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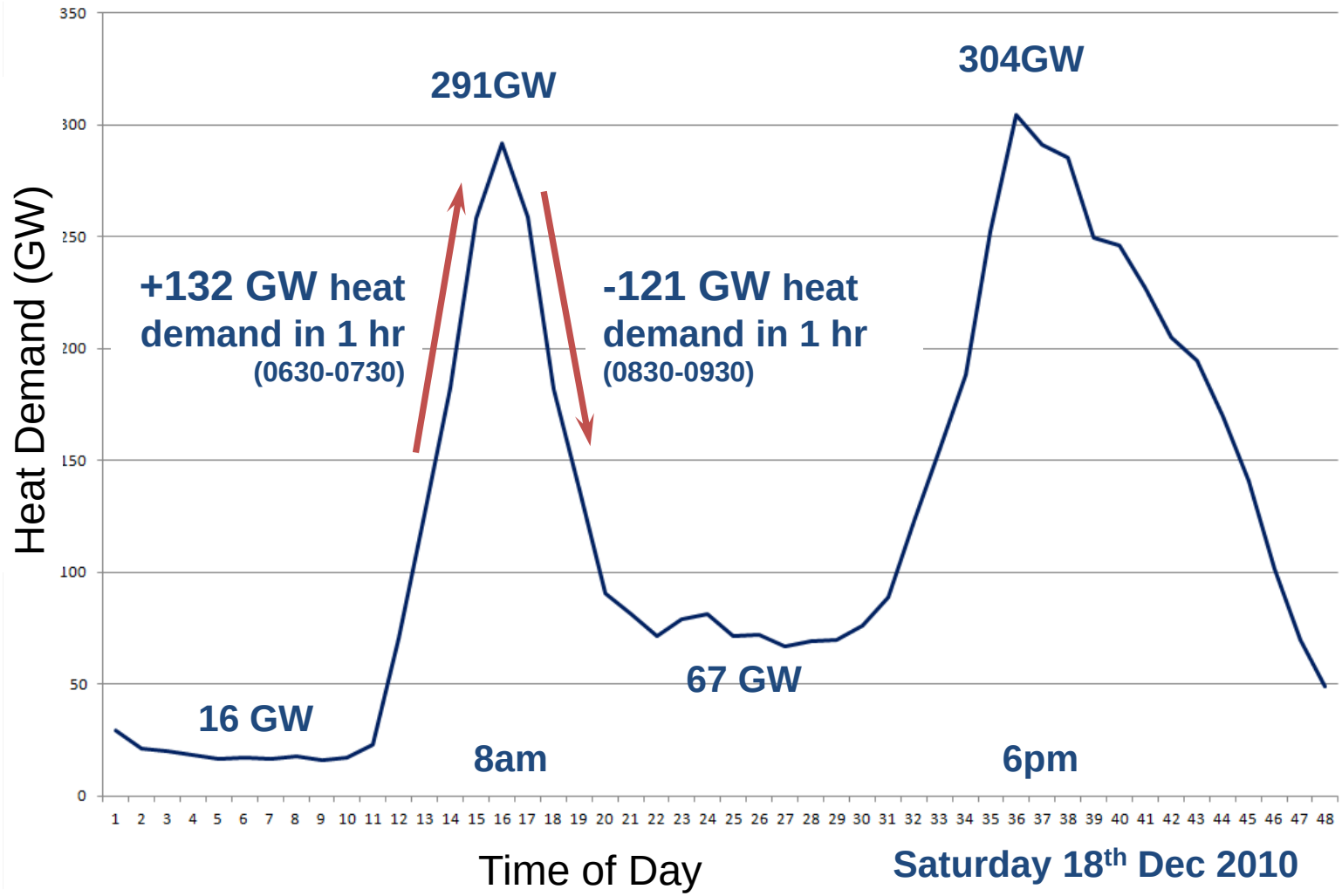
A Decade to Develop and Prove our Options

Jo Coleman, Strategy Director

UK heat challenge – demand variation

100x the capacity of Dinorwig pumped store in 1 hour



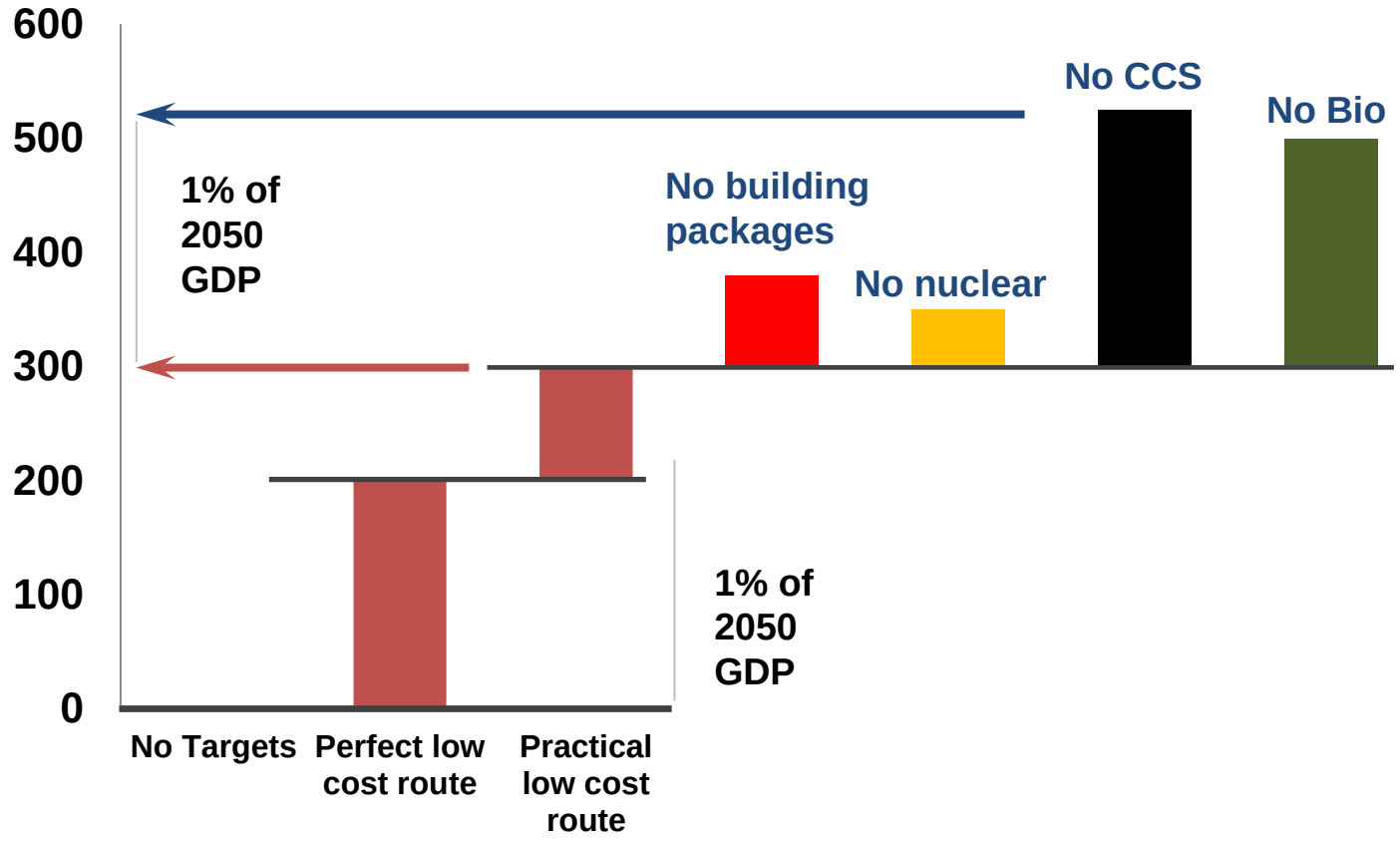
132GW/hr = 36MW/s
Dinorwig = 108MW/s
and 1.32GW total

Some technologies appear more valuable than others

Poor system optimisation doubles the cost of a 2050 UK low carbon energy system

Additional cost of delivering 2050 -80% CO2 energy system

NPV £ bn 2010-2050

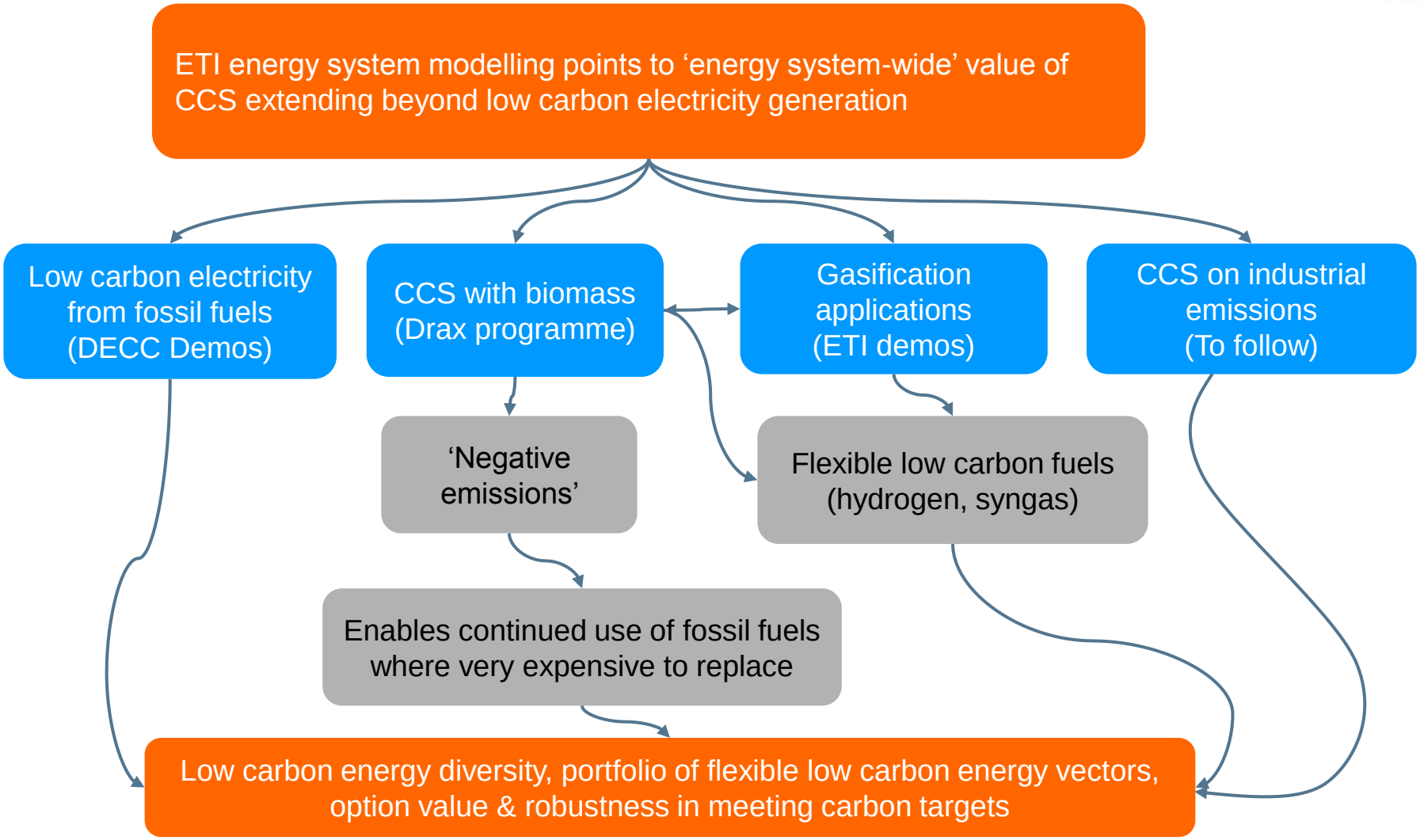


Rome wasn't built in a day

Several rounds of development are required to drive up functionality, drive down cost and deliver system benefits

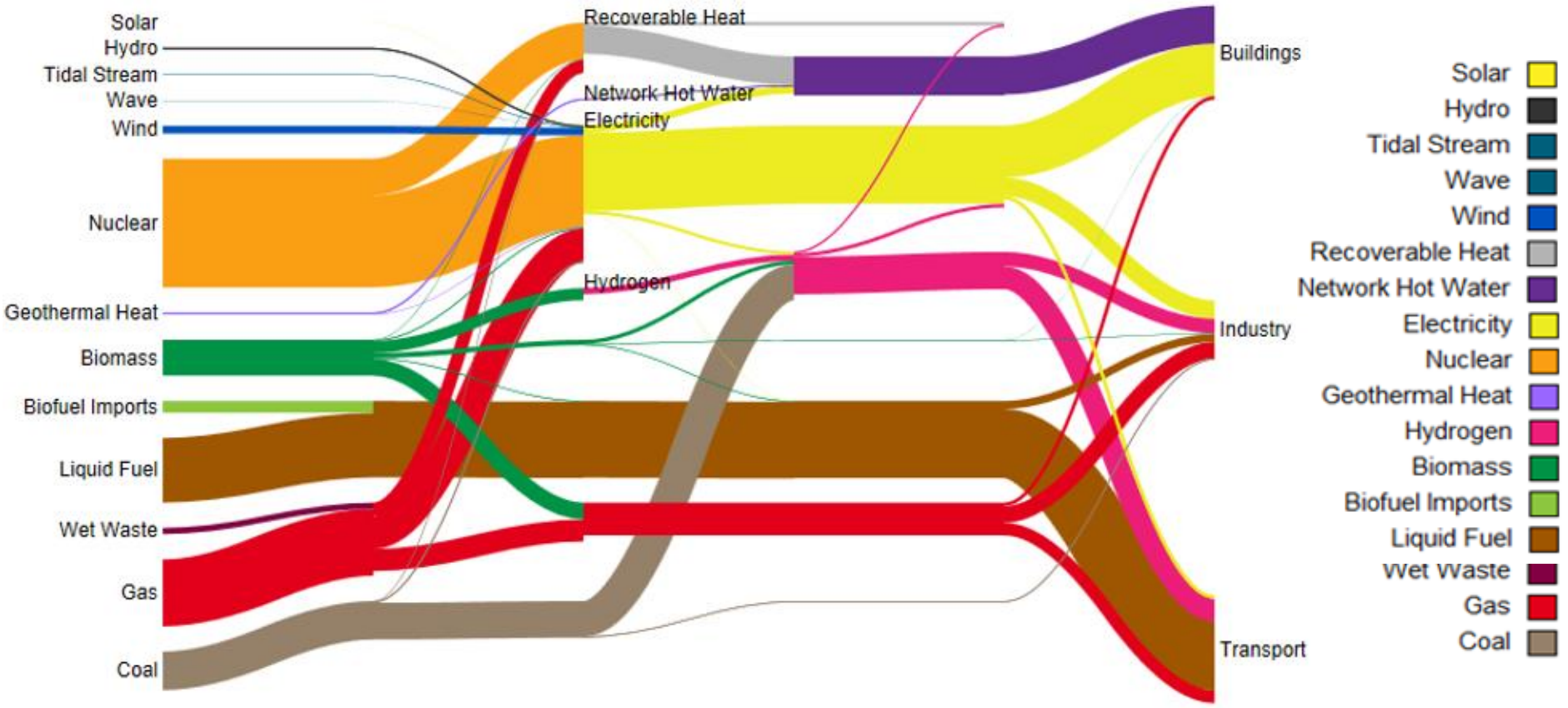
CCS is high value as it creates options

application of the same infrastructure for power, industry, enabling bioenergy usage and H2 production



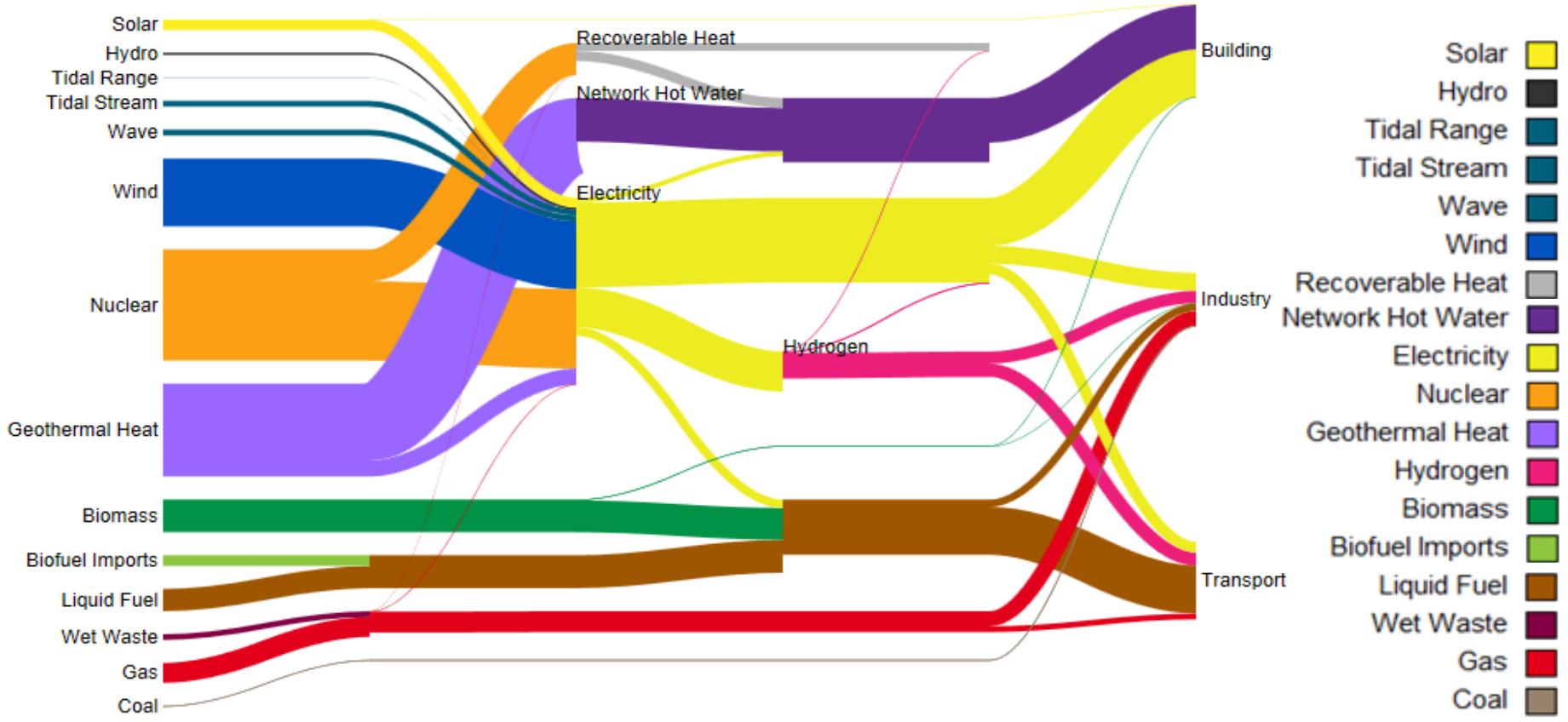
Infrastructure challenges predominantly mid and downstream

Mean Reference Case 2050



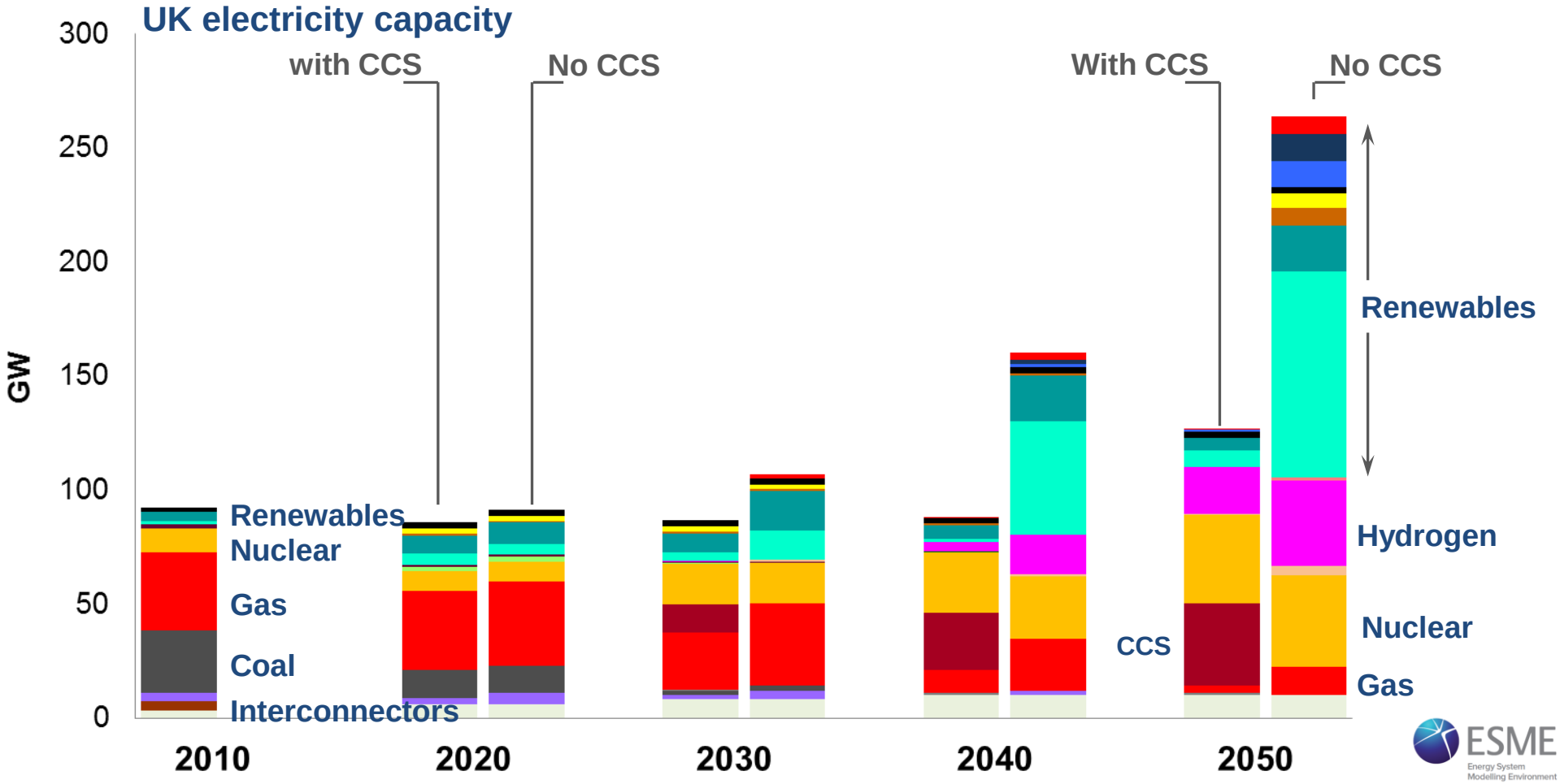
Removing a key option leads to very different infrastructure requirements

No CCS Sensitivity 2050



Electricity system fundamentally different with or without CCS

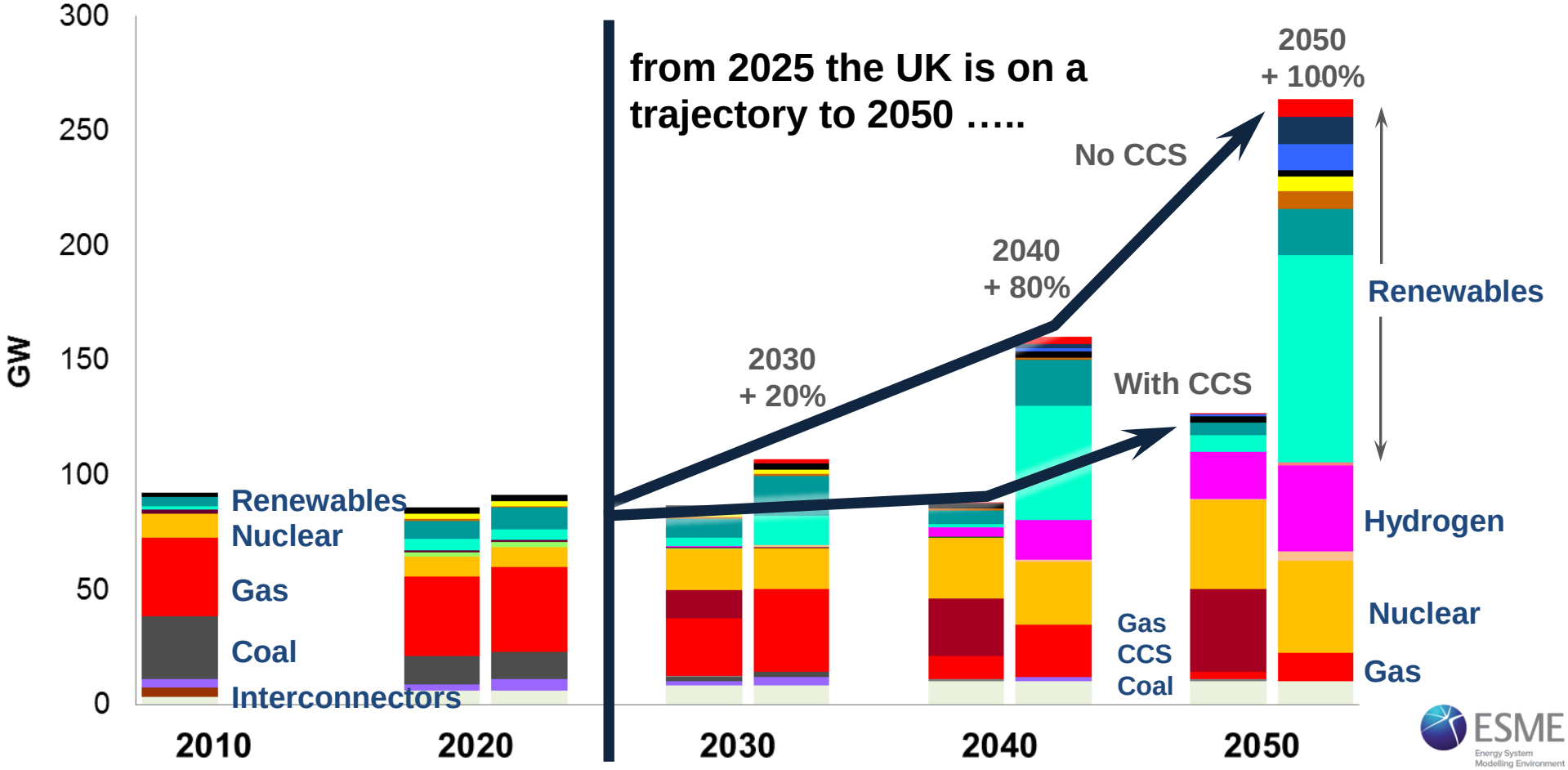
UK electricity generation capacity doubles & increase is entirely renewables



Electricity system fundamentally different with or without CCS

Trajectories alter from mid 2020's

UK electricity capacity



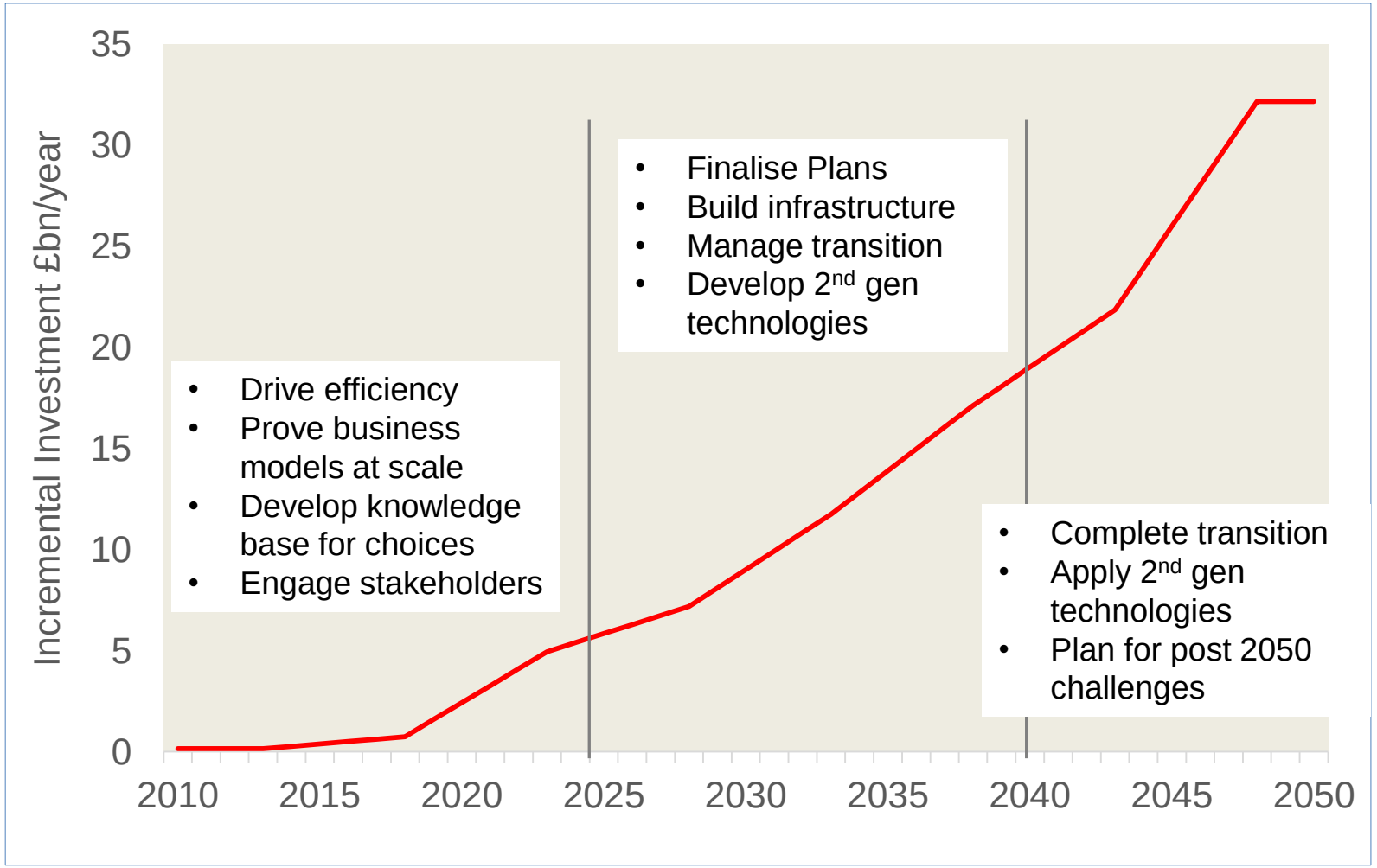
Preparedness – What is required?

Innovation in business models, cost reduction and to build investor confidence

- Continue to drive efficiency measures
  - Homes, Cars, Industry
- Prove key business models at scale i.e.
  - Nuclear plants 1 and 2
  - 2 CCS full chain projects built, backbone for further development
  - 2% of housing stock (500,000 houses) in whole house retrofit, including heat supply
  - 2% of UK car sales (40,000) alternatively fuelled cars sold per year
  - Bioenergy value chain
- Drive down costs
  - Offshore Wind, Tidal, Wave

- Develop knowledge base for choices i.e.
  - Develop understanding of issues related to new energy vectors ie H2 infrastructure, transport, metering, safety regulations
  - Bioenergy scientific evidence and regulation
  - Gas grid repurposing /decommissioning
- Engage stakeholders
  - Consumers, voters, public

Investing in a UK transition at an increasing rate



A clear CCS infrastructure development plan to 2025 is emerging

Development pathway set by DECC's commercialisation programme

Pursue network development

- Secure, low cost, multiple emitters (gas, coal, chemicals)
- Expandable with rapid ramp up capability

Develop at least 2 Hubs

- Easington Hub (SNS) appears to have the lowest overall cost

New CCS power plant needed

- 2 GW of new gas plant
- 1 GW of new coal plant

7 New Aquifers need to be appraised

- One appraised every year between 2018 and 2025

	Investment cost to 2025 (£Bn 2010)
Generation	3.2
Capture	2.5
Transportation	0.5
Storage	0.7
Appraisal	0.2
TOTAL	**7.1 (3.9 for CCS)**

ETI working to build investor confidence

Financing CCS

In partnership with Ecofin Foundation

Working with banks, insurers, developers, IEA, EIB and GIB to build common understanding of strategies to enable private sector financing of CCS

Commercial development

Contributed to the DECC Cost Reduction Task Force

Leading the UK CCS Commercial Development Group (with Ecofin) to follow up on CRTF recommendations and actions

Supporting the UK CCS storage Group developing national strategy

Infrastructure strategy

Proposals linking effective siting of CCS infrastructure to demand centres published in 2013

The bioenergy landscape is complex and the value chain is fragmented

Interactions and inter-dependencies across the entire value chain

Multiple feed stocks

Multiple pre-processing methods

Multiple conversion technologies

Multiple energy vectors

Multiple end uses and markets

Multiple routes from feed stock to end use

Many small market participants; little consolidation or integration

There are a number of fundamental questions that remain unresolved

How much of the theoretical negative emissions could be realised through bioenergy deployment in the UK?

Critical issues:

- Availability / sustainability of UK biomass production
- The use of bioenergy in conjunction with CCS

ELUM | BwCCS | VCM | MPR

ETI interventions

What would be the best ways to use this bioenergy in the future UK energy system?

Critical issues:

- Interaction of bioenergy with the rest of the UK energy system
- Technology & infrastructure roll out across all sectors

VCM | EfW | ESME

ETI interventions

What are the right combinations of feed stock, pre-processing, and conversion technologies?

Critical issues:

- System-level assessment and demonstration
- Cost and performance improvements

VCM | EfW | BwCCS | Bio Demos

ETI interventions

Are the right policy mechanisms in place and are there public acceptability issues that need addressing?

VCM | MPR

ETI interventions

We have a decade to prepare our options

- National decisions by 2025 on bio-energy and CCS are central to the design of the energy system; e.g. will inform energy for vehicles choice
- There is much to be done to prove the credibility of these choices
- Preparedness involves developing options and understanding trade offs, proving the technical operating business and regulatory models at scale
- Today, a broad range of alternatives needs to continue to be developed but wide scale rollout of multiple alternatives and their supporting infrastructure is unaffordable
- By 2025 we need to have agreed these choices and have a plan for delivering the required infrastructures, including storage
  - Plans for withdrawing from infrastructures that will not be required by 2050 are also required
- New and unfamiliar market structures will be required for the transition to be successful

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Widespread CCS delivers £10-30bn p.a. UK system level cost saving from 2030