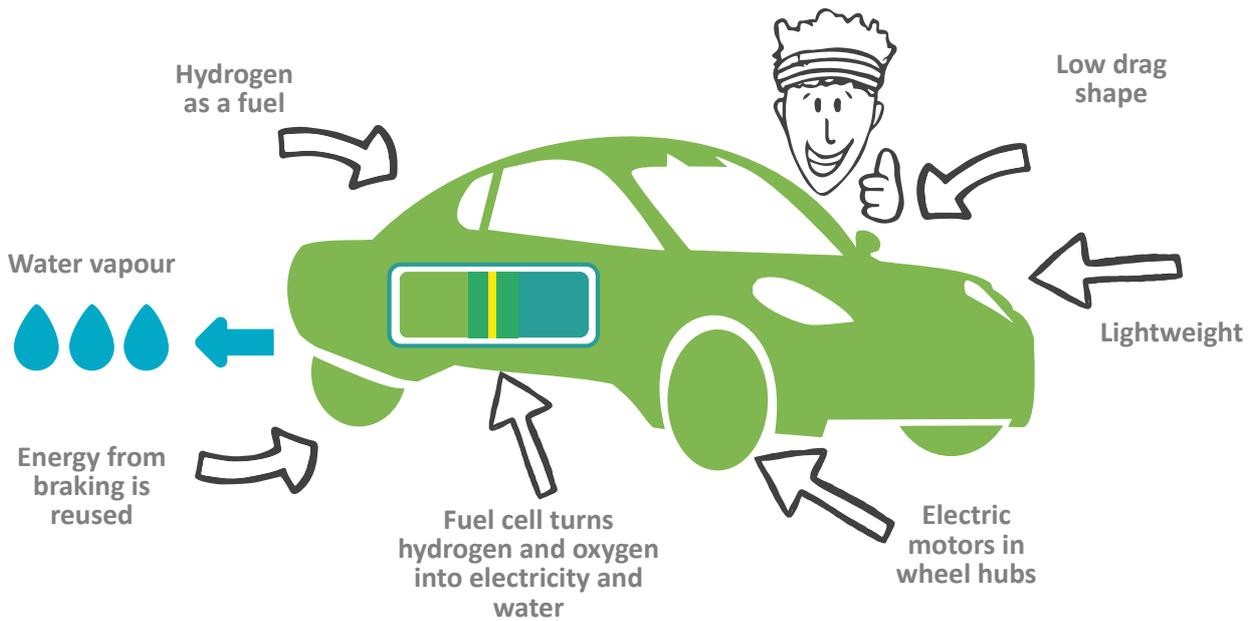
Renewable energy is used to make hydrogen in the electrolyser. The hydrogen fuel can be stored in a tank to power the hydrogen fuel cell electric vehicle or for heating.

Why make Hydrogen Fuel?

- ✓ **Storage:** Energy is stored until it is needed.
- ✓ **Clean in Use:** No pollution or greenhouse gases.
- ✓ **Impact:** Lower impact to the environment than other types of energy storage.



The hydrogen fuel cell electric vehicle



Activity time!

Tick the correct boxes so the explanation makes sense.

Hydrogen fuel contains...

huge amounts of no a small amount of

energy compared to other fuels.

In the fuel cell, hydrogen and oxygen from the air are used to make...

Electricity Smoke Sausages

and water.

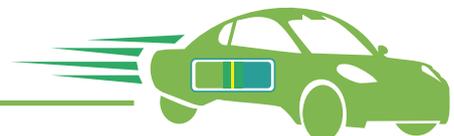


The...

Electricity Mice Petrol



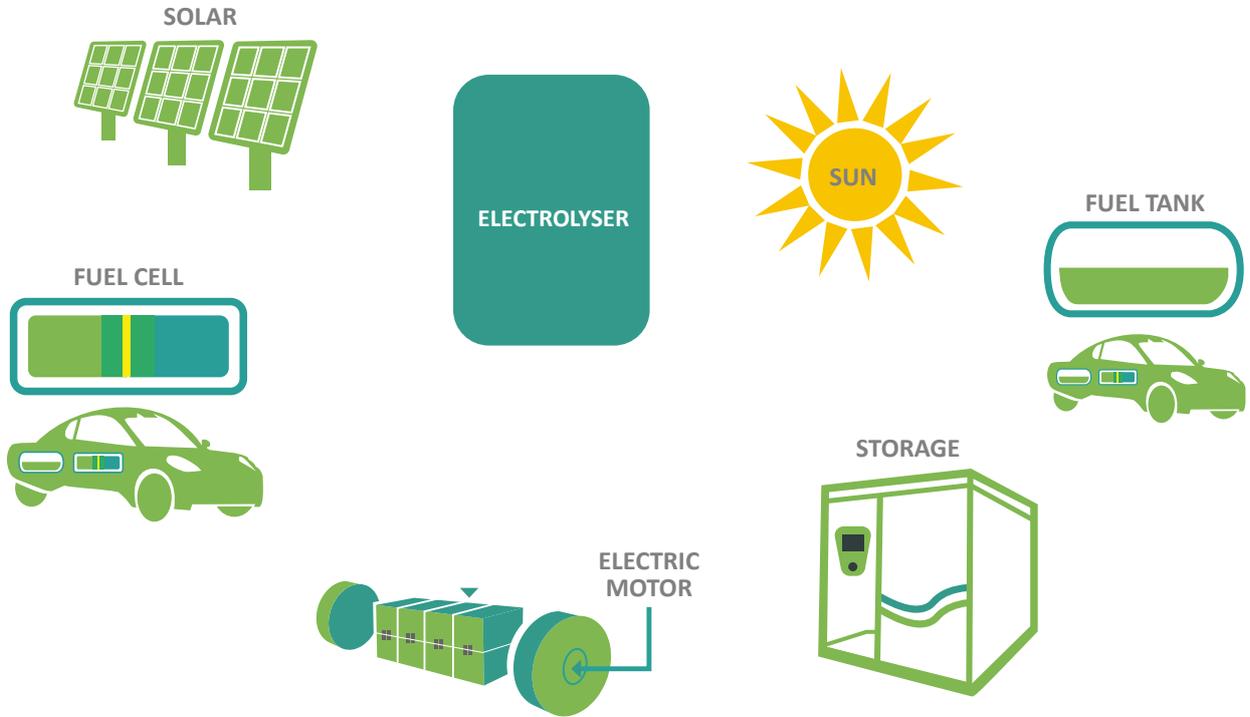
power the motors inside the wheels.



Activity time!



Join the pictures to form the energy chain from the sun to the hydrogen fuel cell electric vehicle's electric motors.



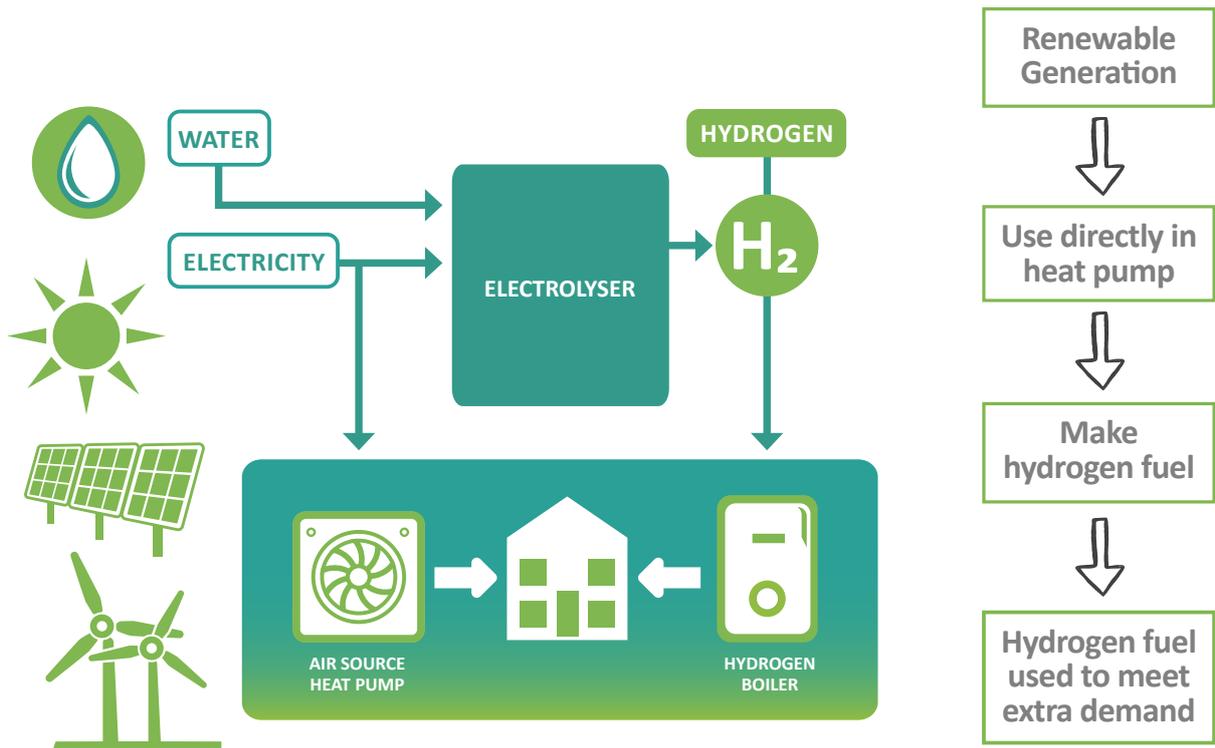
WORD SEARCH

- Hydrogen
- Fuel Cell
- Renewable
- Fossil Fuel
- Electrolyser
- Storage
- Generate
- Wind
- Solar
- Gas
- Coal
- Oil



H	W	T	H	S	P	J	R	B	V	K	O	T	P	S	B	A	T	J	E
T	O	R	S	Y	R	B	V	I	C	O	A	L	M	T	D	P	M	S	L
P	C	E	V	G	D	S	C	A	K	P	V	B	S	E	R	C	U	K	E
T	S	J	P	Q	U	R	A	D	K	J	E	R	Y	K	W	P	E	V	C
J	I	S	B	K	U	V	O	R	U	I	D	T	E	X	I	O	R	B	T
T	S	O	T	V	M	B	Q	G	R	W	C	O	M	G	N	Z	I	Q	R
I	V	Q	S	O	C	U	T	U	E	G	J	V	I	Q	D	H	Q	U	O
U	G	X	S	G	J	M	S	S	N	N	Q	B	S	L	P	D	U	R	L
W	S	T	O	R	A	G	E	R	E	H	S	F	Q	C	R	Y	I	K	Y
K	T	K	D	I	J	I	T	F	W	Q	D	O	P	K	B	M	V	D	S
V	T	O	E	A	H	T	O	S	A	G	P	S	C	M	X	A	T	J	E
V	K	B	P	D	Q	J	E	K	B	P	U	S	S	O	T	V	S	X	R
I	X	F	U	E	L	C	E	L	L	A	S	I	U	F	Q	J	O	Q	S
S	R	K	V	F	Q	T	U	A	E	E	U	L	K	C	B	V	L	U	U
V	J	K	C	W	A	V	P	U	I	W	G	F	R	O	T	K	A	Q	V
B	S	I	X	R	B	I	P	O	T	M	V	U	K	V	A	S	R	O	R
W	T	S	E	P	U	Q	H	F	C	U	S	E	F	G	P	T	X	P	E
S	X	N	S	Q	A	Q	R	E	R	T	H	L	Z	W	G	A	S	X	I
Y	E	U	Z	U	T	I	S	S	Q	B	Q	S	A	X	I	U	B	R	X
G	W	J	V	K	U	V	B	T	J	Z	K	W	Q	R	Y	A	S	Z	A

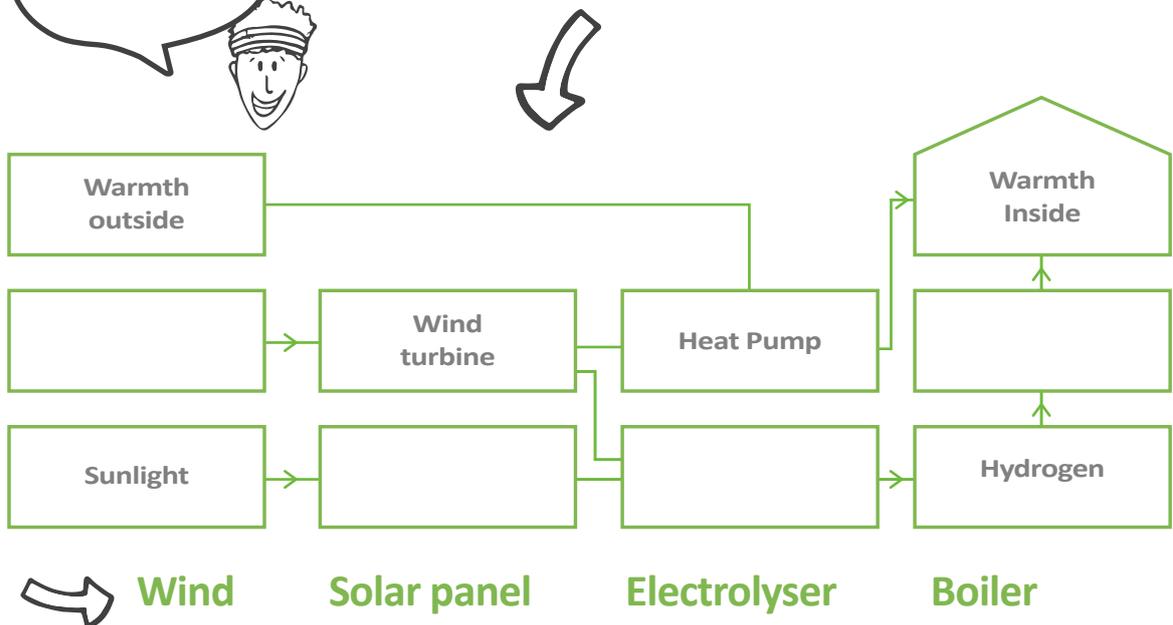
Heating



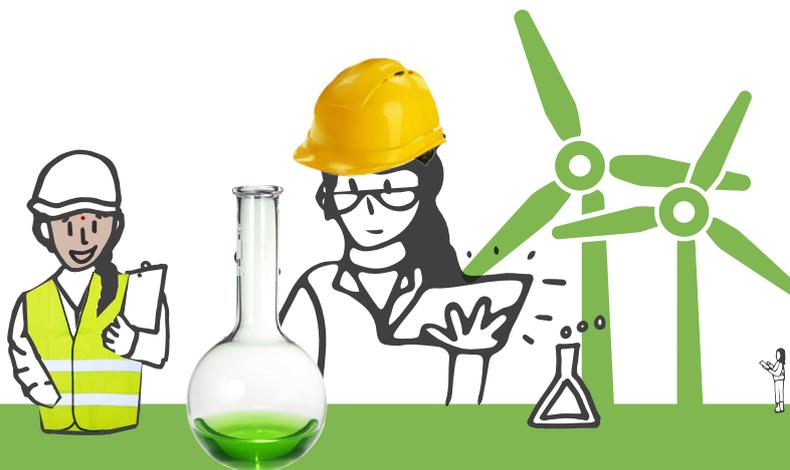
The building's heating uses renewable energy to power a heat pump. The heat pump makes use of warmth in the outside air to create a comfortable temperature inside the building. This is even more efficient than using standard electric heaters. On very cold days a heating boost is provided by a hydrogen fuel boiler.



Fill in the gaps in this flow chart



The renewable energy and hydrogen future will require people with a wide variety of skills to build and run it. It will help people in our county meet their needs for transport and energy whilst reducing our carbon emissions.



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

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

Start your journey using the links below

Find out more about the MILFORD HAVEN:ENERGY KINGDOM
<https://www.pembrokeshire.gov.uk/mh2-energy-kingdom>

Find out about renewable energy
<https://www.bbc.co.uk/bitesize/topics/zp22pv4/articles/ztxwqty>

Find out more about Hydrogen
<https://www.bbc.co.uk/bitesize/topics/zstp34j/articles/z3pp97h>

How fuel cells can help tackle climate change
<https://www.youtube.com/watch?v=v8IW4D5cN50>

How fuel cells work in more detail
<https://youtu.be/MQG87a8EwzY>



Project Partner Information

<https://www.pembrokeshire.gov.uk/mh2-energy-kingdom/project-partners>

Take a virtual tour of the refueller and the heating system

(Please open in Chrome for full functionality – the information points do not work in Edge)

www.ccatproject.eu/MHEK-Hydrogen-Refueller
www.ccatproject.eu/MHEK-Hybrid-Heating-System

“These innovative virtual tours enable us to reach a much broader audience and to communicate the exciting MILFORD HAVEN:ENERGY KINGDOM hydrogen developments happening here. A more inclusive learning experience, the digital nature of the tours allows access to all - students, residents and industry staff alike (indeed, anyone with internet anywhere in the world) can now visit the facility in detail simply not possible in real life. Early inclusion of the community can help increase support and awareness of the renewable energy developments happening right here in Milford Haven as part of Pembrokeshire’s adaptation to climate change.”

Graphic Design: isadevonald.co.uk

