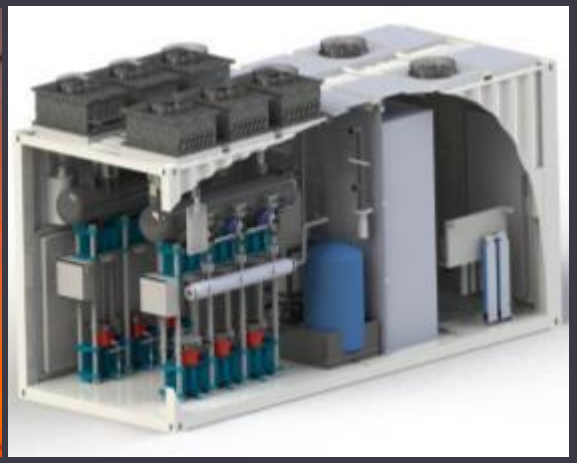
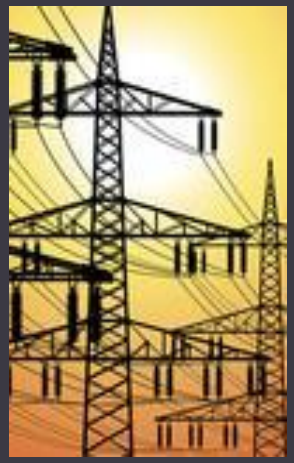
H_2 AND FUEL CELLS FOR STATIONARY APPLICATIONS AND H_2 INFRASTRUCTURE – HYDROGEN BUNKERING

ITM POWER

16/6/17 | VALENCIA


DR KRIS HYDE
TECHNOLOGY MANAGER, ITM POWER

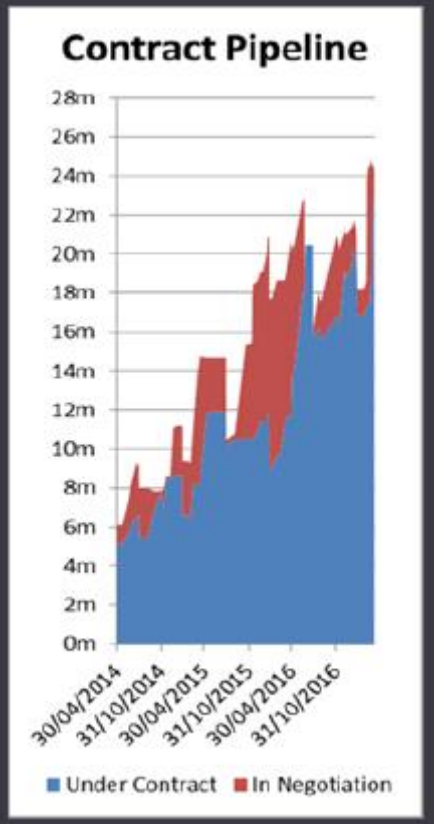
kbh@itm-power.com
@H2KH

ITM POWER
Energy Storage | Clean Fuel

ITM POWER

SUMMARY

- Manufacturer of electrolysis equipment
- Offer turn-key solutions
- Two sites in Sheffield
- IPO in 2004:
- £7.5m investment by JCB
- ~75 employees
- Key markets are hydrogen refuelling and power to gas
- Rolling out 11 UK hydrogen refuelling stations
- Two power to gas plants in Germany



£23.02m of projects under. £4.16m in negotiation. Total pipeline of £27.18m*

*Correct at 5/6/17

ITM POWER
Energy Storage | Clean Fuel

EXECUTIVE DIRECTORS AND COMPANY SECRETARY

Dr G Cooley
Chief Executive Officer

Graham joined ITM Power as CEO in 2009. Before that Graham was Business Development Manager in National Power plc and spent 11 years in the power industry developing energy storage and generation technologies.

Before joining ITM Power Graham was CEO of Sensortec Ltd, founding CEO of Metalysis Ltd, a spin out of Cambridge University and founding CEO of Antenova Ltd.

Dr Simon Bourne
Chief Technology Officer

Simon joined ITM in 2002 as a Technical Manager and has been one of the leading scientists involved in the development of ITM's suite of patented membrane materials.

Before joining ITM, Simon was a project engineer with Sonatest Plc and a researcher with the Ministry of Defence. Simon has a BSc Hons in Materials Science from UMIST and a PhD from Cranfield University.

Andy Allen
Company Secretary and CFO

Andy graduated from the University of Sheffield in 2004. He went on to qualify as a chartered accountant with Barber Harrison & Platt in Sheffield. His first move into industry was to Manheim Auctions head office as Finance Manager, before joining ITM power as Financial Controller in March 2011.

Dr Rachel Smith
Executive Director

Rachel has worked for ITM since its incorporation in 2002. Starting as a research scientist Rachel has a solid background in ITM materials and their use in electrochemical cells.

She has worked on and managed various externally funded projects and now acts as the funding co-ordinator for ITM's activities. Rachel also manages ITM's patent and trademark portfolio.

NON-EXECUTIVE DIRECTORS

Prof R Putnam
Non-Executive Chairman

Roger Putnam is a former Chairman of Ford of Britain, ex-President of the Society of Motor Manufacturers & Traders and a member of the Government's Energy Review Partnership and Automotive Innovation and Growth Team.

The Partnership will report to the Chancellor on the country's future energy strategy and the AIGT to the Prime Minister on alternative fuels and transport.

Peter Hargreaves FCA
Non-Executive Director

Peter joined the board of ITM in February 2004 as a Non-Executive Director. After qualifying as a chartered accountant he was employed by KPMG, Unisys and Whitbread and Company Limited. In 1981 he founded the national investment brokerage Hargreaves Lansdown Plc where he remains an Executive Director.

Sir Roger Bone
Non-Executive Director

Sir Roger was President of Boeing UK from 2005 to 2014. He is a non-executive director of F and C Investment Trust plc, and a non-executive director and trustee of the National centre for Universities and Business. He was one of the Prime Minister's honorary Ambassadors for British Business from 2009 to 2015. Previously he has been British Ambassador to Brazil and to Sweden and was an Assistant Under Secretary of State in the Foreign and Commonwealth Office

Lord Roger Freeman
Non-Executive Director

Lord Freeman is a member of the House of Lords and is a member of the Advisory Boards of Thales S.A. and PricewaterhouseCoopers (UK).

Robert Pendlebury
Non Executive Director

Bob has worked in senior management positions in both Ford Motor Company and JCB. Joining JCB in 1991, he became their Engineering and Research Director. He remains a consultant to JCB, Associate Engineering Director to the JCB Academy and a Visiting Professor to Loughborough University. He is a Mechanical Engineering graduate of Leeds University, Chartered Engineer and Fellow of the Institution of Mechanical Engineers.

THE EXECUTIVE AND NON-EXECUTIVE TEAM

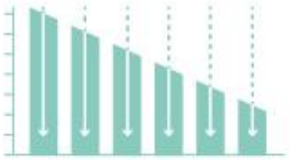
HYDROGEN ENERGY SYSTEMS

ITM POWER
Energy Storage | Clean Fuel

ORDERS OF
£15.68m
OVER THE LAST
12 MONTHS
UP
100%

DEAL PIPELINE OF
£21m
UP
60%
YEAR-ON-YEAR

LOSSES
DECREASED
BY
20%
YEAR-ON-YEAR



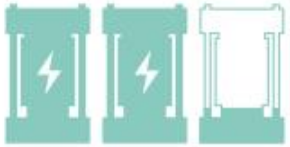
HEAD COUNT
UNCHANGED

66
PERMANENT STAFF
SINCE 2012

ACHIEVED

LONG RUN
COST TARGET
€1m/MW

SOLD
5.25MW



OF LARGE SCALE
ELECTROLYSERS

1st
UK
POWER-TO-GAS
CONTRACT WITH
nationalgrid

OPENED **THREE**
NEW REFUELLING
STATIONS IN UK

AND **ONE** IN USA

FUEL CONTRACTS
WITH

TOYOTA
HYUNDAI
COMMERCIAL GROUP
arcola energy
ARVAL BNP PARIBAS GROUP
Europcar
ANGLO AMERICAN

Shell

REFUELLING STATION
ON SHELL FORECOURT

ACHIEVEMENTS IN THE LAST 12 MONTHS

HYDROGEN ENERGY SYSTEMS

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Energy Storage | Clean Fuel

RAPID RESPONSE ELECTROLYSER

Available in 10MW modules | Responds in 1 sec | Self-Pressurises to 50 bar

RAPID RESPONSE

HYDROGEN ENERGY SYSTEMS

ITM POWER
Energy Storage | Clean Fuel

PRODUCTS

ITM POWER
Energy Storage | Clean Fuel

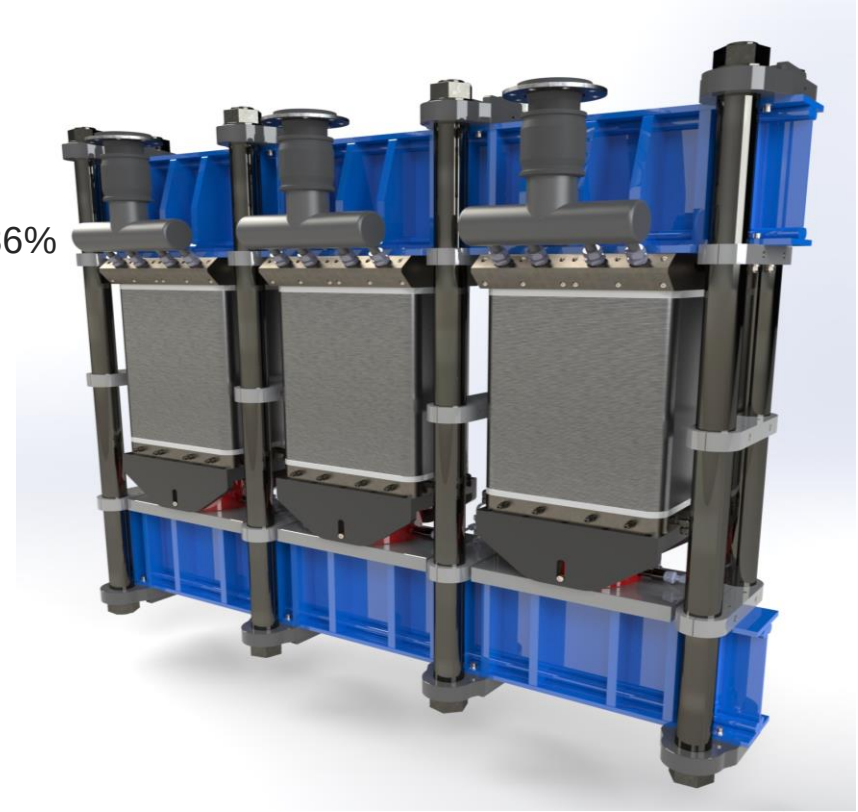
Company image

MARKET OFFERING

Rapid Response | High Pressure | High Efficiency | MW scale

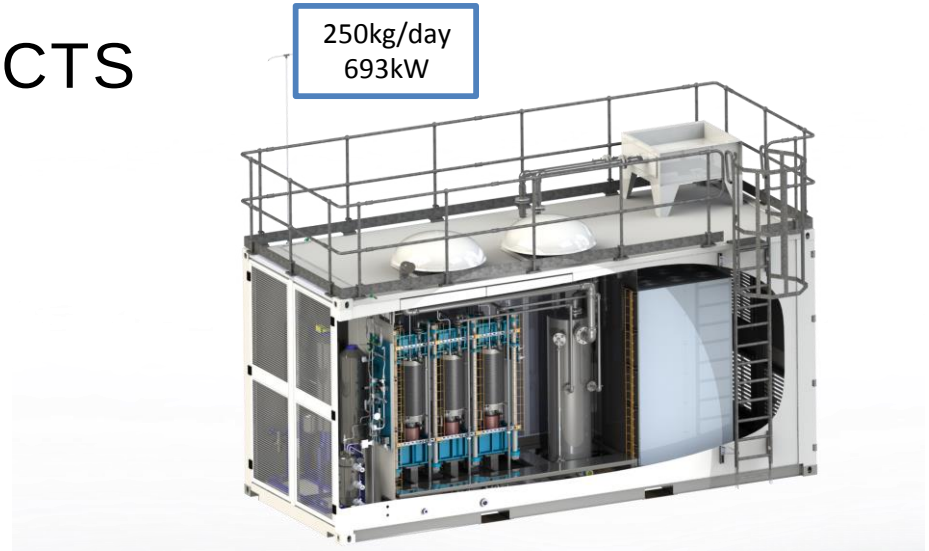
- Rapid response: less than 1s; for primary grid balancing
- High pressure: up to 50bar;
- High efficiency: 77% measured by Thuga Group; 86% measured by RWE (with heat recovery)
- Large scale: 10MW modules available today
- Compliant: EU and USA
- Operations: Large PEM:

  >3yrs in the field

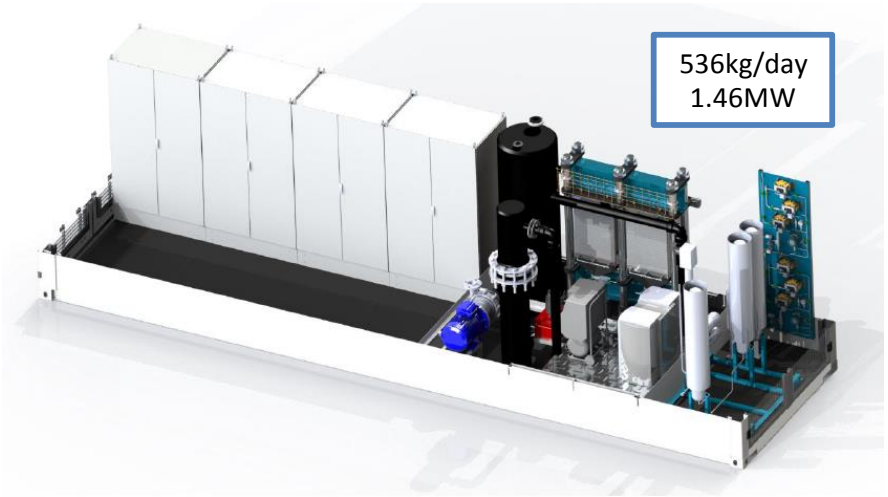


CONTAINERISED PRODUCTS

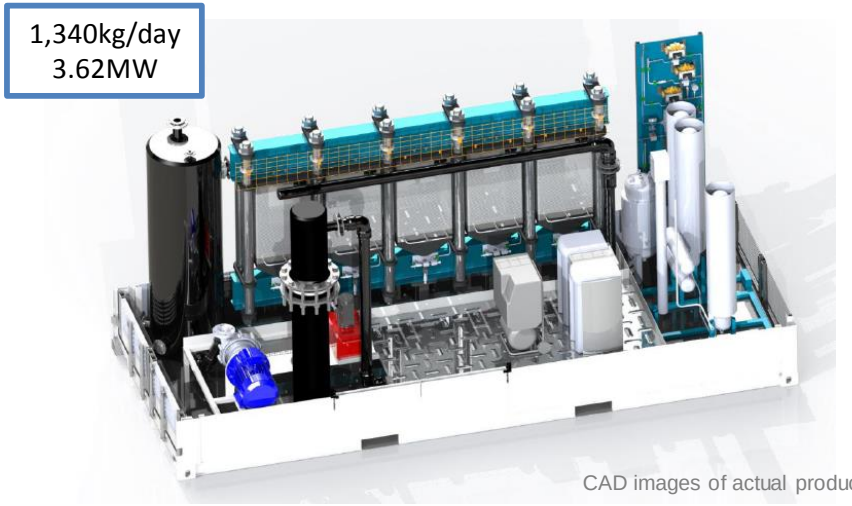
83kg/day
245kW



250kg/day
693kW



536kg/day
1.46MW



1,340kg/day
3.62MW

CAD images of actual product

MARKET OFFERING

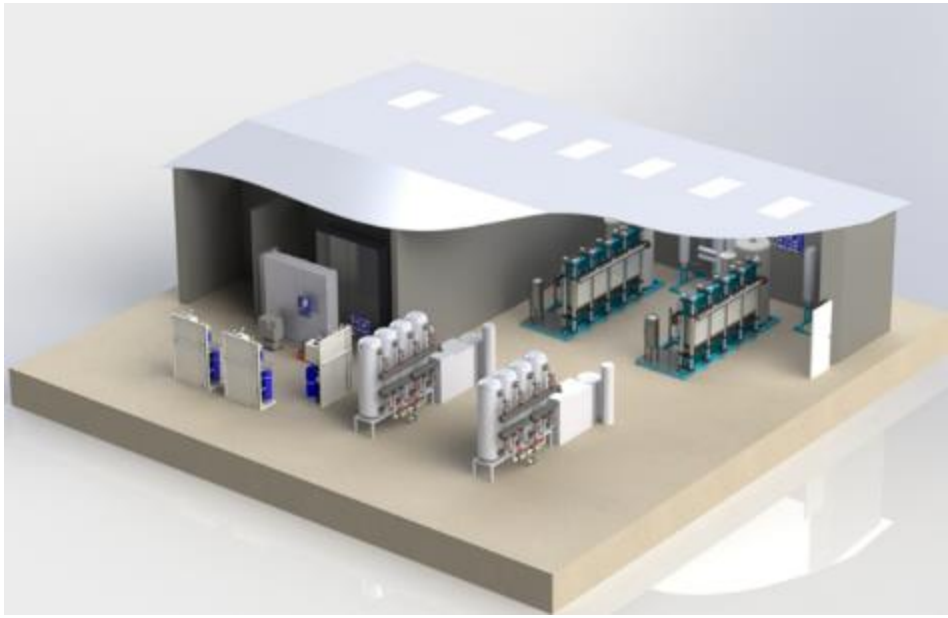
ENERGY STORAGE | CLEAN FUEL

ITM POWER
Energy Storage | Clean Fuel

BUILDING SOLUTIONS

Tailored to suit customer requirements

- Sized for hydrogen large schemes
- Rapid response for grid balancing
- Larger stack platform enables smaller footprint
- Skid mounted options for use indoors
- Multiple modules can be operated together



Metric	L	XL	XXL
Number of Stacks	3	4	15
Max Output (kg/24hr)	805	1,075	4000
System Power (MW)	2.00	2.69	10.0
System Efficiency (kWhr/kg)	53 - 60	53 - 60	53 - 60
Footprint	Custom	Custom	Custom

LARGE APPLICATIONS

1MW to 10MW

- Bus / train refuelling stations
- Small P2G demonstrations

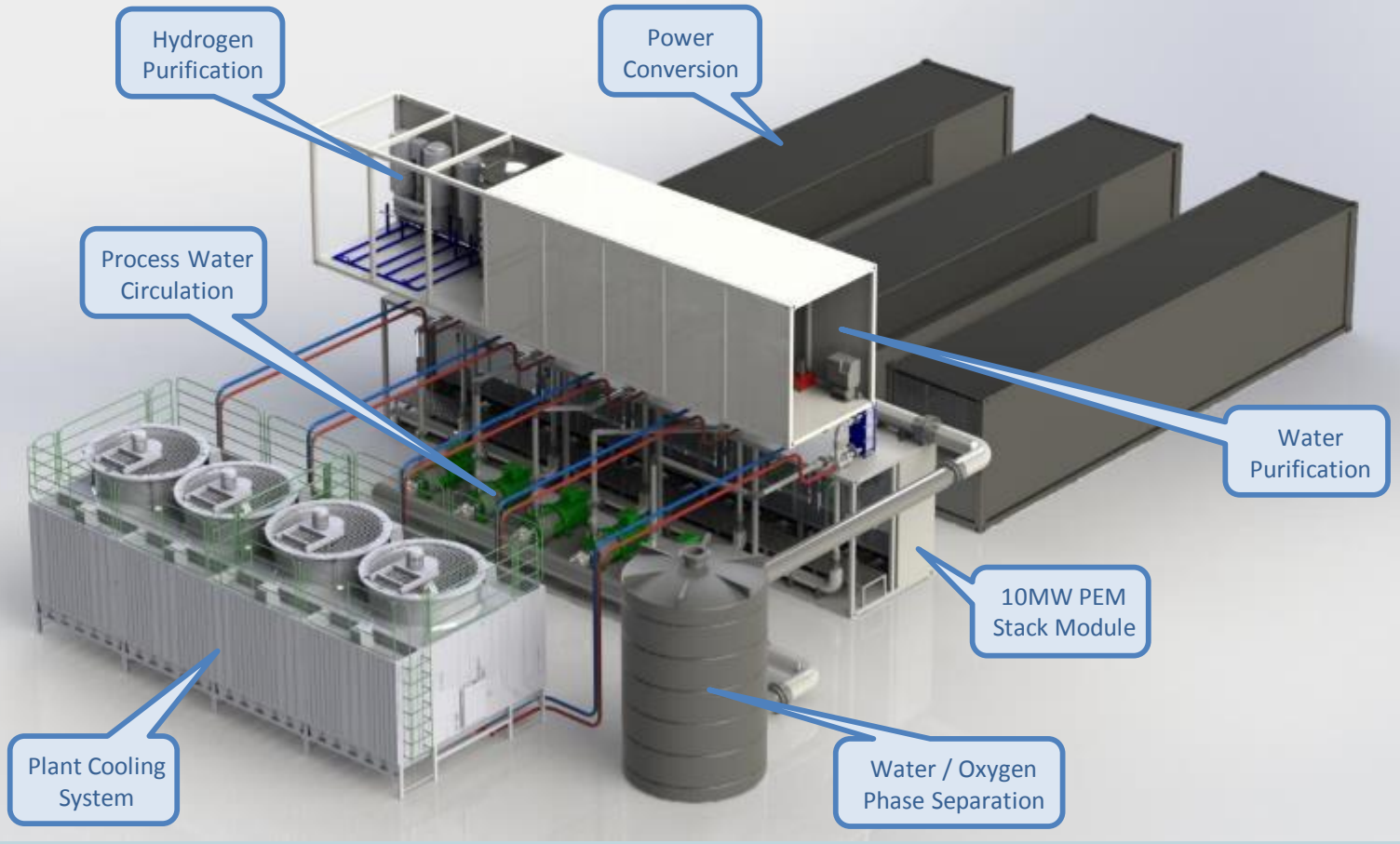
10MW to 60MW

- Large transport schemes
- Power-to-Gas installations
- Chemicals Industry

60MW to 100MW

- Power-to-Gas installations
- Chemicals Industry
- Refineries

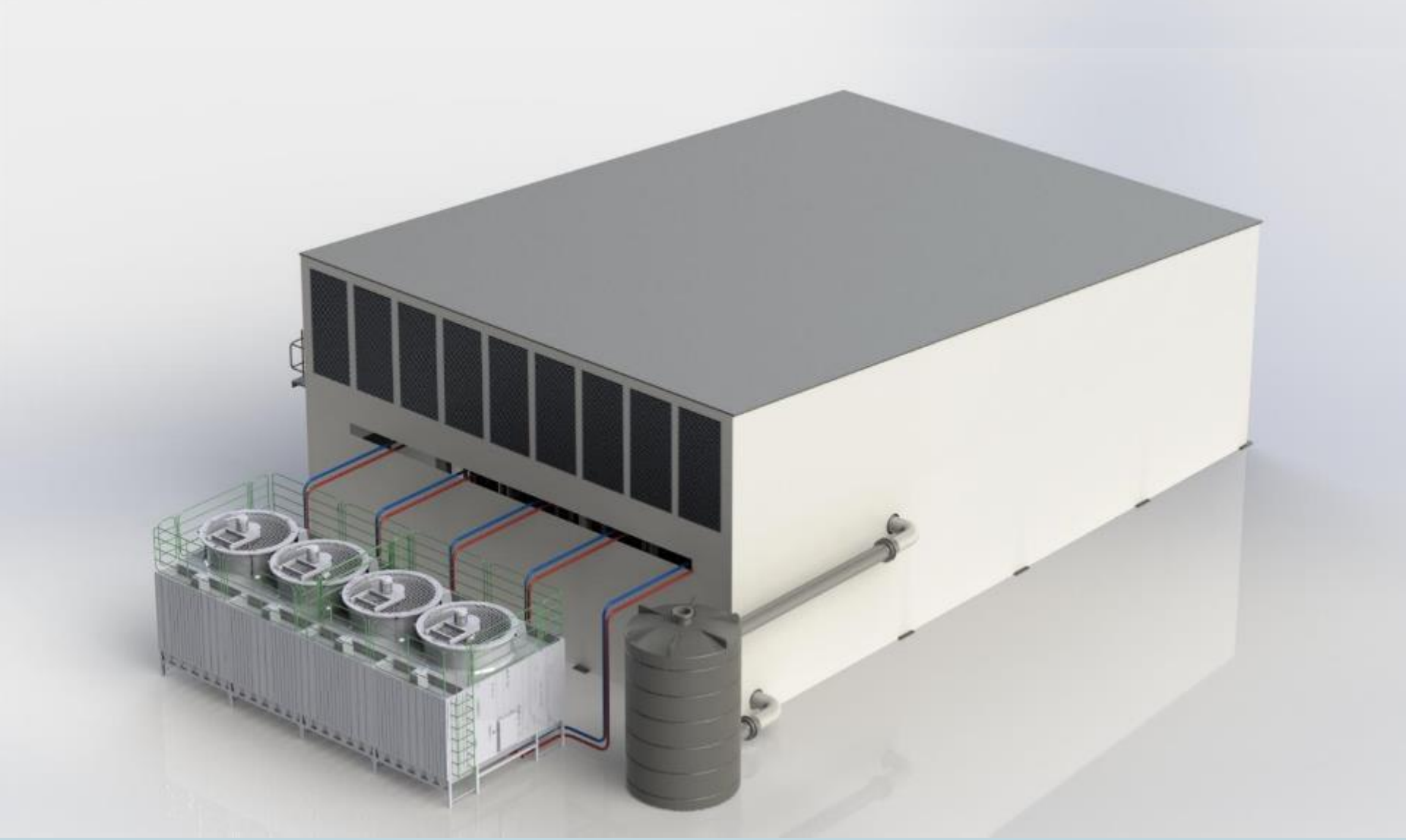

Stock image



10MW TURN KEY SOLUTION

HYDROGEN ENERGY SYSTEMS

ITM POWER
Energy Storage | Clean Fuel



10MW TURN KEY SOLUTION

HYDROGEN ENERGY SYSTEMS

ITM POWER
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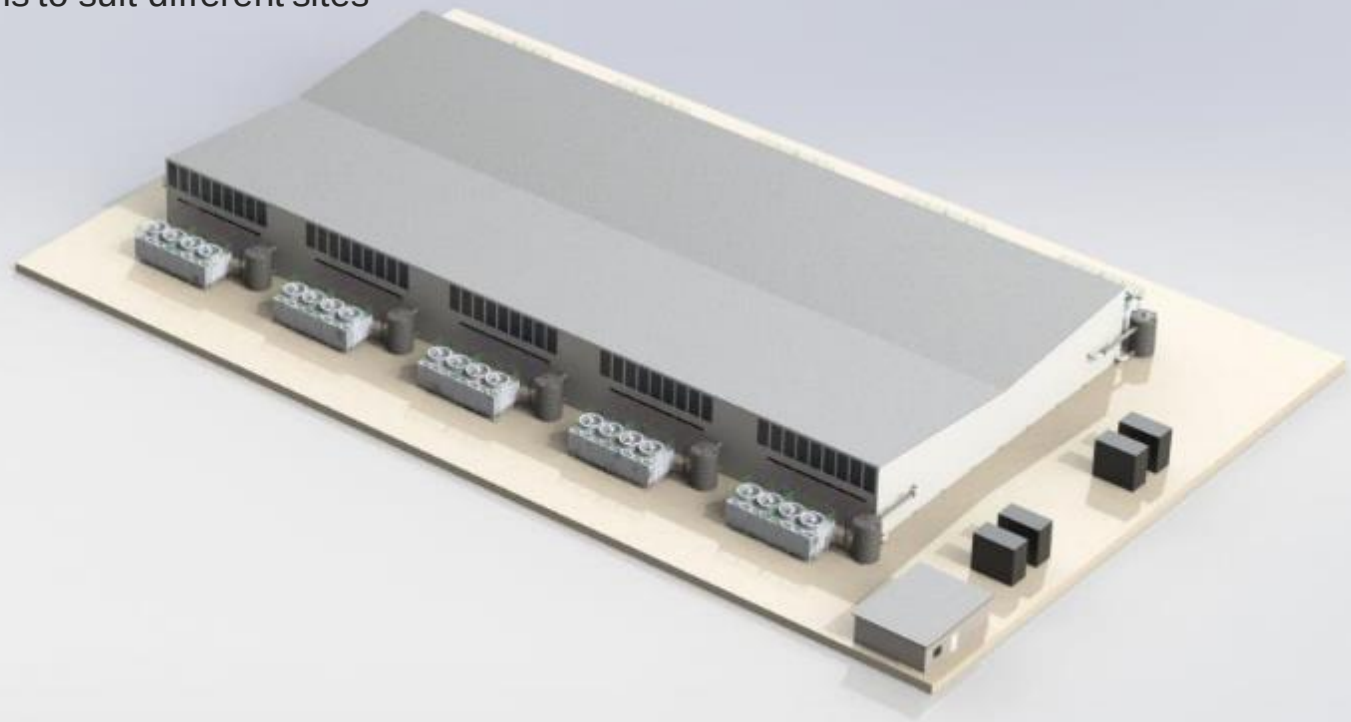
100MW SYSTEM

Scale up through replication

- Replication maintains standardisation
- Multiple layout options to suit different sites
- 40 x 87m building



100MW ELECTROLYSER PLANT DESIGN

HYDROGEN ENERGY SYSTEMS

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H_2 REFUELLING EXPERIENCE

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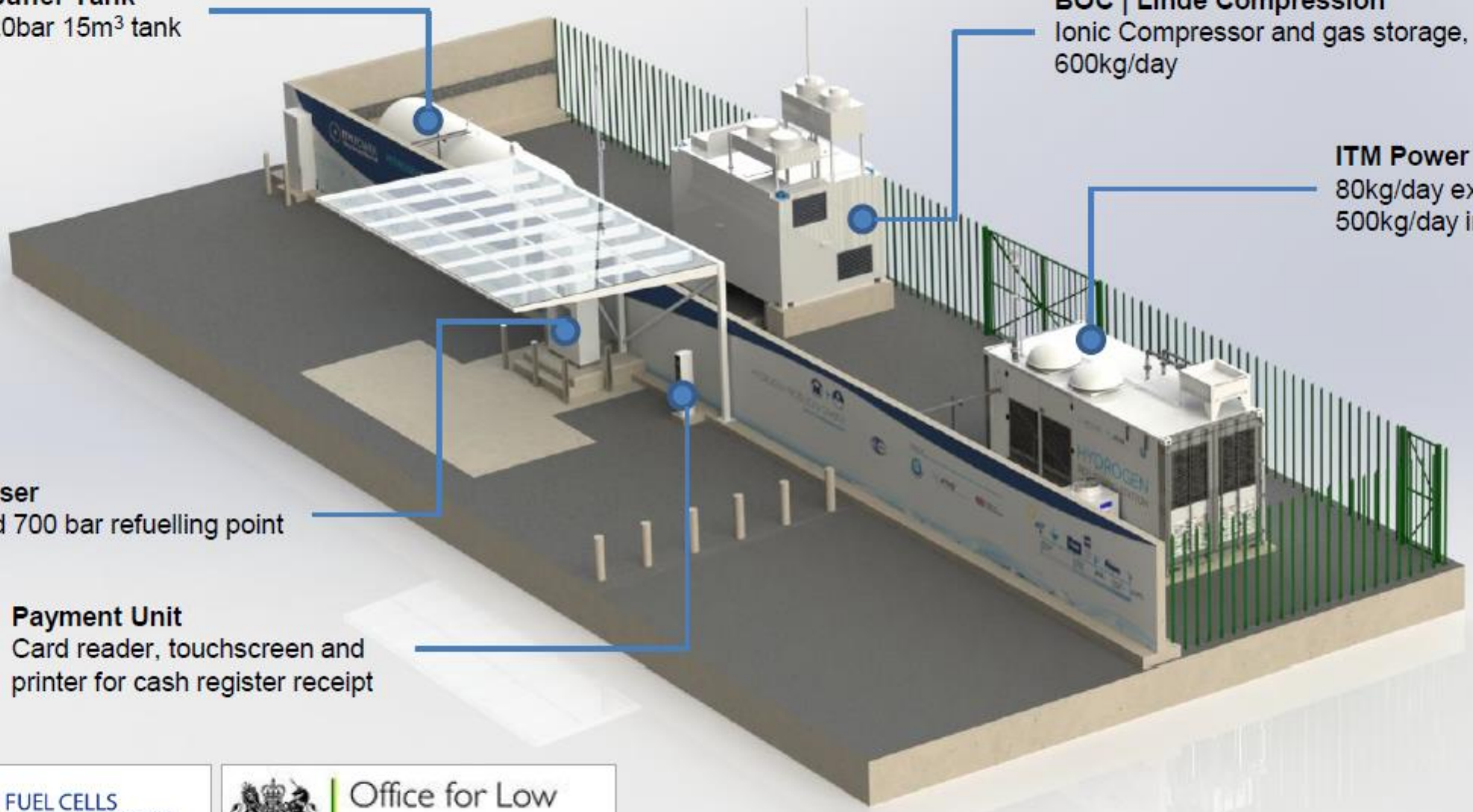
WHAT IS AN FCEV REFUELLING STATION?



FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

BOC
Member of The Linde Group

FCEV REFUELLING STATION

VEHICLES | ROLL OUT

ITM POWER
Energy Storage | Clean Fuel

ITM POWER | FUEL CONTRACTS

UK stations | £10/kg | dispensing 1tonne/day by the end of 2018

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

ITM POWER | FUEL CONTRACTS

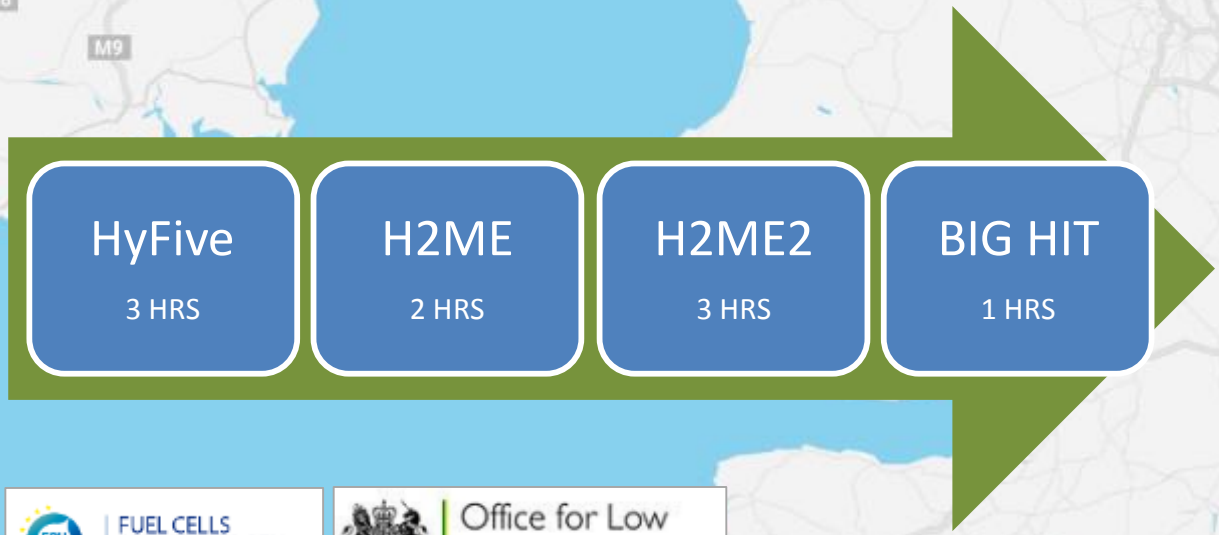
ENERGY STORAGE | CLEAN FUEL

ITM POWER
Energy Storage | Clean Fuel

ITM POWER HRS SITES

Four FCH JU projects that define UK hydrogen fuel

- Build | Own | Operate model
- 4 operational HRS and 2 in production
- Siting collaboration with Shell
- Dispenser collaboration with BOC Linde



FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

ITM POWER HRS SITES

ENERGY STORAGE | CLEAN FUEL

ITM POWER
Energy Storage | Clean Fuel

HYFIVE | LONDON

FCH JU Project number: 621219

- NPL Teddington London Opened May 2016
- CEME Rainham London Opened Oct 2016
- Cobham M25 Shell forecourt Opened Feb 2017


NPL Teddington


CEME Rainham A13

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

Company images

HYFIVE | LONDON

ENERGY STORAGE | CLEAN FUEL

ITM POWER
Energy Storage | Clean Fuel

HYFIVE | LONDON

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FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

Company images

H2ME | UK

FCH JU Project number: 671438

- Beaconsfield M40 Shell Forecourt Opening Q2 2017
- Gatwick M23 Shell Forecourt Opening Q3 2017
- Forecourt integration with dispenser under the main canopy

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Office for Low Emission Vehicles

Shell

H2ME | UK

ENERGY STORAGE | CLEAN FUEL

ITM POWER
Energy Storage | Clean Fuel

BIRMINGHAM SUBJECT TO FINAL CONFIRMATION

Tysley Energy Park | 3MW | 1,500kg/day

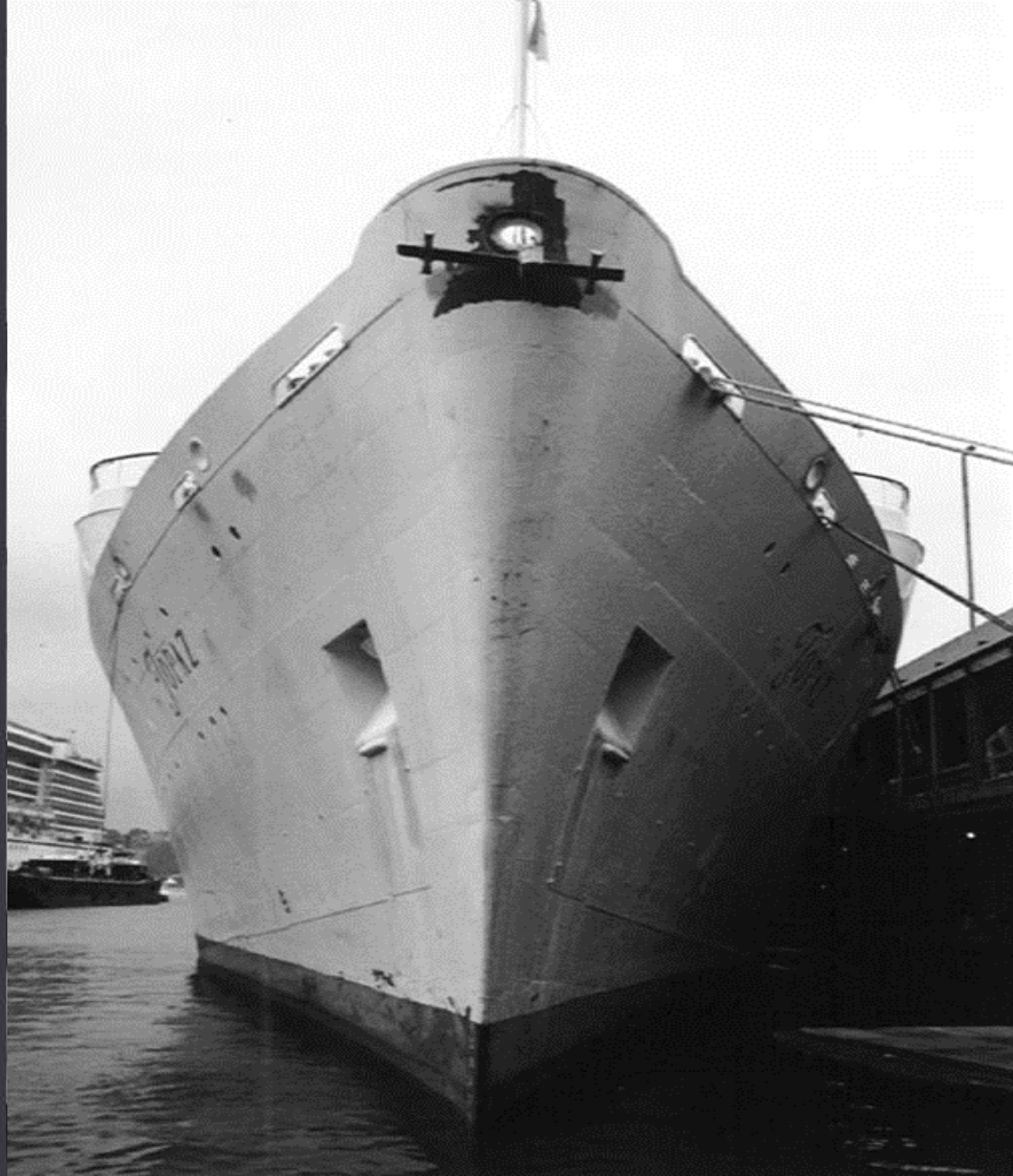
- 3MW Grid Balancing Electrolyser
- Linde ionic compression & 350 bar dispenser
- Grant led by ITM Power
- Subject to final confirmation

BIRMINGHAM

BUS REFUELLING STATIONS

ITM POWER
Energy Storage | Clean Fuel

HYDROGEN SHIPPING

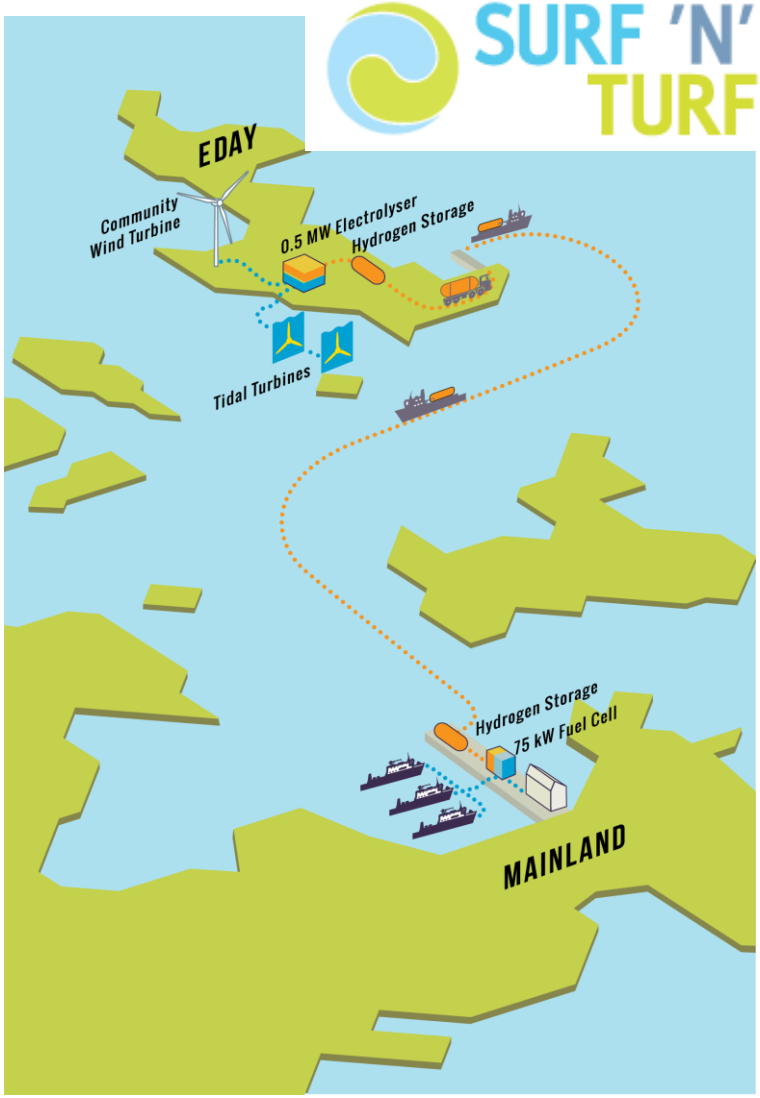


ITM POWER
Energy Storage | Clean Fuel

SURF N TURF:

Project funded by Natural Scotland through Local Energy Scotland:

- Utilise EMEC's hydrogen
- Bring benefits to Orkney



natural scotland
SCOTTISH GOVERNMENT

LOCAL ENERGY SCOTLAND

Community Energy Scotland
Empowering Communities

EMEC ORKNEY
THE EUROPEAN MARINE ENERGY CENTRE LTD

ORKNEY ISLANDS COUNCIL

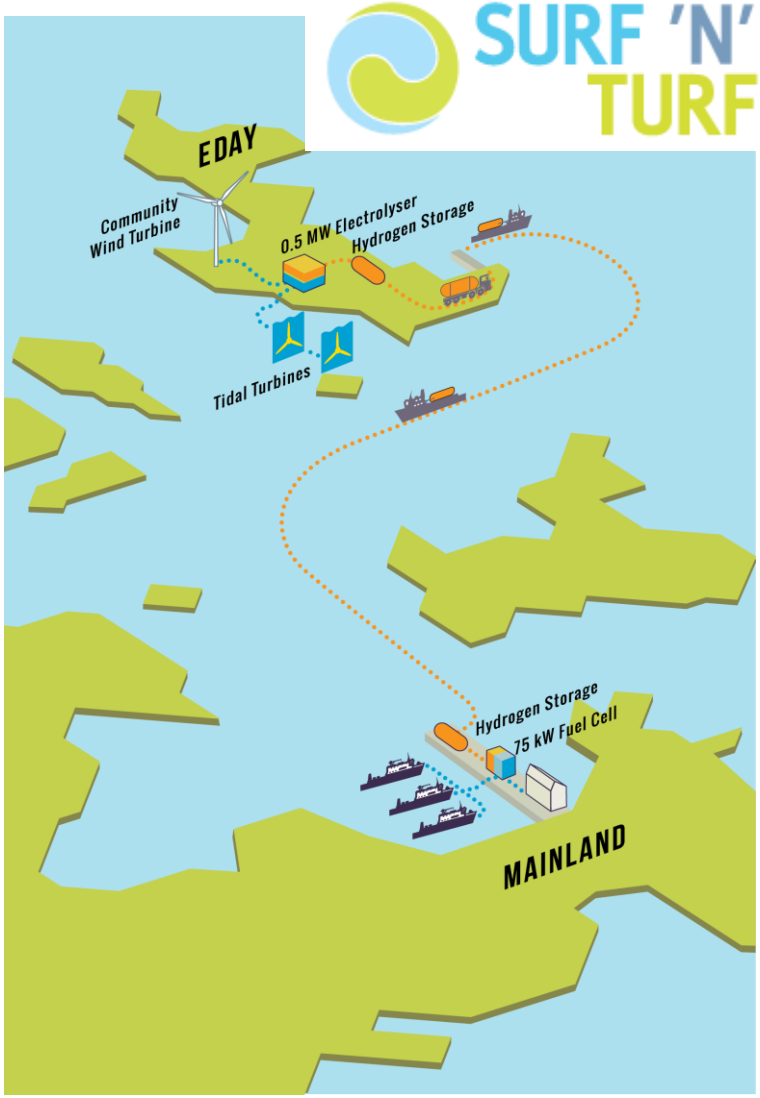
EDAY PARTNERSHIP

University of the Highlands and Islands Orkney College

ITM POWER
Energy Storage | Clean Fuel

SURF N TURF:

- In UK crews can not work on H_2 vessels without familiarisation training. No vessels on which to train.
- 75kW FC designed to DNV standards
- Set up training course for H_2 ships' crews



DUAL Ports

Decarbonising port business today

What is DUAL Ports?

DUAL Ports is a €5.2m project, 50% co-funded by the European Union and the European Regional Development Fund through the Interreg North Sea Region Programme 2014 – 2020, Eco-innovation priority. The project runs from 10th of November 2015 till 30th of June 2019.

The objective of DUAL Ports is

reducing the environmental footprint of regional entrepreneurial ports,

improving the sustainability of port operational and administration resources,

promoting responsible growth and supporting eco-innovation oriented development.

Interreg
North Sea Region
DUAL Ports
European Regional Development Fund

EUROPEAN UNION

Port Oostende
energy por

DUAL Ports

Decarbonising port business today

Partners

The Port of Oostende leads a consortium of 10 Flemish, Scottish, Danish, German and Dutch harbour authorities and organisations:

The ports of Oostende (Lead Partner), Zwolle (with Kampen and Meppel), Vordingborg, Emden and Skagen (future).

The private/public organisations; Fair Winds Trust, ITM Power, Orkney Islands Council, HWWI GmbH and Vordingborg Erhverv.

The participating ports and local authorities are expected to implement initiatives that will reduce carbon emission. This implementation will be tangible through eight different pilots projects.

Interreg
North Sea Region
DUAL Ports
European Regional Development Fund

EUROPEAN UNION

Port Oostende
energy port

DUAL Ports

Decarbonising port business today

Pilots

- Building a business case for alternative, non-conventional energy sources systems: e.g. liquefied natural gas and hydrogen,
- Developing low carbon logistic products, bridging old and new technologies: a Sailcargo trading network through port facilities´ eco-adaptation,
- Testing environmentally friendly equipment in ports: an intelligent LED lighting network,
- Piloting new ways of sustainably managing the port environment: soil treatment; sustainable space use and port management through co-siting/dockland;
- Sharing technology/processes/plans for ressource efficient management: Green officer + sustainability management system;
- Sharing ressources for low carbon management & processes in ports: low carbon planning & management.

Interreg North Sea Region DUAL Ports
European Regional Development Fund

EUROPEAN UNION

Port Oostende energy port

DUAL Ports

Decarbonising port business today

ITM Power's Task

- Design of a hydrogen bunkering system for ferry's and large vessels
- Design general system, but apply to Orkney
- Consider boat requirements (pressure, mass H_2)
- Model different bunkering methods (cascade, direct fill)
- Link with IMO, MCA andd certifying authorities

Interreg North Sea Region DUAL Ports
European Regional Development Fund
EUROPEAN UNION
Port Oostende energy port

H_2 AND FUEL CELLS FOR STATIONARY APPLICATIONS AND H_2 INFRASTRUCTURE – HYDROGEN BUNKERING

ITM POWER

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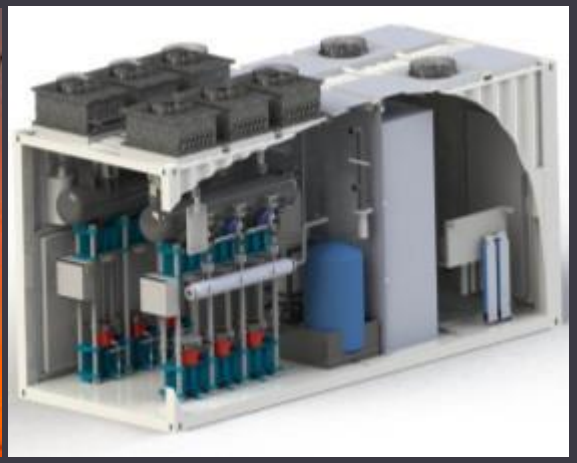
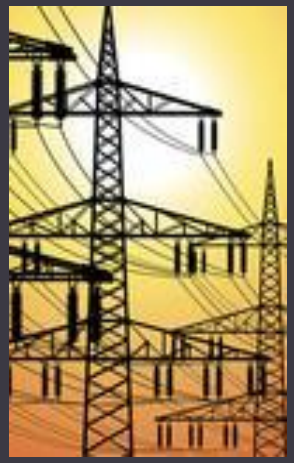


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