



IDEA2021

Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas



Hydrogen Fueled CHP

Kurt Koenig, HDR | Daniel Foulds, HDR



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Hydrogen as a Renewable Fuel

<https://cleantechnica.com/> ⓘ

Shell Launches Giant Green Hydrogen Plant In EU, USA Next?

3 days ago — Shell spices up **green hydrogen** race with giant new electrolyzer in the EU and new offshore wind farm for the Jersey Shore.

<https://www.greentechmedia.com/> ⓘ

NextEra Energy to Build Its First Green Hydrogen Plant in ...

Jul 24, 2020 — Through its Florida Power & Light utility, **NextEra** will propose a \$65 million pilot in the Sunshine State that will use a 20-megawatt electrolyzer to ...

<https://www.wsj.com/> ⓘ

The Green Hydrogen Puzzle Is Starting to Fall Into Place - WSJ

Jun 10, 2021 — **Green hydrogen** is a crucial ingredient in policies to cut carbon emissions to the net-zero benchmark by 2050. It has the capacity to decarbonize ...

<https://www.forbes.com/> ⓘ

The World's Biggest Green Hydrogen Plant Is Planned For ...

May 26, 2020 — A green **hydrogen plant** is planned for the Los Angeles area — one that converts waste to **fuel**. If it works, it could be a game-changer for both ...

<https://www.renewableenergyworld.com/> ⓘ

Green hydrogen, Holy Grail for long-term energy storage ...

Nov 12, 2020 — Using renewable electricity to convert water to **hydrogen** fuel is one answer for the **energy storage** needed for solar and wind power to reach ...

<https://grist.org/> ⓘ

Europe is going all in on hydrogen power. Why isn't the US ...

Aug 6, 2020 — **Hydrogen** was supposed to be the future of **energy**, but today the technology has yet to reach its full potential.

<https://www.forbes.com/> ⓘ

Green Hydrogen, The Fuel Of The Future, Set For 50-Fold ...

Dec 14, 2020 — **Green hydrogen** is produced using renewable energy and electrolysis to split water and is distinct from grey hydrogen, which is produced from ...

<https://www.nrel.gov/> ⓘ

Answer to Energy Storage Problem Could Be Hydrogen ...

Jun 25, 2020 — Digital illustration of wind turbines, solar panels, and **hydrogen energy storage**. An analysis from NREL researchers suggests hydrogen has the ...



Hydrogen Colors

- Grey Hydrogen – Created through steam methane reformation
- Blue Hydrogen – Create using methane reformation combined with carbon capture and sequestration
- Green Hydrogen – Created using water and electrolysis power by renewable energy



Hydrogen Markets

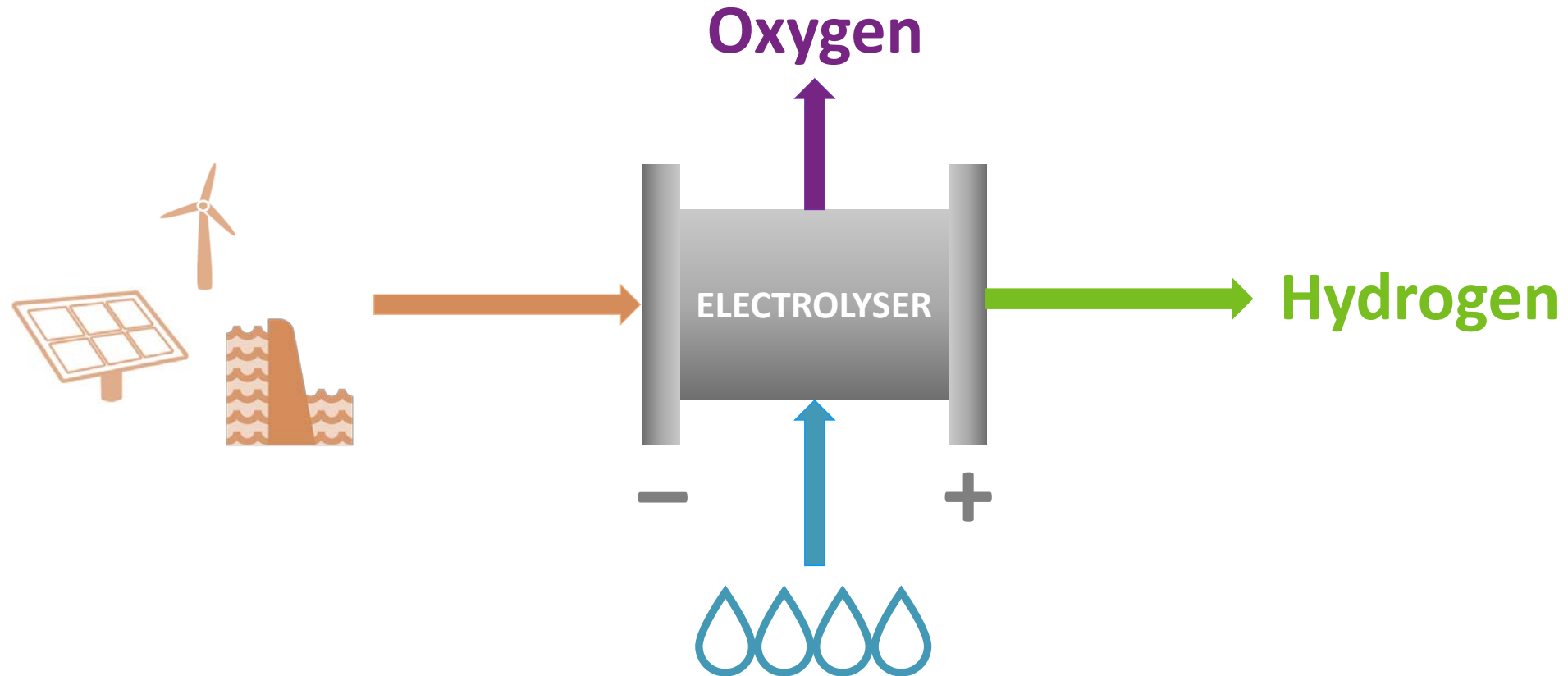
TODAY

Ammonia Creation
Methanol Creation
Refining

TODAY + TOMORROW

Ammonia Creation
Methanol Creation
Refining
Power Generation
Transportation
Energy Storage
District Energy
Residential and Commercial

H_2 Green Hydrogen - Generation



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Green Hydrogen – Storage and Distribution

Storage Options

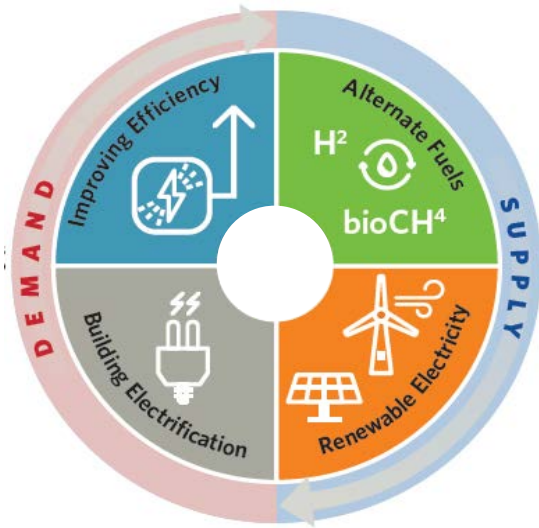
Compression + Tanks/Tubes
Liquefaction
Salt Domes/Caverns

Distribution Options

Natural Gas Pipeline Blend
Hydrogen Pipeline
Truck (gas or liquid)
Ammonia

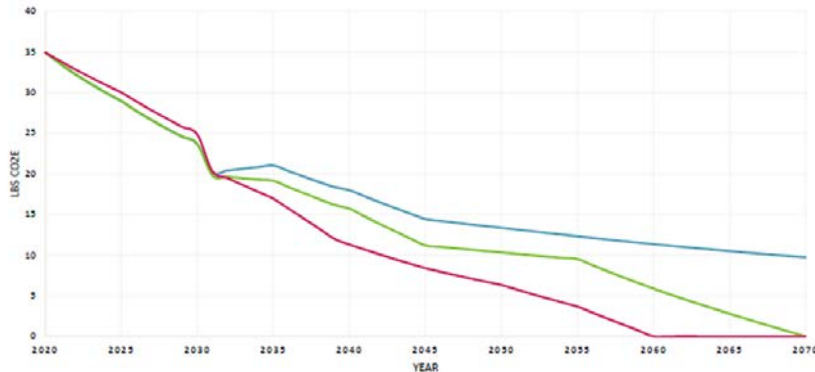


Green Hydrogen – Role in Campus Energy



POUNDS CO₂E PER SQUARE FOOT

— BAU — Transitional — Transformative



Pathways to Zero Carbon

Electrification

- Reliant on Utility
- Intermittent Renewable Integration
- Energy Storage
 - Battery
 - Hydrogen

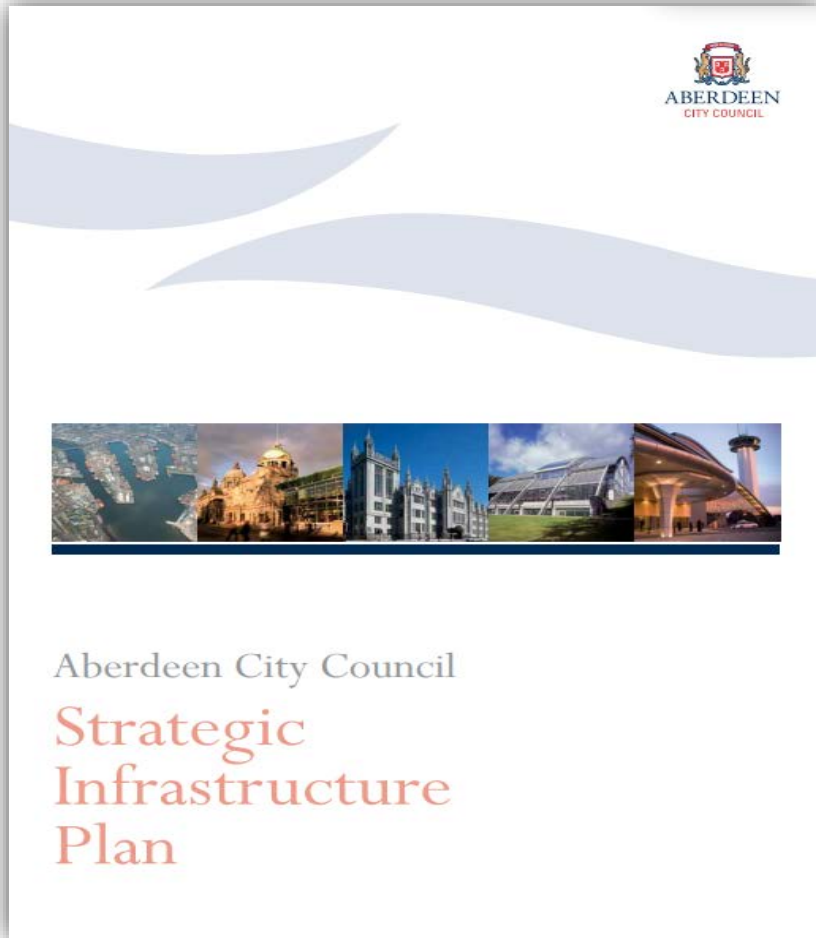
Requires Infrastructure Transformation

Alternative Fuels

- Renewable Natural Gas
- Hydrogen
- Turbines, Engines, Fuel Cells

Keep Existing Energy Infrastructure (steam, HW, etc)

The Event Complex Aberdeen – The History



LOW CARBON MANAGEMENT PROGRAMME 2010-2015

Aberdeen City Council has a strong track record of tackling carbon emissions. The council was one of the first to sign up in 2004 to the Carbon Trust Local Authority Carbon Management Programme (LACMP), which aims to reduce emissions from our buildings, vehicles, street lighting and landfill sites.

To help achieve this goal Aberdeen City Council has developed several strategic tools which include:

- **Environmental Management Policy –**
Statement endorsed by the Chief Executive which commits to minimise pollution, reduce emissions from our operations; manage waste sustainably and reduce energy consumption.
- **Decentralised Energy Programme (2008) –**
Commits to the installation of a decentralised energy system to all new build Council properties and replacement of heating and hot water systems in existing Council owned buildings as the normal default position as well as adopting an annual target of a 2.5% reduction in fuel purchased on the bulk of contracts for properties owned by this Council to apply over the next 10 years.
- **Council Travel Plan (2006) –**
Sits within the Local Transport Strategy and aims to reduce the environmental impacts of Council travel and transport.
- **Sustainable Building Standards for Council Owned Buildings (2008) –**
Introduced to ensure any new builds or major refurbishment carried out by the Council meet sustainable building criteria.
- **Sustainable Procurement Policy and Guidelines (2002) –**
Designed to address the full range of concerns relating to the socio-economic and environmental impacts of goods and services purchased by the Council (update underway).

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Strategic Infrastructure Plan:

- Replacement of existing AECC at Bridge of Don
- New development at Rowett North Site
- On the site of the Rowett Research Institute



The Event Complex Aberdeen – The Brief

Key Requirements

“...a **high standard** comparable to competing venues...”

“... one of the **most sustainable venues** of its type in the UK”

“...positive impression of Aberdeen as Europe’s **Energy Capital**...”



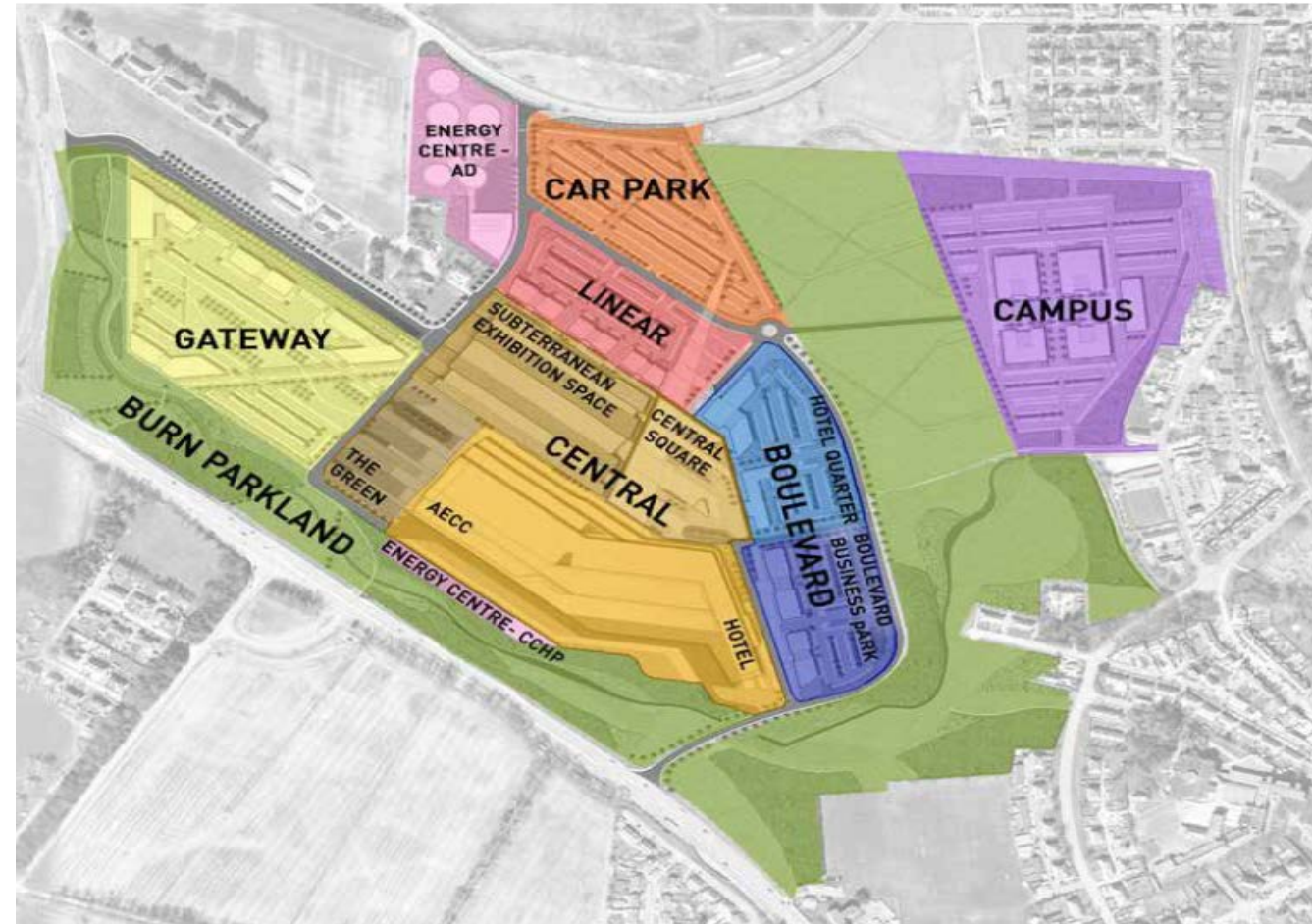
The Event Complex Aberdeen – The Brief

Key Requirements

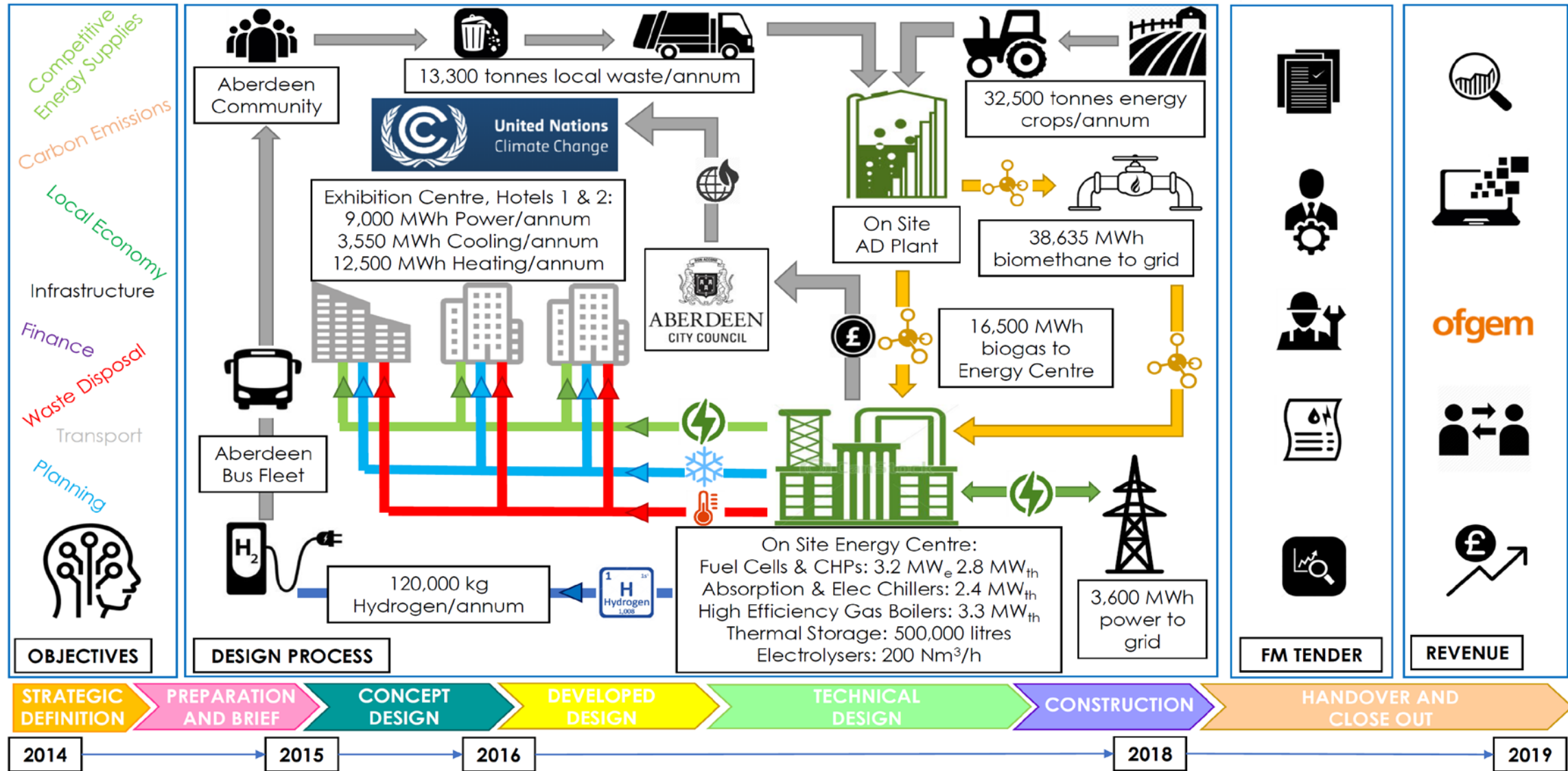
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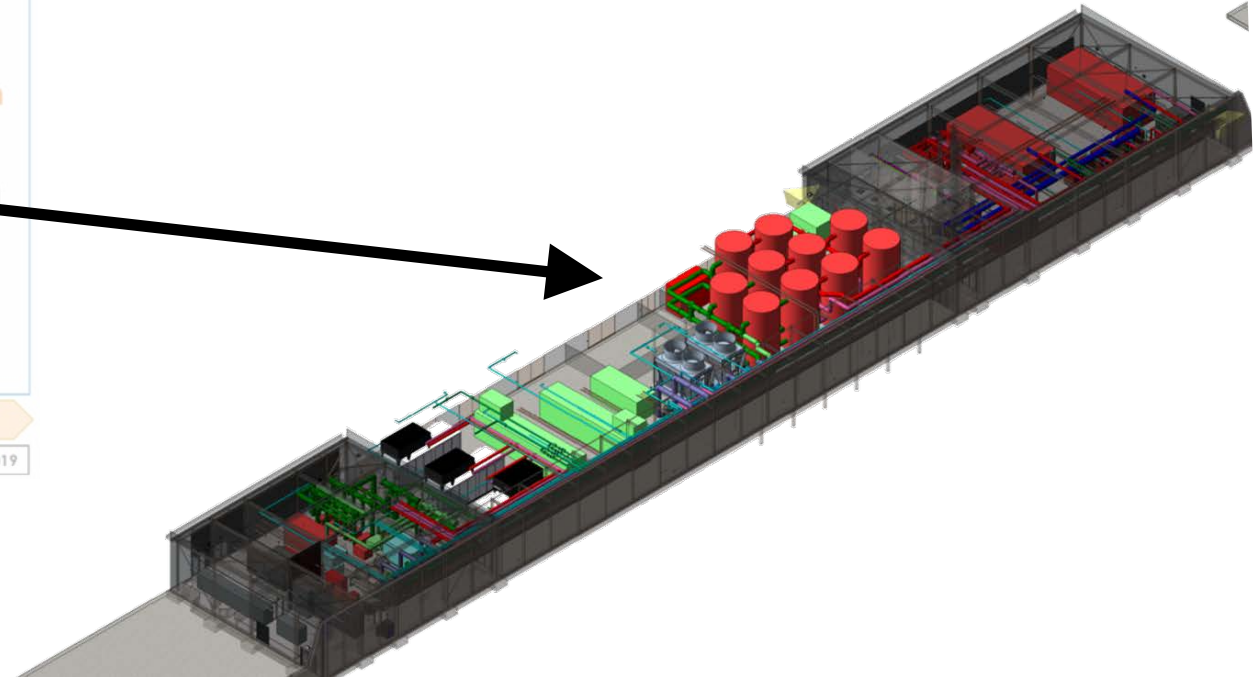
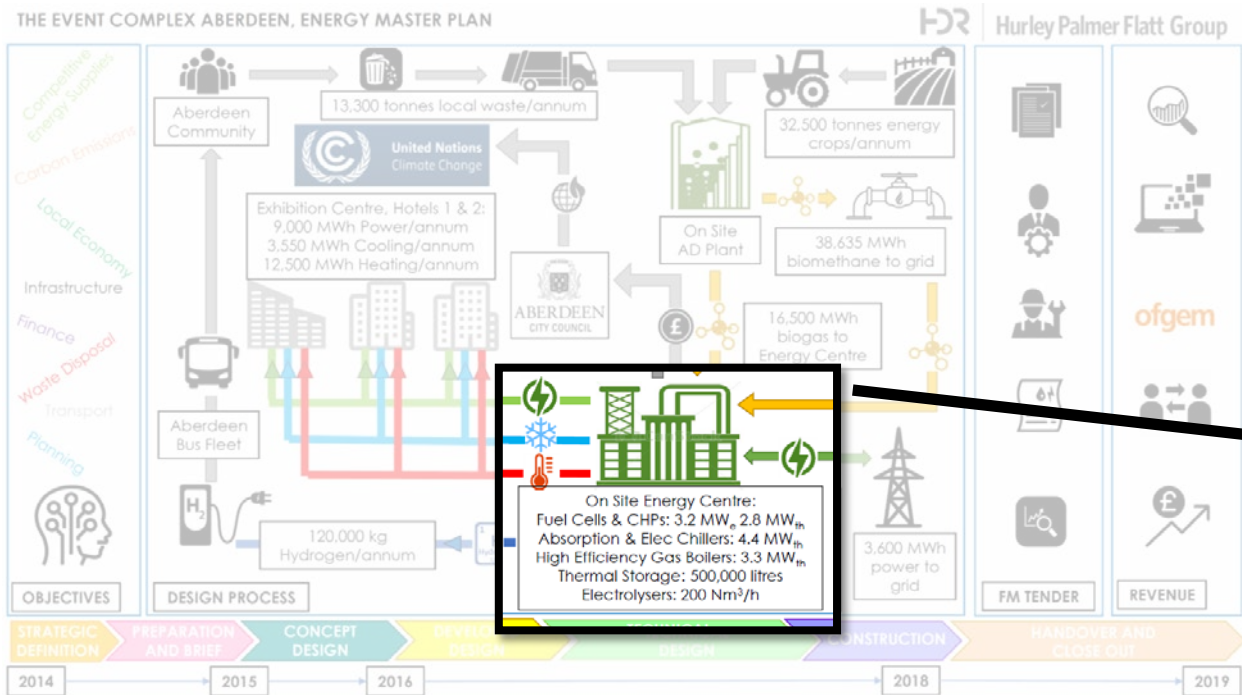


The Event Complex Aberdeen – Energy Strategy



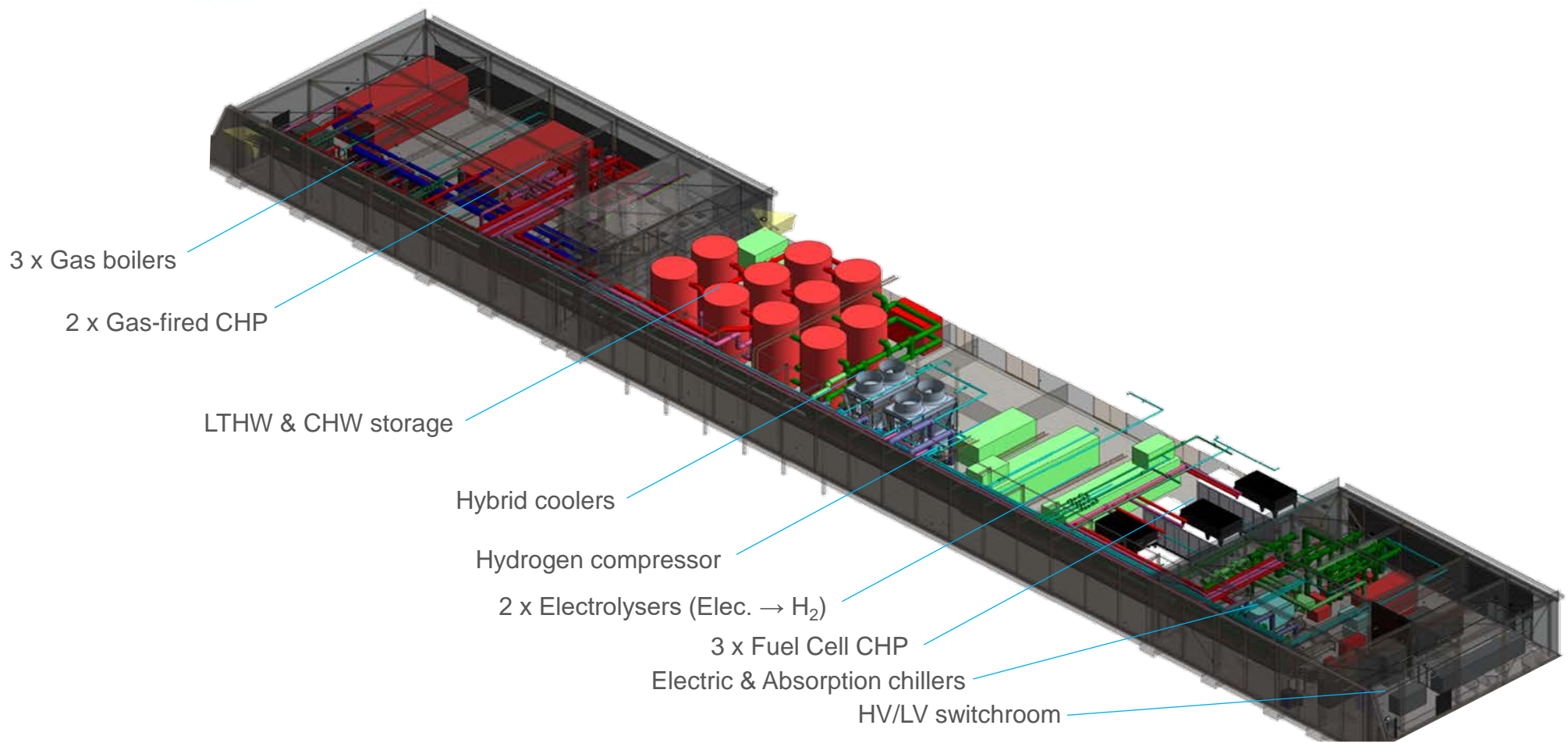


The Event Complex Aberdeen – Energy Center

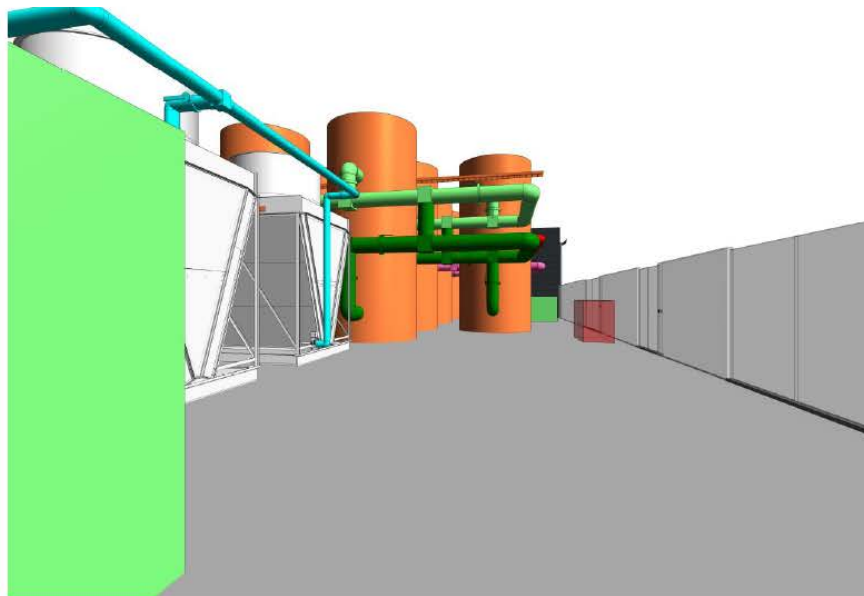




The Event Complex Aberdeen – Energy Center



H₂ The Event Complex Aberdeen – Energy Center





The Event Complex Aberdeen – Heating & Cooling





The Event Complex Aberdeen – Demand Profile



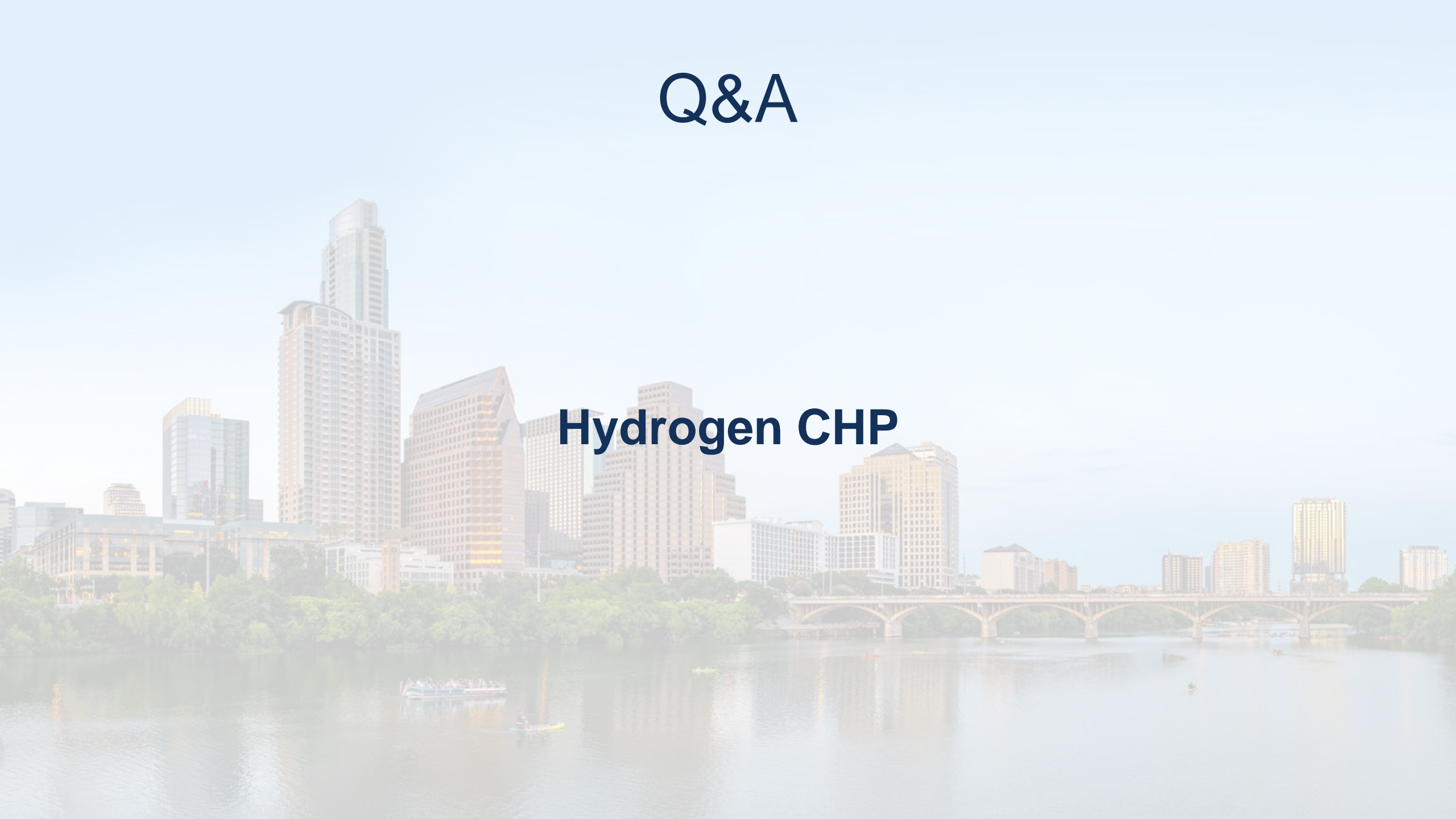


The Event Complex Aberdeen – KTP



Q&A

Hydrogen CHP



Thank You!

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