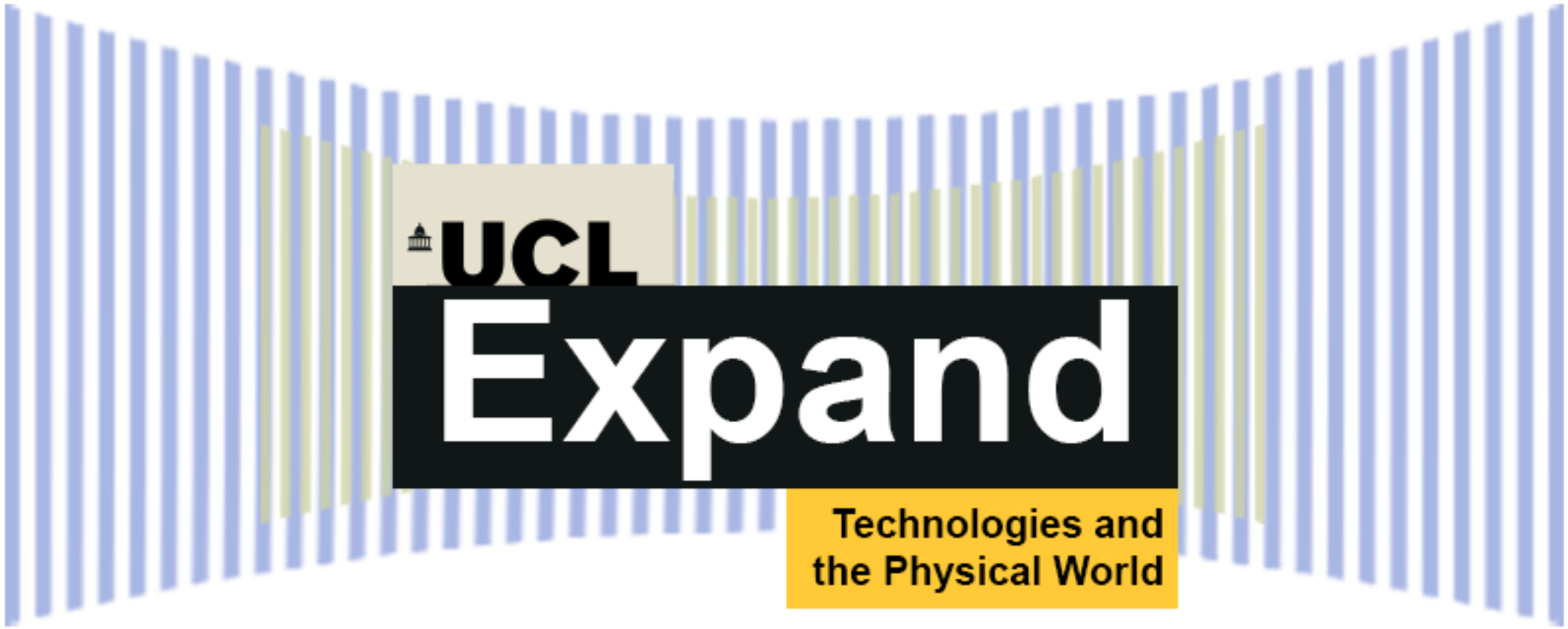


Online Session 1: Hydrogen generation and storage

Our aims for graduation

The goal is to **produce a poster** and **present your findings**.

Your poster will be an accumulation of knowledge that you have gathered over the next 4 weeks.

The poster may include information received directly from these sessions and must include information you have gathered from your own research.

In essence, these sessions are only to introduce you to various topics of possible discussion. It is ultimately up to you to decide on which topic you will focus, and how you present your findings.

More details for the project

- The presentation of findings should be able to be summarised in approximately 10 minutes. This should not limit the total amount of content you may include in your poster.

Basically, your poster should have more content in it that you fully intend to cover in your presentation. This allows you to include more details in the poster but also allows you to gloss over fine details when it comes to your presentation.

Food AND Brand Lab
Cornell University

IN PIECES:
FOOD IS MORE FILLING WHEN PRE-CUT INTO PIECES

Aner Tal & Brian Wansink
CORNELL UNIVERSITY

UCL Expand
Technologies and the Physical World

ABSTRACT

To investigate if cutting a food into pieces has an effect on satiety, students were given a bagel that was either (1) whole, (2) cut into 4 pieces which were kept together, or (3) cut into 4 pieces which were spread out. A general linear model revealed that overall satiety was the highest when food was cut into pieces, but only when the pieces were kept together.

OBJECTIVES

- Is food more filling when people receive it pre-cut into several pieces?
- Is it the space the pieces fill on the plate or the number of pieces that increase satiety?

Cornell University
Food and Brand Lab

METHODS

- 43 college students
- Asked to finish a mini bagel with cream cheese
- Assigned to 1 of 3 conditions:

- Measured hunger, fullness, and satiety levels on 9-point likert scales

RESULTS

CONCLUSIONS

- Participants reported greater satiety when eating a food that was cut into several pieces, but **only when those pieces remained close together.**
- We suspect that cutting a food into several pieces increases satiety because it **increases the number of units** being eaten, hence increasing the psychological sense of satiety.
- However, if the food is **spread out**, its **volume might appear lower**, therefore countering the positive effects of eating pieces.

Funding provided by **Food and Brand Lab**

For more information,
contact **Aner Tal** at **at425@cornell.edu**

Created by: **Patricia Natalie** | 2015 Summer Intern | Food and Brand Lab | Cornell University

PSYCHOLOGICALLY MANIPULATIVE SECTS IMPLICATIONS ON CHILDHOOD DEVELOPMENT

ABSTRACT

Children raised in Psychologically Manipulative Groups (PMGs) are a unique population regarding which, there is a significant dearth of academic literature. These children face significant challenges whether they remain in the group or build a life for themselves outside. This meta-analysis undertakes a brief survey of available data and draws comparisons with similar populations where data is unavailable.

Leader

Many cult leaders display symptoms of Antisocial Personality Disorder (ASPD). Exploits followers to meet own needs and avoid "zero state". Anyone else's needs are viewed as threat to dominance.

Community

Members who are under the spell of a charismatic leader, are an extension of his personality and power, creating an environment of manipulation and observation that is impossible to escape.

Family

Normal familial bonds form an existential threat to cults. PMGs destroy these bonds by making the group the family. Leader becomes father & parents reduced to "middle managers".

ATTACHMENT

Leaders actively work to destroy dyadic bonds. Parents are taught to believe that normal feelings of affection, concern or attachment to their children are unspiritual & hinder the purpose of the group. With their children, many parents revert to a dissociative regressive state or mirror the hyper-controlling personality of the leader.

AVOIDANT

Parent physically absent or abusive. Child displays no emotion and does not seek reassurance.

AMBIVALENT

Parent not available or safe. Child insecure and in constant need of reassurance but rejects it when offered.

DISORGANIZED

Inconsistency by parents: provide both reassurance and induce fear. Child confused.

ABUSE

PHYSICAL	PSYCHOLOGICAL	NEGLECT	SEXUAL
Group dogma often suggests that harsh discipline is required to "bring up" a child & in the environment of PMGs even minor infractions are seen as insubordination. Parents may also be required to abuse children as proof of loyalty to the leader or to rid the child of "evil".	PMGs suppress autonomy, identity, independent thinking & dignity. Individuals are subjected to ritualized self shaming by public confession. Verbal abuse pervades in the form of criticism, threats, accusations or by members refusing to talk to an ostracized member.	Cults reject modern views on children's medical wellbeing. One study examined 140 religious sect deaths: 90% were survivable with proper medical care. Nutritional, social & educational needs are often neglected as well, while parents focus on service to the cause.	Sect leadership often uses deviant sexual practices not only to satisfy their own aphrodisia, but also as a form of psychological control. Parents also take out their frustrations, at times sexual, on their children as they are easily dominated and morally manipulated.

Statistics from: Bottoms, Shaver, & Goodman (1996)

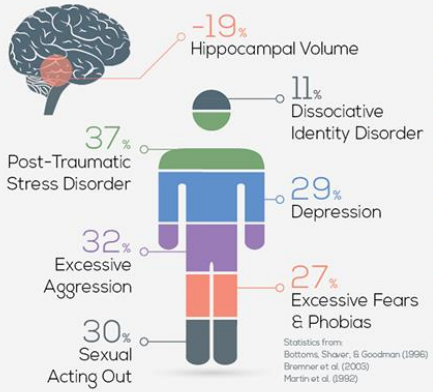
DEVELOPMENTAL TASKS

Cults view normal developmental tasks such as the formation of identity, autonomy and initiative as rebellion against the authority of the leader. Additionally, parents in PMGs often form insecure attachments thereby suppressing or neglecting the child's development.

Model from Furnari (2005) based on Erikson (1950) stages of development and Bryant, Nassler, & Shirar (1992) negative outcomes.

EFFECTS

The effects of abuse, insecure attachment & suppression of developmental tasks are highly comorbid making it difficult to obtain a precise diagnosis or to pinpoint an exact etiological genesis.



Statistics from
Bottoms, Shaver, & Goodman (1996)
Bremner et al. (2003)
Martin et al. (1992)

Schizoid	44%
Avoidant	54%
Dependent	72%
Histrionic	61%
Narcissistic	55%
Antisocial	43%
Compulsive	62%
Schizotypal	55%
Borderline	62 %
Paranoid	54%
Anxiety	76%
Somatoform	71%
Hypomania	45%
Dysthymia	72%
Alcohol Abuse	45%
Drug Abuse	47%
Psychotic Thinking	54%
Psychotic Depression	52%
Psychotic Delusions	52%

LIFE CONSEQUENCES

Individuals leaving the cult environment have high levels of neuroticism, sociotropy and autonomy the effects of which may be ameliorated by time and therapy, yet they will face many significant obstacles.

Lack of Identity

Unlike an adult who joins the cult with a formed identity, a child is entirely shaped by the cult. Thus, outside the group he has no identity and must forge an entirely new self.

Cognitive Function

Reduced hippocampal volume impairs learning & memory. Amygdala damage results in an increased susceptibility to impulsivity, suicide & depression and may result in impaired decision making.

Resocialization

Not only will the child require extensive reeducation, they will also experience outside culture for the first time and be forced to learn an innumerable myriad of unwritten societal norms & rules.

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THEME AND DESIGN

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ACKNOWLEDGEMENTS

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Special thanks to my wife, Cynthia L. Needham without whom this project would have been impossible. And to my two daughters Aimée Dupree and Rochelle Adaire whose unconditional love and patience are a constant support and inspiration.

Today's topic – Hydrogen generation and storage

- Getting energy from hydrogen
- Current and future technologies for commercial hydrogen generation
- Hydrogen long-term storage
- Possible methods of transporting hydrogen

Getting energy from hydrogen

When discussing hydrogen in this context, we are generally talking about Hydrogen gas, otherwise known as H_2

We have previously discussed that hydrogen is an odourless, colourless and tasteless gas. It can also burn and catch fire very easily.

Getting energy from hydrogen

When hydrogen is burned, what happens?

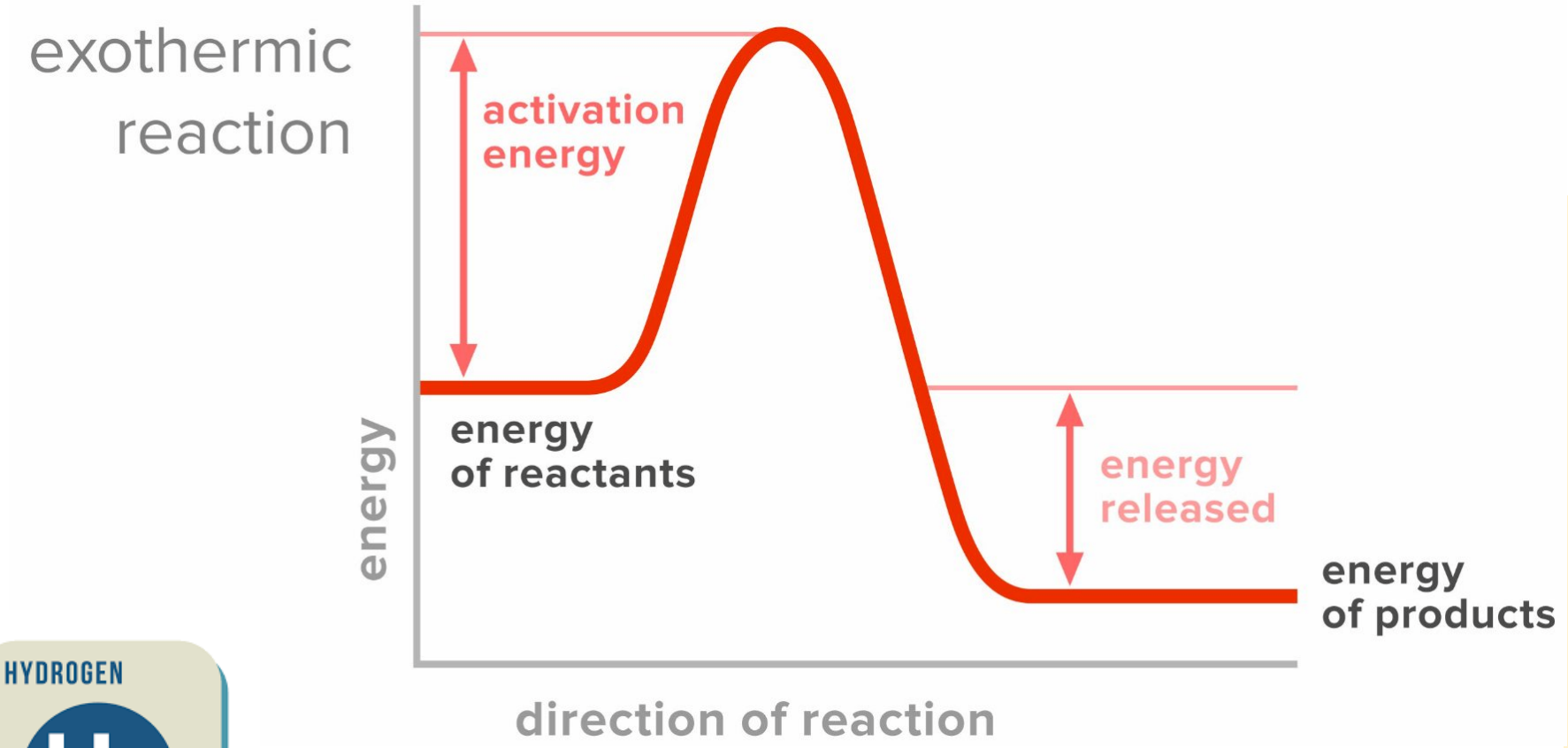
Getting energy from hydrogen

When hydrogen is burned, what happens?

$$2H_2 + O_2 \longrightarrow 2H_2O$$

Additionally, energy is released due to the lower internal energy of H_2O as the product relative to the reactants.

Getting energy from hydrogen



Getting energy from hydrogen

How does this process...

$$2H_2 + O_2 \longrightarrow 2H_2O$$

…compare with burning other fuels such as methane, petrol, diesel?

Getting energy from hydrogen

Using methane as an example:

$$CH_4 + 2O_2 \longrightarrow 2H_2O + CO_2$$

Burning fuels such as methane produces CO_2 whereas burning hydrogen does not. This is crucial in its viability as a future commonplace fuel.

Getting energy from hydrogen

ICEs or Internal Combustion Engines are unfortunately not very energy efficient.

This means, when injecting fuel (of any kind) into the engine, a large amount of energy is lost in heat and other types of energy that do not translate into useable energy or Work.

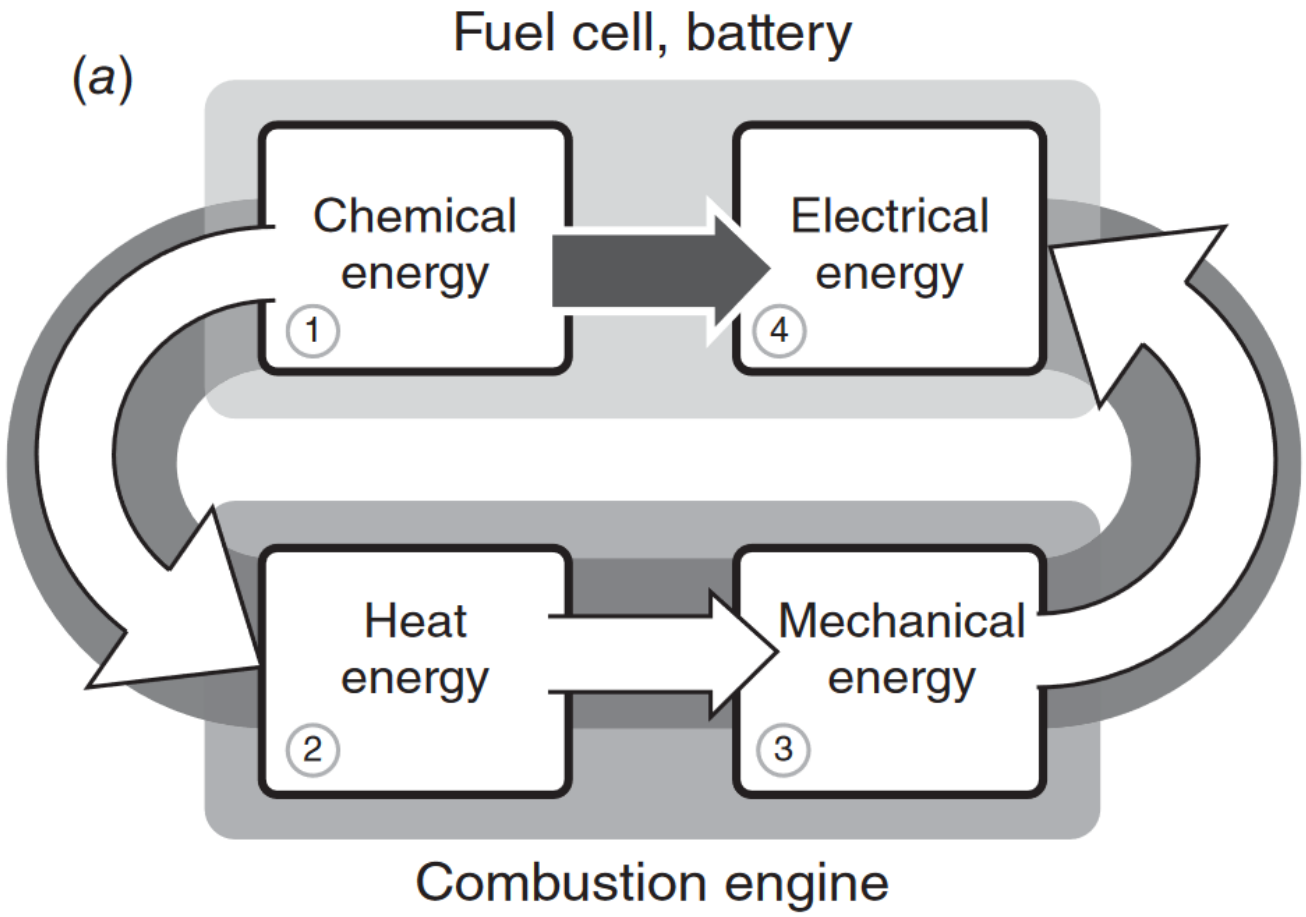
Getting energy from hydrogen

To challenge this, efforts have been made to develop alternative technologies using electrochemistry to extract the energy potentials in a chemical reaction into electricity.

This is where fuel cells are used instead of ICEs.

Getting energy from hydrogen

Consider this:



Getting energy from hydrogen

Therefore, to increase the energy efficiency, we have reduced the number of energy conversions required to get useable energy

Your turn: Task 1

You will be randomly assigned to breakout rooms and asked to discuss one of four documents found on the sharepoint depending on your group number.

1. Who is the author of the document?
2. What is discussed in the document?
3. How recent / relevant is it?
4. Are there any biases you might need to consider before making any decisions based on the information presented?
5. **After reading this document, do you believe research in Hydrogen Fuel Cells should be continually funded or are there better alternatives?**

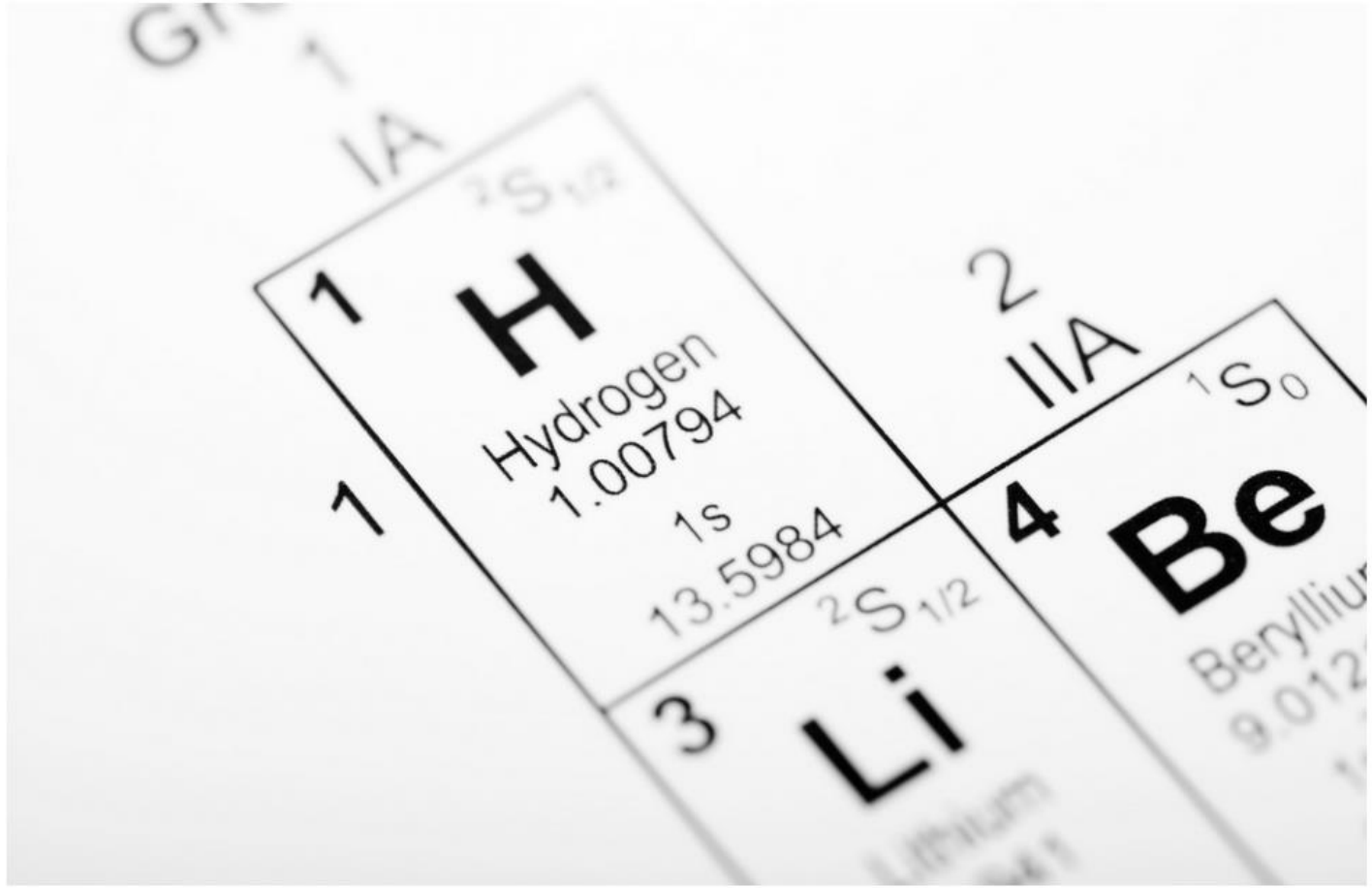
You can find your own personal link in the word document on sharepoint.

Group 1

January 14, 2021

Hydrogen Fuel Cell Advantages and Disadvantages in Material Handling

By Flux Power



Group 2

Feature | Published: 27 August 2020

The hydrogen solution?

Sonja van Renssen

Nature Climate Change **10**, 799–801 (2020) | Cite this article

A new star has exploded back onto the climate scene: hydrogen. It offers possibilities to move away from fossil fuels, but it brings its own challenges.

Download PDF

Sections | Figures | References

Group 3

Hydrogen — Fantasy or fuel of the future?

Show articles

The Big Read Renewable energy + Add to myFT

The race to scale up green hydrogen

Group 4

Warning: the UK government's hydrogen plan isn't green at all, it's another oil industry swindle

Kevin Anderson and Simon Oldridge

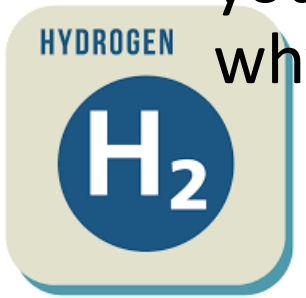
Mon 4 Dec 2023 11.25 GMT

361

A taxpayer-funded drive for 'blue' hydrogen is good news for fossil-fuel lobbyists, but bad news for the climate crisis

What do we need to remember?

- When reading up and researching a topic, it is always important to thinking about the bias and/or motives of the author.
- Some topics are more controversial than others, but even in science and technology there are disagreements.
- For example, applying for funding and grants to continue research in your field can be extremely competitive where you will have to justify why your research is important and what benefits it will bring.



Break time

Generating hydrogen gas

- Since hydrogen gas is not naturally abundant, the process of generating hydrogen gas for use as a fuel is a necessity.

- Naturally, for hydrogen's future viability, the methods in which we generate it must also be environmentally friendly while also being energy efficient.

Consider other fuels

- What are the steps we must take to prepare petrol or diesel before it can be injected into our vehicles?

Consider other fuels

- What are the steps we must take to prepare petrol or diesel before it can be injected into our vehicles?

Simply, crude oil is extracted from the earth, is separated through fractional distillation, and the fraction is treated before being ready for use.

The case for hydrogen

Because natural gas, coal, and oil are preformed all we need to do is gather them and quickly treat them.

In contrast, hydrogen cannot be found naturally and therefore must be created from other substances. This requires energy.

Methods to produce hydrogen

Task 2

Individually, use appropriate research methods to gather information on the most common methods of producing hydrogen.

Have a think about what challenges may arise from using these methods.

Methods to produce hydrogen

Natural gas reforming/Gasification

$CH_4 + H_2O \longrightarrow CO + 3H_2$

Or

$CO + H_2O \longrightarrow CO_2 + H_2$

Problem?

Methods to produce hydrogen

Natural gas reforming/Gasification

$CH_4 + H_2O \longrightarrow CO + 3H_2$

Or

$CO + H_2O \longrightarrow CO_2 + H_2$

Problem?

Produces carbon dioxide and carbon monoxide

Methods to produce hydrogen

Natural gas reforming/Gasification

$CH_4 + H_2O \longrightarrow CO + 3H_2$

Or

$CO + H_2O \longrightarrow CO_2 + H_2$

Despite this, natural gas reforming is the most common method of producing hydrogen currently as large oil companies diversify and invest in “renewable” energies.

Methods to produce hydrogen

Electrolysis

Or Thermochemical/Photochemical/Photobiological Water Splitting

$$2H_2O \longrightarrow 2H_2 + O_2$$

In essence these methods are **fairly** similar in that they use energy to split water molecules into hydrogen and oxygen.

Methods to produce hydrogen

Electrolysis

Or Thermochemical/Photochemical/Photobiological Water Splitting

$$2H_2O \longrightarrow 2H_2 + O_2$$

Something to consider is that these methods are generally more expensive. One of the reasons for this is because we are inputting large amounts of energy to produce a fuel, which will be used to power (release energy) into other things.

Methods to produce hydrogen

Electrolysis

Or Thermochemical/Photochemical/Photobiological Water Splitting

$$2H_2O \longrightarrow 2H_2 + O_2$$

Due to the difficulty in producing green hydrogen, some have questioned its viability as a real substitute to fossil fuels.

As an alternative use, some are considering its generation as a form of energy storage.

Hydrogen storage

Reminder from our intro session:

What are the common methods of storing hydrogen?

Hydrogen storage

Reminder from our intro session:

What are the common methods of storing hydrogen?

ANSWERS

Hydrogen storage

As previously mentioned, some are considering the use of hydrogen not as a nationwide power generator like nuclear power or coal power, but more as a type of energy storage that is saved for rainy days.

What is another common form of energy storage?

Hydrogen storage

As previously mentioned, some are considering the use of hydrogen not as a nationwide power generator like nuclear power or coal power, but more as a type of energy storage that is saved for rainy days.

What is another common form of energy storage? Batteries

Hydrogen storage

How will hydrogen be used as an energy storage?

- Just as batteries require energy to be charged, generating hydrogen gas from water also requires energy.

- When we want to use the energy from batteries, they are discharged. Similarly, when we want to use the energy from hydrogen we can burn it, or we can put it through a fuel cell.

Hydrogen storage

The hydrogen energy storage solution comes to play as building large capacity batteries nationwide is not possible.

Additionally, other renewable sources of energy with variable outputs such as wind and solar (wind only produce energy when its windy and solar only when the sun shines), can put stress on the national grid.

We can solve this problem by connecting these other sources of energy to electrolysers that use excess energy to produce hydrogen which is then stored in depleted gas fields.

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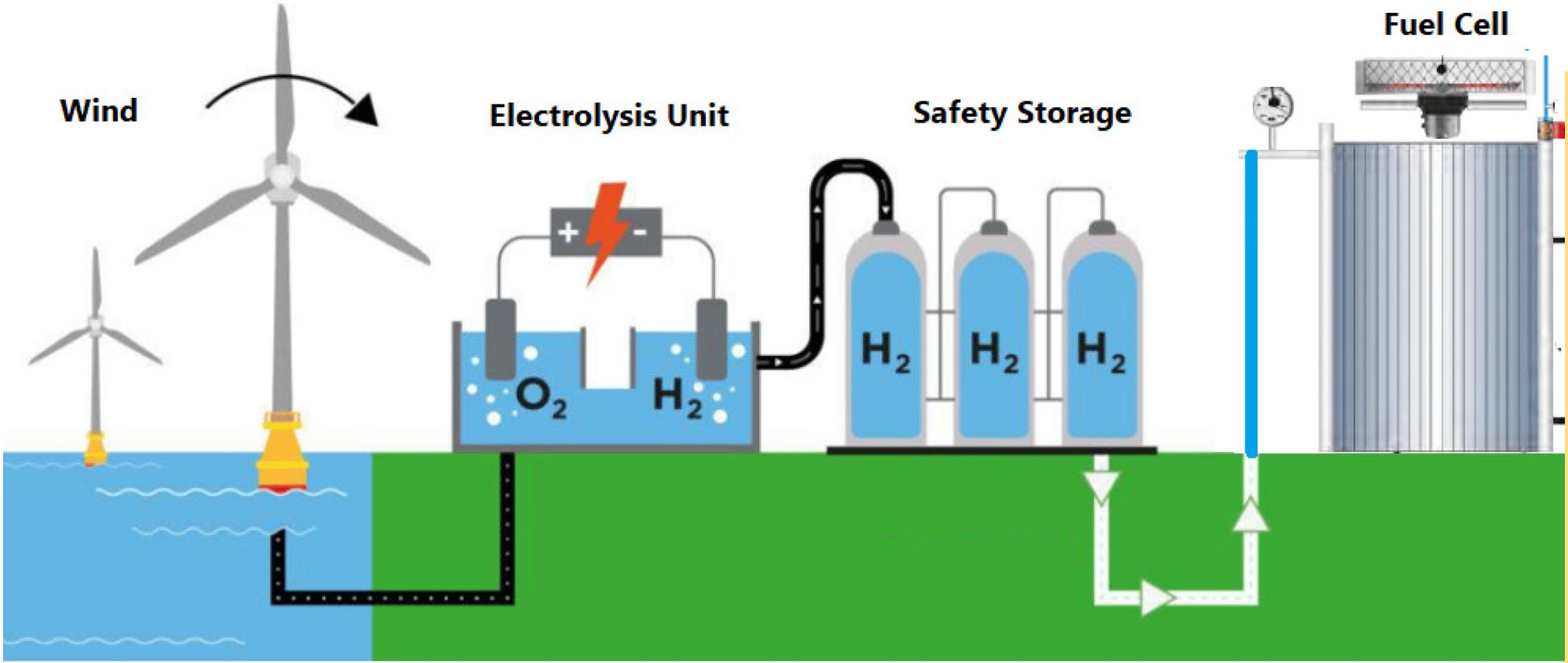

Hydrogen Transport

After discussion of its importance, and how it can be effectively generated, another key factor to consider is how to transport hydrogen safely across countries and borders

Hydrogen Transport – a quick summary

- Similar to oil and gas, it's possible to build pipelines to transport liquified, compressed and/or cooled hydrogen gas.

- Additionally, the fuel could be transport via chemical carriers such as barges for export.

Summary

Today we have discussed:

1. The science of hydrogen
2. How to get energy from hydrogen
3. Methods of generation, storage, transport.

Next sessions

- In depth investigation to fuel cells
- Specific problems that need solutions

Next steps

Before our next session…

- Review the information you have been presented today and get involved in your own research!
- Start thinking about what your poster is going to cover.

What's coming up?

Drop-in sessions are run on the following evenings from 6pm – 7pm.

Monday 26th February

Monday 4th March

Monday 11th March

Monday 18th March

Monday 25th March

Your next subject session will be on the 28th of February from 6pm – 7:30pm.

Any questions?

If you need any support, or have any further questions, please don't hesitate to send the UCL Expand Team an email at wp.post16@ucl.ac.uk or drop us a text on **07857630033.**