

# BEIS Longer Duration Energy Storage Demonstration Competition Event

*17<sup>th</sup> June 2021*



Department for  
Business, Energy  
& Industrial Strategy



# Introduction and Welcomes

**Dr Nina Skorupska CBE,  
Chief Executive of the REA**



Department for  
Business, Energy  
& Industrial Strategy



---

# Energy Storage Innovation

## *Net Zero Innovation Portfolio*

*Matthew Billson, UK Department for  
Business, Energy and Industrial Strategy*

Deputy Director for Energy Innovation –  
Strategy & Portfolio



Business, Energy  
& Industrial Strategy



Department for  
Business, Energy  
& Industrial Strategy



# Agenda

**2.15 Policy Context** - Hannah Clapham, Head of Energy Storage, BEIS

**2.30 Competition Details** - Georgina Morris, Programme Manager – Smart Energy and Built Environment Innovation, BEIS

**3.00 Break**

**3.15 Application Details** - Andy Wilson, Project Manager - Smart Energy Innovation, BEIS

**3.30 Q&A on Competition & Application Details**

**4.00 – 5.30 Showcase, networking and private 1-2-1 sessions** (schedule sent to relevant parties in advance)



Department for  
Business, Energy  
& Industrial Strategy



# Remo Housekeeping – in Presentation Mode

While presentations are being made, all attendees are in listen only mode.

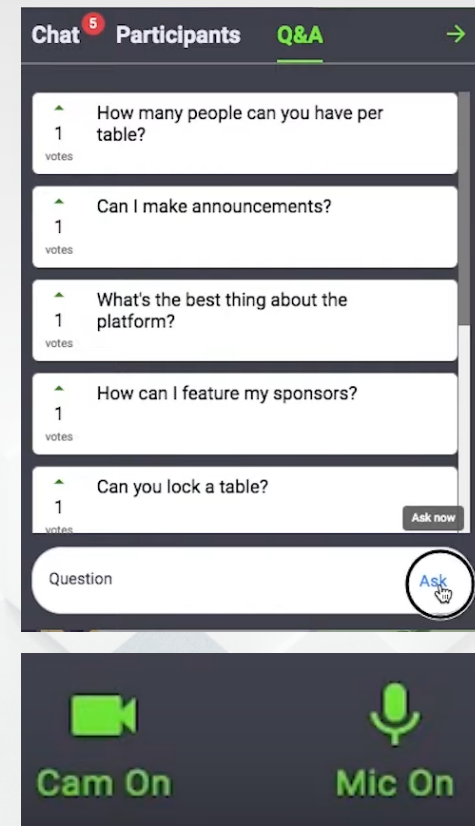
All presentations are being recorded.

Questions can be asked via the Q&A chat box on the right. Attendees can 'vote up' other people's questions.

All question will be captured after the event to be taken away by BEIS.

During the showcase session, those presenting will be invited up to the stage, in order to deliver their presentation.

They will then be able to turn on their mic and camera.



Department for  
Business, Energy  
& Industrial Strategy



# Remo Housekeeping – in Conversation Mode

During the break and networking session we will return to ‘conversation mode’ with virtual tables.

Attendees should **turn on their mic and camera** using the buttons at the bottom of their screen in order speak with others at the table.

Attendees can easily jump between tables by *double-clicking* on an available chair.

Table conversations are **not** recorded.

Attendees can also change floor by using the menu on the right of the screen. The floors are themed by technology:

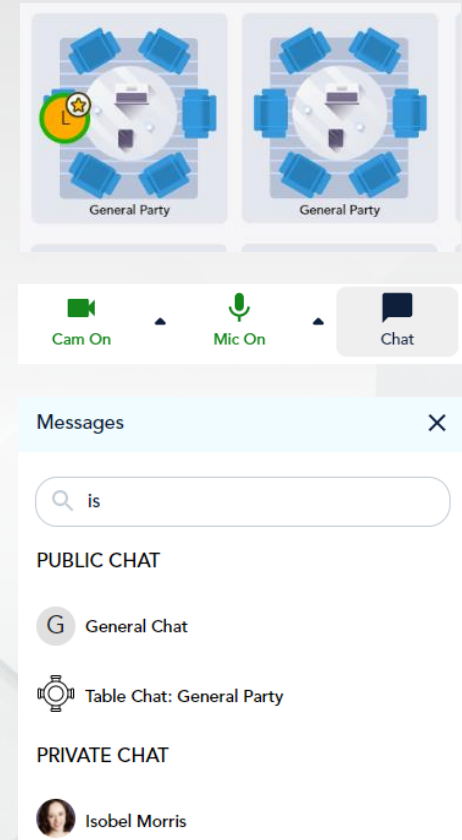
Floor 1: General

Floor 3: Thermal

Floor 2: Electric

Floor 4: Power-to-X

The ‘Chat Function’ can also be used to search for names, send private messages and share details.



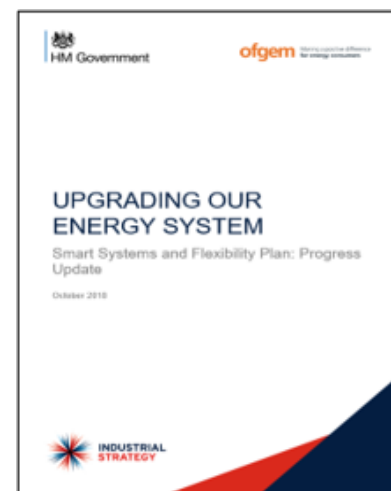
# Policy Context – Long Duration Energy Storage

Hannah Clapham  
Head of Energy Storage, BEIS



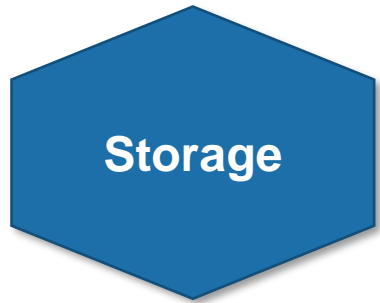
# Electricity storage is essential for meeting net zero

- Flexibility critical for integrating high volumes of low carbon generation, and increased demand from heat and transport. Analysis suggests deploying smart, flexible technologies could unlock savings of up to £12bn per year by 2050<sup>1</sup>.
- Storage enables us to maximise the use of intermittent renewables, balance the system at lower cost and defer or avoid costly network upgrades. Currently ~4GW (inc. 3GW pumped hydro) of storage on the system. By 2050, could need 22–40GW<sup>2</sup>.
- 2017 Smart Systems and Flexibility Plan set out actions to remove barriers, reform markets and invest in innovation – we’ve made good progress against these however barriers still exist to storage at different scales.
- Energy White Paper outlined a commitment to publish the next Smart Systems and Flexibility Plan in Spring this year.
- Longer duration storage (across days, weeks and months) **could help reduce the cost of meeting net zero** by storing excess low carbon generation for longer periods of time – helping to **manage variation in generation**. This will **reduce the amount of fossil fuel** and low carbon generation that would otherwise be needed and **optimise the output from renewables** (rather than curtailing this output, i.e. paying to turn off generators when there is excess supply).





# Enable deployment of all scales of storage....



- Provide regulatory clarity and remove barriers to provide a **best-in-class regulatory framework**.
- Removing barriers to investment in **large scale and long duration** storage without creating distortions.
- Level playing field for **small-scale storage**.



# Design markets to fairly reward flexibility

National and  
Local Flex  
Markets

- Drive development of national and local flexibility markets, and co-ordination between them

CFD and  
capacity  
market

- Consider how flexibility interacts with the CFD and capacity market

Carbon

- Look at how carbon pricing impacts flexibility markets, including transparency and exemptions.

Price Signals

- Consider price signals from network and policy costs could impact consumer flexibility (to be explored in **Alternative Energy Markets** innovation competition).



# UK Energy System: Power-to-X

## Hydrogen

- The Prime Minister's 10 Point Plan and Energy White Paper confirmed our commitment to publish the UK's first ever Hydrogen Strategy.
- The **UK Hydrogen Strategy is set to be published before summer recess** will set out the key steps needed in the 2020s to deliver our 5GW production ambition for use across the economy and set the context for further scale up on the way to net zero. This will provide a clear long-term signal to investors that we are committed to building a UK hydrogen economy and set out the detail of how we will work with industry to achieve this.
- We have been engaging widely across Government, and with industry and the innovation community through the Hydrogen Advisory Council and its working groups, to ensure that the strategy is well-informed and evidence-based.

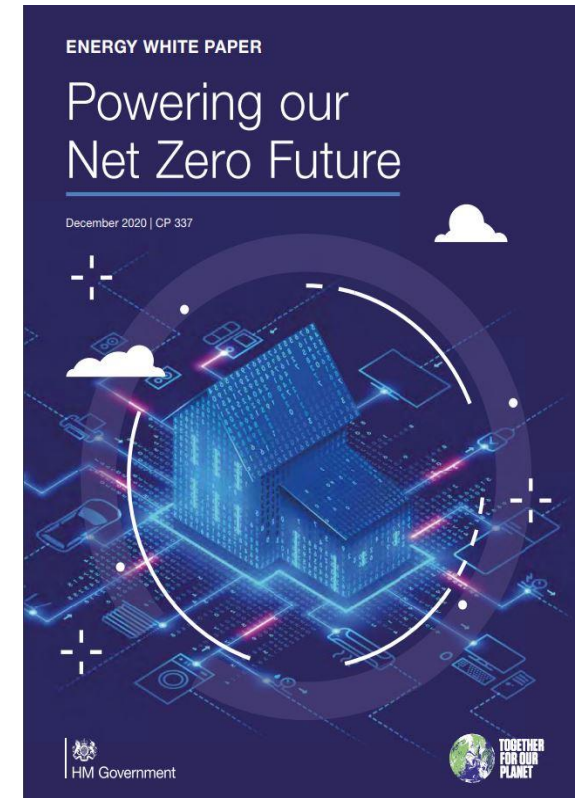


# UK Energy System: Thermal Energy Storage

**Energy White Paper:** The electrification of heat has implications for the GB electricity system, given the increased demand for power and the prospect of different demand patterns which arise from using power for heat. We need to electrify heat in buildings in a way which reduces the need for additional generation and network capacity.

Where the end energy need of electricity is heat the most cost effective, efficient and minimal impact on the grid use of that input electricity would be storing the electricity as heat - either at individual building level or at scale in heat networks connecting to multiple buildings.

- Thermal storage as hot water or phase change material is one of the lowest costs forms of energy storage
- Converting electricity to heat with direct resistive heaters is around 100% efficient and heat pumps range from 250% (air source) to 500% (waste heat source) coefficients of performance (similar to efficiency).
- Reduces the peak electrical demand coming from electrified heat requirements as the energy is delivered as heat directly.





---

# Net Zero and the Green Industrial Revolution

## *Energy Storage Innovation*

*Georgina Morris, UK Department for Business, Energy and Industrial Strategy*

*Smart Energy Innovation Programme Manager*

*UK Delegate to the International Energy Agency - Energy Storage Technology Collaboration Programme*

  
Department for  
Business, Energy  
& Industrial Strategy



Department for  
Business, Energy  
& Industrial Strategy

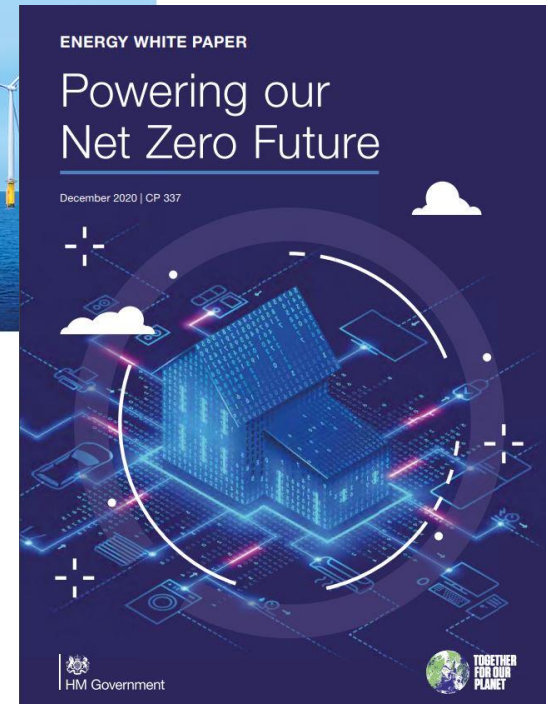
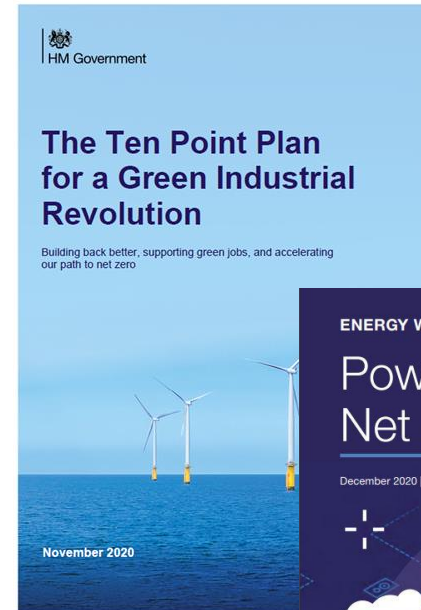
# NZIP Longer Duration Storage Competition

## Programme Overview

This Competition aims to accelerate the commercialisation of first-of-a-kind longer duration energy storage as part of our investment in storage and flexibility innovation

Energy Storage and Flexibility innovation was included as one of ten key priority areas in the **Prime Minister's Ten Point Plan for a Green Industrial Revolution**, and amounts to funding at least £100m within the BEIS £1bn+ Net Zero Innovation Portfolio.

The Programme will support the demonstration of innovative Longer Duration energy storage technologies which provide grid flexibility, through a longer duration storage capability and the provision of novel services/system benefits.



Industrial Strategy

# NZIP Longer Duration Storage Competition

Electricity

Thermal

Power-to-X

## Stream 1 – Actual Demonstration

- Technologies currently at TRL 6/7
- Actual demonstrations in operational environments
- Circa £37m innovation funding awarded in the form of Capital Grants
- Requires securing additional private investment.

Electricity

Thermal

Power-to-X

## Stream 2 – Prototype Demonstration

- Technologies currently at TRL 4/5
- System prototypes in relevant or operational environments
- Circa £30m innovation support awarded in the form of Small Business Research Initiative (SBRI) contracts
- Requires risk-sharing

# NZIP Longer Duration Storage Competition

## Technology Categories

The Competition will support proposals that can demonstrate and trial innovative longer duration static energy storage products, within the following technology categories:

- **Electrical energy storage**
- **Thermal energy storage**
- **Power-to-x**

Each application must specify which single technology category the project falls within (electrical storage, thermal storage or power-to-x). Any technology that **discharges the majority of its energy** as electricity should apply to the electrical category, any technology that discharges the majority of its energy as heat should apply to the thermal category and as technology that discharges the majority of its energy as an energy carrier should apply to power-x.

BEIS reserves the right to reallocate technologies to a different category where appropriate.





# NZIP Longer Duration Storage Competition

## Stream 1: pre-commercial demonstrator (grant)

- A maximum of **£7.2M** will be available for **Phase 1**, with a maximum expected grant value of **£1M per project**. We intend to fund ~9 projects in Phase 1
- We have currently allotted **£30M** to **Phase 2**. The maximum expected funding available **per project** is **£11M**. We intend to fund ~3 projects in Phase 2.
- All project activities need to be completed by the **31st March 2025**.
- The Competition grant stream will be delivered as a grant programme within the terms of the EU-UK Trade and Cooperation Agreement (TCA) (dated 31 December 2020) and World Trade Organization (WTO) Subsidies and Countervailing Measures.
- The Competition will fund **experimental development**. Operation, maintenance and further development costs for the developed demonstrators are out of the scope of this Competition.
- Funding intensities towards eligible project costs will be dependant on organisation type and size. BEIS reserves the right not to fund at the maximum allowable funding intensities.

# NZIP Longer Duration Storage Competition

## Phased Delivery

This Competition consists of two phases:

Phase 1, **running from November 2021 until November 2022;**

and Phase 2, running from **December 2022 until March 2025.**

## Stream 1 - pre-commercial demonstrator (grant)

**Phase 1: Mobilisation** (*intending to fund ~9 projects, with ~3 from each technology category; subject to eligibility*).

Phase 1 is a mobilisation phase, where projects are required to put in place the technical, legal, financial and commercial measures for delivery of Phase 2.

**Phase 2: Build and Demonstration** (*intending to fund ~3 projects, 1 from each technology category; subject to eligibility*).

Phase 2 is a build and demonstration phase, where projects build and demonstrate their technology fully.

  
Department for  
Business, Energy  
& Industrial Strategy



Department for  
Business, Energy  
& Industrial Strategy

# NZIP Longer Duration Storage Competition

## Stream 2: first-of-a-kind prototypes (SBRI)

- A maximum of **£1.5M** will be available for **Phase 1** feasibility studies, with a maximum value of **£150,000 per project**. We intend to fund ~12 projects in Phase 1.
- We have currently allotted **£29M** to **Phase 2** demonstration projects. The maximum expected funding available **per project** is **£9.45M**. We intend to fund ~3 projects in Phase 2.
- All project activities need to be completed by the **31st March 2024**.
- At least **50% of the contract value** must be attributed directly and exclusively to **research and development** services.
- SBRI is aimed at organisations working on research and development (R&D) of an innovative process, material, device, product, or service prior to commercialisation. Projects requesting funding for commercialisation activities are not eligible.

# NZIP Longer Duration Storage Competition

## Phased Delivery

This Competition consists of two phases:

Phase 1, running from **November 2021 until March 2022**;

and Phase 2, running from **April 2022 until March 2024**.

## Stream 2 - first-of-a-kind prototypes (SBRI)

**Phase 1: Feasibility study** (*intending to fund ~12 projects, with ~4 from each technology category; subject to eligibility*).

In this phase, projects will be expected to scope and develop a feasibility study for their proposed technologies, covering potential deployment on the UK energy system.

**Phase 2: Build and demonstration of the technology prototype** (*intending to fund ~3 projects, 1 from each technology category; subject to evaluation*).

Projects which receive Phase 2 funding will be expected to build a full-system prototype of their proposed technology and demonstrate it in a relevant (TRL 6) or operational (TRL 7) environment .

  
Department for  
Business, Energy  
& Industrial Strategy



Department for  
Business, Energy  
& Industrial Strategy



# NZIP Longer Duration Storage Competition

## Eligibility Criteria

We expect all technologies in scope to be able to demonstrate the ability to charge utilising electricity, in view of delivering key flexibility services to the UK power grid

## Stream 1

- In Phase 1 projects will be expected to mobilise their proposed technologies to prepare for potential deployment on the UK energy system
- Lead organisations must be UK-registered to be eligible for funding
- The technology demonstrator must be for the UK energy system (inc. Northern Ireland) and thus meet the needs of the UK energy system. The demonstration itself must take place in the UK. This does not preclude elements of the project from being conducted outside the UK or part of project costs being spent outside of the UK.

## Stream 2

- The Phase 1 feasibility study must cover the UK
- Phase 2 prototype must benefit the UK energy system and be demonstrated in a relevant or operational environment within the UK.

BEIS  
Department for  
Business, Energy  
& Industrial Strategy



Department for  
Business, Energy  
& Industrial Strategy

# NZIP Longer Duration Storage Competition

## United Kingdom

The rules set out apply equally to all applicants from England, Wales, Scotland and Northern Ireland that are eligible to receive funding.

### Stream 1 (grants) - Northern Ireland

Grants awarded to applicants and partner organisations from Northern Ireland will also be subject to scrutiny from the European Commission in accordance with Article 10 of the Northern Ireland Protocol to the UK/EU Withdrawal Agreement.

Applicants (sole applicants and lead project members of consortium bids) must be able to demonstrate that they are financially viable.

Applicants based in Northern Ireland, or with significant interests or subsidiaries in Northern Ireland, will also be subject to scrutiny from the European Commission in accordance with Article 10 of the Northern Ireland Protocol to the UK/EU Withdrawal Agreement.

# Questions

Applicants may ask questions at any time prior to **14:00 on 7 July 2021**

- Email questions to [storage.innovation@beis.gov.uk](mailto:storage.innovation@beis.gov.uk)
- Note that in the interest of fairness, all questions asked will be anonymised and publicised on the gov.uk page for the competition.
- Publication of the Q&A is expected **14 July 2021**, however individual direct questions may be answered before that date.

# Break

***Last chance to book limited remaining 1-2-1 sessions with BEIS – message Lindsay Barnett on Remo***

*We shall now be going into conversation mode for 15 minutes, feel free to network and move around tables and floors.*



Department for  
Business, Energy  
& Industrial Strategy



---

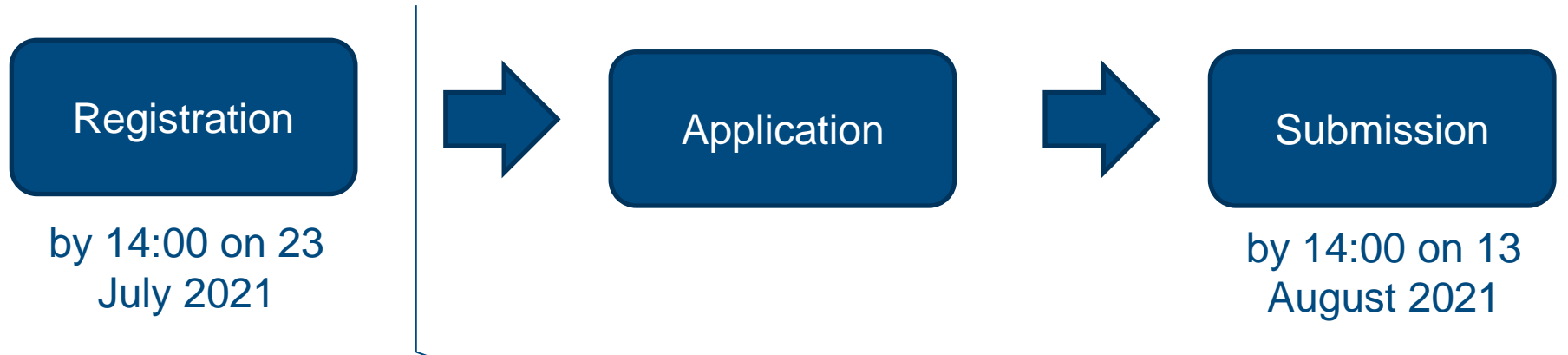
# Longer Duration Energy Storage Demonstration Innovation Competition **Application process**

Andy Wilson, Project Manager - Smart Energy Innovation, BEIS

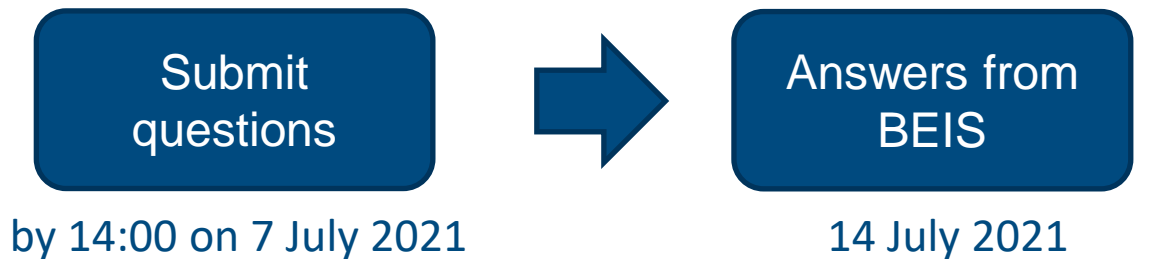
17 June 2021

  
Department for  
Business, Energy  
& Industrial Strategy

# Application process



# Q&A process



  
Department for  
Business, Energy  
& Industrial Strategy



# Registration

**Registration is a requirement for all applicants.**

It is approximately a five-minute process and requires:

- Organisation and contact details
- Project title
- Selection of the application stream
- A brief (200 words) summary of the project

You will be provided with a password required to access the application form.

You must be registered by **14:00 on 23 July 2021** to enter the competition.

# Application

Once registered, applicants will gain access to the application form.

The front page of the application form includes an offline word version, including:

- All questions asked during the application process
- Details of the word limits for all questions

The offline version is **for reference only** and all applicants are expected to **complete the online form in full.**



Department for  
Business, Energy  
& Industrial Strategy

## Long Duration Energy Storage

### Stream 1 Application Form

**Important: please fill in this form using the [Long Duration Storage Guidance Notes \(June 2021\)](#)**

If you would like to see the complete set of questions you can click on [this link to download a Word version](#). *Please note you must complete your application using this online form.*



Department for  
Business, Energy  
& Industrial Strategy



# Application

The application itself requires:

- Organisational details
- Confirmation of an organisation's eligibility (section 5 of guidance)
- Responses to the selection criteria (section 6 of guidance)
- Confirmation of the benefits your innovation will contribute to the wider Net-Zero Innovation Portfolio
- A public description of the project
- Confirmation of acceptance of the terms and conditions

Applications must be submitted by **14:00 on 13 August 2021**

**Incomplete applications will not be considered**

  
Department for  
Business, Energy  
& Industrial Strategy

# Application

Each stream also requires a number of stream-specific submissions:

- A set of declarations
- A technical data form
- A financial model for the project (stream 1 only)
- A project cost breakdown form

Supporting documentation can be uploaded to the application

Please note that there **is no guarantee supporting documentation will be read** by the assessors.

It is suggested that where supporting documents have been uploaded, their relevance and context is discussed in the body of the application.

# Questions

Applicants may ask questions at any time prior to **14:00 on 7 July 2021**

- Email questions to [storage.innovation@beis.gov.uk](mailto:storage.innovation@beis.gov.uk)
- Note that in the interest of fairness, all questions asked will be anonymised and publicised on the gov.uk page for the competition.
- Publication of the Q&A is expected **14 July 2021**, however individual direct questions may be answered before that date.

# Q & A



Department for  
Business, Energy  
& Industrial Strategy





# Showcase

*Facilitated by Mark Sommerfeld, Head of Power and Flexibility REA*



Department for  
Business, Energy  
& Industrial Strategy



# Housekeeping

The 1-2-1 sessions with BEIS are also now starting. This session is being recorded so you will be able to watch the video if you miss anything.

The purpose of this showcase is to help facilitate consortium building and networking

These pitches will have no bearing on any eventual competition bids.

These are meant as 'elevator-style' pitches. Each speaker will only have **one minute and one slide**.

Speakers will be invited up to the stage one by one. They will then be able to unmute and turn on your camera and mic. Speakers please be ready to avoid delays between speakers.

Attendees will not be able to ask questions of the presenters, however, make a note of their name and find them during the networking session.

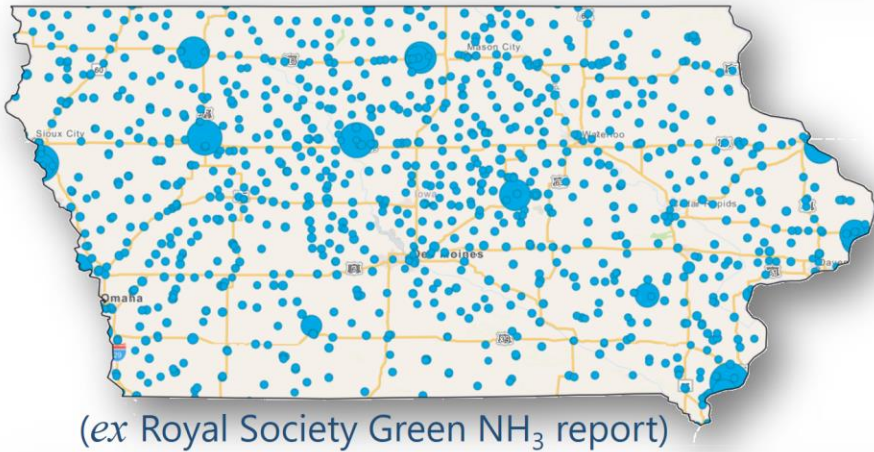




# Power to ZCFs: (LDES-2)

green NH<sub>3</sub> and H<sub>2</sub> production  
TRL 4-6 prototype demonstration  
consortium building

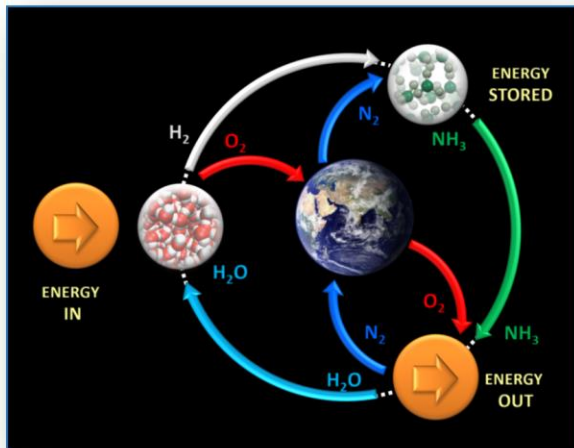
**IOWA:** 0.8Mt NH<sub>3</sub> (1087 sites)  $\cong$  2.5TWh



Bill DAVID



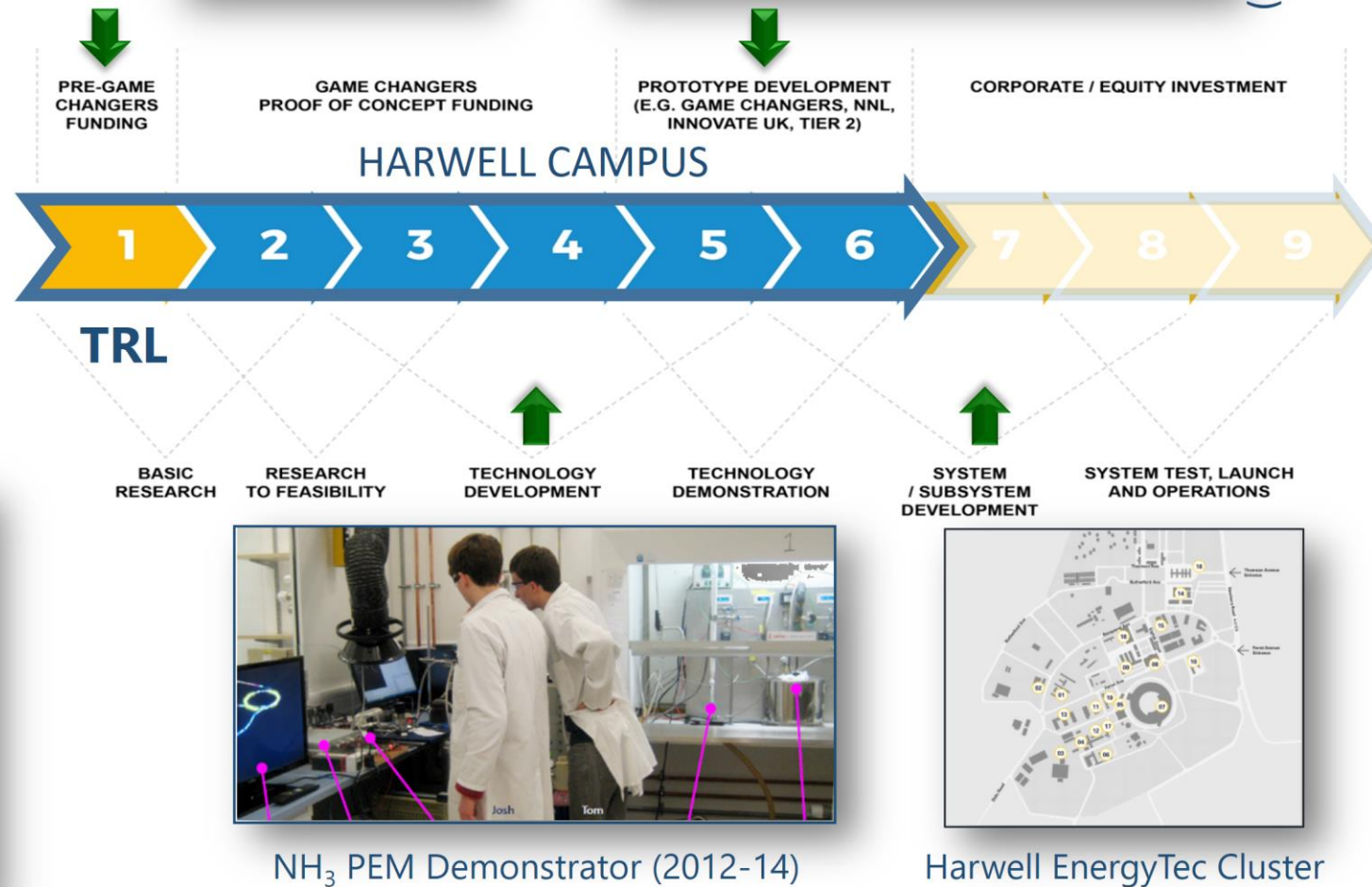
Science and  
Technology  
Facilities Council



Novel NH<sub>3</sub>  
Catalysts (2011-)



Green Ammonia  
Demonstrator (2017-)



NH<sub>3</sub> PEM Demonstrator (2012-14)

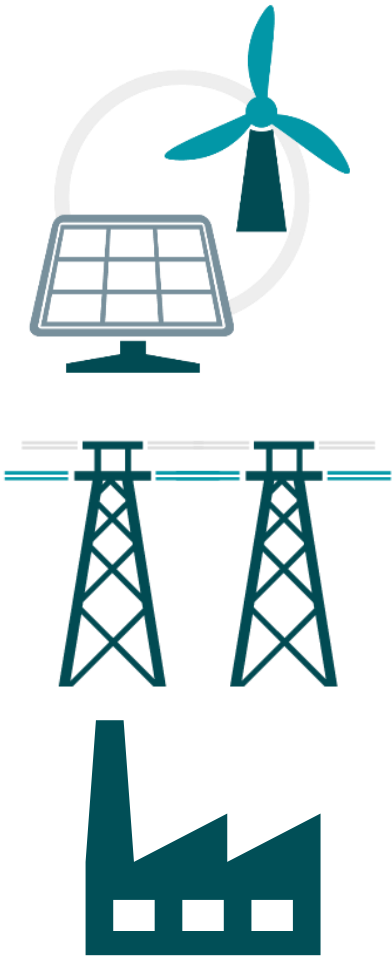
Harwell EnergyTec Cluster

# THERMO-MECHANICAL STORAGE



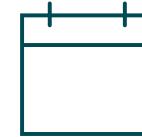
Cheesecake Energy Ltd

The world's greenest battery



Thermal and compressed air energy storage

for **30-40% lower cost** than lithium-ion



Long-lasting system based on proven industrial hardware – targeting **25 year** service life



Potential for **heat integration** – can deliver heat in cogeneration mode, or absorb heat to increase electrical output



Uses rotating machinery to deliver **resilience** to the grid or microgrid

Seeking a renewables generator, DNO or consumer requiring **1-5 MW** for **5-10 hours** at full power



# Ultra low-head storage using existing infrastructure and Tidetec two-way optimized turbine solution with high pumping efficiency



BEIS category:

Electrical storage

Locations:

Tidal basins

Redundant dry-docks

Tidal lagoons

Energy Islands

Efficiency:

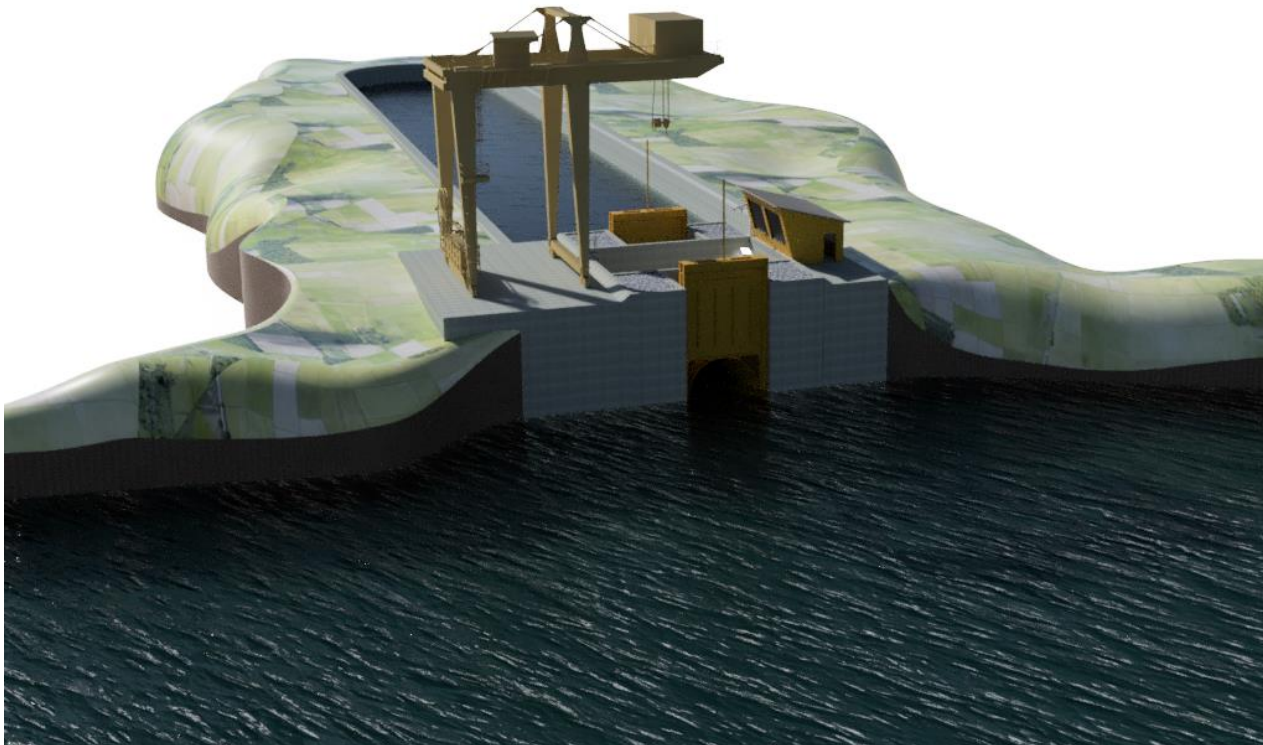
Longer duration storage: >70% roundtrip efficiency

Tidal enhanced storage: >140% efficiency

Proof of concept with tested model turbine

Concept design phase funded

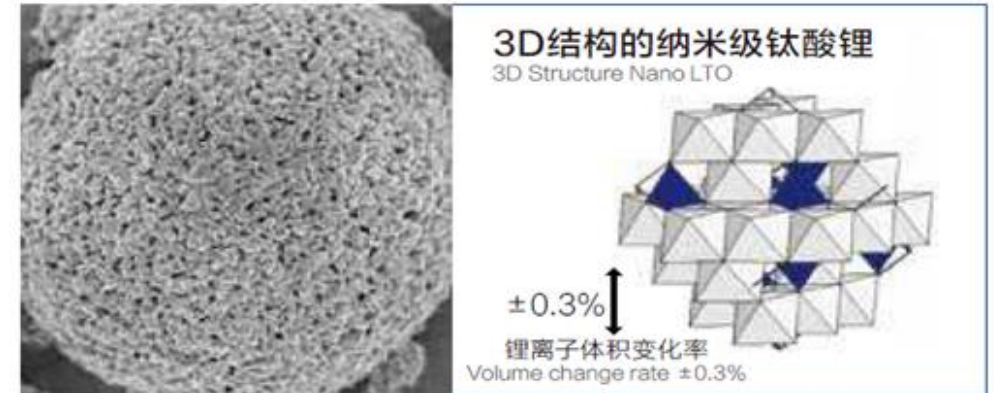
Industrial partners welcomed



# Innovation – Role of Battery in Energy Storage

## LTO (Lithium Titanate (Li<sub>2</sub>TiO<sub>3</sub>)) — by ECO ESS Ltd UK

- The LTO material breaks through the limitation of the traditional graphite anode's 2D layer structure and has a stable **3D crystal structure**.
- **High-density Lithium-Ion** battery that safely store energy while delivering incredible performance.
- During the charging & discharging process, the material structure **hardly changes**, and is called “**zero strain material**”.
- LTO material hardly forms **unstable SEI film**.
- LTO material has **higher electric potential** with lithium metal.
- These **robust** and reliable batteries with 10-years warranty.
- **When more capacity** is needed.
- Fast charge in 6mins, wide temperature range (-50°C~ 60°C) , **30 years' service life**, no fire, no explosion, high security and high efficiency.



脱嵌过程, LTO结构稳定 (体积变化率±0.3%), 具有长循环寿命特性。  
De-intercalation process of "Li-ion+"(Volume change rate ±0.3%), stable LTO structure enables long cycle life.

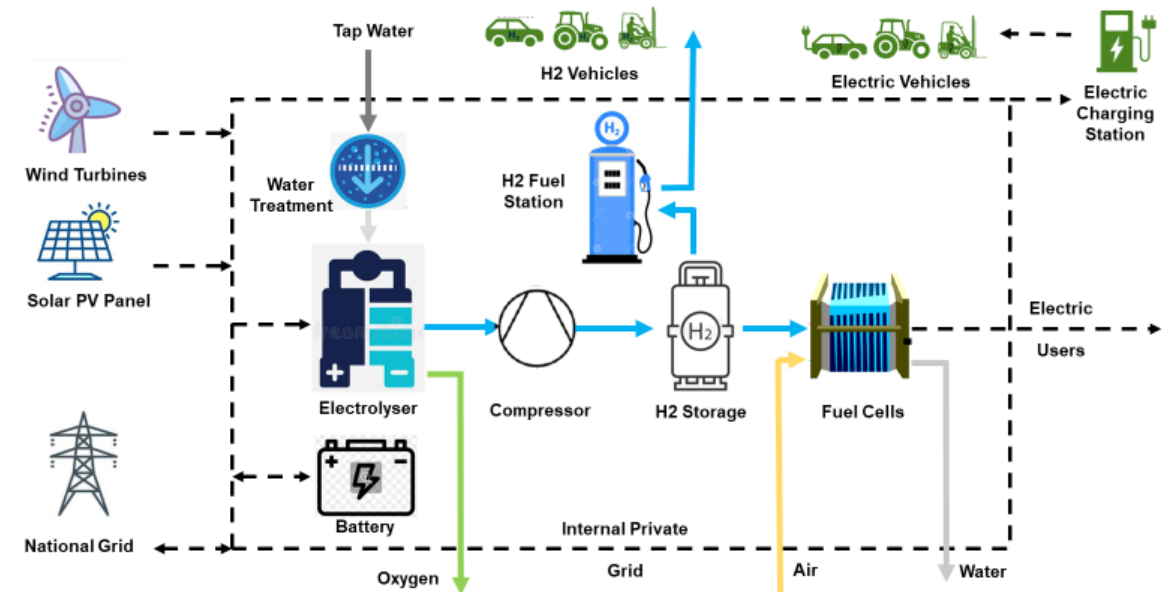
<b>Lithium Titanate (Li<sub>2</sub>TiO<sub>3</sub>) — LTO</b>	
2.40V nominal; typical operating range 1.8–2.85V/cell	
50–80Wh/kg	
1C typical; 5-10C maximum, charges to 2.85V	
10C possible, 30C 5s pulse; 1.80V cut-off on LCO/LTO	
3,000–7,000	
-40 - 50°C	
One of safest Li-ion batteries	



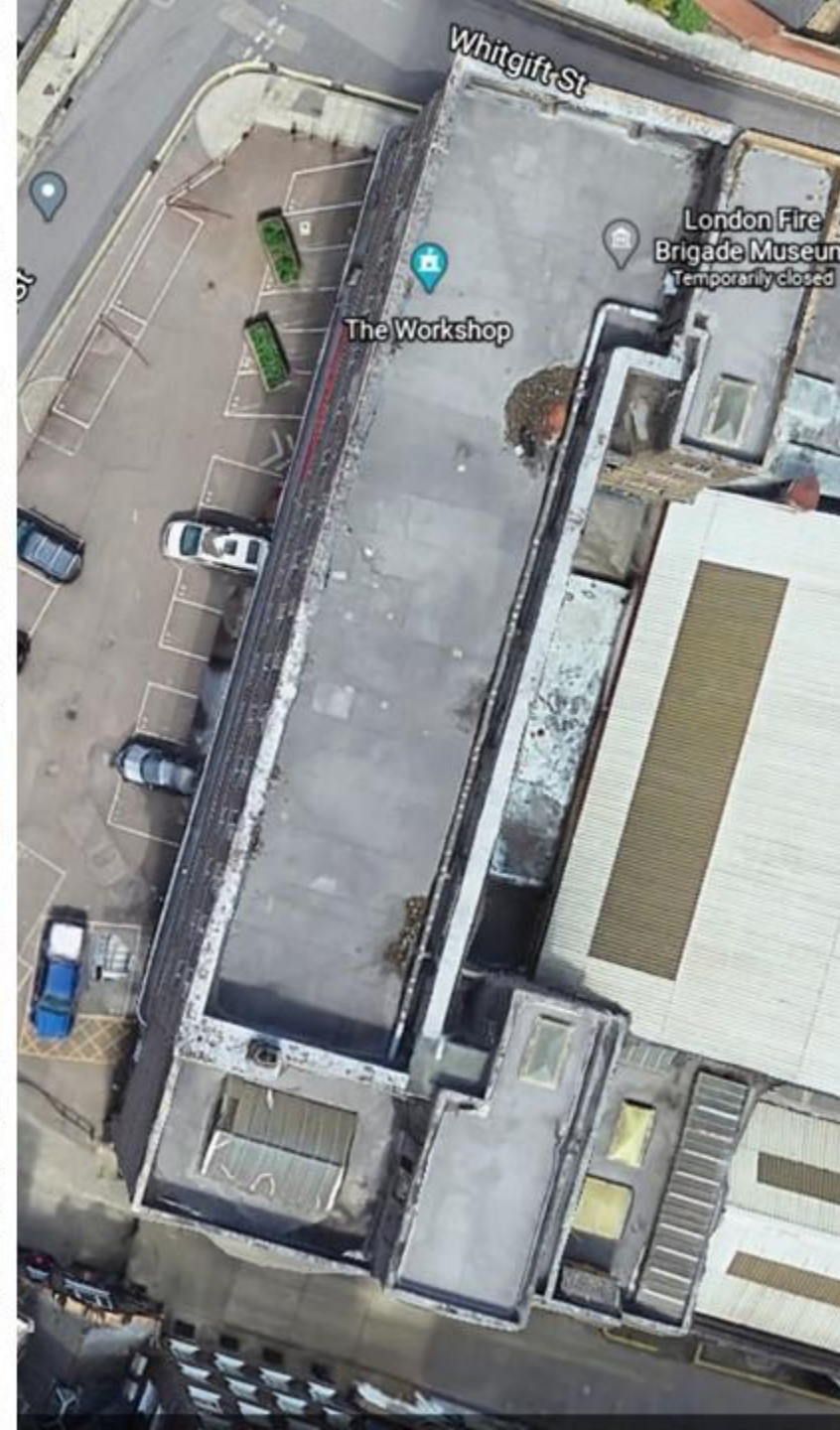


# HYDROGLEN: renewable hydrogen farming community

- HydroGlen is a *green hydrogen* powered *farming community* project in north-east UK being developed by Water to Water together with the James Hutton Institute, providing a *scalable and replicable demonstrator* for farming and other rural communities to become self-reliant, low carbon energy producers and exporters, generating 100%+ of their *electricity, heating and transport fuel* energy requirements *renewably*.
- Located at the James Hutton Institute's research farm and residential community at Glensaugh, HydroGlen offers a decentralised community scale renewable energy model that can meaningfully contribute to UK's hydrogen and *net-zero ambitions* through collective contributions of multiple projects across the UK's rural areas.
- Feasibility study completed Q4 2020. Early engagement with key stakeholders undertaken Q1 2021. *No show-stoppers* identified.
- OFFERING:** technology agnostic, rural operational farm operated by a world-leading research organisation [The James Hutton Institute](#) supported by renewable project specialists, [Water to Water](#) committed to the realisation of the project.
- SEEKING:** consortium partners, technology partners, investment







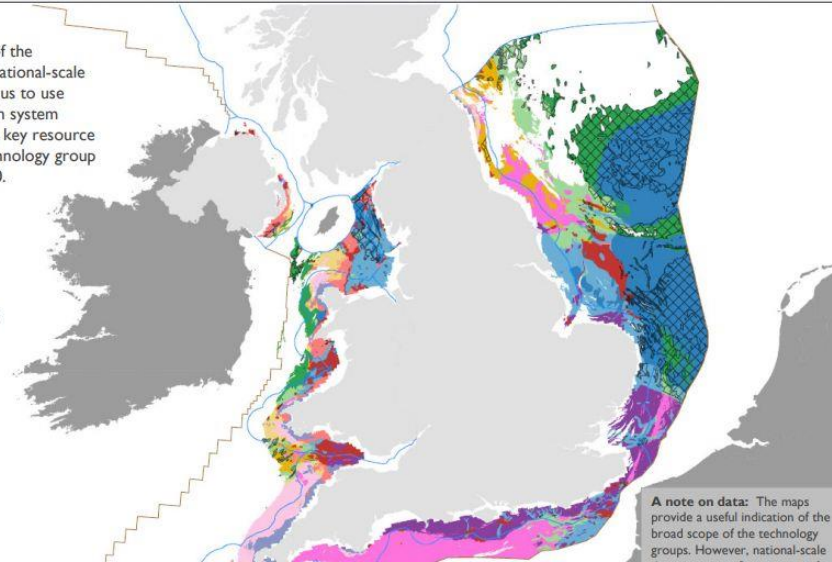




## resource areas for offshore wind

Accounting for the UK's diverse seabed characteristics and recognising regional differences

Combining the results of the technology study with national-scale spatial datasets allowed us to use geographical information system mapping to visualise the key resource areas in which each technology group could be applied in 2040.



### SHORE WIND TECHNOLOGY GROUPS

- TG-1 Jacket with suction caissons
- TG-2A Monopiles, driven, simple seabed
- TG-2B Monopiles, driven, complex seabed
- TG-3A Monopiles, drive-drill-drive, simple
- TG-3B Monopiles, drive-drill-drive, complex
- TG-4A Jackets, driven, simple seabed
- TG-4B Jackets, driven, simple seabed
- TG-5A Jackets, drive-drill-drive, simple
- TG-5B Jackets, drive-drill-drive, complex

**A note on data:** The maps provide a useful indication of the broad scope of the technology groups. However, national-scale

# H2GO POWER: Luke Sperrin, CTO



Our technology utilises chemistry to store hydrogen safely, at near ambient pressures which is significantly **safer**, more **efficient**, and **lower cost**

## #NOPRESSURE

We do not compress or cryogenically freeze hydrogen to store it

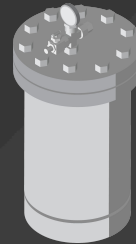
- *Looking for end users / use cases*
- *Team up with EL and FC companies*
- *Renewable energy operators, Grids, Industry, Hydrogen hubs*
- *Stream 1*

[luke@h2gopower.com](mailto:luke@h2gopower.com) | [www.h2gopower.com](http://www.h2gopower.com)

## Large scale energy storage

### Plug & Play (PnP) stationary storage

Storing renewable energy as H<sub>2</sub> for peak demand



### Hydrogen Storage Module

(low pressure H<sub>2</sub> storage)



### Utility-scale Storage

### Hydrogen management

Optimising the storage of hydrogen



### AI-driven Hydrogen Management System

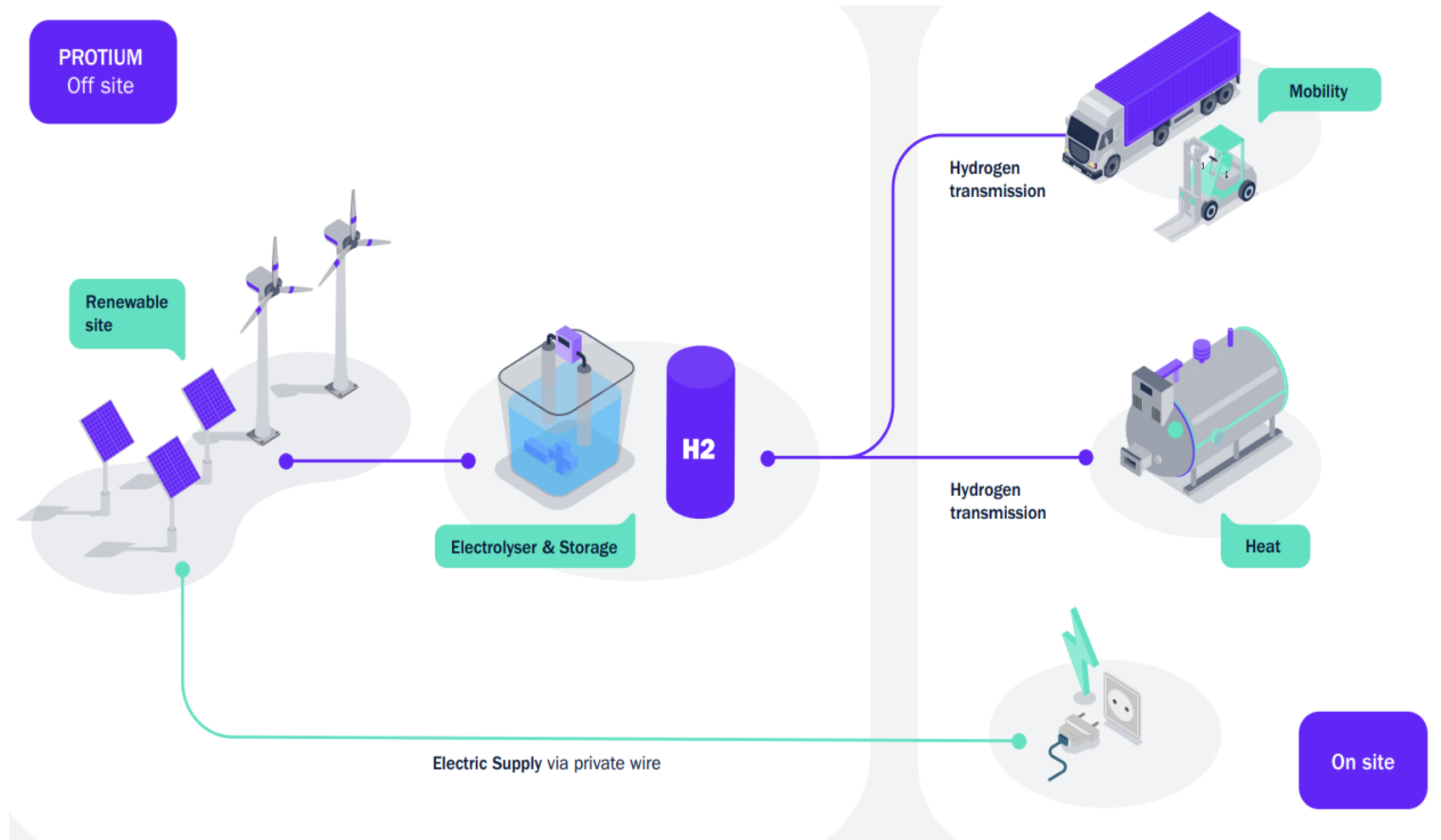


# Protium delivers zero emission energy solutions through a Hydrogen Energy Services (HESCO™) Model



- We enable UK industries and local government to **reach zero greenhouse gas emissions**.
- To achieve this, Protium develops, builds and finances renewable energy projects that produce **green hydrogen** from water and renewables.
- We focus on projects and sectors where **early commercial traction** is viable without relying on government grants or subsidies.
- We **build consortiums** between technology providers and end users to bring low carbon hydrogen solutions to life

## Illustrative project configuration



# Invinity VS3 Vanadium Flow Battery (VFB)



Vanadium flow technology with superior performance



Invinity VS3 "Six-pack"

## Value Proposition

- **Longer Duration** – Optimized for 4-10 hours discharge
- **Durable** – 25-year lifetime, no cycling degradation costs
- **Economic** – Lower LCOS in high-throughput applications
- **Safe** – Low fire risk removes costs and deployment barriers
- **Versatile** – Sub-second response and other stability services
- **Sustainable** – No conflict minerals; all parts recycled

## UK Grid Opportunity

- **Minimise curtailment** of renewables at grid connection point, maximising connection value for generators
- **Zero-emissions stability** and balancing services to avoid turning off renewable generation
- **Zero-emissions reserve**, providing capacity to meet high scarcity value and future balancing services
- **Flexible network development** to match shifting demands of renewable generation and cross-sector electrification
- **Future-proof portfolio** against price risk and increasing system requirements

## Track record on Innovation Projects



CALIFORNIA  
ENERGY  
COMMISSION

EMEC  
THE EUROPEAN MARINE ENERGY CENTRE LTD



ARENA

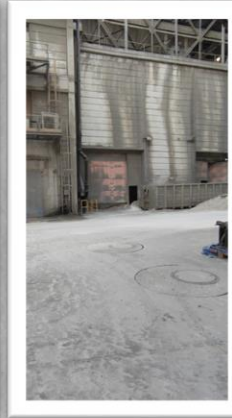
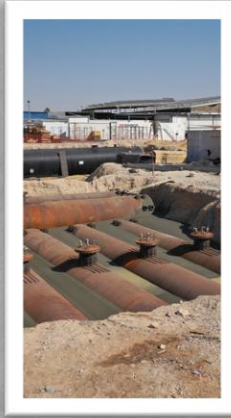
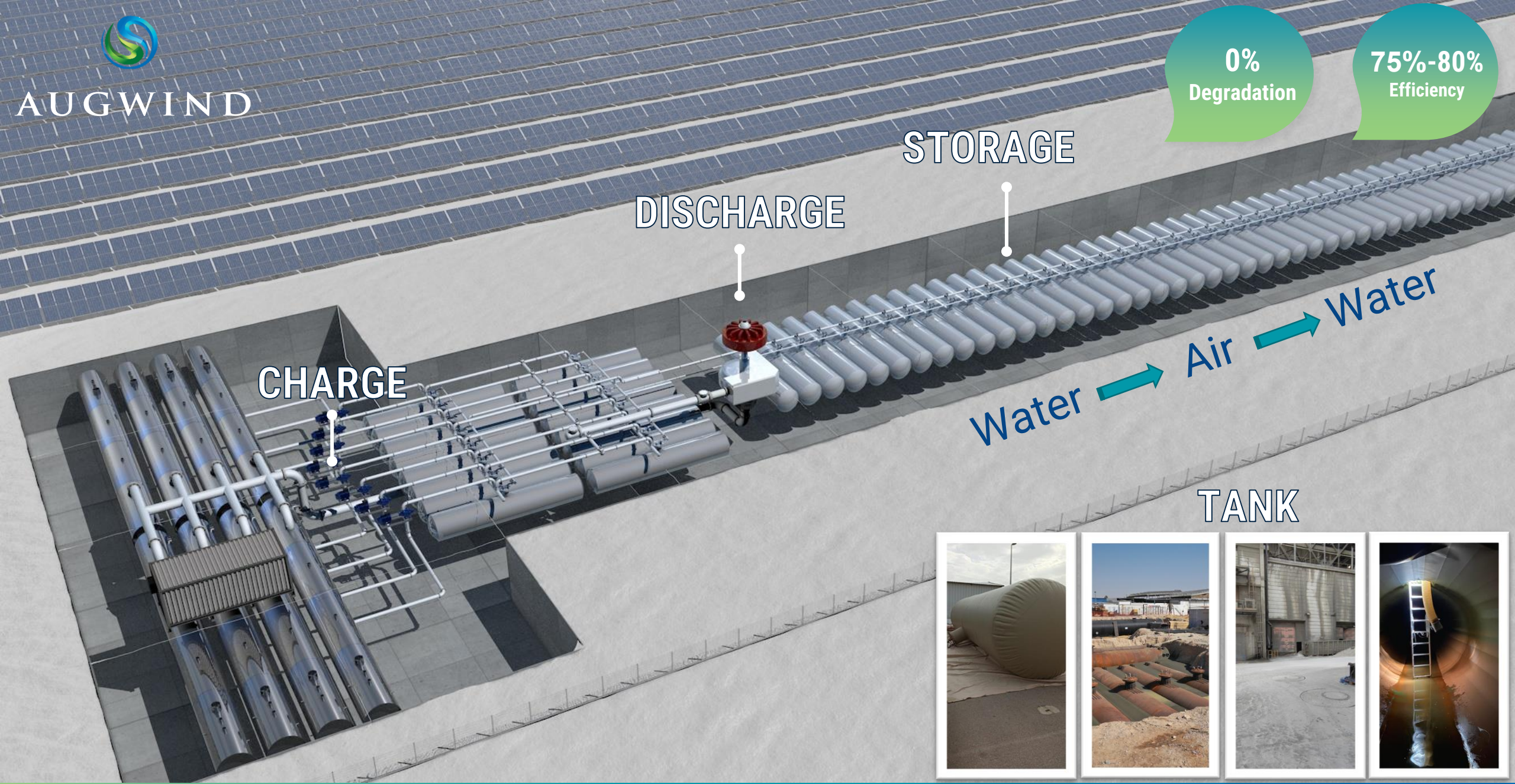




AUGWIND

0%  
Degradation

75%-80%  
Efficiency





# ENERGY DOME: USING CO2 TO FIGHT CLIMATE CHANGE

[www.energydome.com](http://www.energydome.com)

Energy Dome S.p.A has developed a breakthrough technology for utility scale energy storage with durations between **4h and over** that uses **CO2 as a working fluid**. This technology is called:

CO2 is a fluid that can be liquid at ambient temperature reaching very high energy densities and low storage costs

The logo features a blue circle with a white 'C' inside, followed by a grey '2' and the word 'BATTERY' in blue capital letters.



The logo consists of a white stylized arch above the word 'ENERGYDOME' in white capital letters, all on a dark blue rectangular background.  
**ENERGYDOME**

Highly competitive LCOS

RTE of +75% with no degradation over time

25+ years of project lifetime

No site dependency

Reliable and well known of-the-shelf equipment

EPC performance wrap available

Technical demonstrator anticipated COD 1Q22

Energy Dome is open to partnering with a developer / site owner to jointly develop and bid a [100-200MWh] project into the BEIS Long Duration Storage Competition

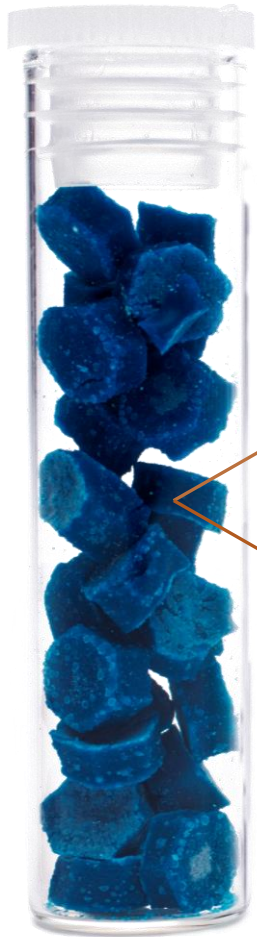
In case of interest please contact:

Rembrandt Niessen, *CCO*.

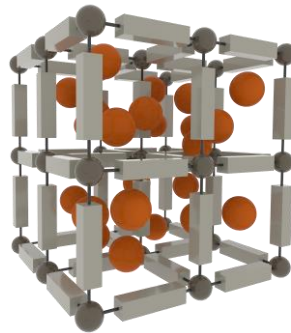
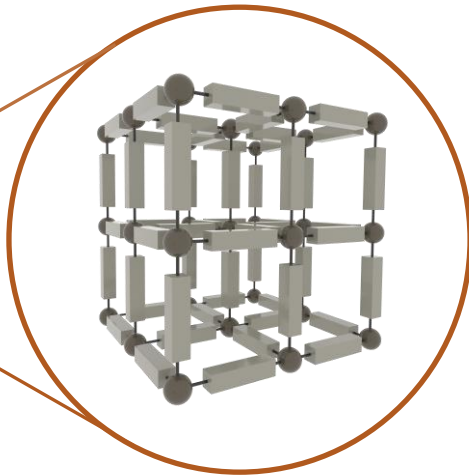
[rembrandt.niessen@energydome.it](mailto:rembrandt.niessen@energydome.it)

Francesco Oppici, *BD Manager*.

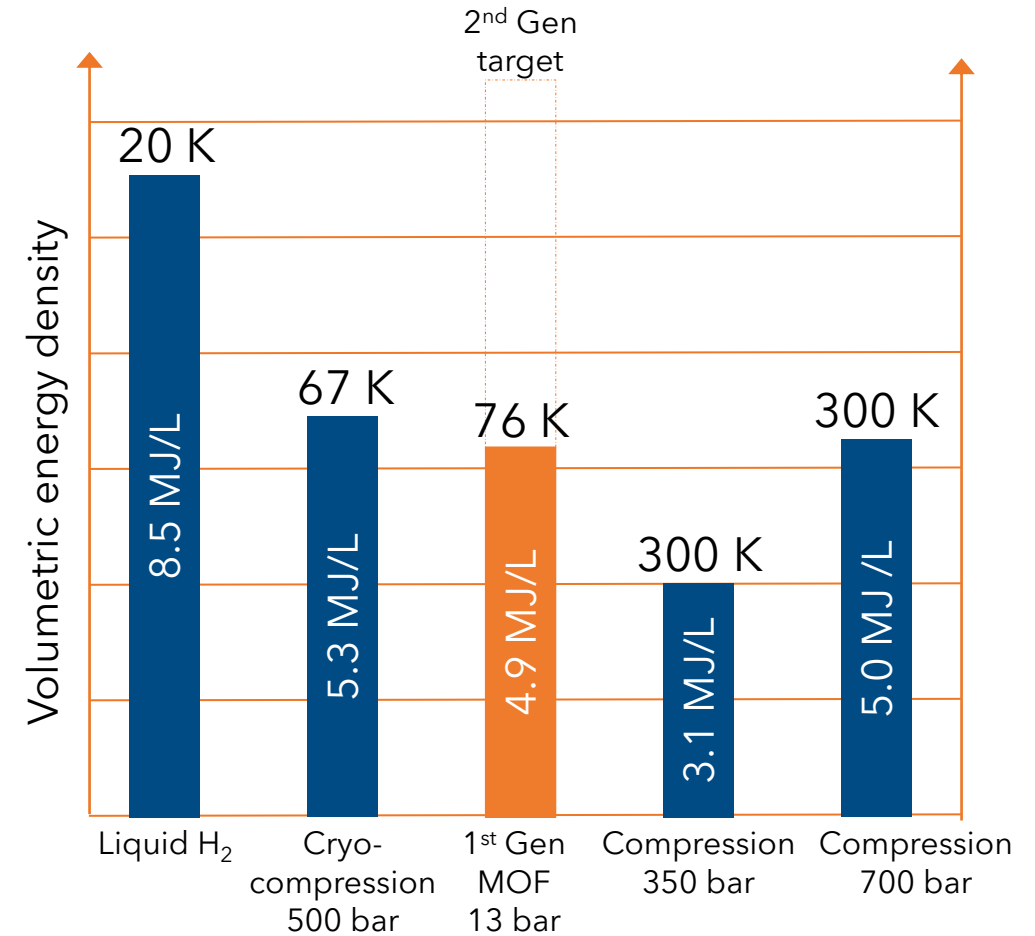
[f.oppici@energydome.it](mailto:f.oppici@energydome.it)



Metal-organic frameworks:  
molecular sponges

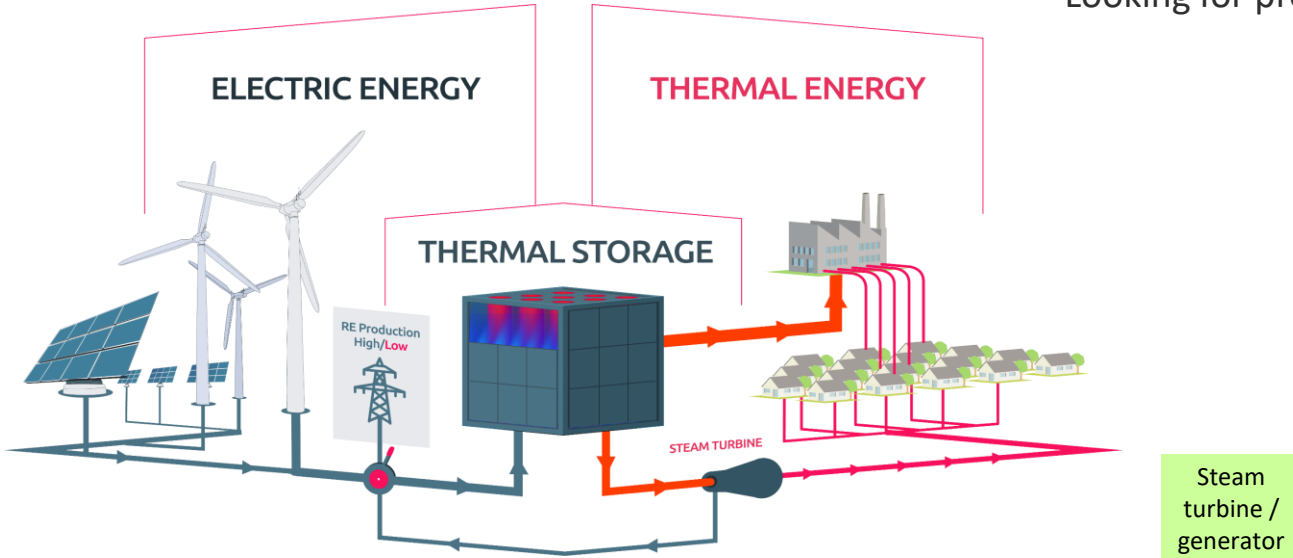


Meeting 40 g/L target at 13 bar



# LUMENION - grid scale thermal energy store

CO<sub>2</sub>-free Process heat for UK industries

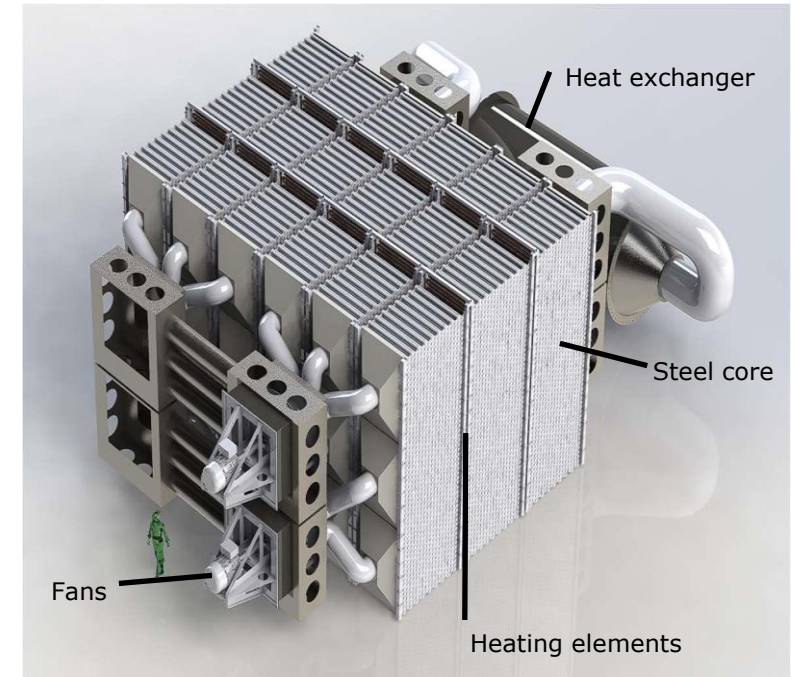
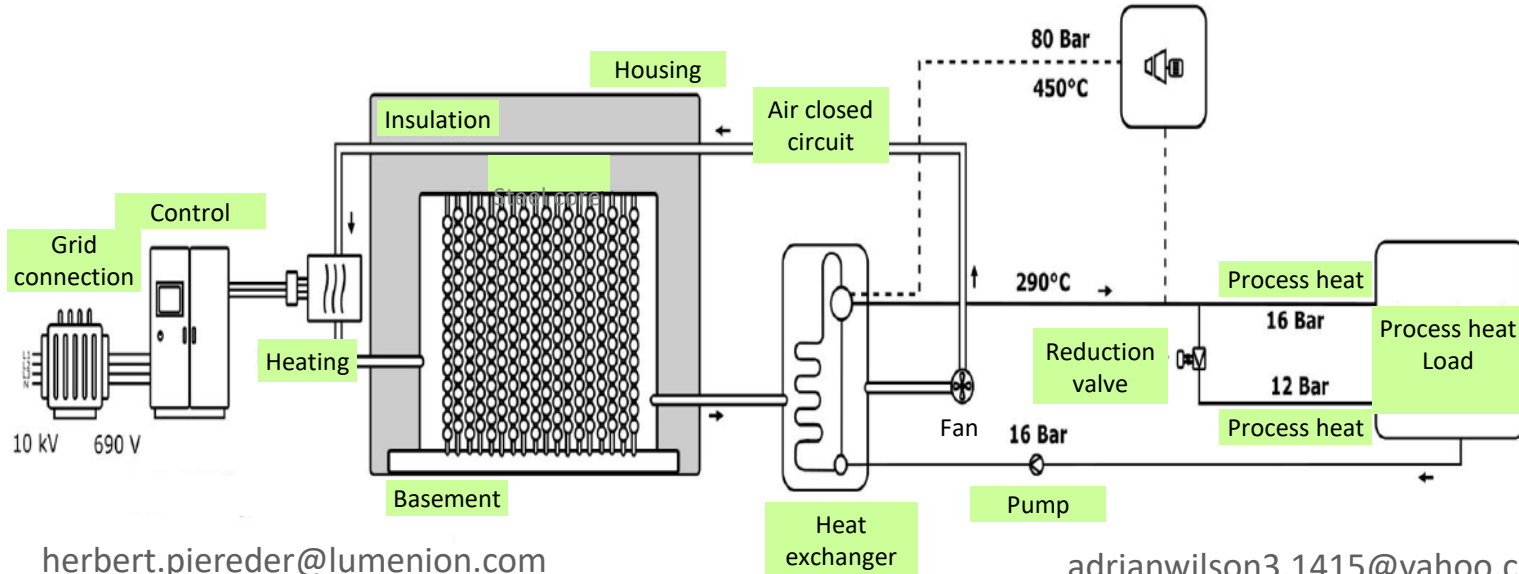


Looking for project partners:

Industries such as chemical, distilleries, bakeries, thermal power plant, refineries, wind and PV developers, utilities, SOEC green hydrogen, aggregators

UK manufacturers

UK suppliers





# Longer duration storage technologies



## Chemical

Hydrogen electrolyzers, ammonia and synthetic fuels

## Thermal

Electro-Thermal Energy Storage (with Siemens Gamesa)

## Mechanical

Compressed Air Energy Storage

## Conversion back to power

Hydrogen fuelled gas turbines

Hydrogen Power Units (with GeoPura)

# ***Networking***

*We shall be returning to conversation mode,  
please feel free to network.*

*There will be a final wrap up at 5.28*





# *Wrap up*

**Dr Nina Skorupska CBE,  
Chief Executive of the REA**

*Thank you for joining us this afternoon.*



Department for  
Business, Energy  
& Industrial Strategy

