

EXETER CITY FUTURES  
HYDROGEN WORKSHOP



**CITY SCIENCE**  
delivering decarbonisation

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*This summary report has been prepared by Jo Muncaster, Associate Director of Carbon Accounting at City Science.*

## 2 Workshop Information

On Wednesday 2<sup>nd</sup> November 2022 (14:00 – 17:00), Exeter City Futures held an in-person *Hydrogen for Exeter* workshop at the Jury’s Inn, Exeter. Those invited included City and County Councillors, Senior Officers, Exeter City Futures Partners (Exeter City Council, Devon County Council, University of Exeter, Exeter College, and Global City Futures) and other City Leaders. A full list of attendees can be found in the appendix.

The purpose of the session was to gain a shared understanding of the part that hydrogen could play in the decarbonisation of energy in the city and to inform ECF partners of the existing private sector and academia hydrogen opportunities that were being progressed in the local area.

The session also included presentations from four companies on how their business was developing hydrogen solutions and innovation in Devon. The companies and their solutions included:

- **Green Emerald:** Site-based electrolyzers for industrial processes
- **Two Drifters Distillery:** Developing Carbon Capture and Storage solutions in Devon
- **Centrax GT:** Developing gas turbines to operate from hydrogen
- **Carlton Power:** Partnering with a local solar farm to develop a green hydrogen electrolysis site

Following the presentations, the attendees participated in a guided workshop (hosted by City Science) enabling the attendees to consider whether hydrogen was a suitable solution for the city’s energy needs, and how it could be best utilised in a low-carbon energy system. These discussions were shaped via a three-horizons analysis model. At the end of the session each group presented the highlights of their discussions.

The session’s programme can be found in Table 1.

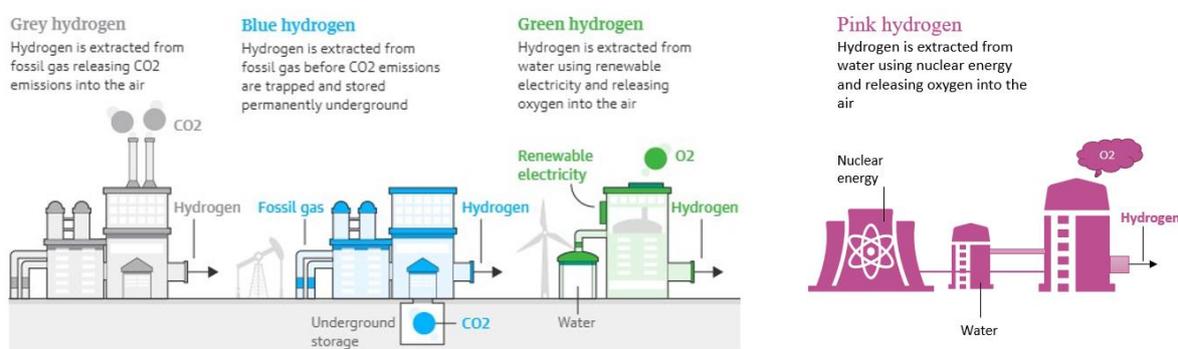
Time	Session	Presenter
2.00-2.05	Introduction and welcome	Jo Yelland (ECF)
2.05-2.25	What is Hydrogen, national policy and future uses	City Science
2.25-2.45	Current and Future emissions and uses of energy in Exeter	City Science
2.45-3.00	Green Emerald – Innovation in Exeter	Gary Nicholson
3.00-3.15	Russ Wakeman – CCUS in Exeter	Russ Wakeman
3.15-3.30	Centrax GT – Technology transition	Pete McCaig
3.30-3.45	Refreshments	
3.45-4.00	Carlton Power – Building capacity in the South West	City Science
4.00-4.20	Question and Answer Session	Jo Yelland (Chair)
4.20-4.40	Structured small group discussions	City Science
4.40-4.50	Feedback on group discussions	City Science
4.50-5.00	Summing up, next steps and close	Karime Hassan (ECF)

Table 1: Session Programme

### 3 Introduction and Welcome

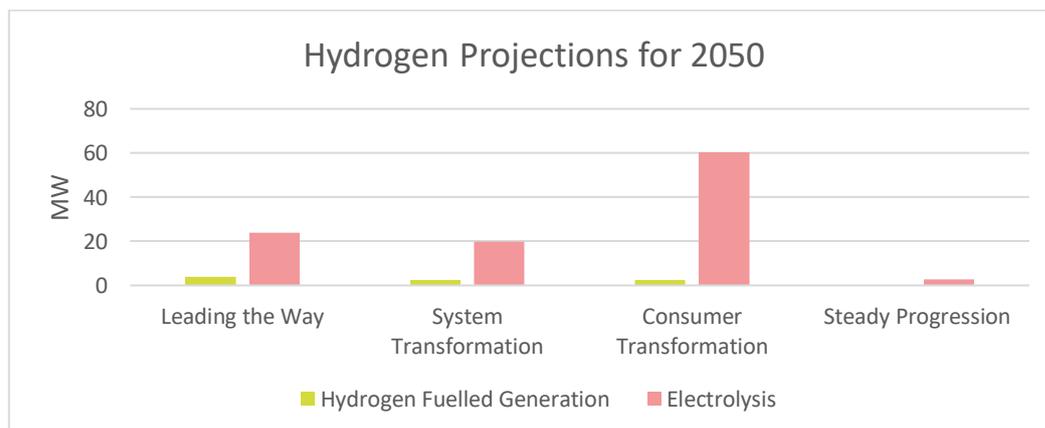
#### 3.1 Presentation Highlights

- Hydrogen forms a key element of the Government’s Energy Security Strategy and an opportunity to reduce carbon emissions through fuel switching.
- The Government strategy to 2030 proposes Small-scale electrolytic production, direct pipeline hydrogen and trucked hydrogen to demand hotspots, transport use and heating trials.
- Moving through to 2050 the government expects large scale production of green and blue hydrogen throughout industry and transport with some use in the gas network.
- Hydrogen colours were discussed and the current limitation of the energy grid to support additional renewable energy infrastructure and the ability for hydrogen to store renewable energy.



Guardian graphic. Source: Transport and Environment

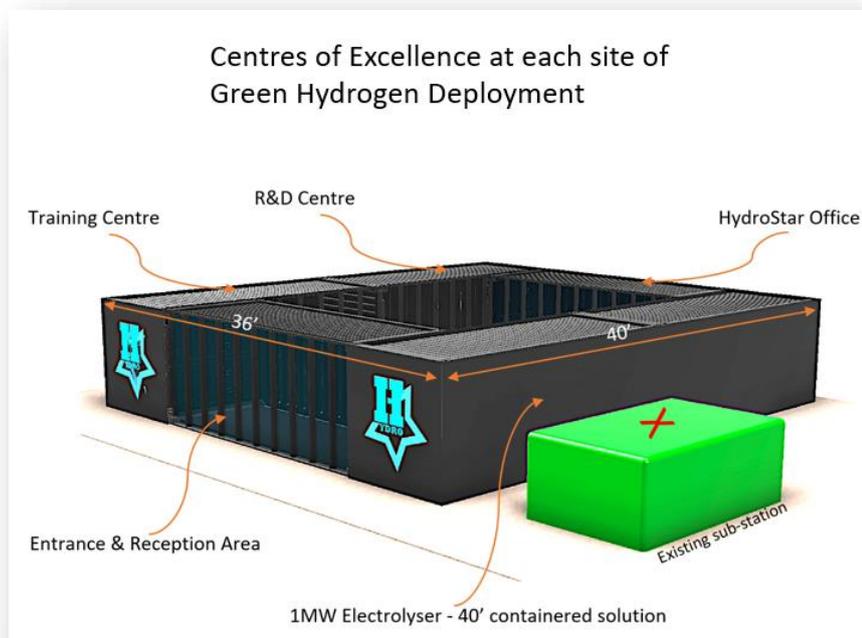
- Possible uses for hydrogen were shared and discussed with the group, highlighting the key opportunities in decarbonising industry and storage of energy to balance demand and supply from renewable energy sources.
- The limited Government investment in hydrogen infrastructure in the South West was highlighted to demonstrate the need for regional focus and promotion where demand would be required.
- Short-term opportunities to use hydrogen gas blending to make a step-reduction in CO<sub>2</sub> emissions.
- The cost of hydrogen was discussed, caveats were included for the reliance of Blue Hydrogen on successful Carbon Capture and Storage (CCS).
- The group was presented the fuel mix use in Exeter and the associated emissions to demonstrate where hydrogen could be used as a substitute.



## 4 Emerald Green

### 4.1 Presentation Highlights

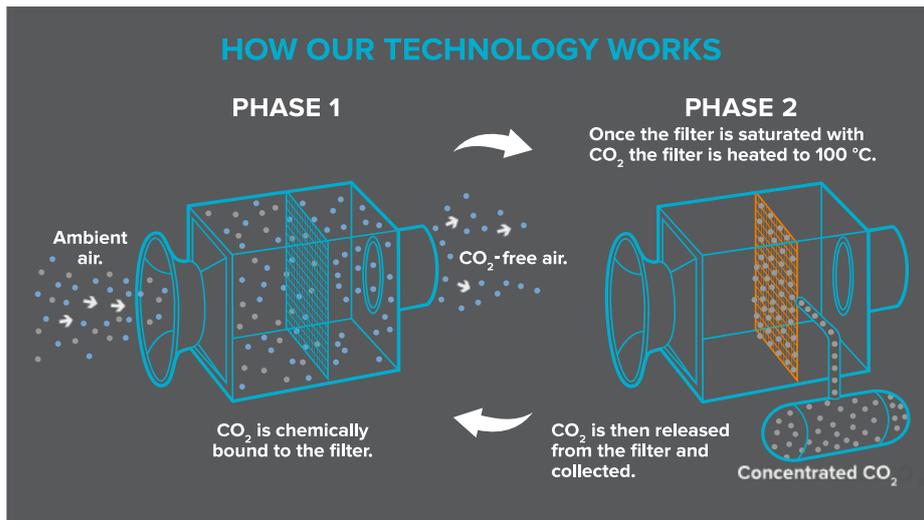
- Emerald Green is a company headquartered in Exeter that is working with local industrial companies to develop on-site electrolysers alongside renewable energy sources, to provide Green Hydrogen for industrial use.
- The company has been working alongside the University of Exeter and City Science to assess the feasibility of an Electrolyser in Exeter that would support the decarbonisation of the city.
- The company is also focused on the smart-city impacts and increasing the quality of data that is available to monitor, model and reduce carbon emissions in the city.
- A key proposal of the company is a Centre of Excellence, focused on hydrogen, that will consolidate all learning and education on hydrogen in the city, to promote inward investment and skills development.



## 5 Two Drifters Distillery

### 5.1 Presentation Highlights

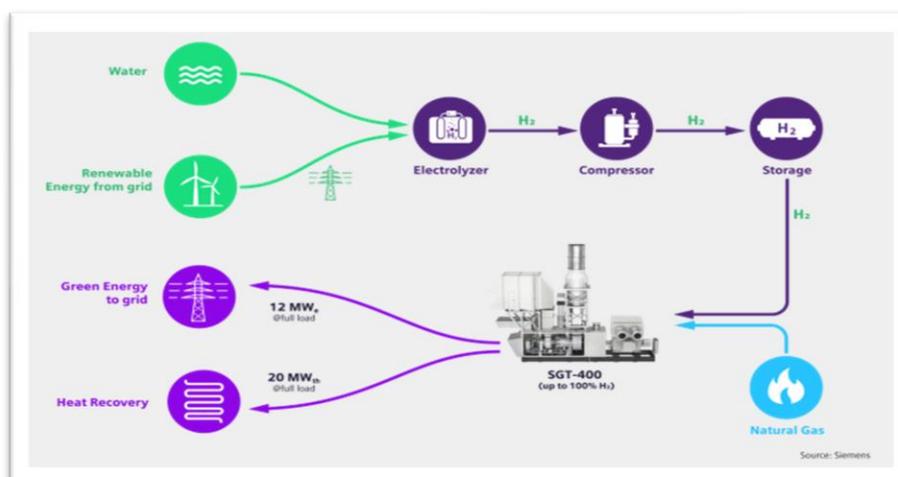
- Two Drifters Distillery already offset their residual carbon emissions through Climeworks who provide Direct Air Capture (DAC) in Iceland.
- They have received a research grant from East Devon District Council to progress local DAC which is supporting the proof of concept, design and chemical testing.
- The project is now working on the construction of the product to provide a demonstrator.



## 6 Centrax GT

### 6.1 Presentation Highlights

- Centrax is a local company that specialises in producing and maintaining gas turbines. Historically these gas turbines have operated from natural gas ( $\text{CH}_4$ ). The company is headquartered in Newton Abbot, with sites across Europe and North Africa.
- Their technology uses core engines from Siemens Energy, and they have been working with Siemens using European funding to research how they can transition their current products to operate on hydrogen through the HyflexPower project.
- Integral to this research project is the production of Green Hydrogen from which to run the gas turbines.



## 7 Carlton Power

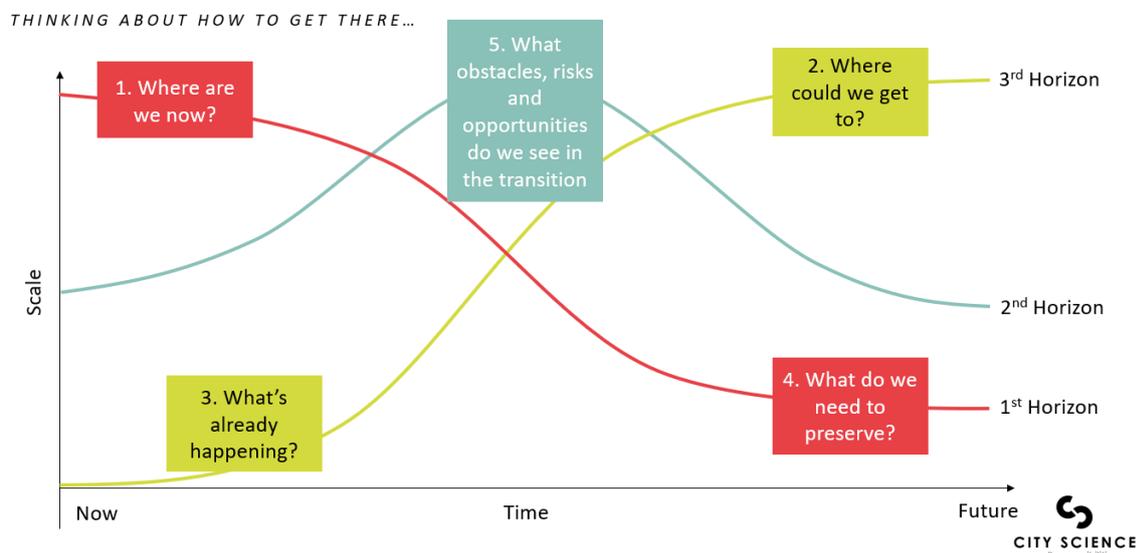
### 7.1 Presentation highlights

- Carlton Power were unable to join in person, Jo Muncaster (City Science) provided an overview of their planned project at Langage Farm in Devon.
- The project builds on their existing infrastructure at Langage Farm to build a 10MW Electrolyser, resulting in 800-1,000 tonnes per annum of H<sub>2</sub> production capacity.
- The consortium (including Langage Farm, Carlton Power, and Heart of the South West) has applied for Net Zero Hydrogen Funding to support the project development, with a view to commence onsite construction in 2024 if successful - resulting in first hydrogen production in 2025.



## 8 The 3 Horizon's Model

Attendees were split into 5 groups. Each group were provided with the three horizon's model (see figure below) to consider what actions the city is already taking, what behaviours or actions it would like to support in the near-future and where they would like hydrogen to be used in the city in the longer term to support a low-carbon future.



The Three Horizon's Model comprises of:

**1<sup>st</sup> Horizon** – The current situation and activities that Exeter currently undertakes that it will reduce or stop in a low-carbon economy/net-zero in the future.

**2<sup>nd</sup> Horizon** – Activities that will need to increase in the near-term to support Exeter's transition to a low-carbon economy/net zero, but will then reduce and stabilise.

**3<sup>rd</sup> Horizon** – Activities that are not currently undertaken in Exeter that will need to be increased in the future to support the low-carbon economy/net zero.

Each group then presented back their considerations to support the development of hydrogen within Exeter.

### 8.1 Group A

#### 1<sup>st</sup> Horizon

No comments

#### 2<sup>nd</sup> Horizon

- Funding for scalability is a challenge
- The university ownership of its estate and infrastructure provides an opportunity to demonstrate hydrogen on-site (living lab opportunity)

#### 3<sup>rd</sup> Horizon

- Commitment to Green Hydrogen over other colours due to low emissions not yet demonstrated by CCS
- Request for access to the amazing expertise at the University of Exeter

## 8.2 Group B

### 1<sup>st</sup> Horizon

- There is a clear opportunity for high CO<sub>2</sub> producers in the city, specifically the hospital, the university, and the energy from waste plant.
- Funding and the cost of production/distribution continues to be a significant challenge

### 2<sup>nd</sup> Horizon

- Further education on the need for change is needed throughout the city prior to presenting hydrogen as part of the solution
- Need for legislation that governs the use of hydrogen
- Need for clear investment opportunities in hydrogen

### 3<sup>rd</sup> Horizon

- There is some green infrastructure in Exeter already that needs to be capitalised on
- Can the local plan support the research and innovation community to make the planning process for hydrogen

## 8.3 Group C

### 1<sup>st</sup> Horizon

- Skills and jobs in hydrogen in Exeter provides an opportunity and a challenge to be met
- Transport in and around Exeter, the Council needs to consider what can it control or influence and what regulation is required

### 2<sup>nd</sup> Horizon

- The Pioneering Cities Grant (phase 2 being a £8m funding opportunity) could enable significant progression to explore Hydrogen
- There is capital funding available for clean energy/H<sub>2</sub> in Exeter, both the private and public sector should be chasing it

### 3<sup>rd</sup> Horizon

- Social Justice – there is a strong need for a fair transition together
- Exeter City Futures has an opportunity to lever industry stakeholders

## 8.4 Group D

### 1<sup>st</sup> Horizon

- Behavioural change is required, incentive needs to exceed net benefit
- Upfront capital investment is not attractive

### 2<sup>nd</sup> Horizon

- There are multiple solutions
- Government Hydrogen strategy is not consistent with local targets
- Legal/legislative lever often required for behaviour changes (e.g. seat-belts, smoking) on top of education and taxation
- Quick win identified in the 20% blending that could be done in the national gas grid

- ECF Partner need to lead by example with large scale projects at the hospital, university and council estates

### 3<sup>rd</sup> Horizon

- It can be difficult to adapt older properties, this may provide an opportunity for hydrogen as an alternative solution to electrification
- Funding gap is not just the capital requirements, but also the operating expenses

## 8.5 Group E

### 1<sup>st</sup> Horizon

- Businesses have an immediate need to tackle energy costs and independence which may incentivise uptake of existing technologies (i.e. electrification)
- Safety will be a key resident concern and proximity to properties

### 2<sup>nd</sup> Horizon

- Research and development can provide site solutions for industry

### 3<sup>rd</sup> Horizon

- It's not yet clear where the priority for hydrogen should be and what the level of usage in the city will be
- There should be an expectation that only Green Hydrogen is supported

## 9 Summary & Recommendations

In closing, the workshop had a clear appetite for developing their understanding of hydrogen and the part it will play in the decarbonisation of Exeter. Some key themes and challenges emerged from the discussion between the private and public sector attendees:

- A collective understanding that “green” hydrogen should be the only “colour” of hydrogen that Exeter looks to develop in the city, focusing on the low emissions and not being reliant on the development of CCS technologies.
- Looking to large, city-based estates to provide demonstration “living-lab” example projects to grow skills and education in the city.
- The session highlighted a need to review the sector-based hydrogen demand in the city to identify where production might need to be based and what the impact was likely to be on planning and residents.
- Challenging slow behaviour change was raised as a key opportunity for the city, focusing on education and skills building.
- Identifying capital funding opportunities that will fast-track industrial solutions in the city will be necessary for hydrogen development.

The following key recommendations emerged from the session and could be considered by ECFpartners:

- ECF could establish a working group to create a hydrogen strategy and delivery pathway, to identify the key sectors that will drive hydrogen demand and supply in the city in the period up to 2050.
- The creating of a local energy network, identifying and connecting local businesses operating in hydrogen, to generate a cluster that will attract inward investment.
- Working with large private estates in the city to facilitate living lab/demonstrator projects, focused on hydrogen as a low-carbon fuel alternative
- Identify planning and legislative barriers to hydrogen development in the city and seek to find a pathway to resolve any barriers.

## 10 Appendix

### List of Session Attendees

Type	Attendee	Organisation
Attendee	Cllr Yvonne Atkinson	Exeter City Council
Attendee	Cllr Percy Prowse	Devon County Council
Attendee	Matt Bellamy	EON
Attendee	Cllr Carol Bennett	Exeter City Council
Attendee	Cllr Amal Ghusain	Exeter City Council
Attendee	Claire Gibson	HoTSW LEP
Attendee	Ben Gilbert	City Science
Attendee	Andrea Harkin	House of Marbles
Attendee	Cllr David Harvey	Exeter City Council
Presenter	Karime Hassan	Exeter City Council & ECF
Attendee	Ian Holyoak	Michelmores
Attendee	Cllr Paul Knott	Exeter City Council
Presenter	Peter McCaig	Centrax GT
Attendee	Cllr Emma Morse	Exeter City Council
Attendee	Paul Mucklow	University of Exeter
Presenter	Jo Muncaster	City Science
Presenter	Gary Nicholson	Green Emerald/Hydrostar
Attendee	Cllr Josie Parkhouse	Exeter City Council
Attendee	Cllr Martin Pearce	Exeter City Council
Attendee	Jo Pearce	Exeter City Council
Attendee	Lucy Powell	Exeter City Council/ECF
Attendee	Cllr Tess Read	Exeter City Council
Attendee	Chris Smith	University of Exeter
Attendee	Darren Stockley	Ixora Energy
Attendee	Steve Strang	Exeter College
Attendee	Rebecca Villemaire	South West Water
Presenter	Russ Wakeham	2 Drifters Rum
Attendee	Cllr Ruth Williams	Exeter City Council
Attendee	Cllr Duncan Wood	Exeter City Council
Presenter	Jo Yelland	Exeter City Council/ECF