

# Unlocking decarbonisation through low carbon hydrogen

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**WEF UK Onshore Energy System Review**

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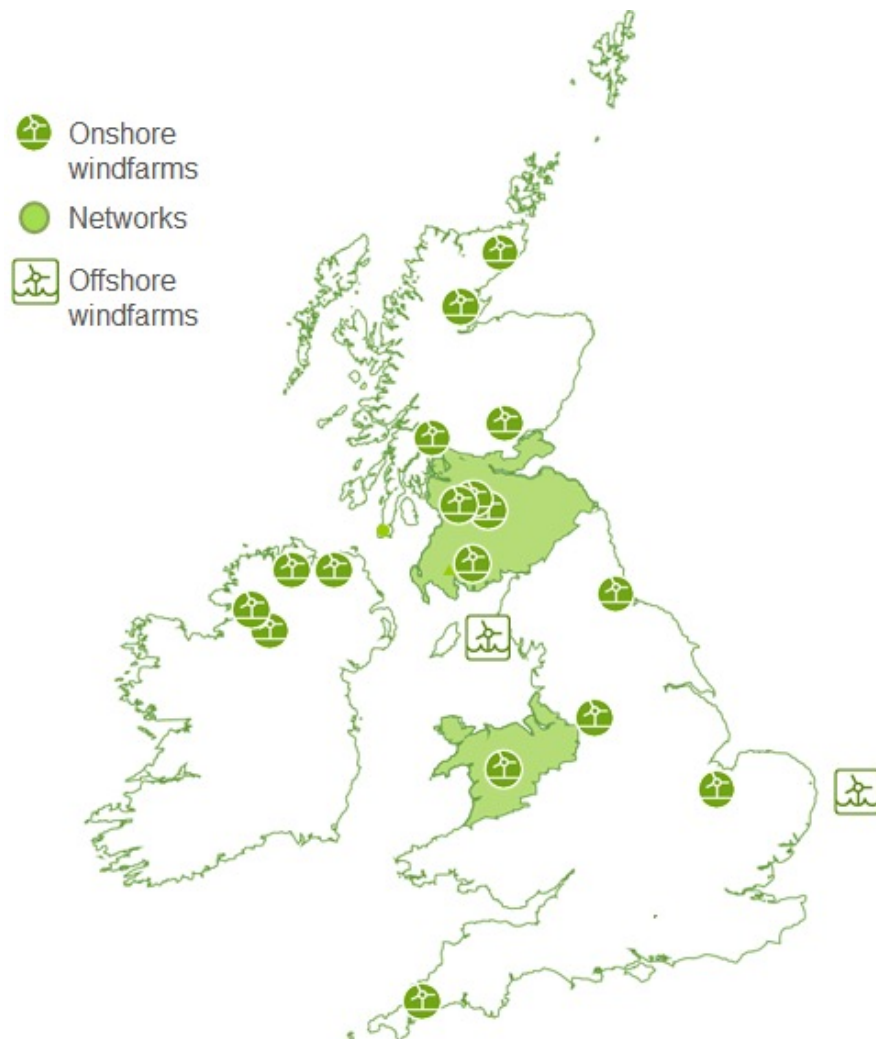
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# ScottishPower

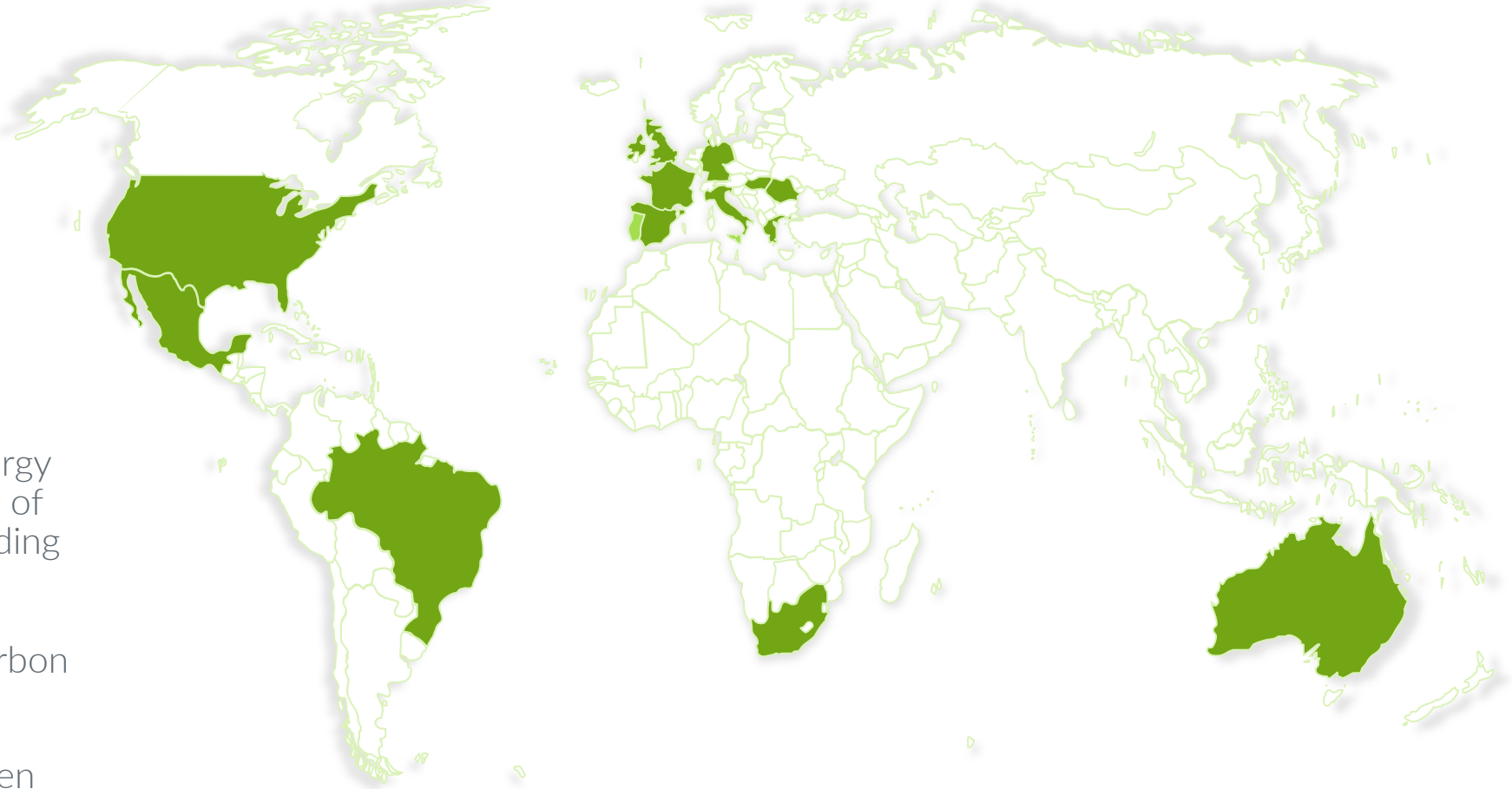


## First integrated energy company generating 100% green energy

- Investing over £10 billion in the UK between 2020 and 2025
- 40 operational windfarms in the UK with over 2,900MW of capacity
- 4.8 million electricity and gas retail customers across the UK
- Networks: 3.5 million points of supply and 110,000 km of power lines
- Over 5,700 employees
- In 2022 auction, secured CfDs for 1,400MW of offshore wind, 396 MW onshore wind and 326 MW solar PV

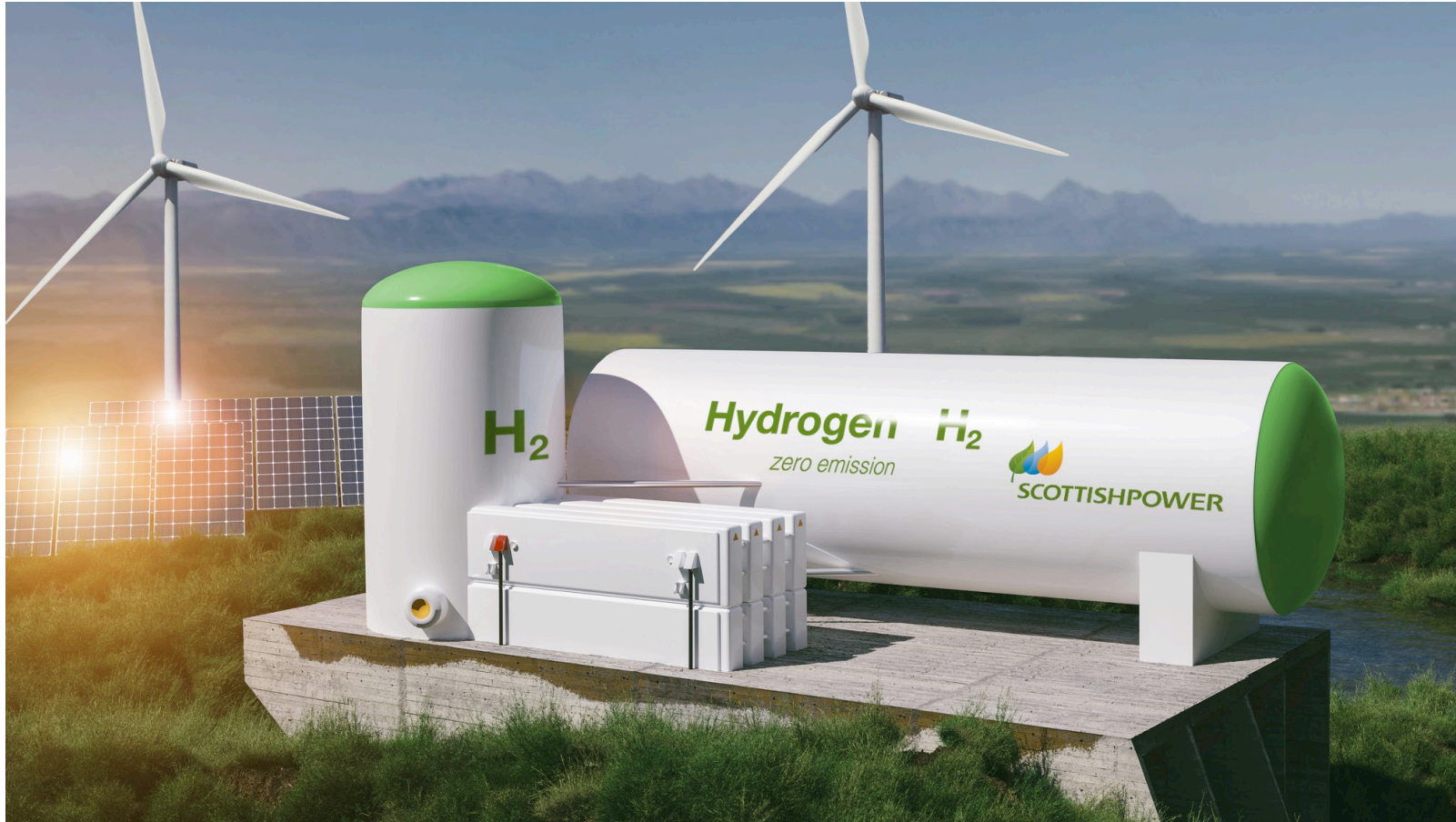
# Iberdrola

- World's no.1 renewable energy developer with over 38 GW of renewable generation (including hydropower)
- Commitment to reaching carbon neutrality by 2050
- More than 60 green hydrogen projects in 8 countries



**Planning global investments of €75 bn 2020-2025 – 51% in Renewables and 40% in Networks**

# ScottishPower hydrogen business



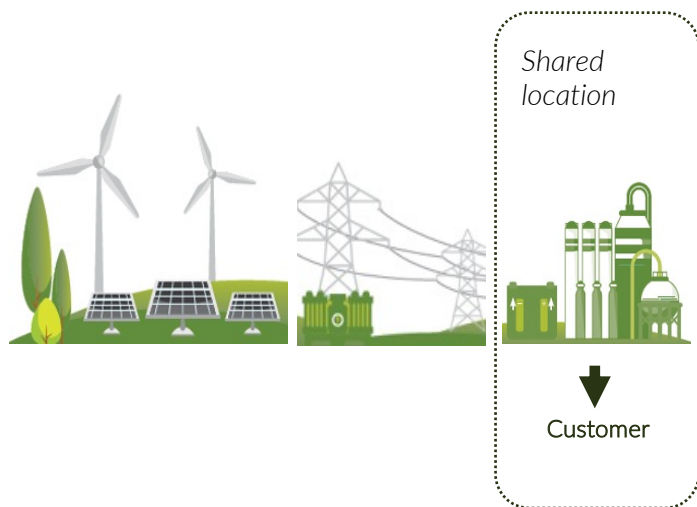
Launched in 2020 to build on our strengths in:

- Renewable energy development
- Supporting customers in the low carbon transition
- Energy management and trading

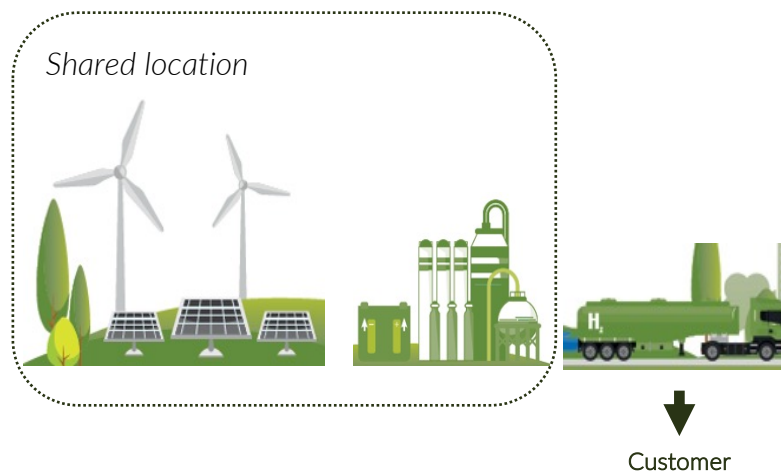
# Approach to hydrogen production

## Three main options for Hydrogen Production

Hydrogen produced at source of demand – backed by SP renewable generation supplied through the electricity network

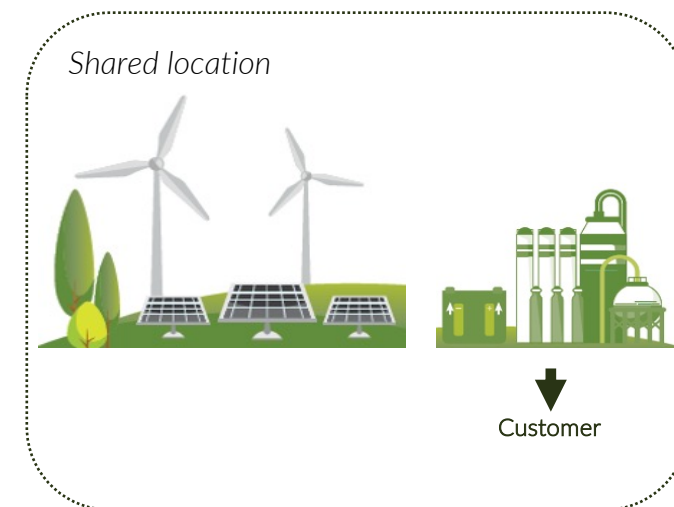


Hydrogen production co-located with renewables – hydrogen transported by lorry or pipeline to customer



*'Hub & Spoke' Model*

Demand, renewable generation, and hydrogen production co-located



**Very large-scale production will need to make use of offshore wind**

# ScottishPower and Iberdrola

## Experience and ongoing projects

### 20 MW plant



#### Whitelee

- Working with ITM Power & Linde Engineering
- Green Hydrogen for Heavy Transport Industry
- Phase 1 – 10MW
- Available 2024

### 2 MW plant



#### Barcelona Bus

- Working with TMB
- Servicing up to 46 hydrogen buses
- Phase 1 operational 2021
- Phase 2, additional 2.5 MW

### 50 MW plant



#### Cromarty

- Partnership with Storegga
- Green Hydrogen for local Distilleries & Transportation
- Phase 1 – 29MW

### Up to 800 MW plant



#### Puertollano

- Working with Fertiberia
- Green Hydrogen to facilitate green ammonia production
- 4-phases project from 2021 to 2027

# ScottishPower positioning on hydrogen

- Green hydrogen, produced using 100% renewable electricity, will have a critical role to play in decarbonising those parts of the economy that will be difficult to electrify, such as marine transport and aviation
- Hydrogen can be more effectively used in these niche applications and is currently an inefficient and expensive technology for decarbonising heat and light vehicles
- Domestic heating already have zero carbon alternatives such as electric heat pumps that are ready to be deployed today, with significantly greater efficiency
- In transport, battery electric is the most efficient and most cost-effective decarbonisation option for lighter vehicles.

## Opportunities - from grey to green



Industrial feedstock



Chemicals

## Opportunities - hard-to-abate sectors



Maritime transport



Air transport



Long-haul heavy transport

# Whitelee Green Hydrogen



## Summary

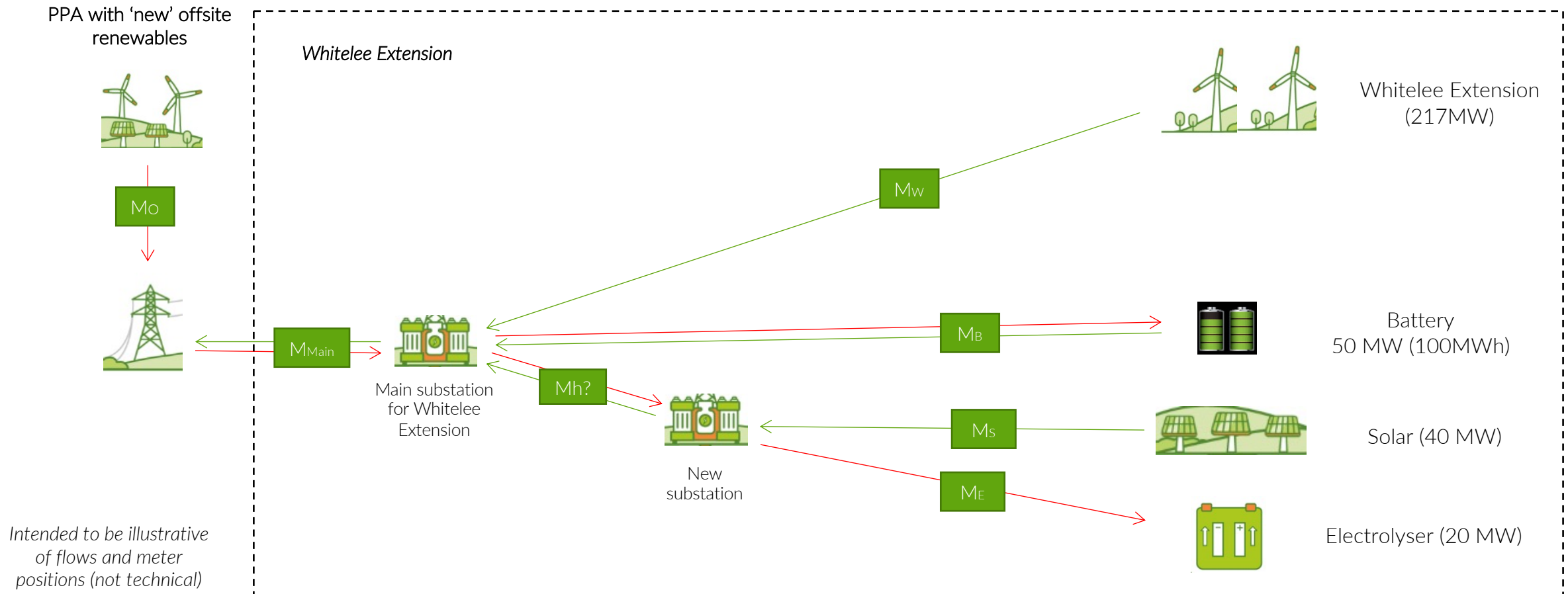
- Co-located at Whitelee Windfarm, near Glasgow
- 20MW Planning Application, incl. up to 40MW solar PV, with a 50MW, 50MWh battery
- Anticipated planning consent Q1 2023, operations 2024
- £9.4 million grant from BEIS Storage at Scale innovation fund
- In partnership with ITM/ILE

## Applications:

- Multi-purpose production site for industrial use & heavy transport refuelling supply etc. as well as regional refuelling depots
- Increasing interest from local distilleries for high temperature heating

# Metering

## Metering arrangements are complex



# Power supply options

Preferred power supply options are driven by economics and policy/regulation

Rank	Option	RTFC eligible?	HBM eligible?	Avoids grid cost?	Comments/complications
1	Whitelee solar	✓	✓	✓	• Limited hours of availability
2	Constrained Whitelee wind	✓	✓	✓	• Interaction with constraint payments
3	Whitelee wind	X	✓	✓	• How is availability affected by existing support mechanisms?
4	New off-site wind PPA	✓	✓	X	• Metering
5	Battery	X	X	✓	• What is most valuable uses for battery
6	Grid electricity	X	X	X	• For back-up when zero output from solar and wind

Optimal mix will develop over time

# Renewable Transport Fuel Obligation (RTFO)

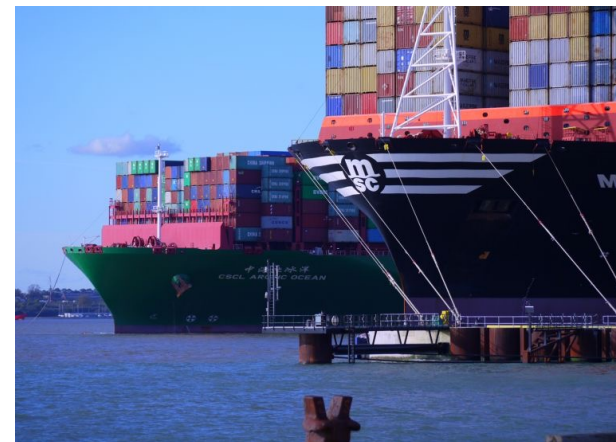
RTFO is key driver for green hydrogen production

## SP position on RTFO

- We support:
  - Additionality requirements given the need to demonstrate real carbon savings
  - Temporal correlation linking hydrogen production with electricity generation

## SP position on recent RTFO reforms

- We support:
  - RTFC eligibility for hydrogen produced using offsite renewable assets
  - Use of Power Purchase Agreement (PPAs), not guarantees of origin, to demonstrate link to renewable asset
  - Use of CfD-supported renewables to facilitate deployment at scale

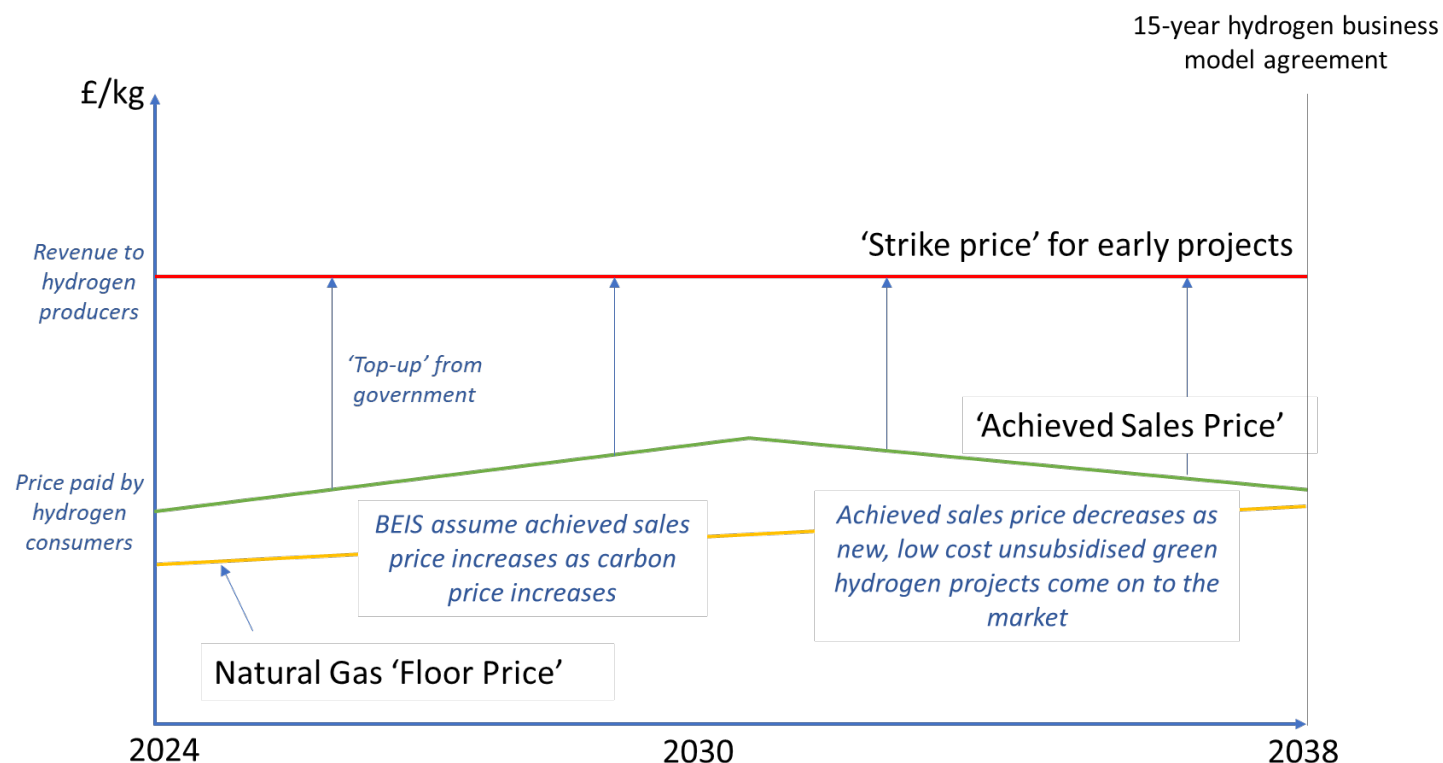


# BEIS Hydrogen Business Model (HBM)

BEIS HBM mechanism will play key role in promoting development of hydrogen production

## Issues

- HBM provides alternative support mechanism to RTFO for transport uses and supports industrial uses
- For Whitelee Hydrogen, both HBM and RTFO could be important
- Natural gas 'floor price' embeds natural gas price risk into the mechanism – not helpful for green hydrogen projects
- Complexity in determining and monitoring achieved sales price
- Administrative burden for both government and industry likely to be high



Complexity creates risks of unintended consequences

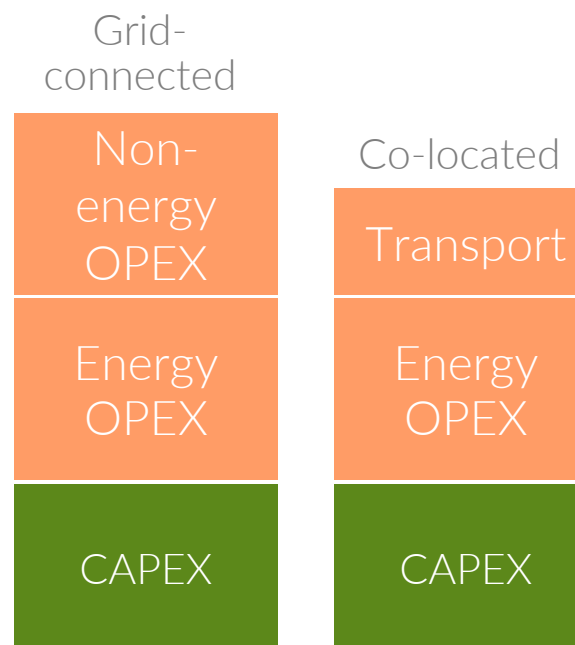
# Regulatory and policy framework

Is the regulatory and policy framework around network charging fit-for-purpose for the hydrogen economy?

## Potential impacts of networks charging on development of hydrogen production

- Onshore green hydrogen production – current charging environment favours co-location
- Offshore wind – right balance between onshore and offshore hydrogen production?
- Exports – competitiveness in foreign markets
- Domestic decarbonisation – sits within broad policy framework

### *Levelised costs of hydrogen*



# Grid costs and hydrogen production

Key question is which of the elements of cost, following the EII reduction, should apply to hydrogen production?

- **Grid costs:** - cost-reflective grid costs still apply (DUOS, TNUOS, losses)?
- **Policy costs** - is there a case for reducing renewable support costs to zero where hydrogen is being produced using dedicated, non-supported, renewable assets?
- **Balancing costs (BSUoS)** – electrolyzers can benefit the overall system rather than imposing a costs, depending on their operation
- **Capacity market supplier levy** – again if hydrogen is produced using dedicated renewable assets, do they use the ‘service’ provided by the capacity market?
- **Climate Change Levy** – what’s the rationale for green hydrogen production paying the CCL when they are producing a zero-carbon product?

## The future of large-scale, low cost green hydrogen production



*ScottishPower Renewables East Anglia Windfarm*