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The 2050 Challenge and Technology Solutions

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What is the ETI?



- The Energy Technologies Institute (ETI) is a public-private partnership between global energy and engineering companies and UK Government

Delivering...

- Targeted development, demonstration and de-risking of new technologies for affordable and secure energy
- Shared risk
- Leverage for Members - funding, expertise and market access
- Accelerated development schedules - in advance of market
- Competitive advantage for Members



ESME Strategic design tool 2020 - 2050

*integrating power, heat, transport and infrastructure providing national/
regional system designs*



Setting strategic direction

World-class ETI capability in energy system modelling and strategic analysis



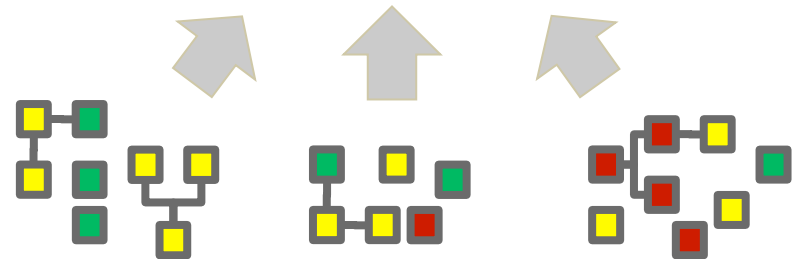
Focused on the integrated UK energy system – power, heat, transport and associated infrastructure

Which energy technologies do we need and when?

Creating commercial confidence

Viable commercial operation

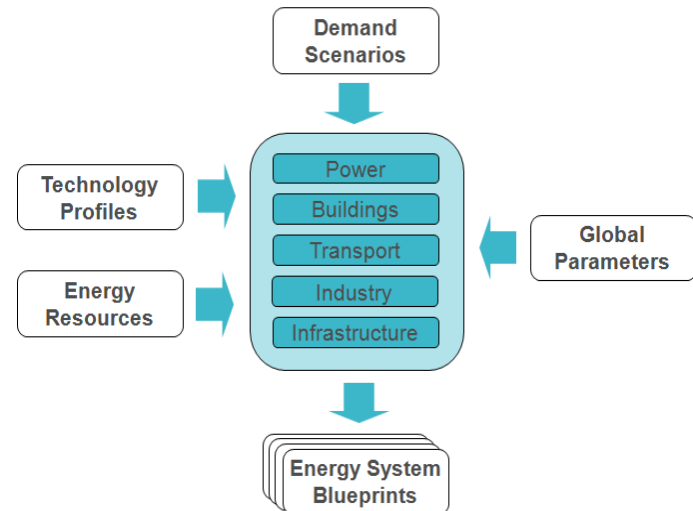
ETI Delivery of engineering demonstrations of innovative low carbon energy systems



Innovative technologies, sub-systems and information

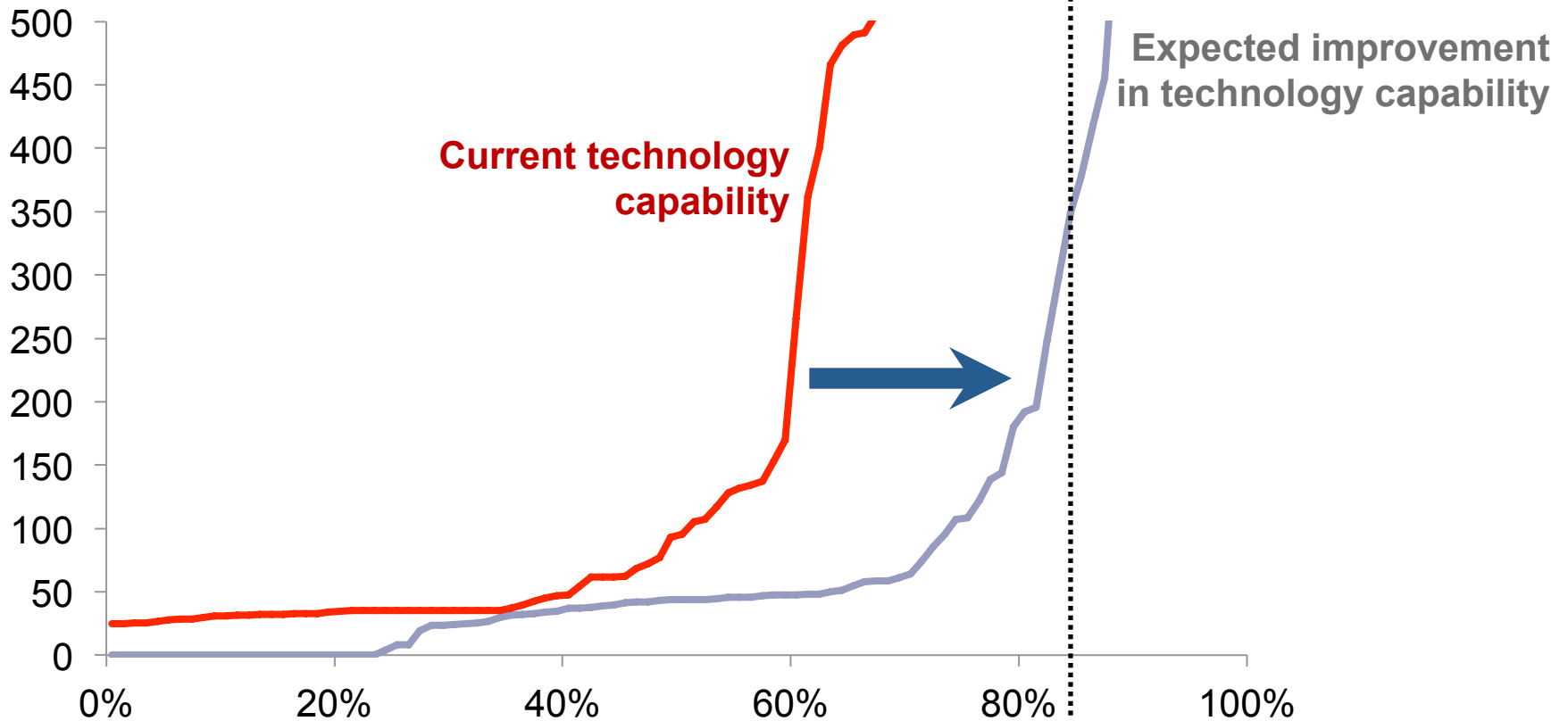
Energy System Modelling Environment

- A national energy system design tool
- Distinctive modelling approach
 - Least cost optimisation (policy neutral)
 - Focus on the “destination” and backcasting
 - Probabilistic treatment of uncertainties
 - Includes spatial & temporal factors
- Informed by ETI members/ advisors
- Internationally peer reviewed

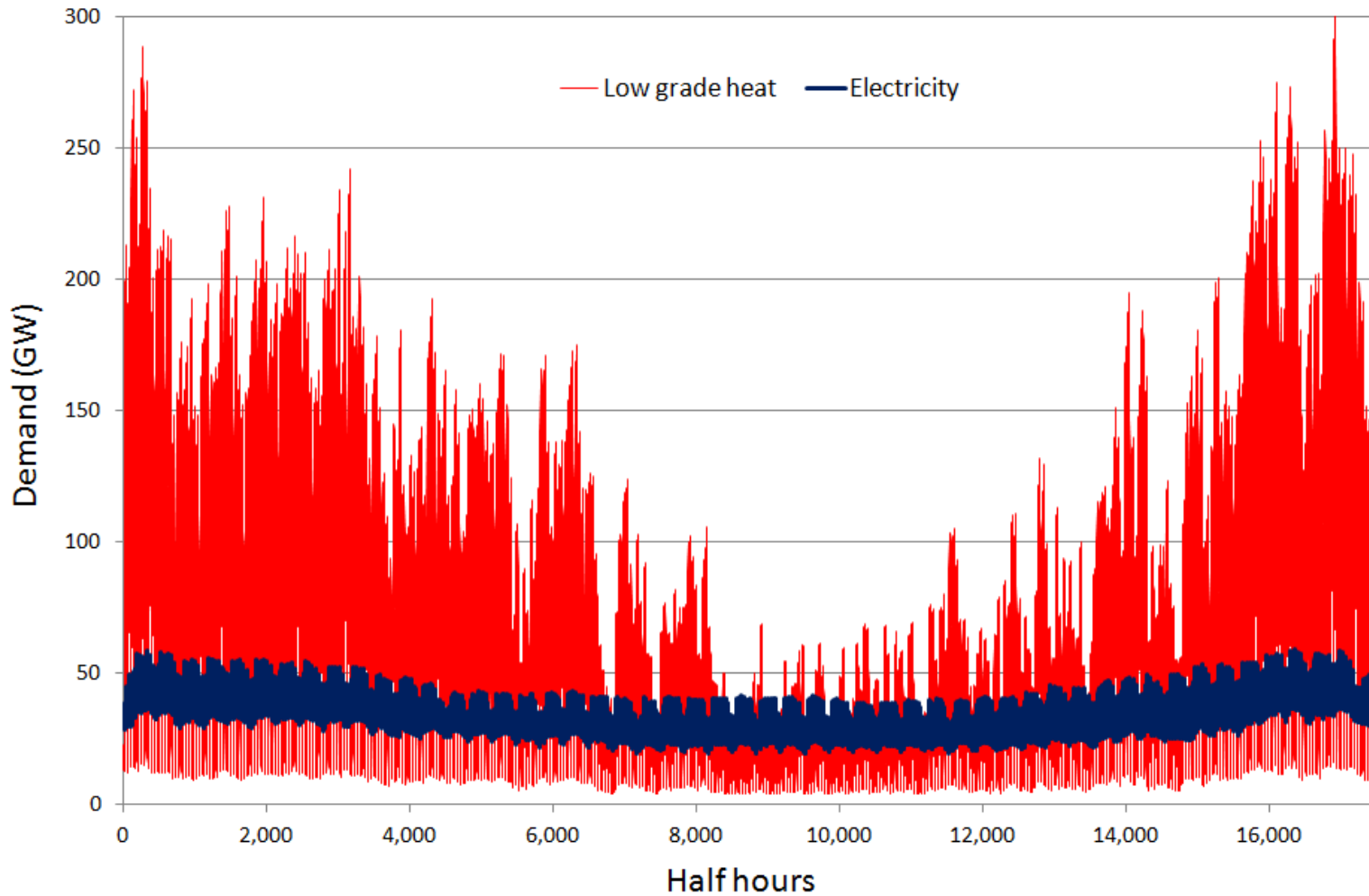


Low carbon doesn't have to be expensive (<1%GDP 2010-2050)

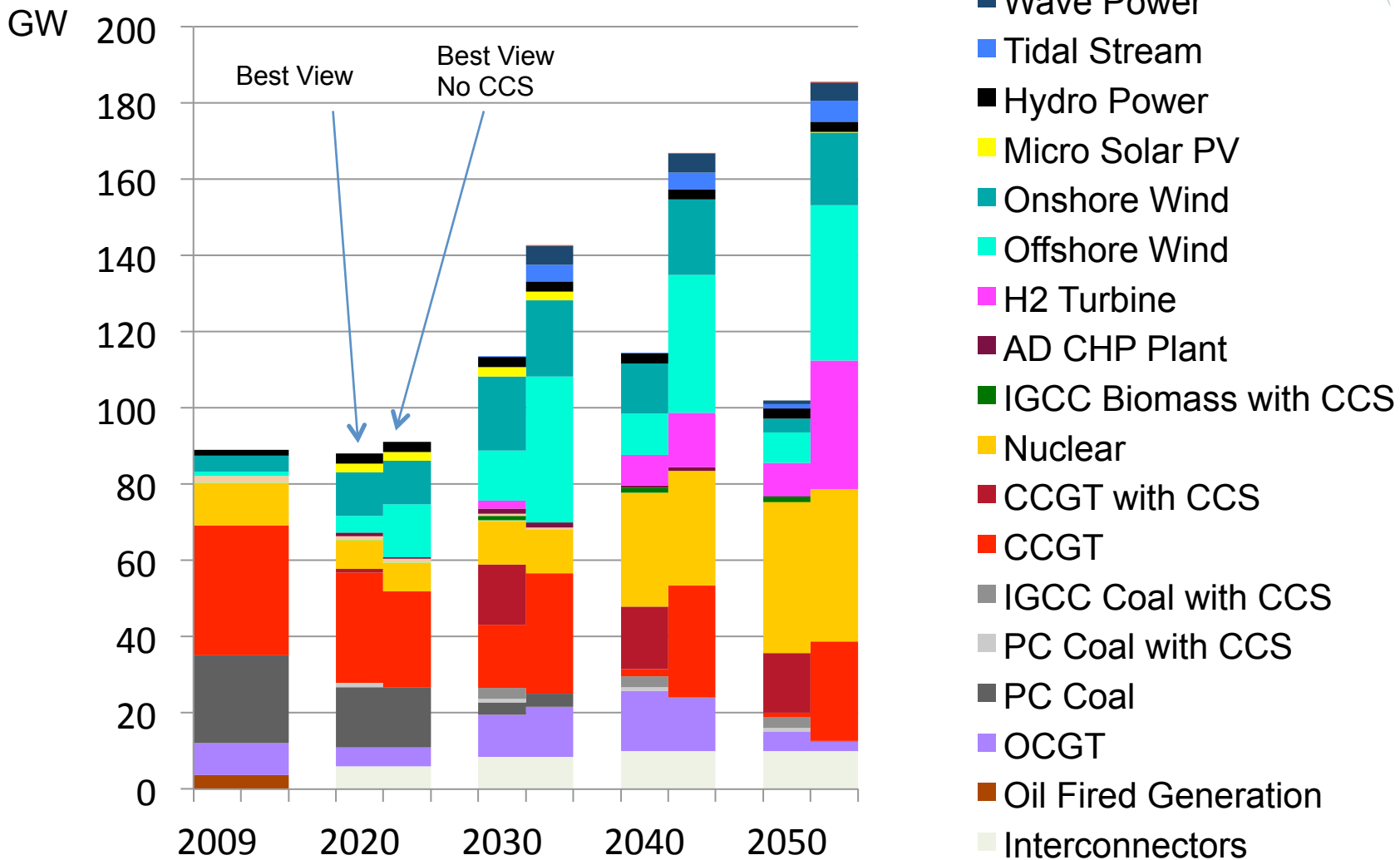
**Abatement Cost
£/Tc CO₂ in 2050**



GB electricity and low grade heat demand (2010)

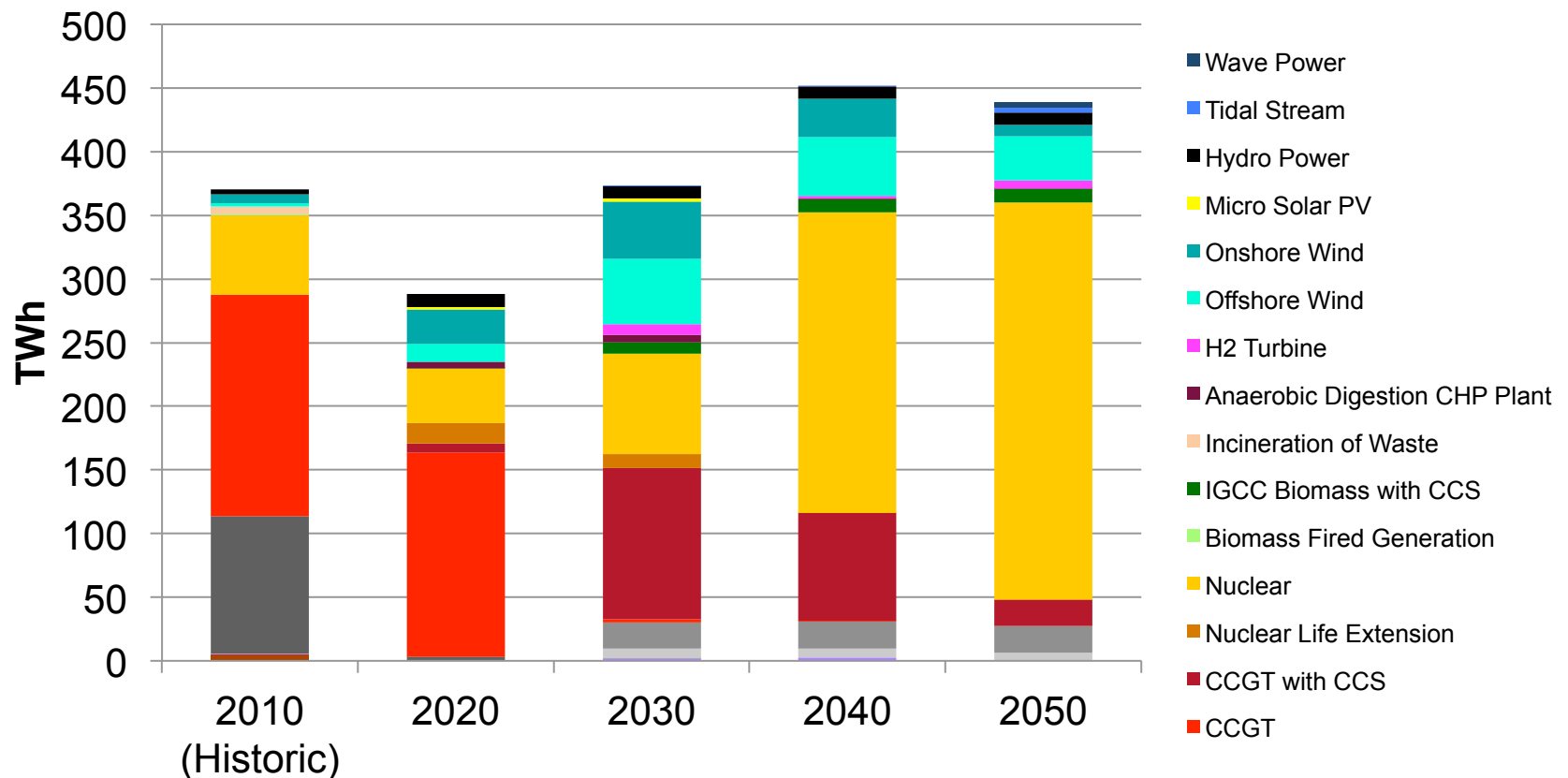


Large increase in power capacity without CCS

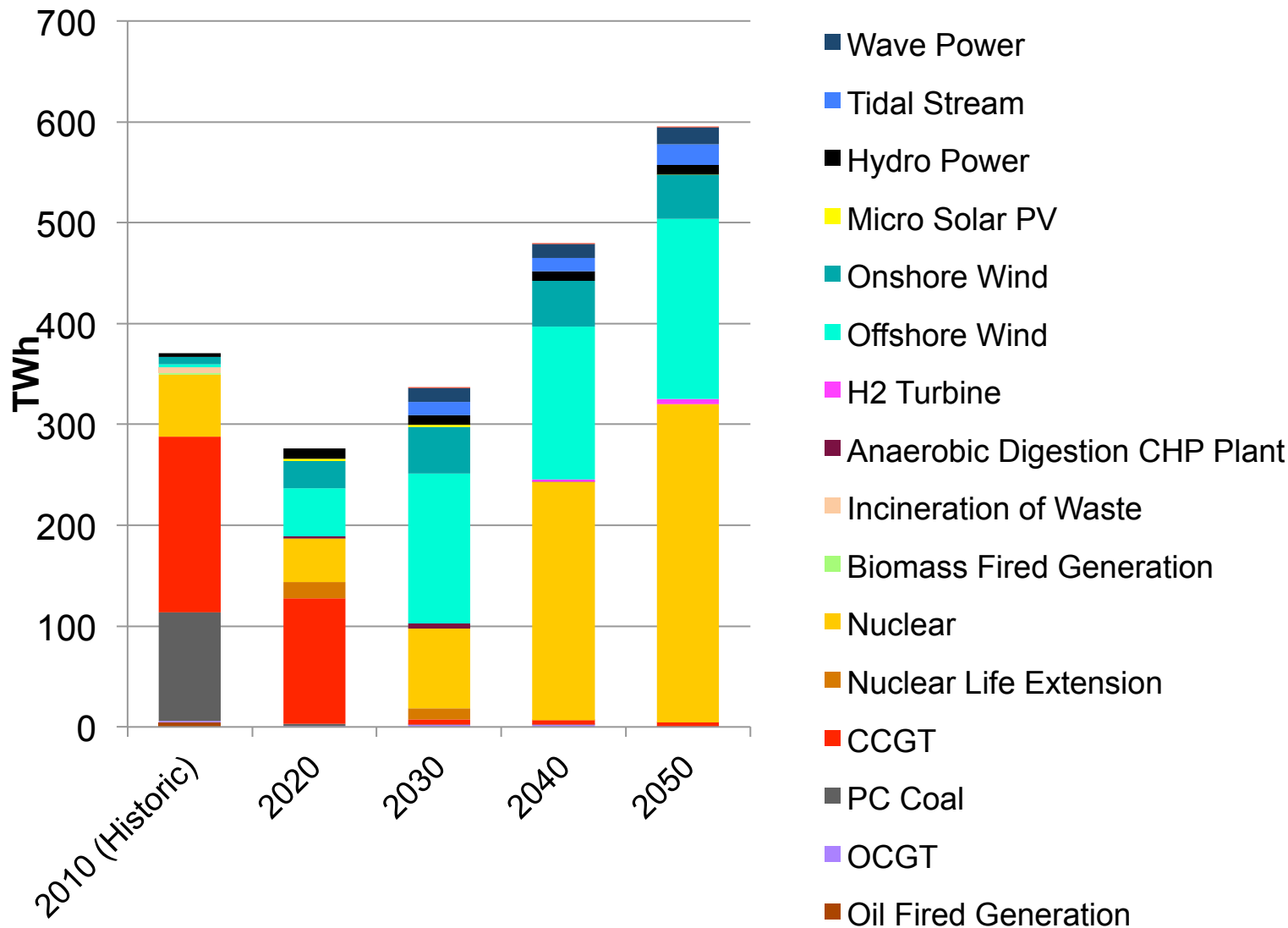


ESME Scenario – With CCS Electricity Generation

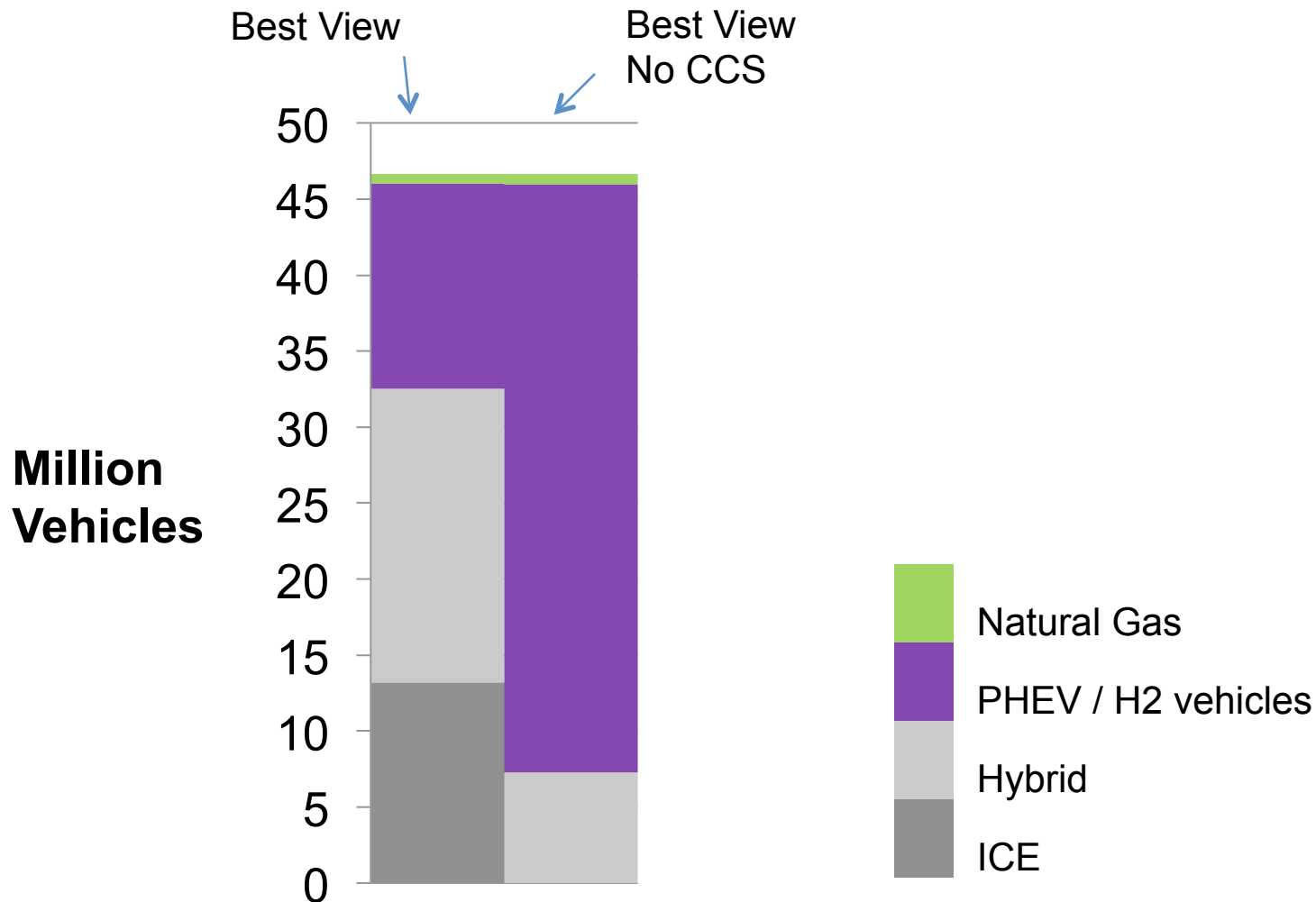
Electricity Generation



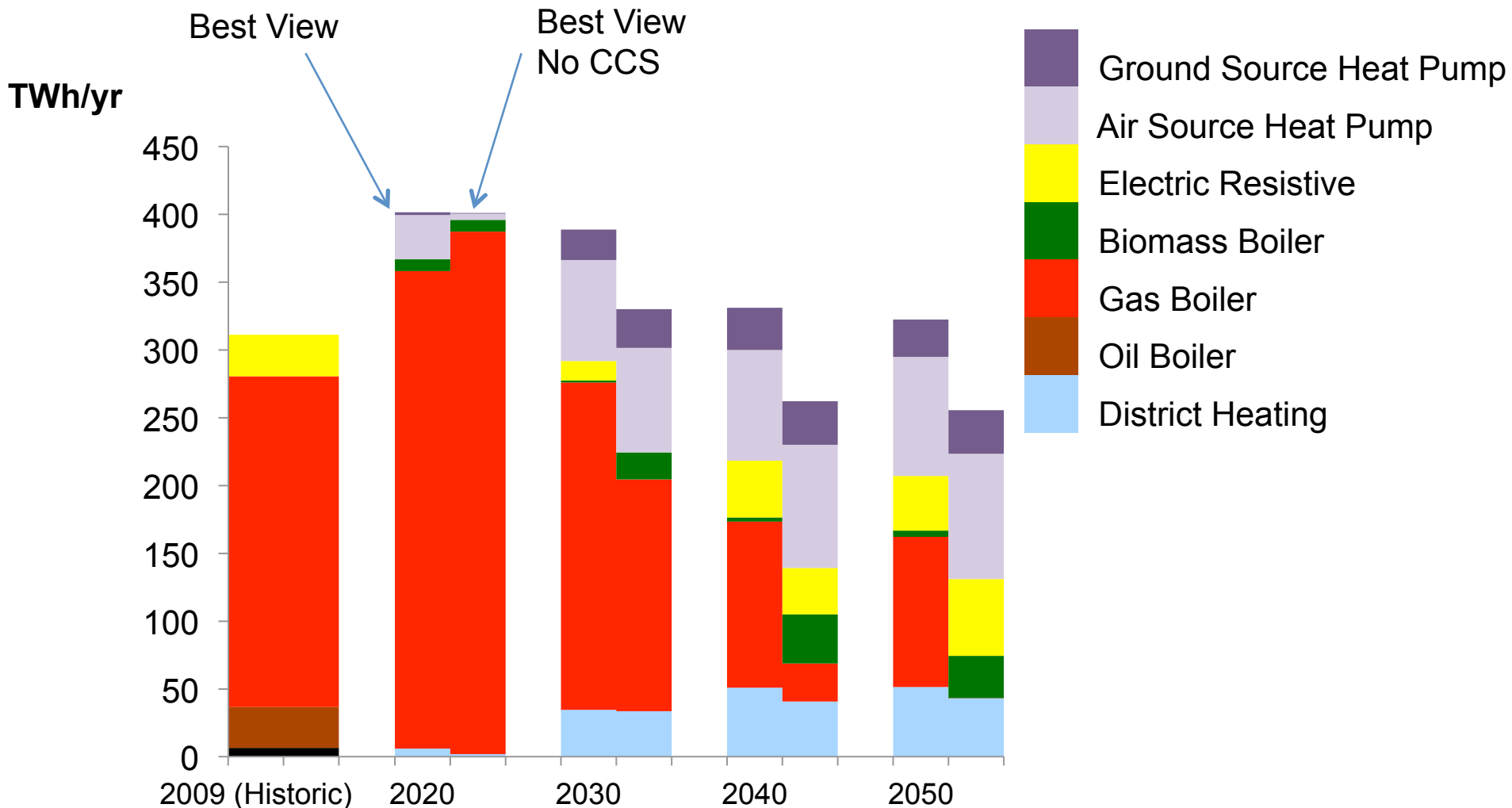
ESME Scenario – No CCS Electricity Generation



Implications of CCS on decarbonising transport?

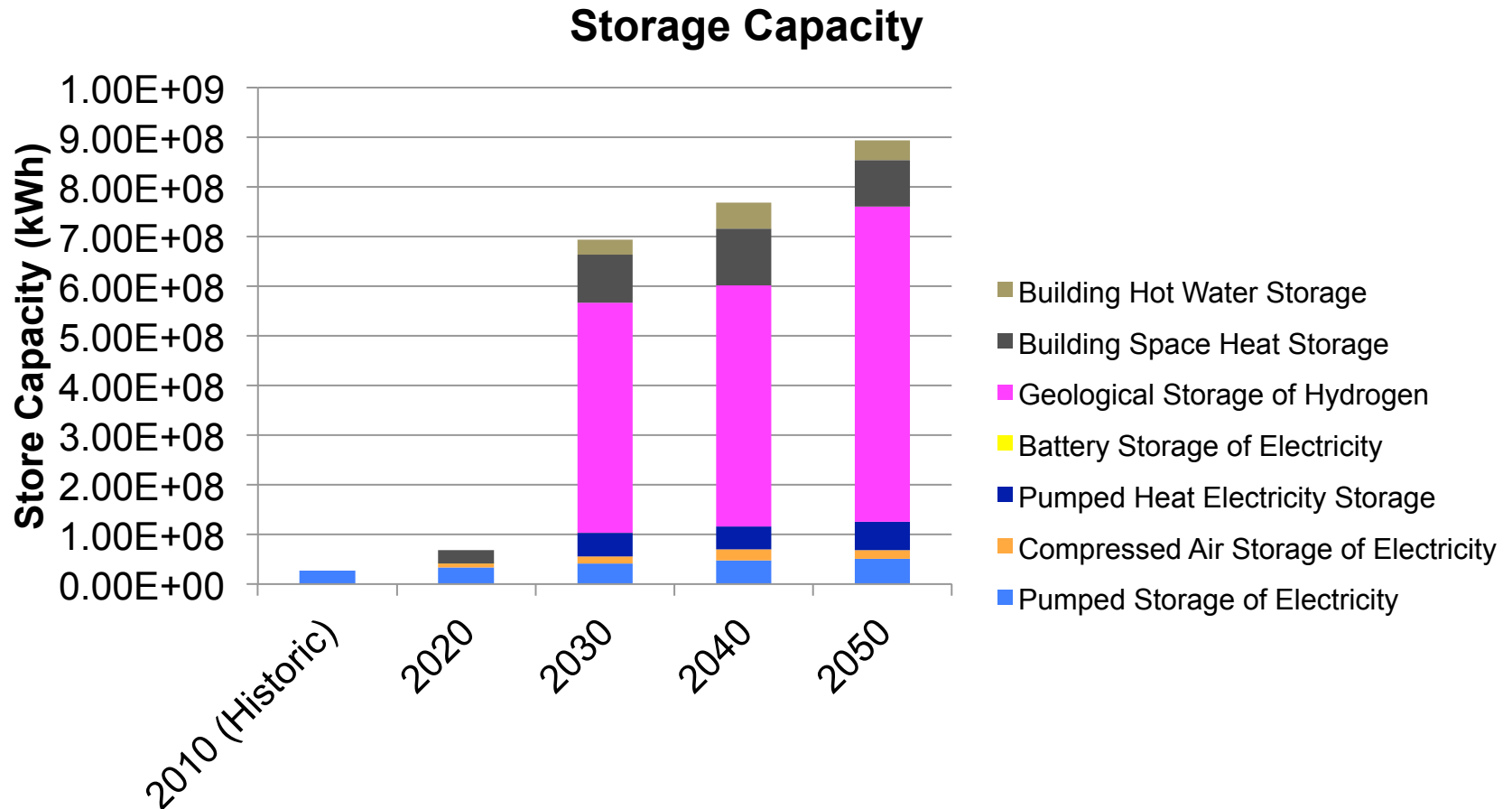


Implications of CCS development on heat?



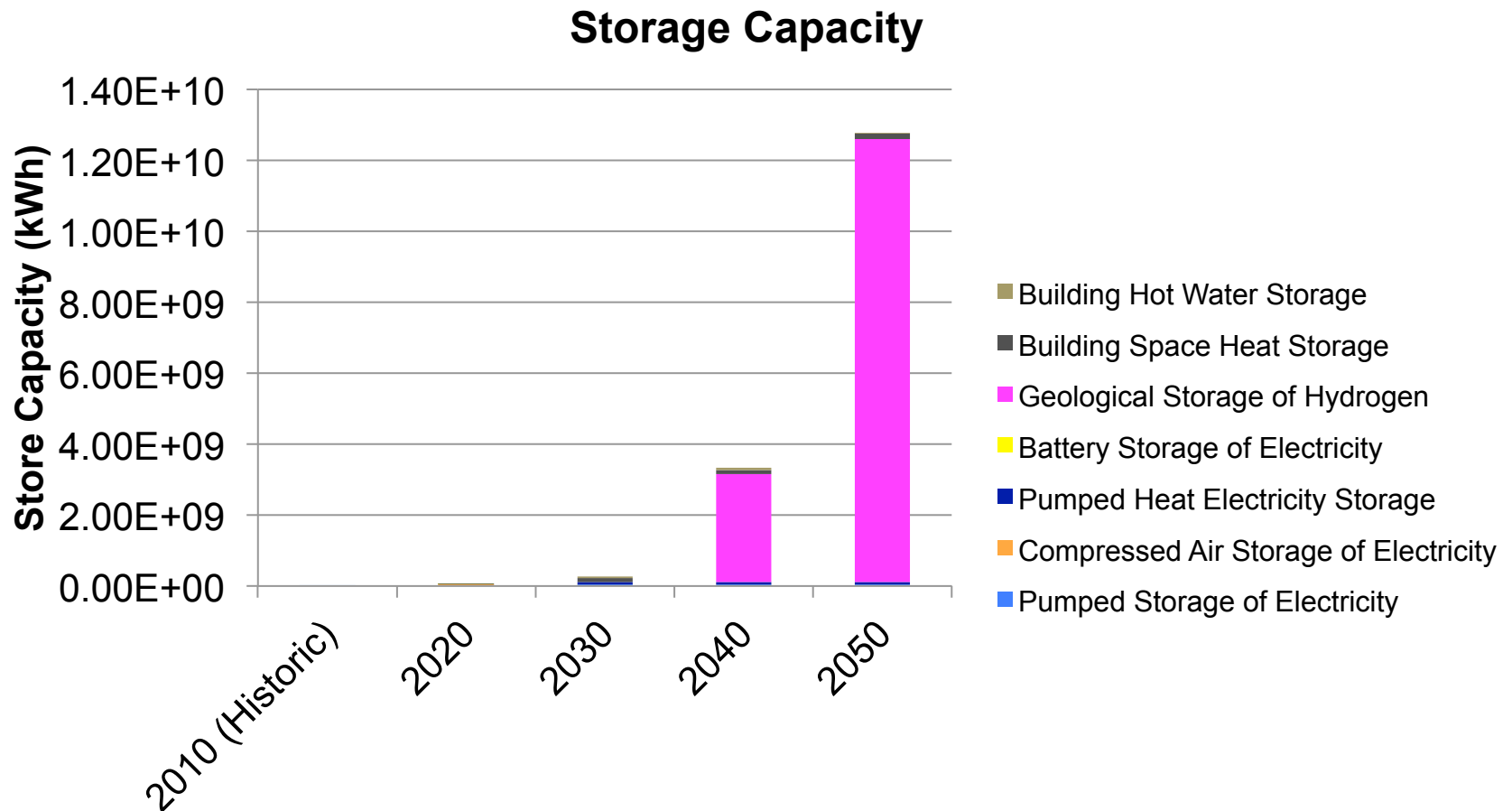
ESME Scenario – With CCS

Storage Capacity



ESME Scenario – No CCS

Storage Capacity

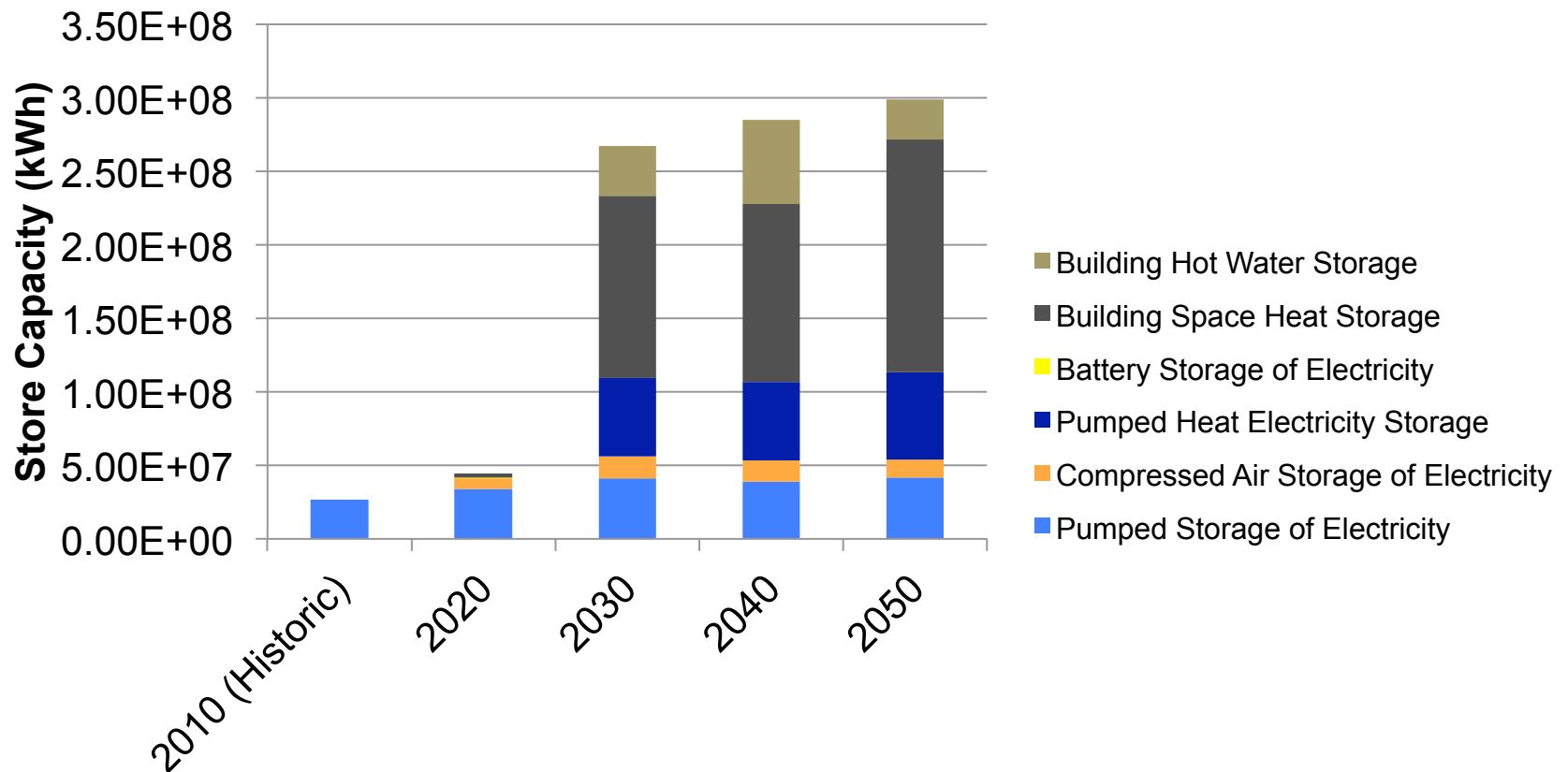


ESME Scenario – NO CCS

Storage Capacity Excluding Hydrogen

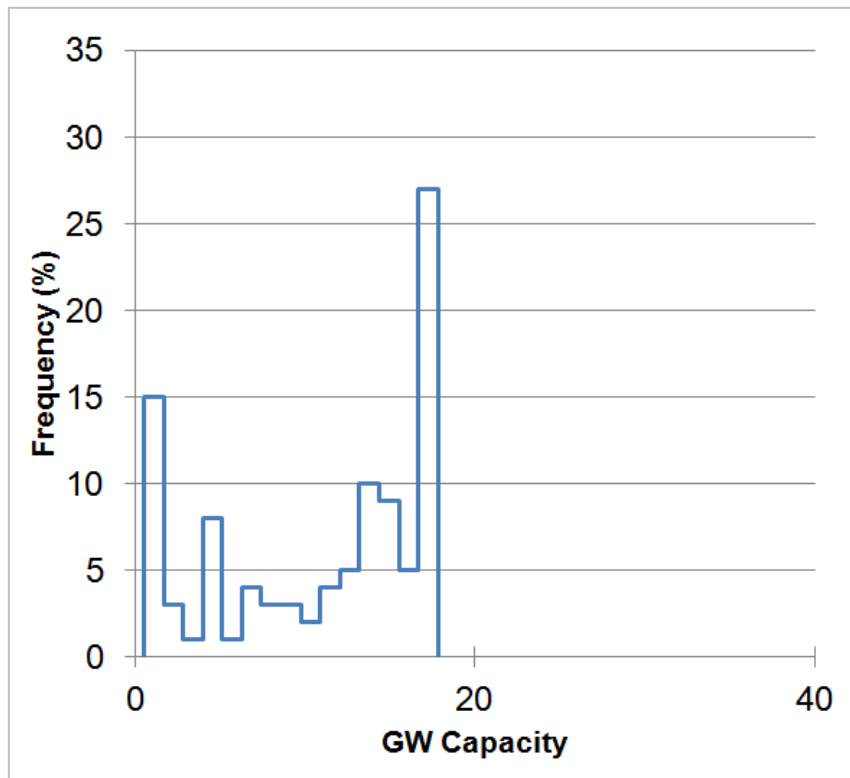


Storage Capacity

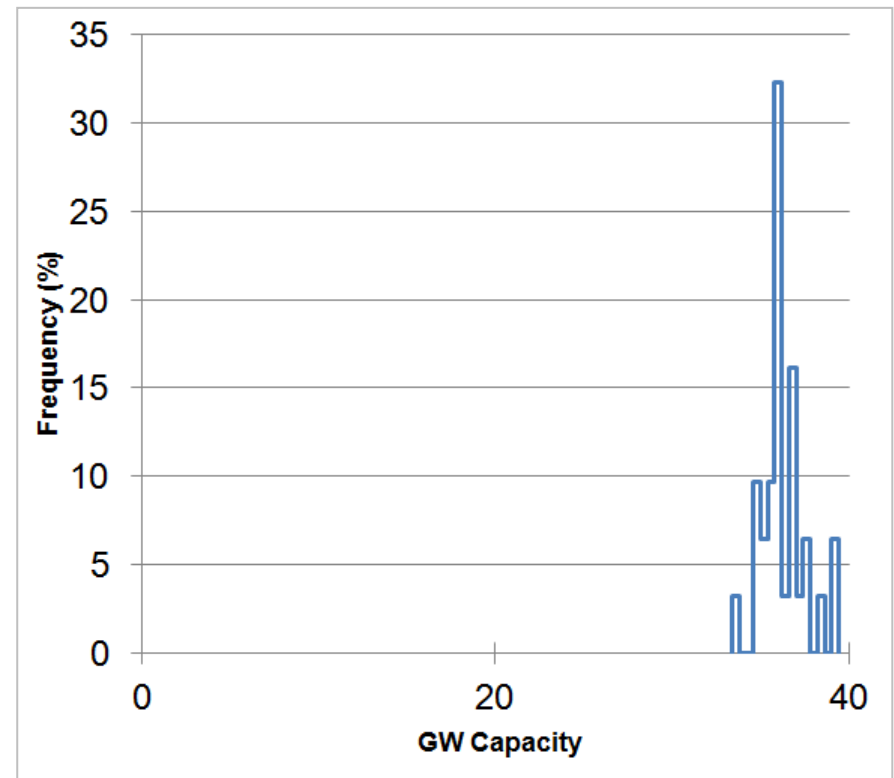


Example of Offshore Wind as a “CCS Hedge”

Optimised 2050 world (i.e. with CCS)



Optimised 2050 world without CCS available



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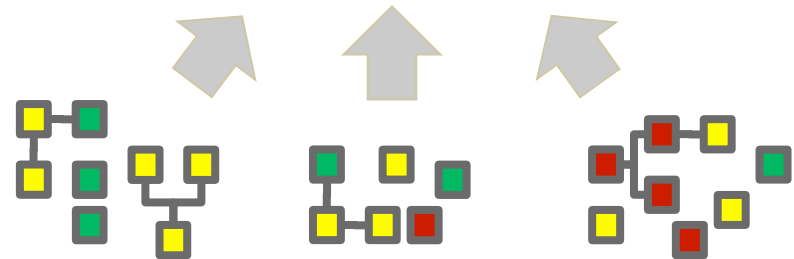
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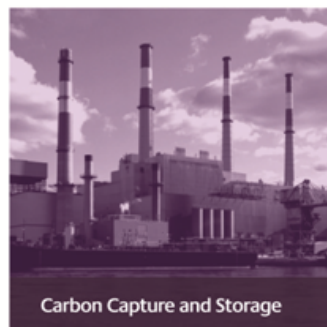
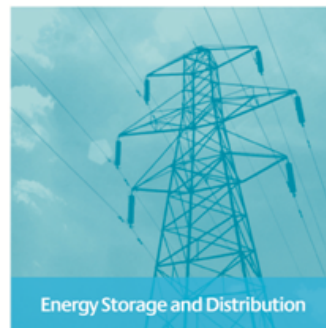
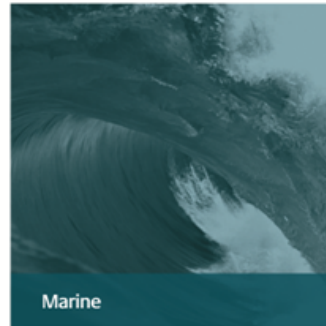
Viable commercial operation

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Innovative technologies, sub-systems and information

ETI Programmes

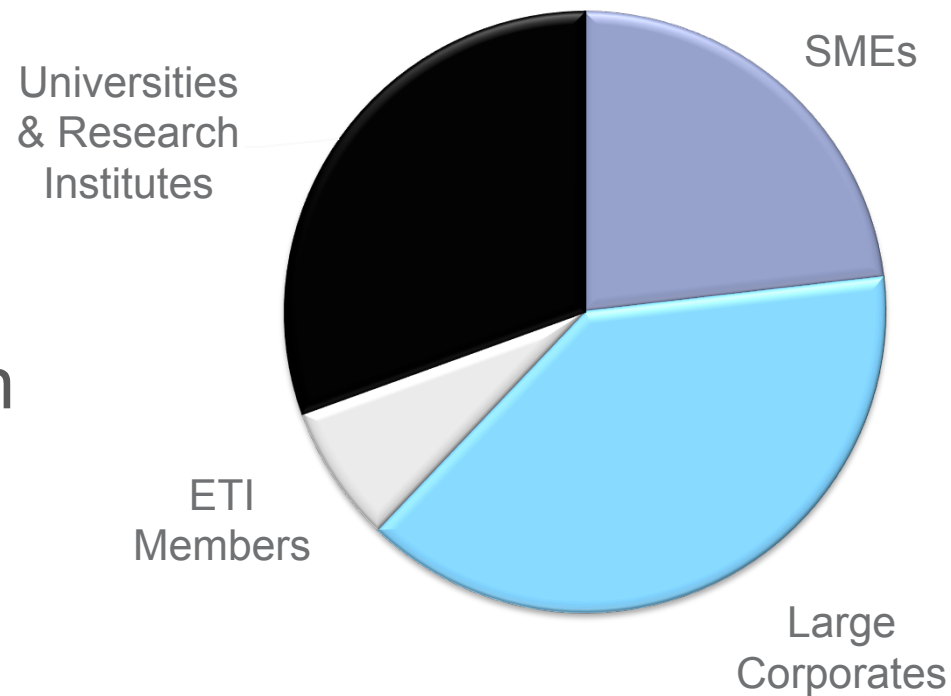


Commissioning and funding projects

£208m
major projects
underway

£162m
further projects in
development

Organisations working with the ETI



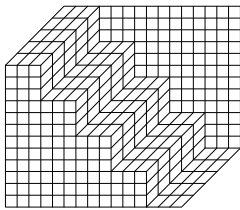
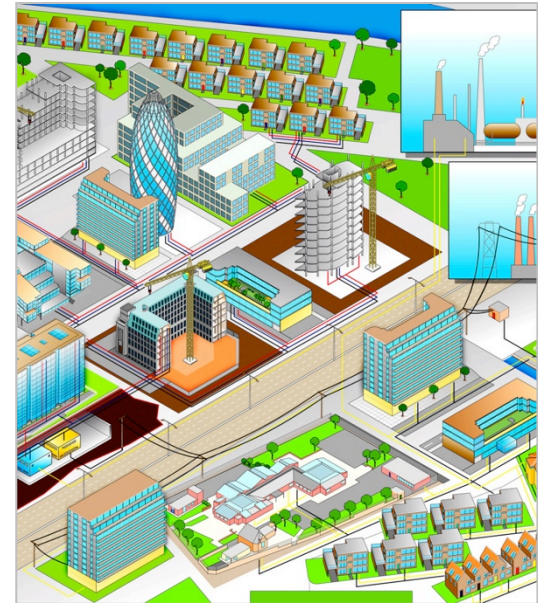
Who We Work With



2050 Energy Infrastructure Outlook

Deliverables

- Cost data tool for infrastructure optimisation analysis. Vectors included are Hydrogen, Gas, Electricity and Heat.
- Includes for new build, repurposing, refurbishment and abandonment.



Buro Happold

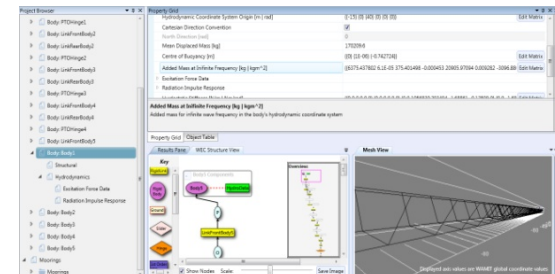


PerAWaT – Performance Assessment of Wave and Tidal Array Systems



Deliverables

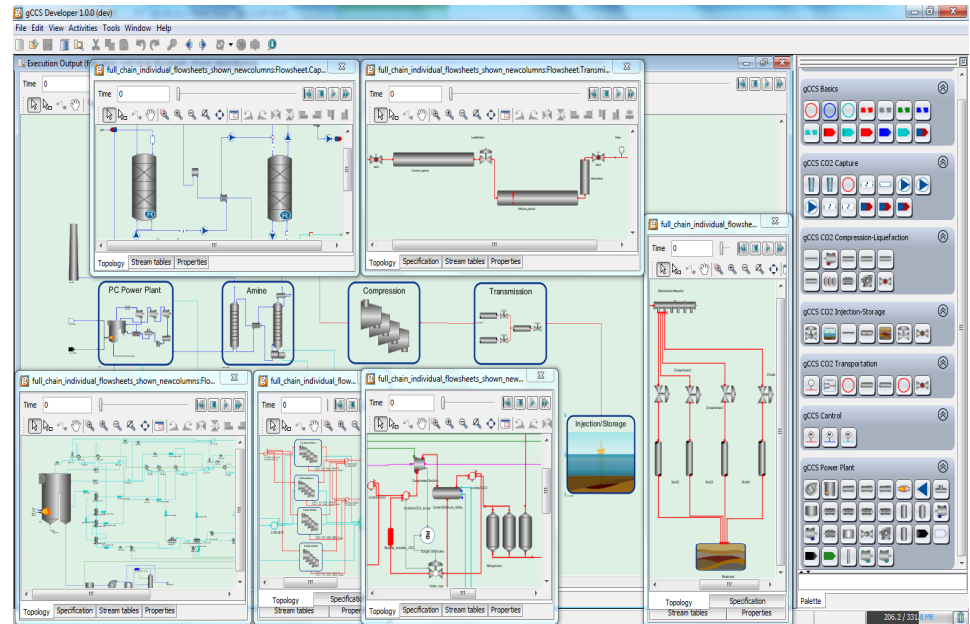
- Tool for assessing energy yield from tidal and wave arrays
- Validated numerical models of wave and tidal devices, interaction between devices in arrays and interactions between arrays



CCS Tool-kit

Deliverables

- Tool kit allowing simulated build of system allowing evaluation of components, system requirements and operational characteristics
- Target availability mid 2014

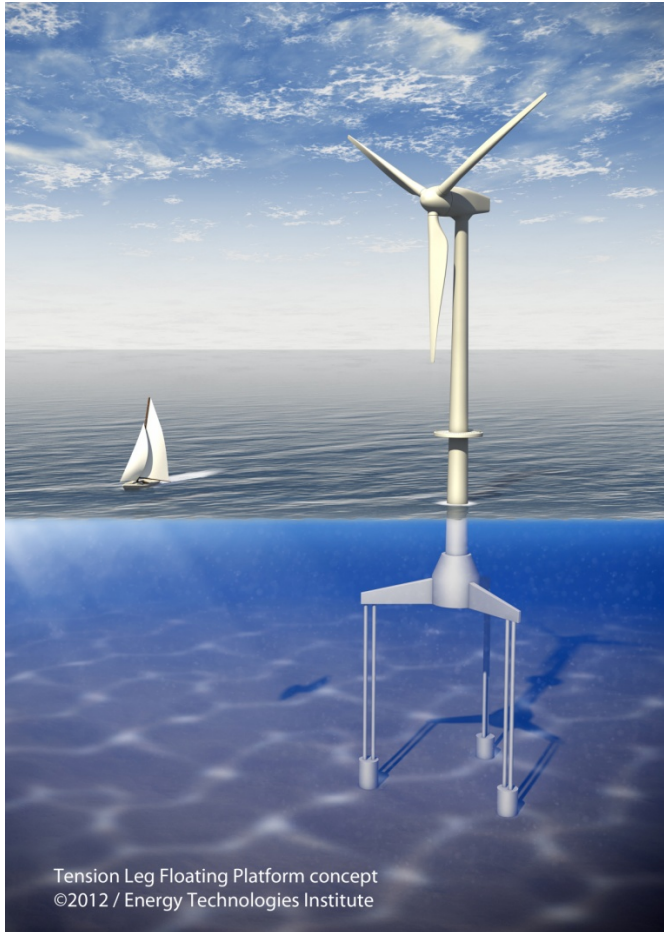


£15.5m Investment – Very Long Blades (Blade Dynamics)



Floating Offshore Wind System Demonstrator

Up to £25m project



- Front End Engineering Design (FEED study)
 - TLP approach
 - Best “additionality for ETI”
 - Led by Glostern Associates
 - Alstom 6MW turbine
 - Contracts signed February 2013
 - 12 month project
 - Preferred site: wave hub, off NW coast of Cornwall
- Followed, if good enough investment case, by full scale demonstrator
 - In water 2015/16

Distribution Scale Pumped Heat Electricity Storage

- Demonstration of the *Iisentropic* electricity storage system
 - 11kV connected substation on Western Power Distribution's network
 - 1.4 MW / 4 hour (5.6 MWh) rating
 - Design, development, construction, testing & in-service operation for up to 2 years



Iisentropic

A new era in electrical energy storage and recovery

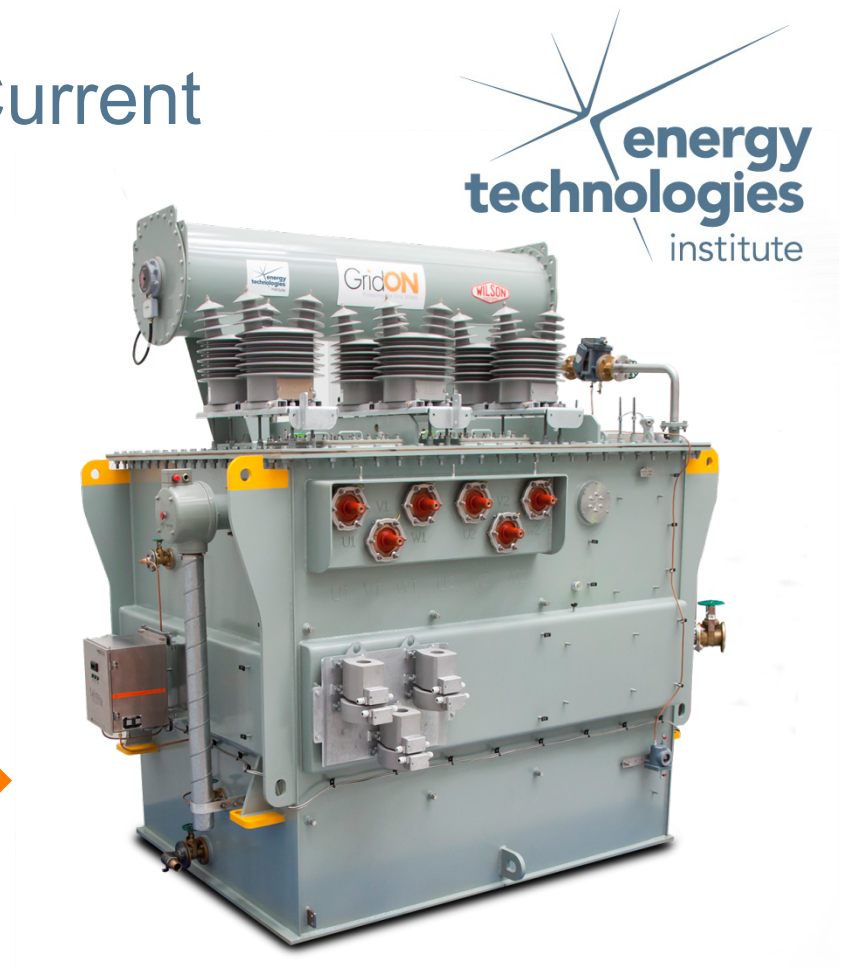
**WESTERN POWER
DISTRIBUTION**

Serving the Midlands, South West and Wales

Pre-Saturated Core Fault Current Limiter (PCFCL)

- 10MVA Device

- Built in Wilson Transformer, Melbourne Australia.
- Tested in November 2012.
- Shipped in December 2012.
- Scheduled to arrive in UK March 2013.
- Scheduled to complete commissioning June 2013.
- UKPN Demonstration Site Newhaven, E Sussex
- Scalable to 33kV and 132kV



GridON
Protecting the grid. Wisely.





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