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The 2050 Challenge and Technology Solutions

Phil Proctor – Programme Manager Energy Storage and Distribution

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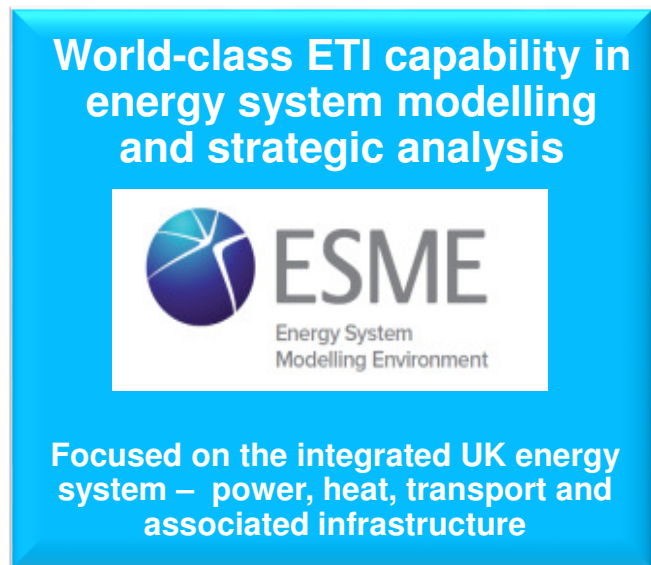
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ESME Strategic design tool 2020 - 2050

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

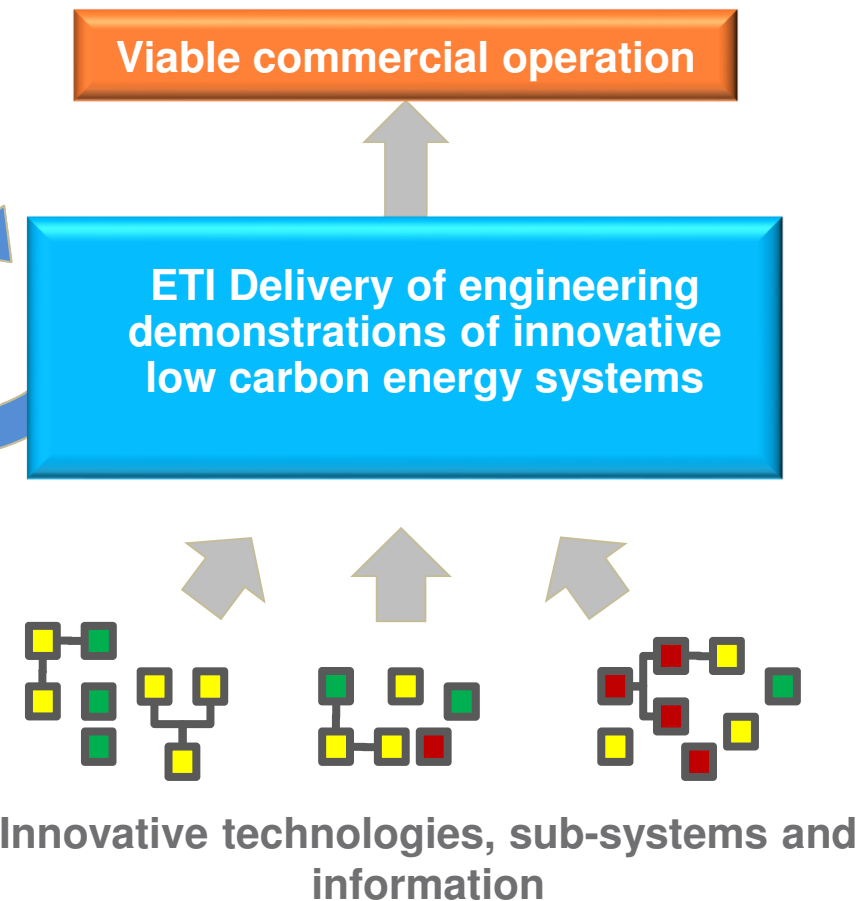


Setting strategic direction



Which energy technologies do we need and when?

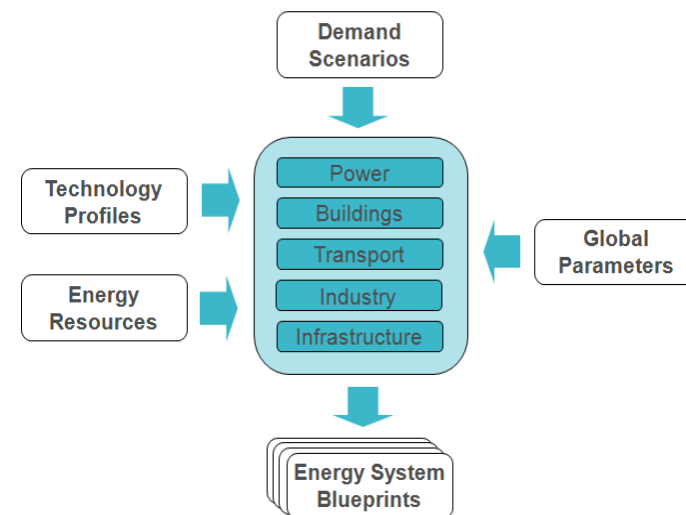
Creating commercial confidence



Energy System Modelling Environment

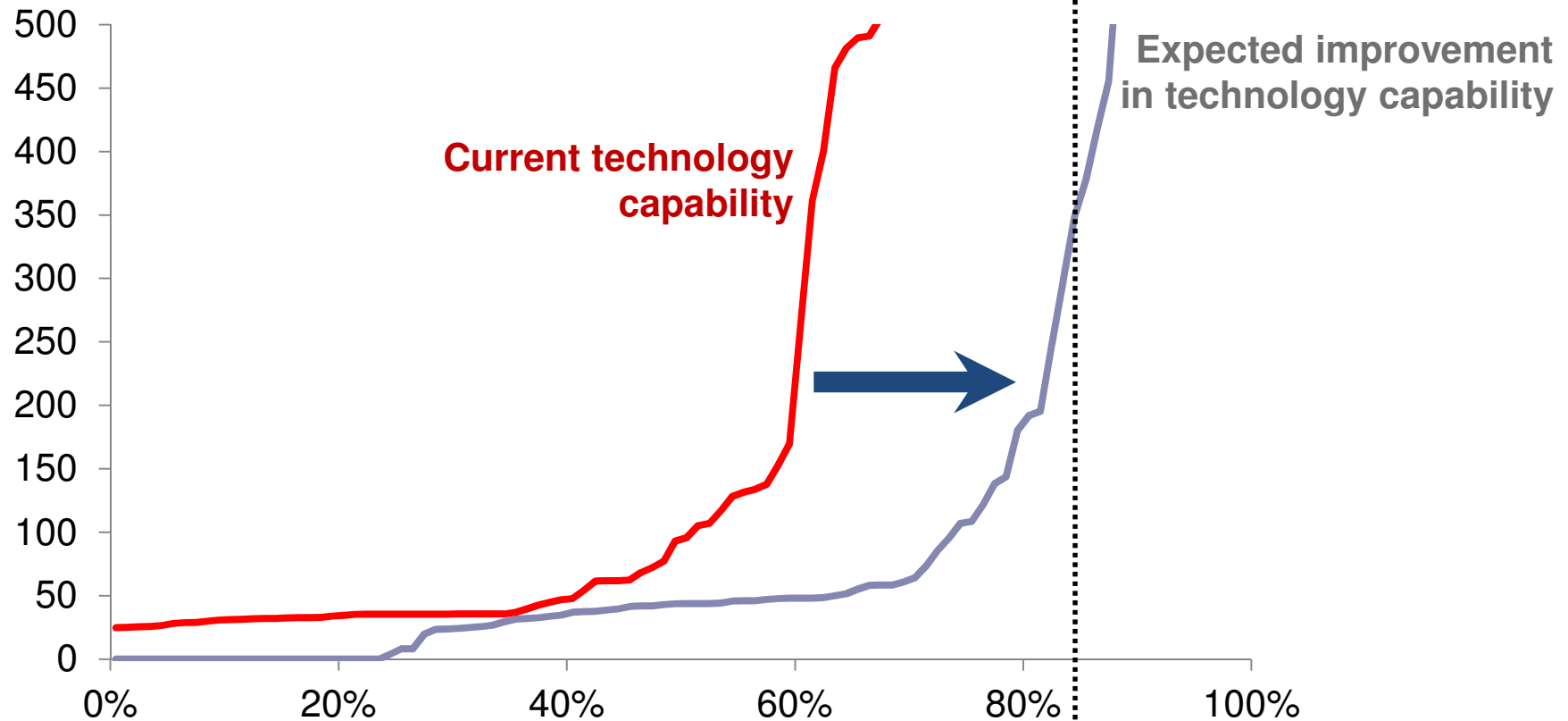


- A national energy system design tool
- Distinctive modelling approach
 - Least cost optimisation (policy neutral)
 - Focus on the “destination” and backcasting
 - Probabilistic treatment of uncertainties
 - Includes spatial & temporal factors
- Informed by ETI members/advisors
- Internationally peer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

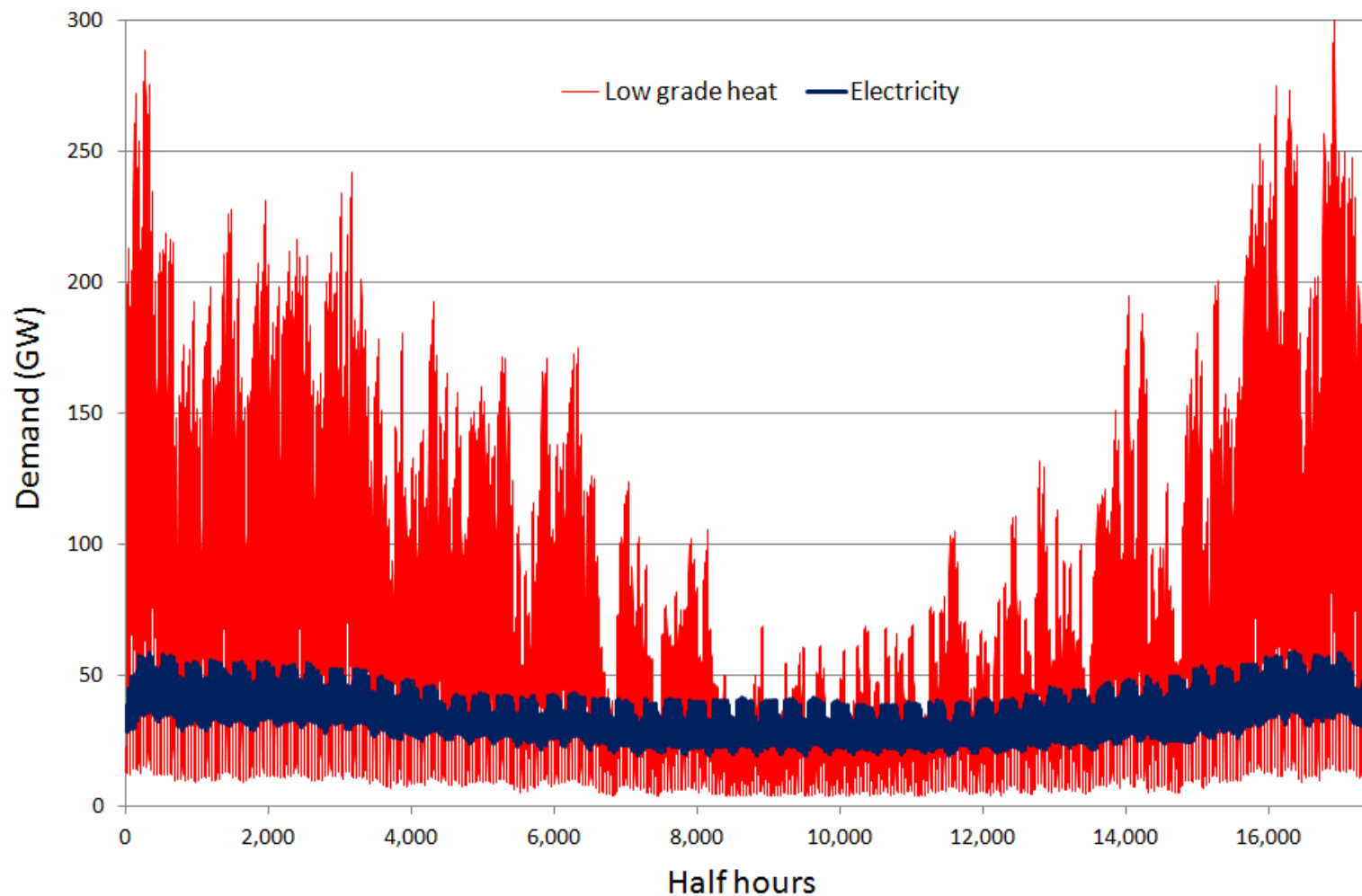


Low carbon doesn't have to be expensive (<1%GDP 2010-2050)

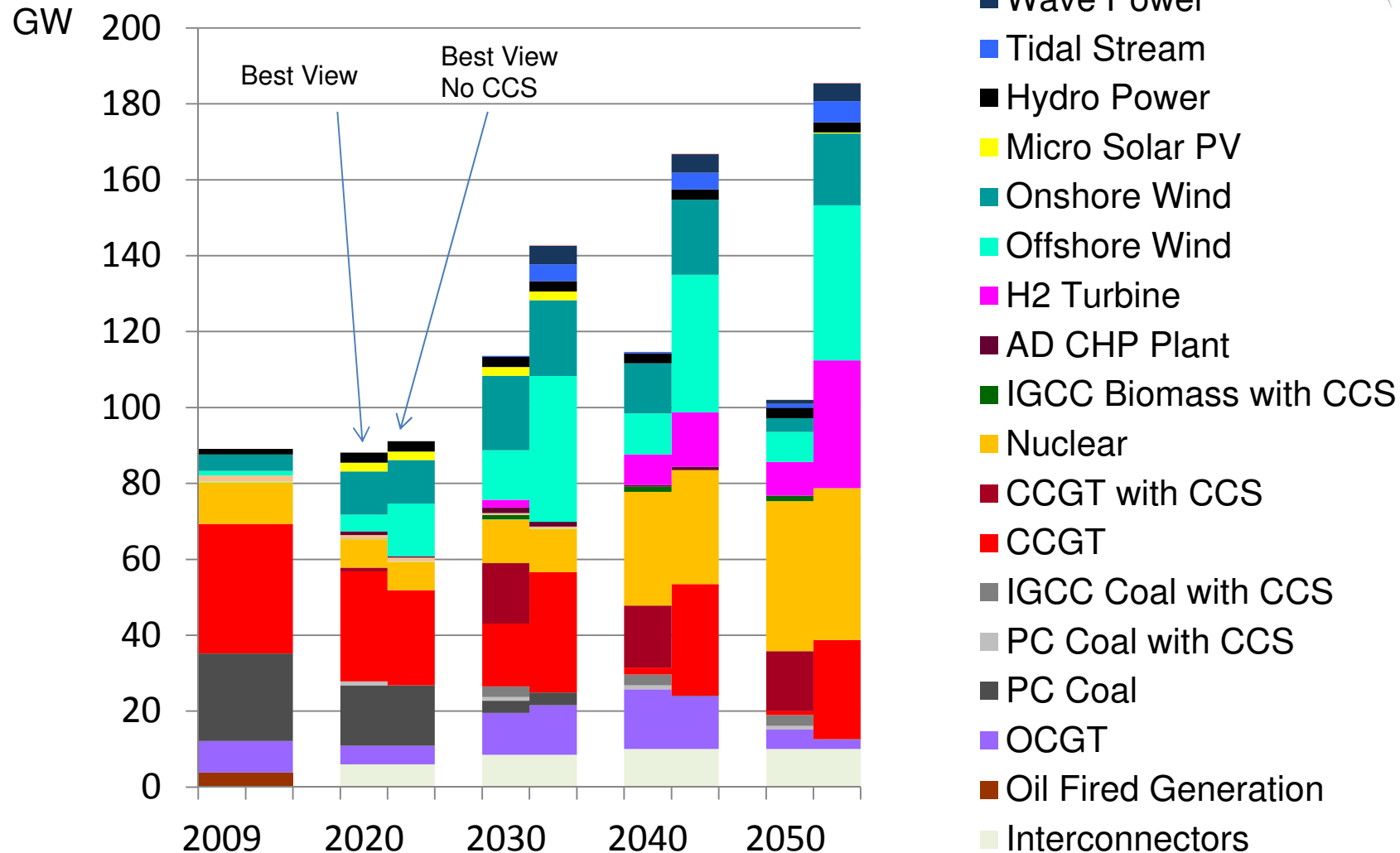
**Abatement Cost
£/Tc CO₂ in 2050**



GB electricity and low grade heat demand (2010)

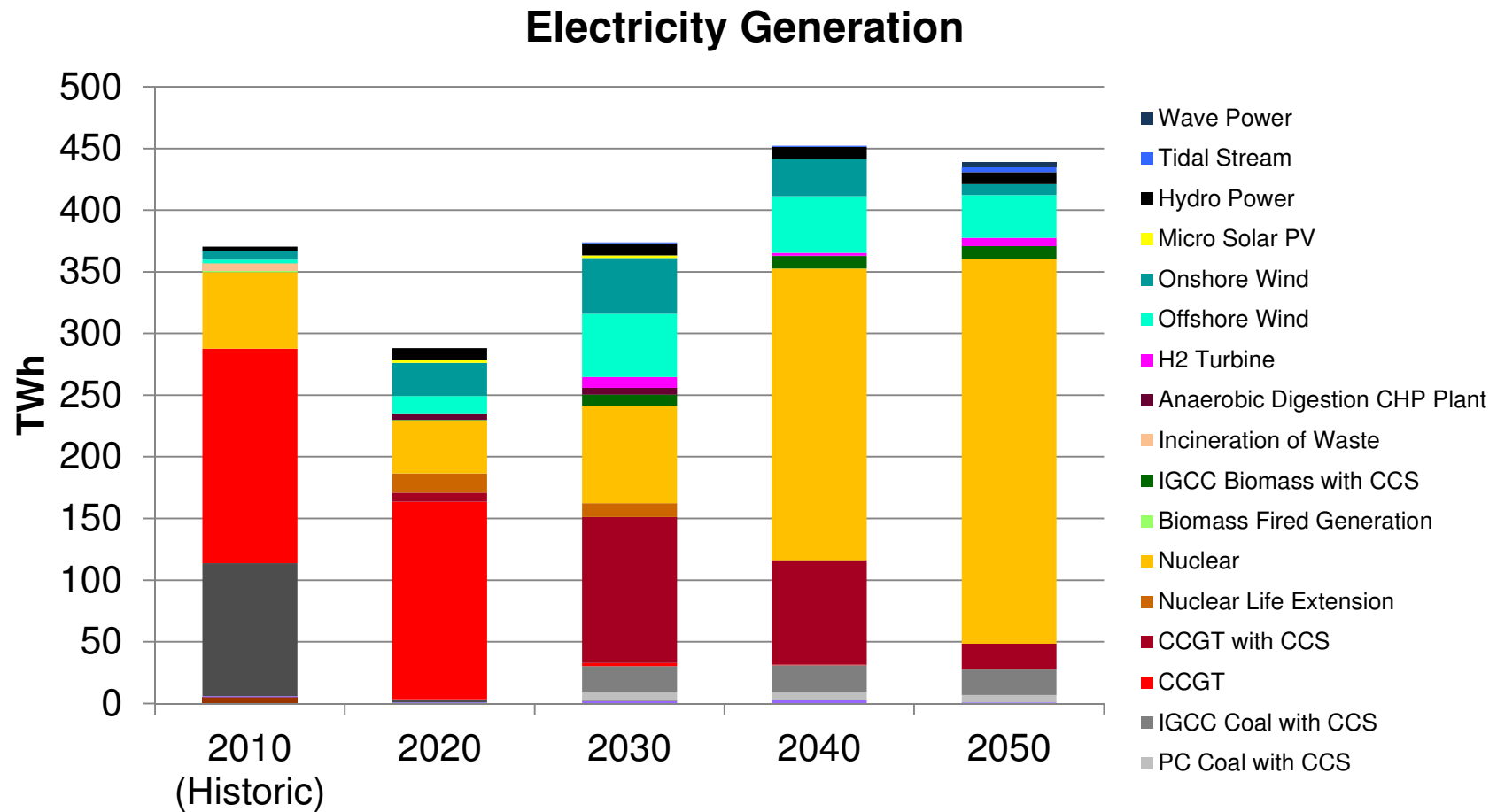


Large increase in power capacity without CCS



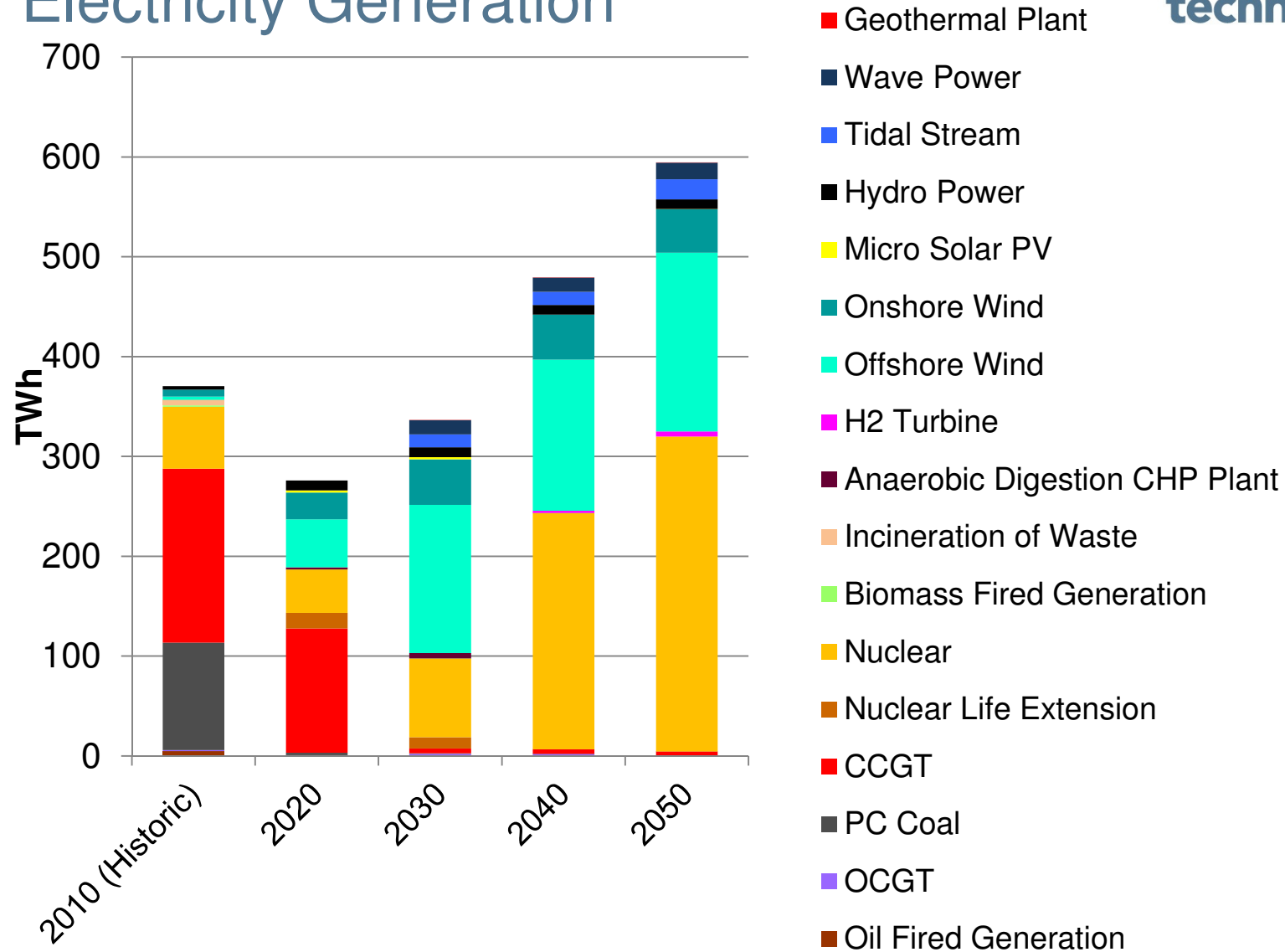
ESME Scenario – With CCS

Electricity Generation

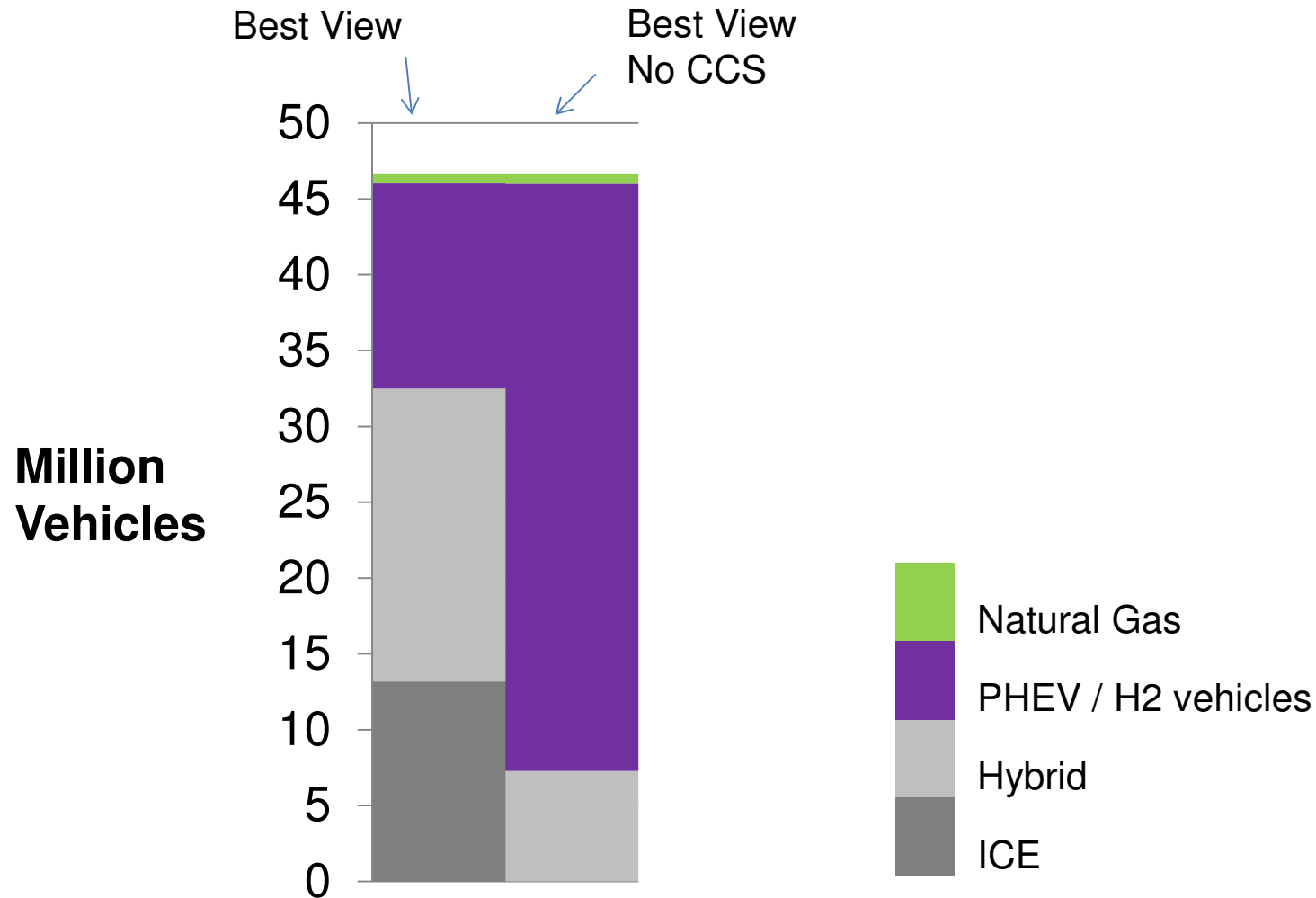


ESME Scenario – No CCS

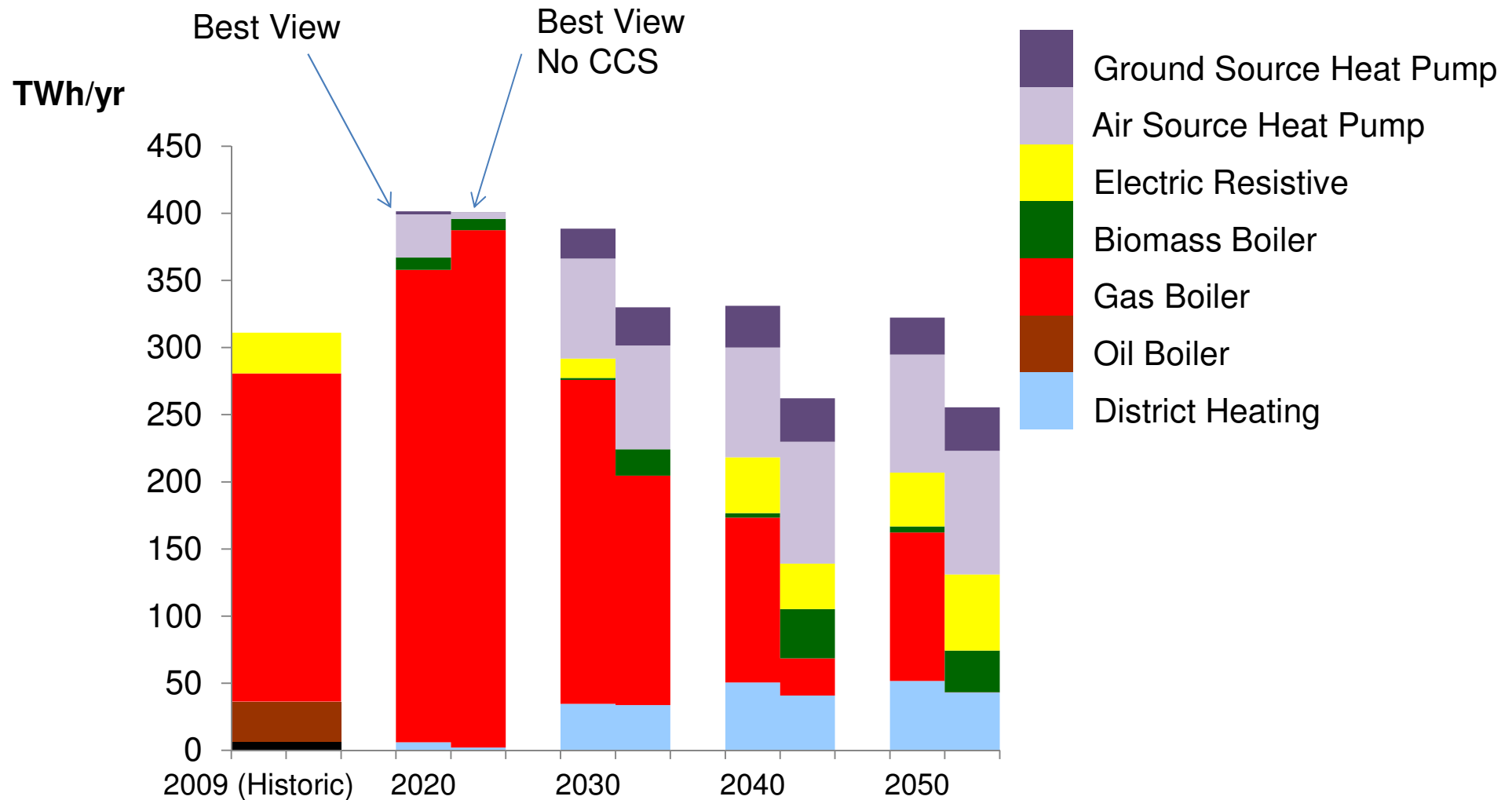
Electricity Generation



Implications of CCS on decarbonising transport?

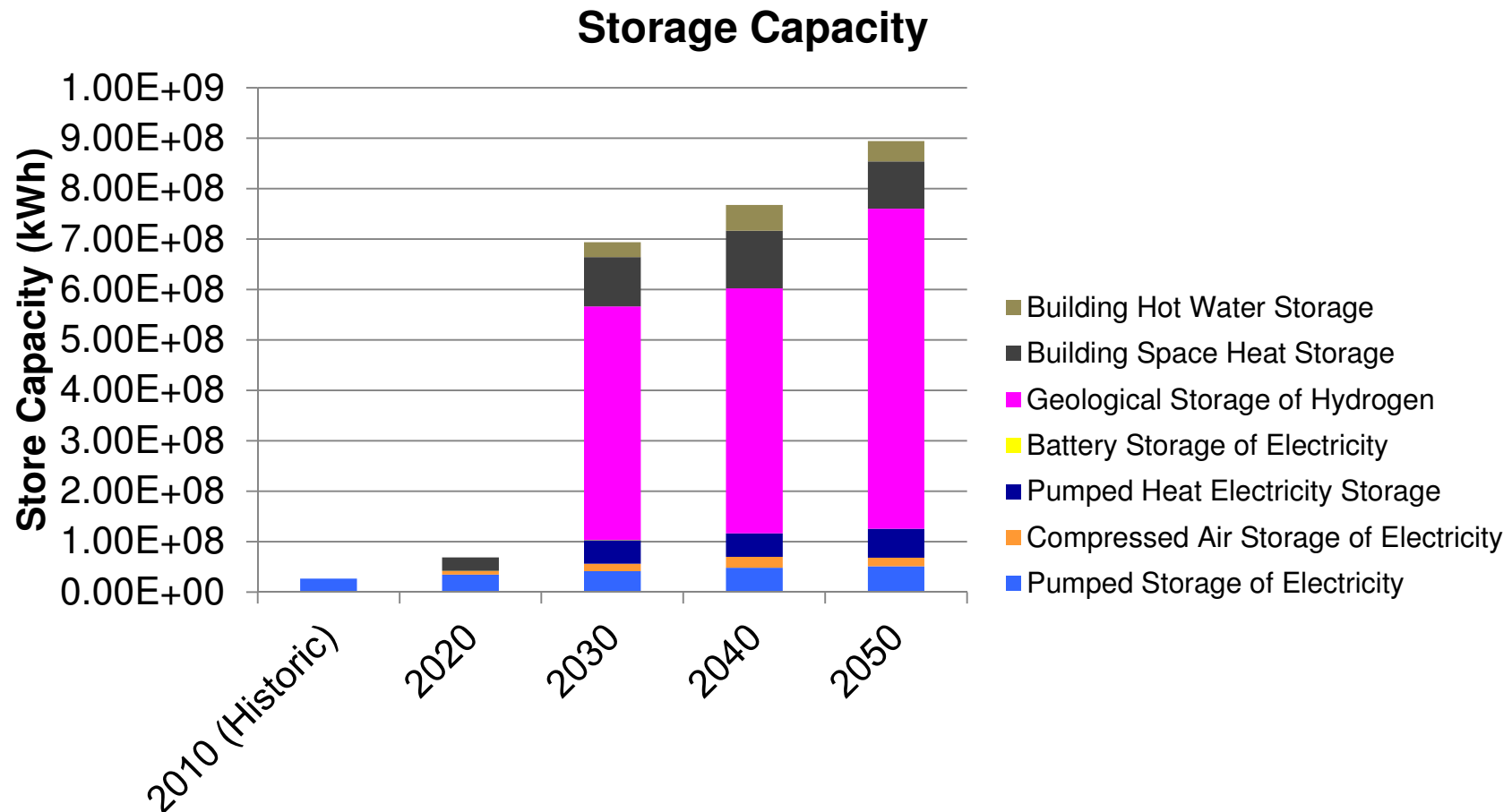


Implications of CCS development on heat?



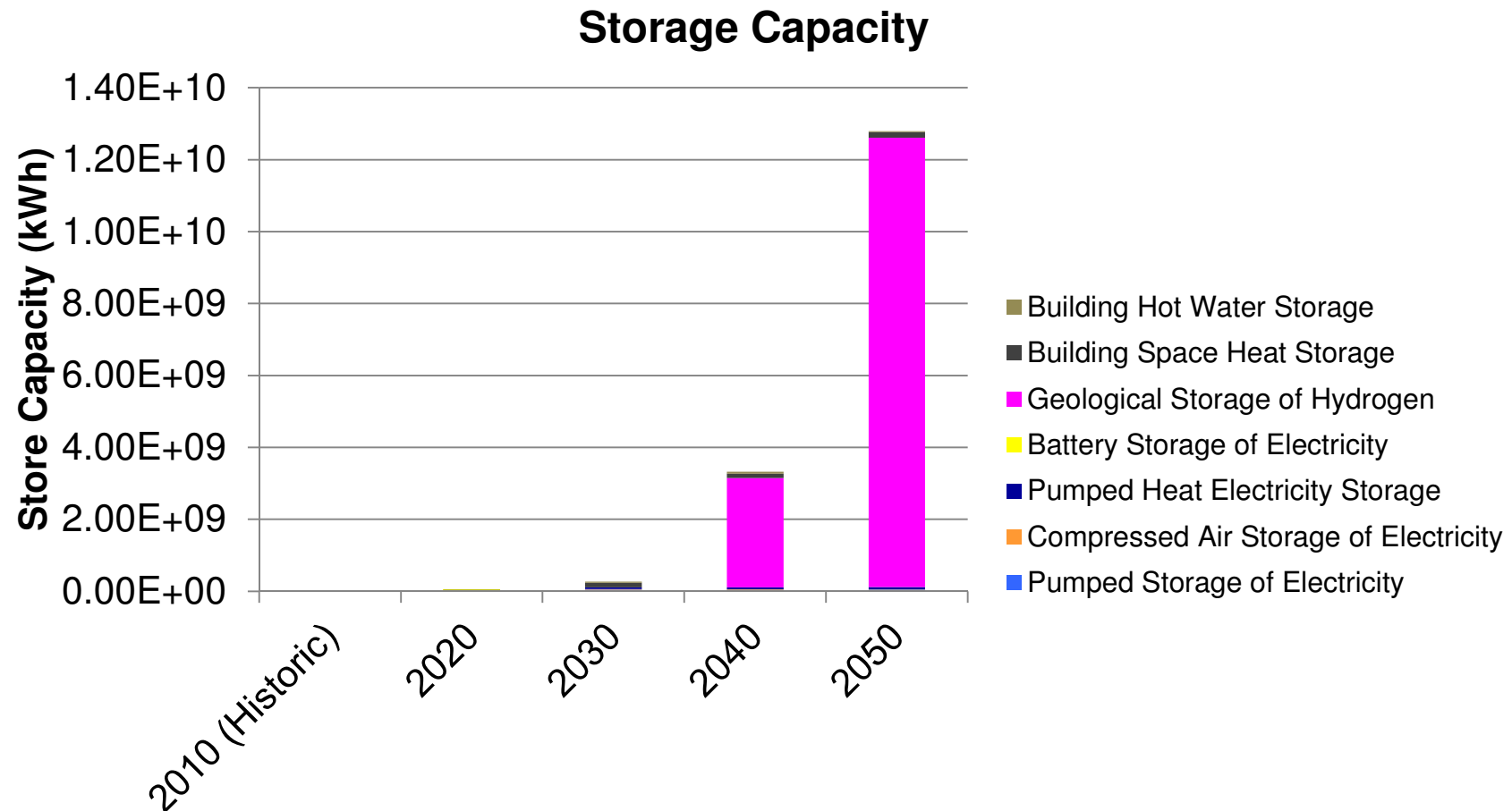
ESME Scenario – With CCS

Storage Capacity



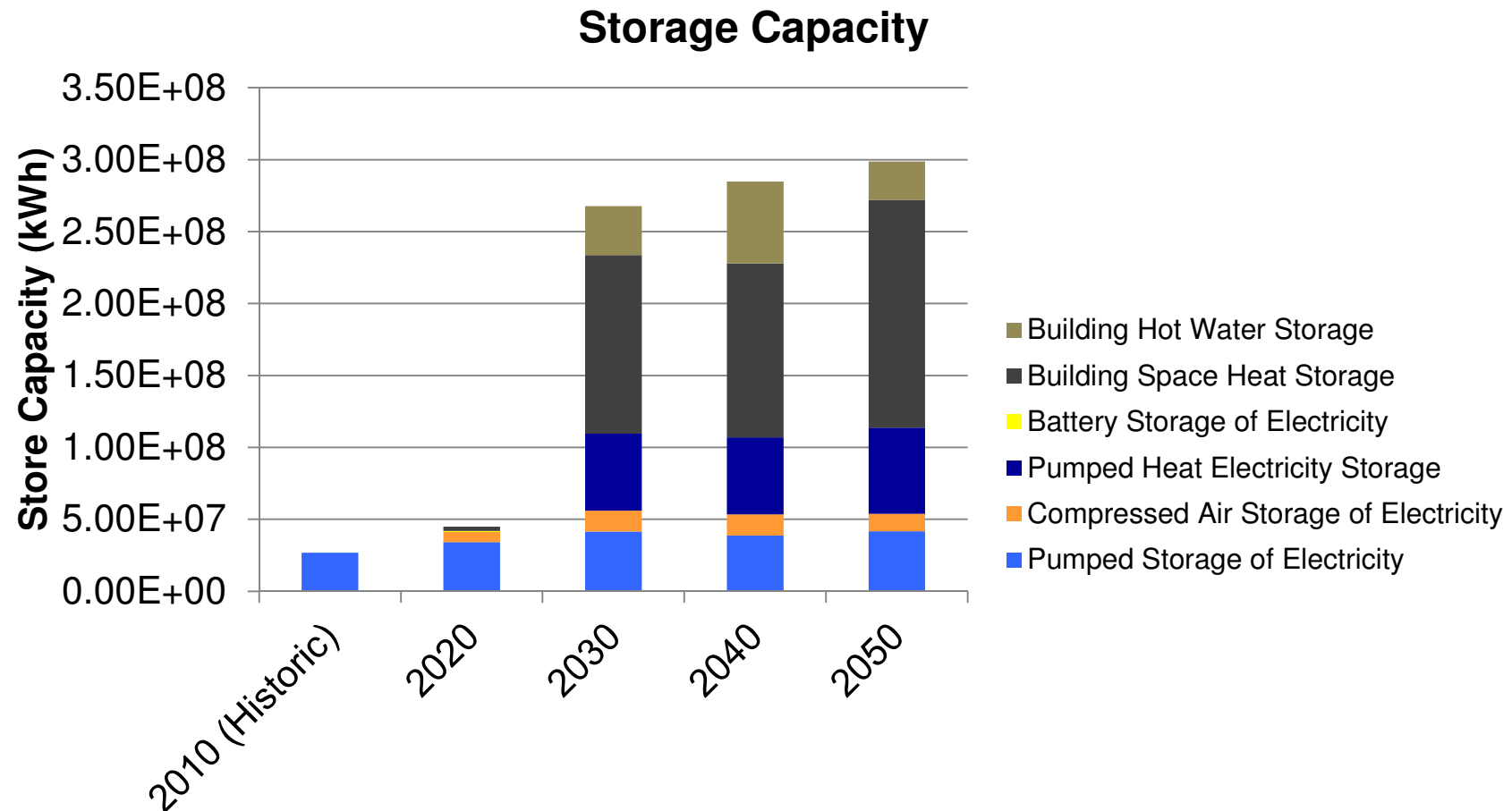
ESME Scenario – No CCS

Storage Capacity



ESME Scenario – NO CCS

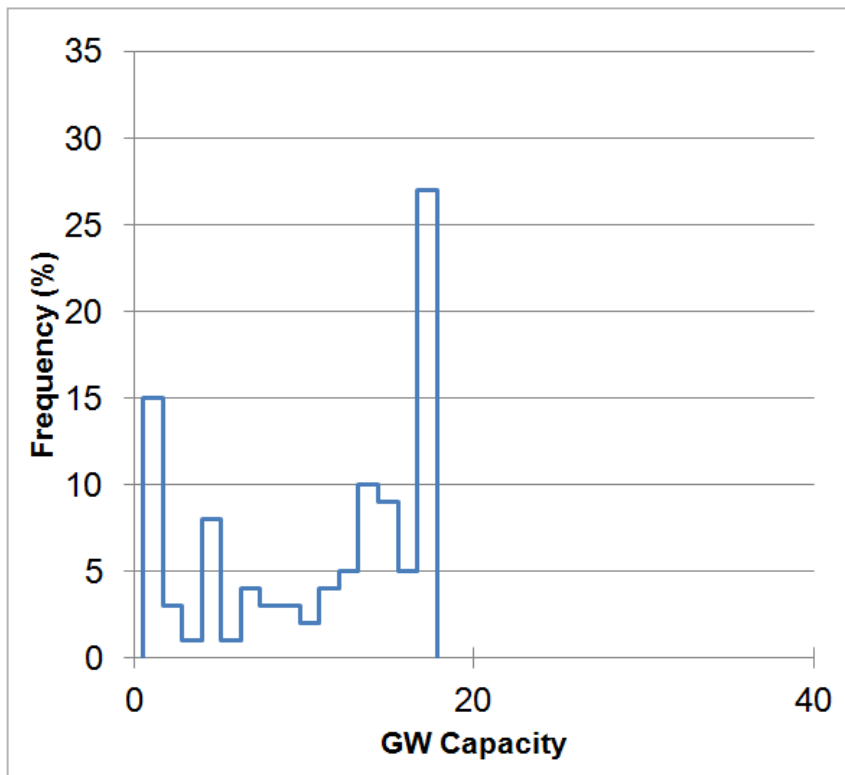
Storage Capacity Excluding Hydrogen



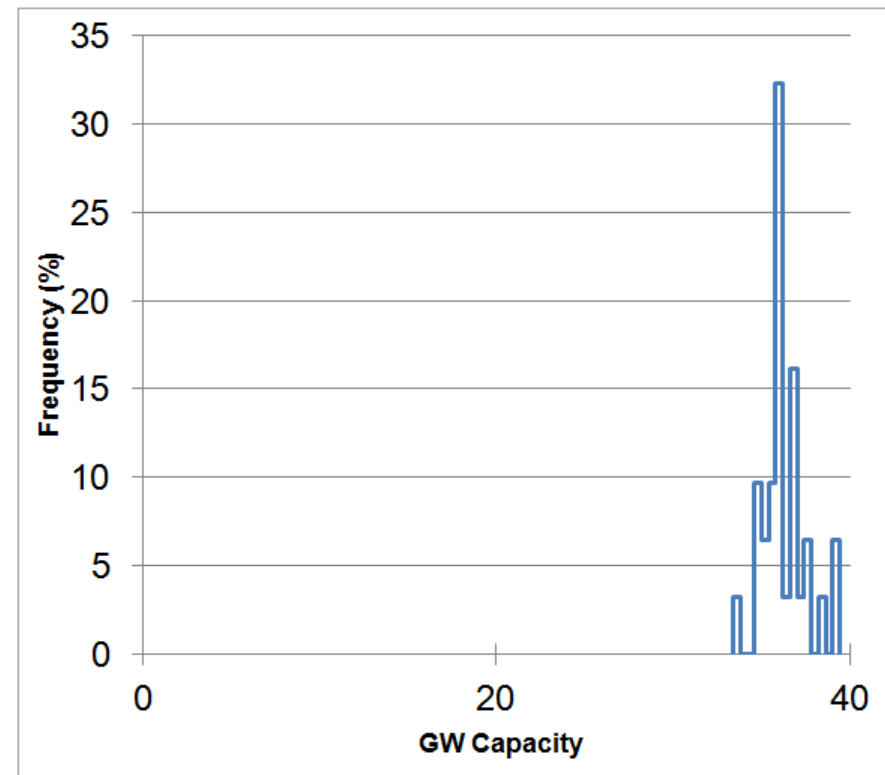
Example of Offshore Wind as a “CCS Hedge”



Optimised 2050 world (i.e. with CCS)



Optimised 2050 world without CCS available

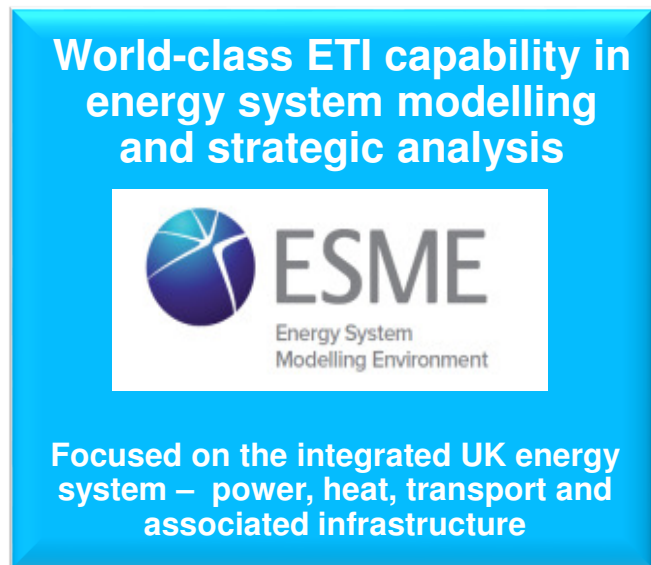


ESME Strategic design tool 2020 - 2050

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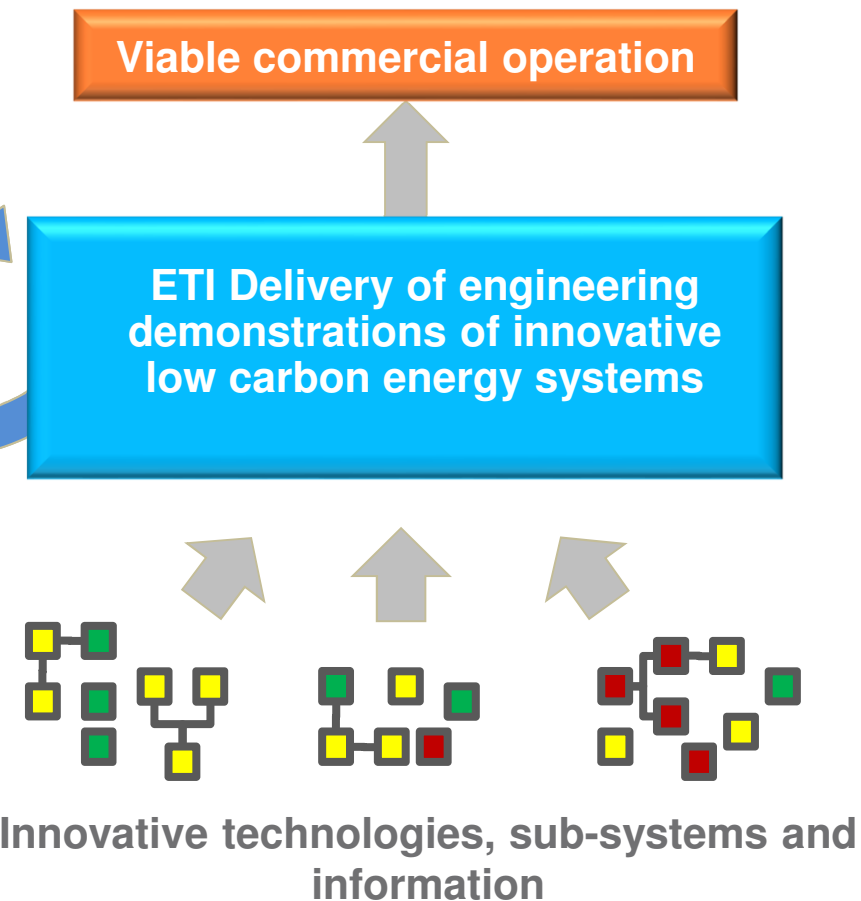


Setting strategic direction

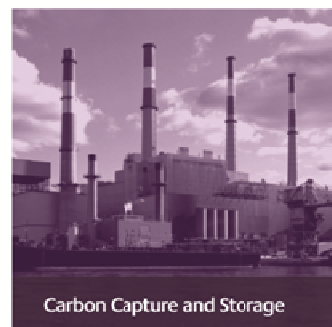
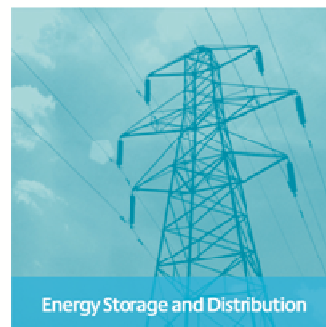
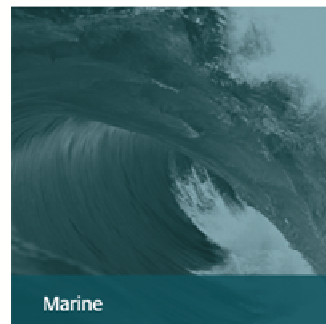


Which energy technologies do we need and when?

Creating commercial confidence



ETI Programmes



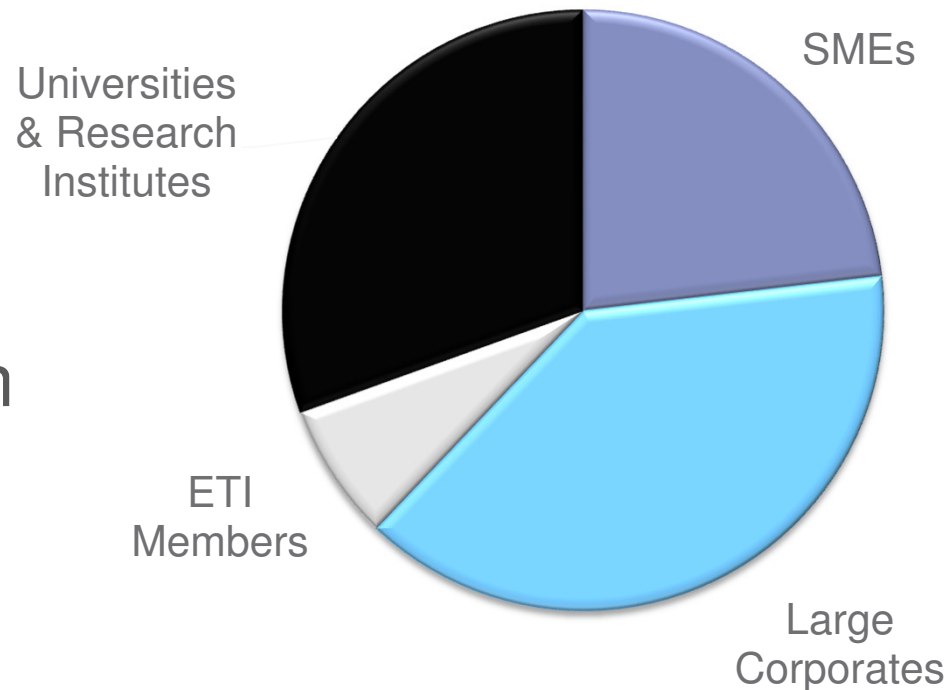
Commissioning and funding projects



Organisations working with the ETI

£208m
major projects
underway

£162m
further projects in
development



Who We Work With

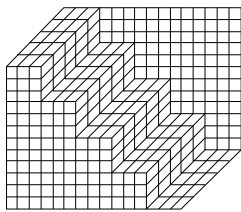


2050 Energy Infrastructure Outlook

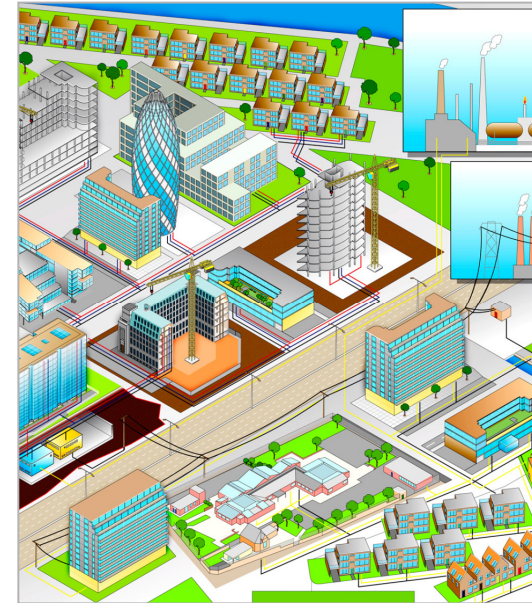


Deliverables

- 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

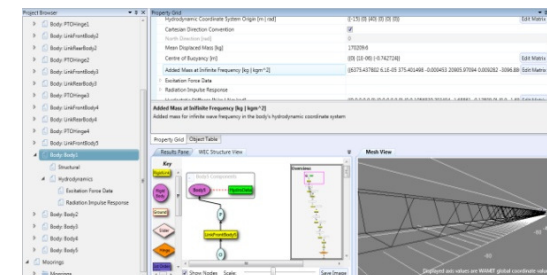


PerAWaT – Performance Assessment of Wave and Tidal Array Systems



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

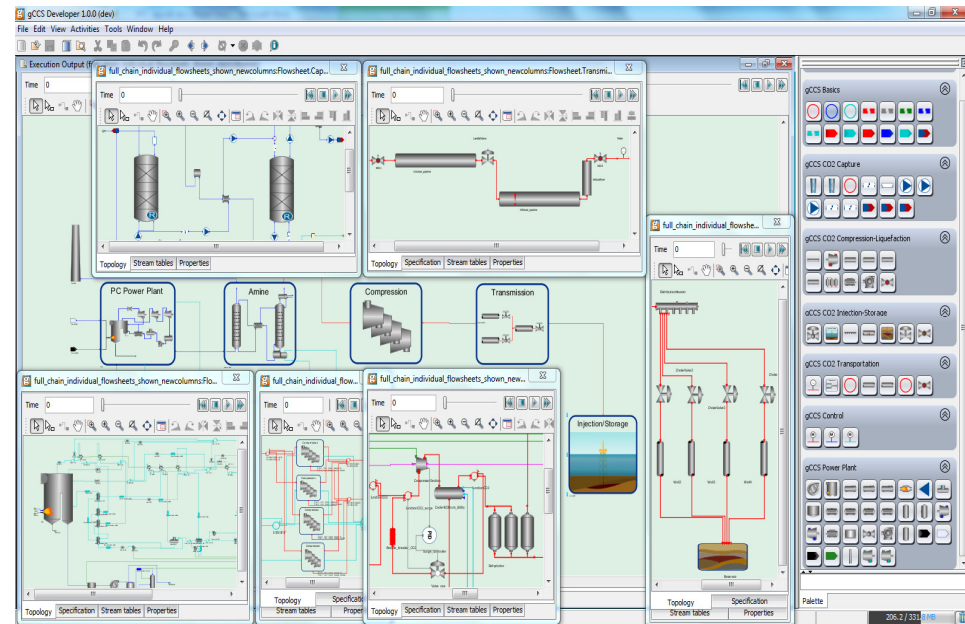


CCS Tool-kit



Deliverables

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

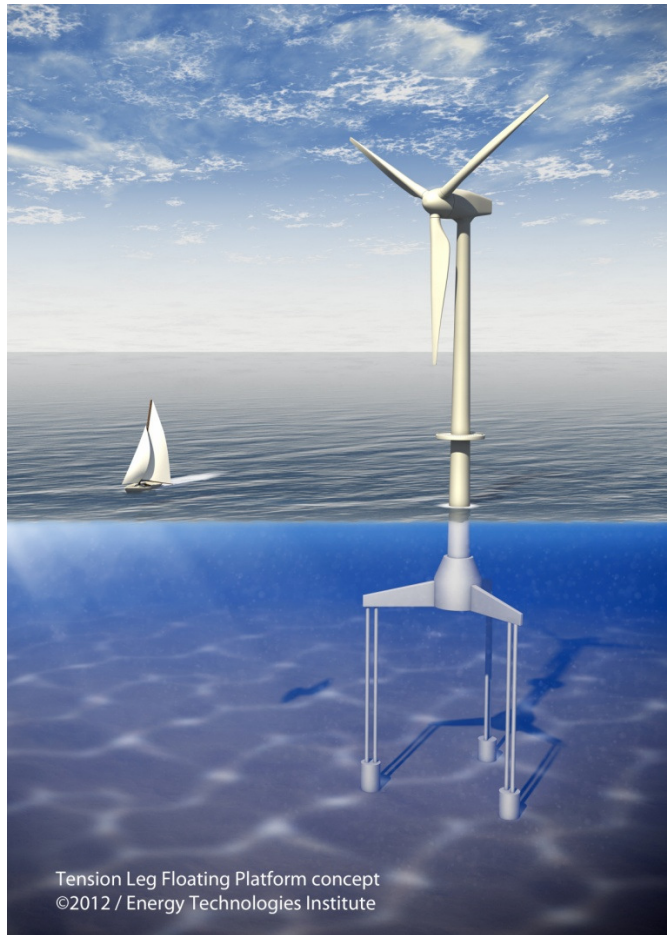


£15.5m Investment – Very Long Blades (Blade Dynamics)



Floating Offshore Wind System Demonstrator

Up to £25m project



- Front End Engineering Design (FEED study)
 - TLP approach
 - Best “additionality for ETI”
 - Led by Glosten 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 *Isentropic* 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



Isentropic

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.





Energy Technologies Institute
Holywell Building
Holywell Park
Loughborough
LE11 3UZ

Email: phil.proctor@eti.co.uk



For all general enquiries
telephone the ETI on
01509 202020.



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about the ETI visit
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