

Wales Ability to Support Hydrogen as a Primary Fuel Media in Portable Application

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Research Methods and Professional Development – ACFA 7004

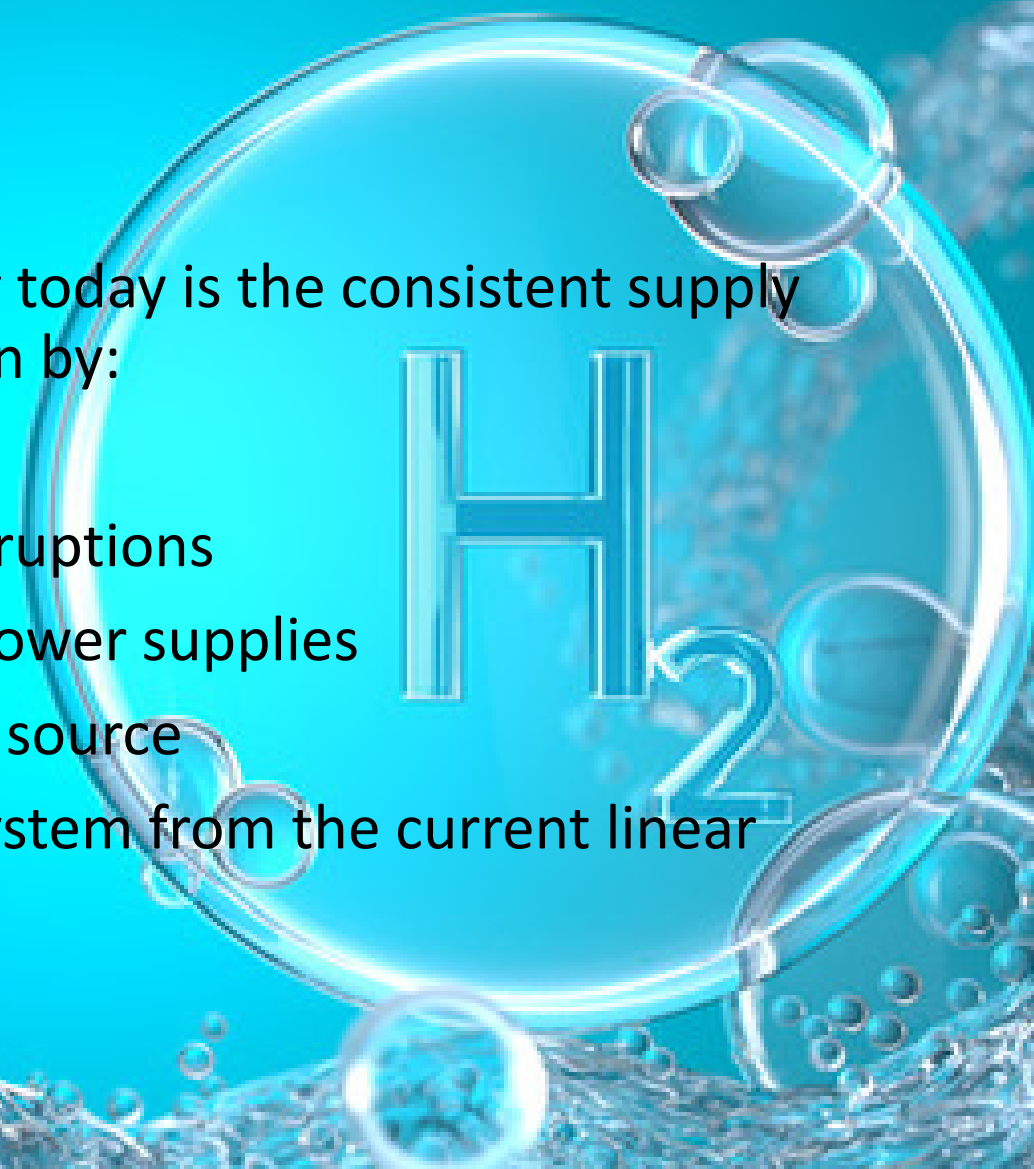
MSc International Innovation Management



Why portable power?

One of the key issues facing our society today is the consistent supply of portable power. This has been driven by:

- Scarcity of supply driven by global disruptions
- Social demands to move to greener power supplies
- Removing external reliance on power source
- Change our power usage to a cyclic system from the current linear system.

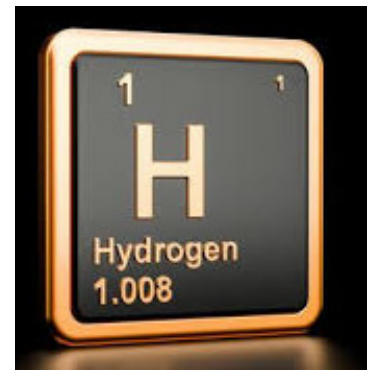


Hydrogen Power

When reviewing the process of powering equipment via a hydrocarbon fuel, it is essentially converting the fuel into a more chemically stable structure. The process of which releases energy stored within the original chemical structure. Hydrogen processing is much the same, without the presence of carbon in the original source fuel.

Hydrogen does however have a higher energy density than typical fossil fuels. For example, petrol has an energy density of 45.8 MJ/kg, where as hydrogen has an energy density of 120 MJ/kg.

This higher density of energy is why hydrogen fuel would appear to be a preferable replacement to traditional fuels.



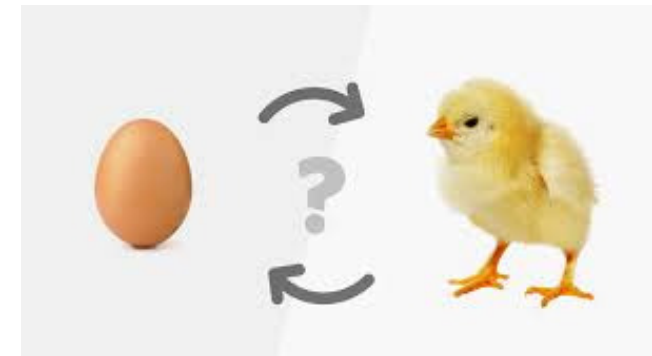
Why research hydrogen infrastructure?

During my initial review of this topic, it appears that there's a hesitation regarding the adoption of an alternative fuels.

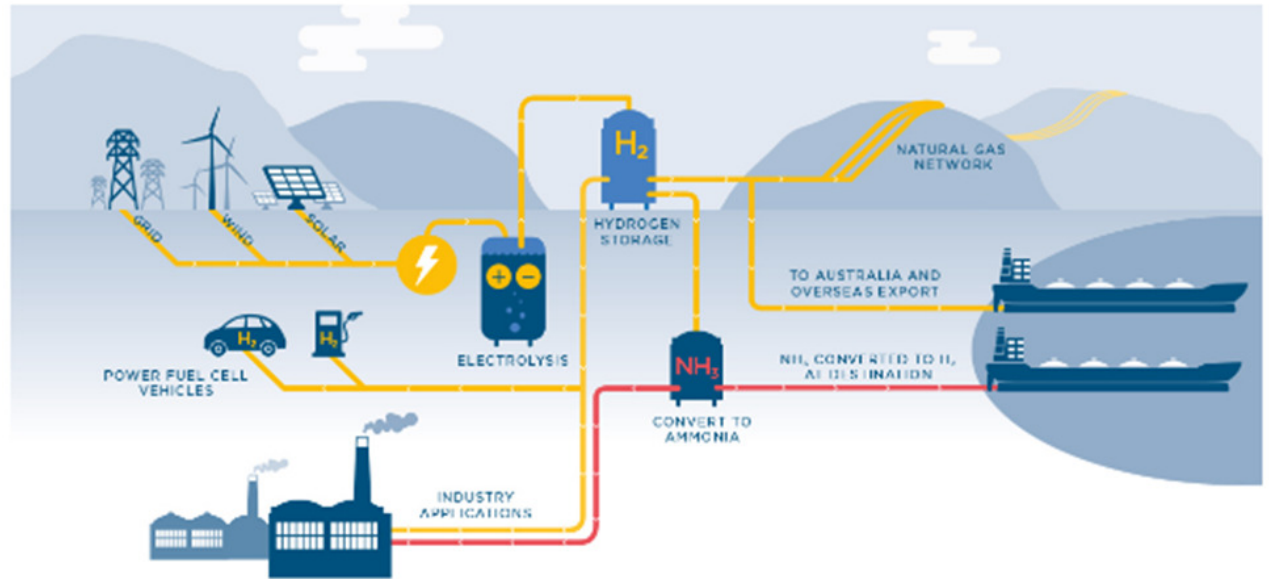
For the public to adopt a technology, the supporting infrastructure is needed to ensure unhindered performance.

This was seen with the slow adoption of electric powered cars, until the supporting recharging infrastructure was put in place.

Following this pattern of behaviour, hydrogen will need a supporting network before it can be used in mass applications.



Research Goals



The research is looking to confirm the status today of Wales readiness to use hydrogen fuel.

In presenting Wales' current ability to support hydrogen as a primary fuel, any investment within the current system will be made clear.

This in turn will highlight areas that require target investment. The development in this infrastructure will future proof the portable energy sector, and reduce implementation time by pre-empt issues that would otherwise hamper the introduction of hydrogen on a mass scale.

Power Predictions

Power prediction is vital to confirming how power demands are expected to change in the coming years.

These forecasts will allow better understanding of scale of investment needed for hydrogen power applications.

Local authority area	Energy use by sector per capita, 2017 (MWh/capita/yr)			
	Agriculture	Industry	Transport	Buildings
Blaenau Gwent	0.17	4.99	3.99	9.05
Bridgend	0.17	6.39	7.54	9.07
Caerphilly	0.09	4.27	4.62	8.18
Cardiff	0.01	6.07	6.39	7.09
Carmarthenshire	1.74	5.12	8.2	9.63
Ceredigion	3.52	3.47	7.23	10.21
Conwy	0.54	2.47	8.35	8.95
Denbighshire	0.93	3.86	7.17	9.37
Flintshire	0.41	14.26	8.75	8.82
Gwynedd	1.06	4.32	7.96	9.07
Regen; Energy use in Wales (2018)	1.38	4.21	6.84	9.28
Merthyr Tydfil	0.1	4.54	5.23	9.25
Monmouthshire	1.44	4.34	12.87	9.58
Neath Port Talbot	0.79	40.07	7.58	13.2
Newport	0.1	8.46	10.6	8.57
Pembrokeshire	1.67	73.61	6.29	21.42
Powys	2.96	4.59	8.69	9.78
Rhondda Cynon Taff	0.06	4.14	6.61	8.28
Swansea	0.07	4.81	5.19	9.51
Torfaen	0.08	6.53	5.02	8.22
Vale of Glamorgan	0.34	6.31	5.87	8.66
Wrexham	0.67	15.24	5.99	9.1



Source: Regen; Energy use in Wales (2018)

Considerations



While reviewing the submitted proposal, it's clear that the current system using traditional fuels are to be utilised where practical. This will assist the adoption of hydrogen technology however, this shouldn't be to the exclusion of system improvements.

i.e. within the original proposal, we consider replacing natural gas supplies with hydrogen. However, would it be more efficient to transmit this energy in its native form of electricity using the existing system and changing the end process to electrical (such as domestic heating)?

Questions ?

