The path to 2050: spending wisely on ‘preparedness’?

Understanding the costs and challenges of delivering deployment-readiness for key technology options

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Overview

What is ‘preparedness’?

What can energy system modelling tell us?

Understanding the costs of preparedness

Spending wisely?

Understanding the UK transition

ETI view of context

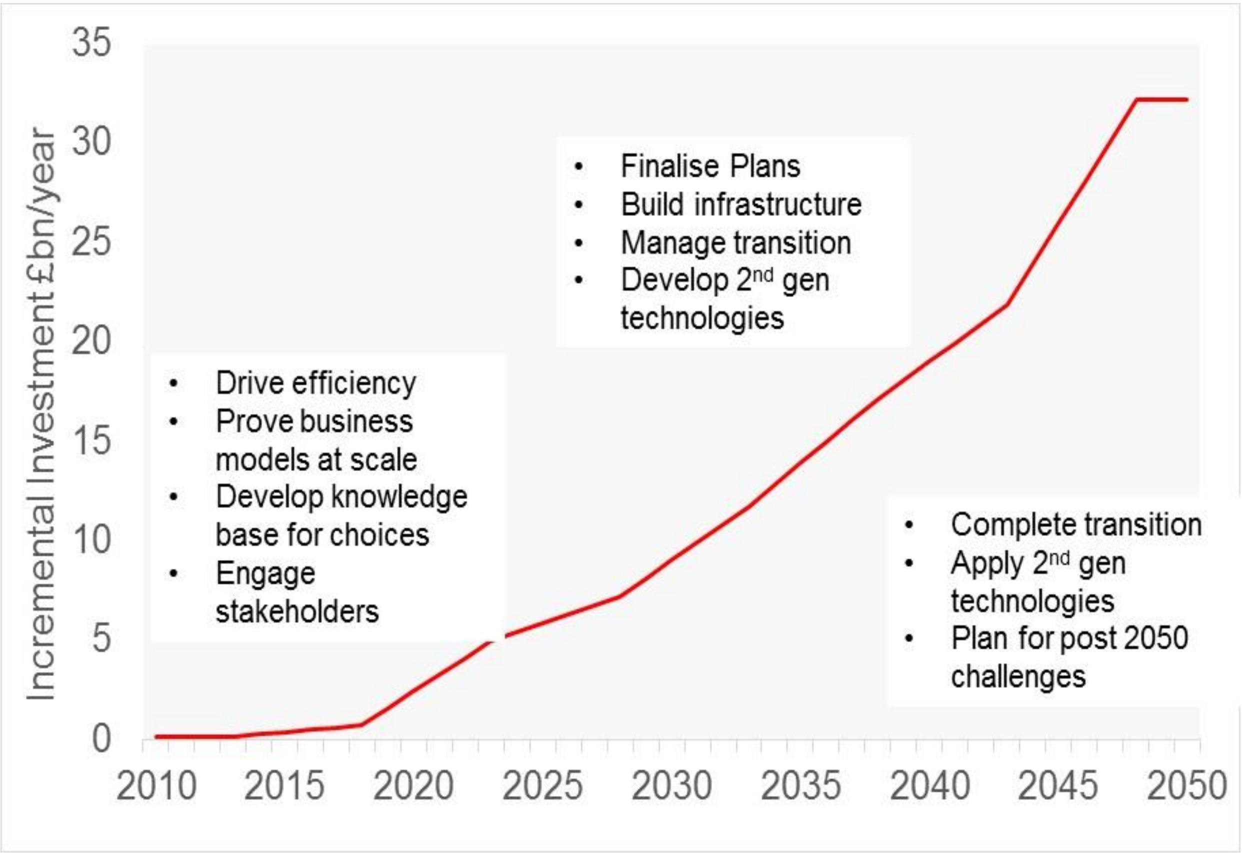
- System-wide perspectives are vital to understand complex, interlinked systems and infrastructures which deliver energy
- The UK transition will be influenced by UK legacy infrastructure, the realities of our climate, our experiences, behaviours & attitudes
- The Climate Change Act is robust, but political sensitivity is high with cost burdens falling disproportionately on poorer households
- Low carbon opportunities reflect the national resource endowment (offshore wind, marine, bioenergy, offshore carbon storage capacity)

Key insights

- Transition to an affordable (~1% of GDP) low carbon energy system by developing, commercialising and integrating known - but currently underdeveloped – solutions
- CCS and bioenergy emerge as the two potentially most valuable technology options in delivering a low carbon future
- The ability (or failure) to deploy these two technologies has huge impact on costs and the national architecture of low carbon systems

Broad phases of transition

Three phases of ETI's Technology Strategy



'Preparedness'

(to mid 2020s) - developing and proving a portfolio of most valuable technology options

'Decide and deploy'

(from mid 2020s to 2040s) - major decisions and investment in infrastructure & roll out of technologies to cut emissions in power, heat and transport

'Next generation'

(from mid 2030s) – complete roll out improve and optimise.

The nature of ‘preparedness’?

Strategic implications

- Preparedness is a relatively low cost phase to create options, demonstrate leadership and build scope for economic advantage in a global market place
- The next decade is critical in preparing for transition, developing and proving key technology options
- Critically important to take a systems approach across all emitting sectors
- Infrastructure planning is inter-related: national decisions on biomass and CCS will impact choices elsewhere in the system
- Significant policy intervention will be required to support key technologies with characteristics that make a pure market approach difficult (e.g. CCS, bioenergy, nuclear, heat networks)

Preparedness

- Technology development
- Early demonstration & deployment
- Business models
- Supporting infrastructure
- Supply chains
- Consumer / social value
- Democratic legitimacy

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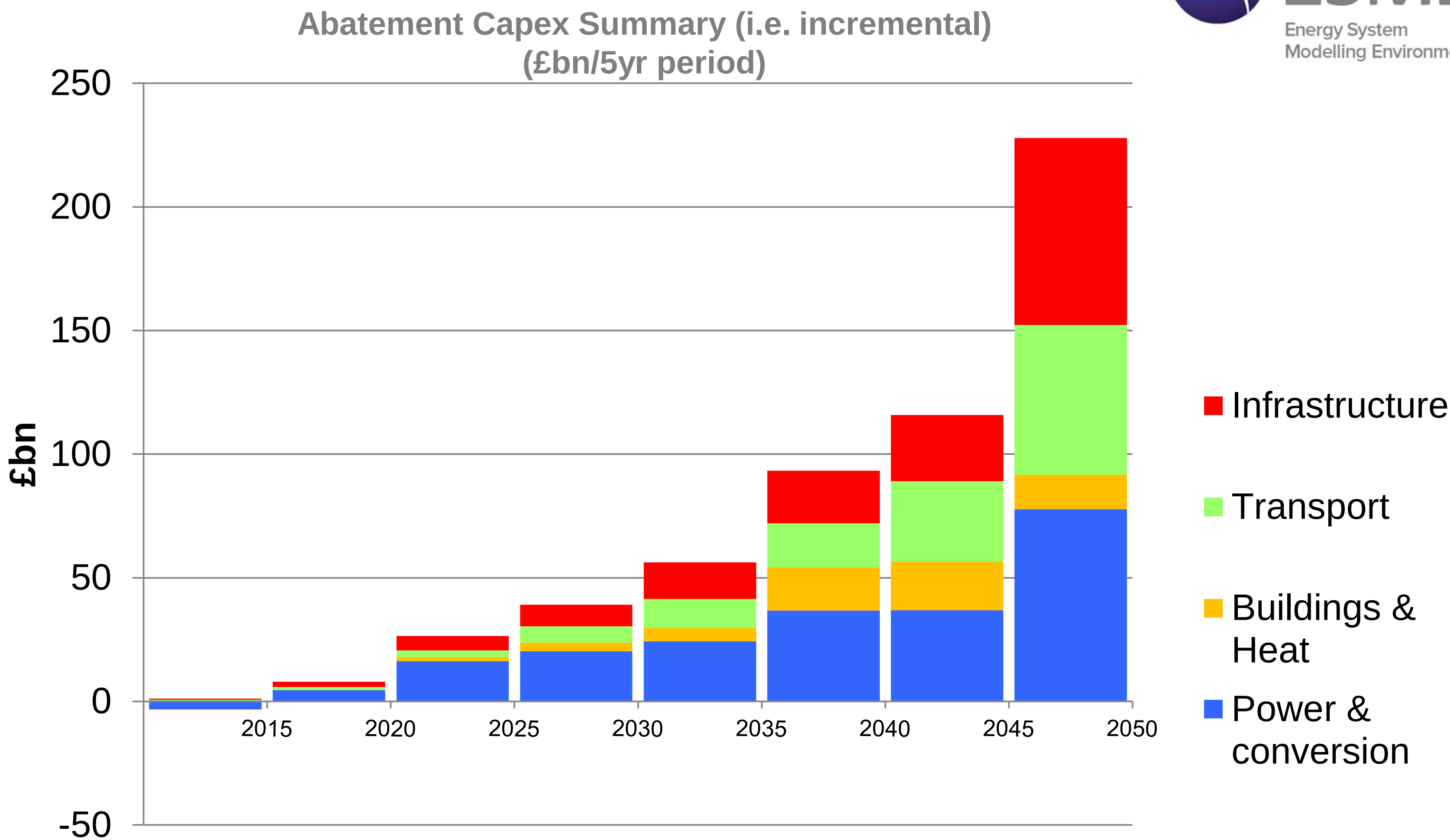
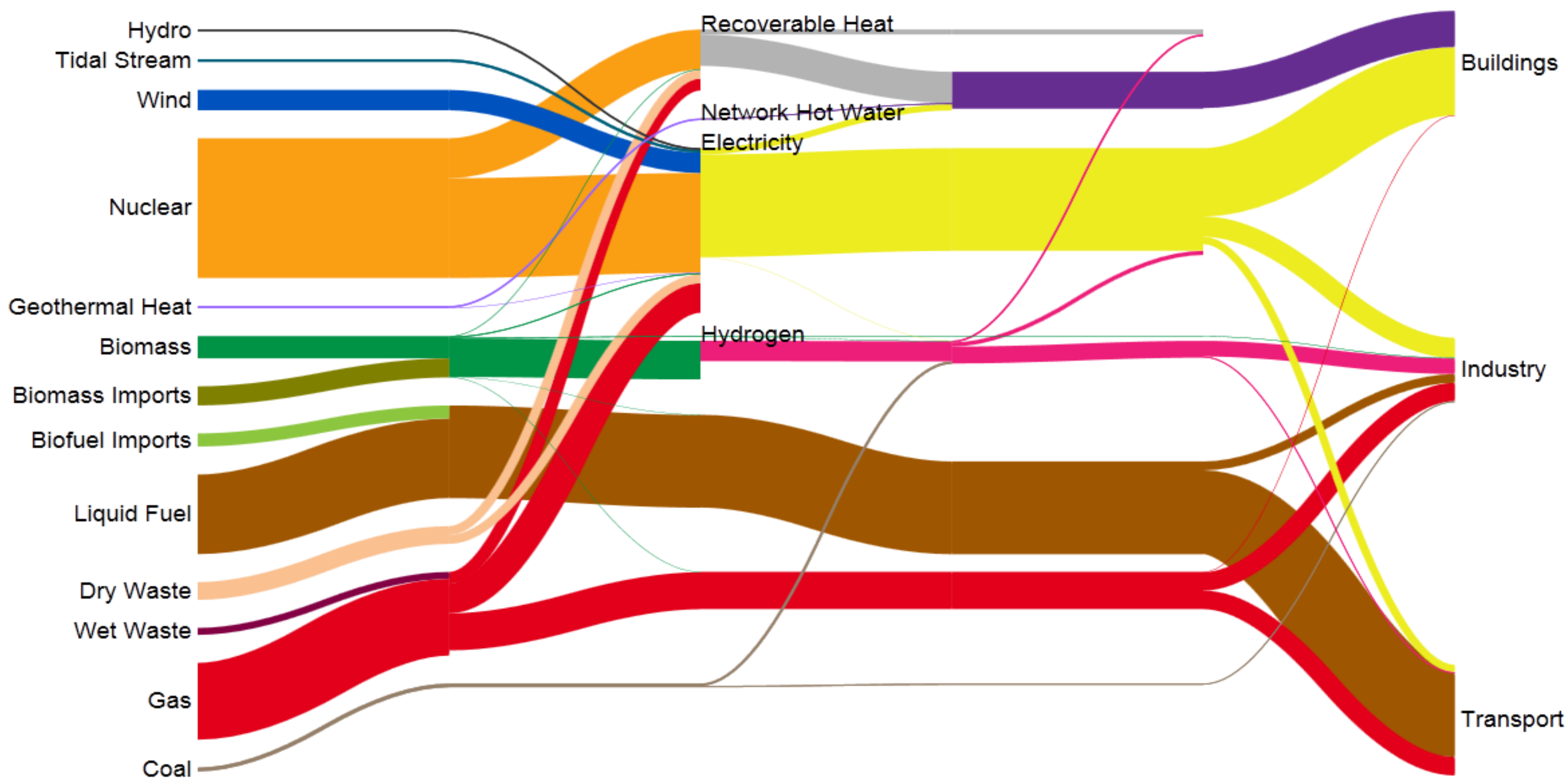
The shape of an 'optimal' transition



DB v3.4 / Optimiser v3.4

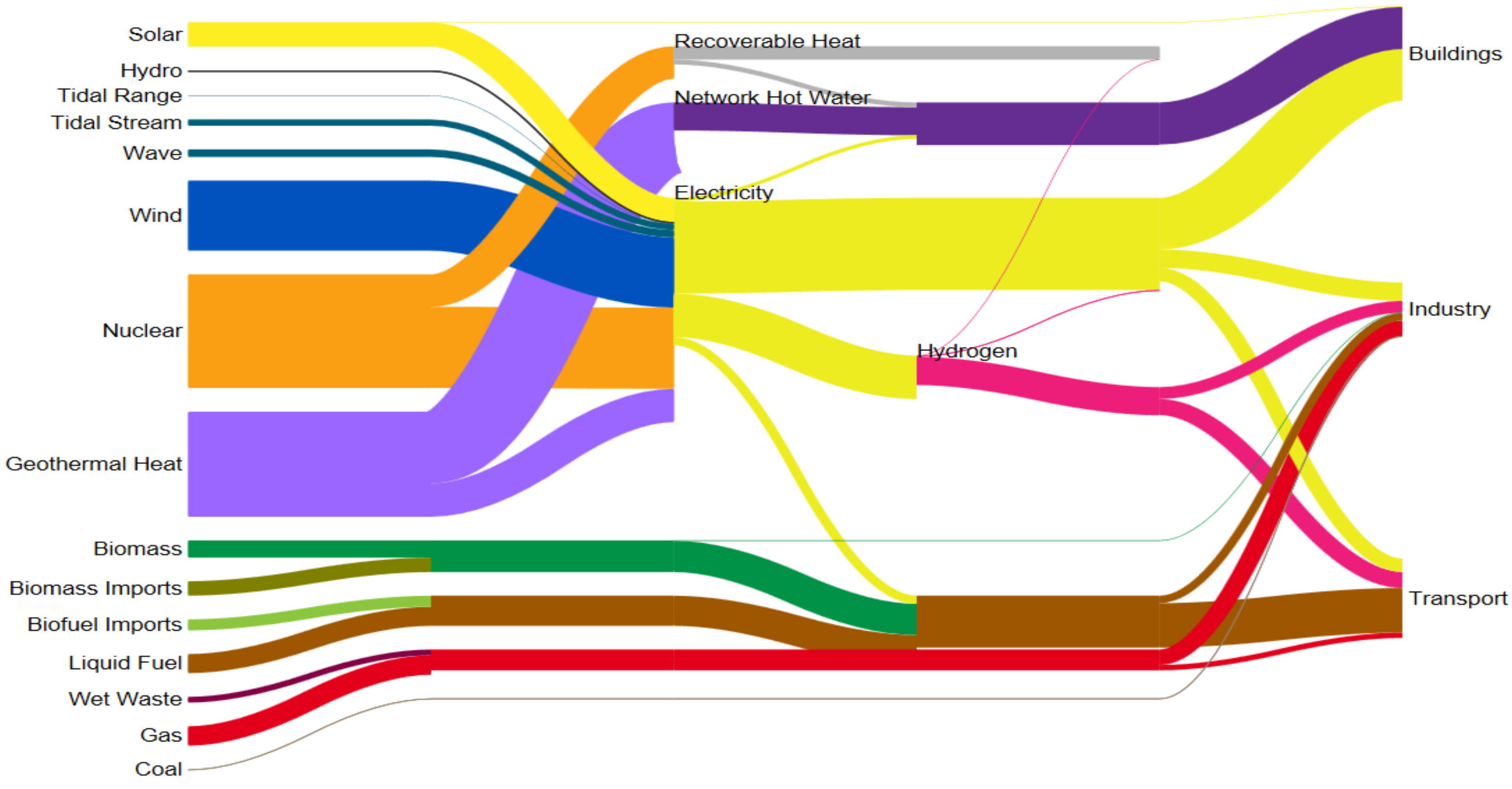
Energy system designs

'Cost optimised' 2050 view



Energy system designs can vary…

‘Cost optimised’ 2050 view: no CCS



Identifying key technology options

Modelling can help us to identify the most valuable technology options for a range of futures

Many key technology options are challenging for pure market-led approaches to deployment

Support will be needed to enable early deployment and create an enabling environment

Carbon Capture & Storage	• preparedness for a large scale CCS sector (capture, transport and storage)
Bioenergy	• options to optimise use of sustainable bioenergy resources as solid, liquid and gaseous fuels.
New Nuclear	• Major new nuclear build programme
Gas vector options	• for power, heat, storage & transport (natural gas, synthetic gases, biogas & hydrogen).
Offshore wind	• reducing cost and increasing productivity
Smart low carbon heat	• Smart integrated systems for mass market adoption
Energy storage technologies	• at various scales to enable a variety of energy system designs
Low carbon vehicles	• Options & infrastructure to enable flexible transition

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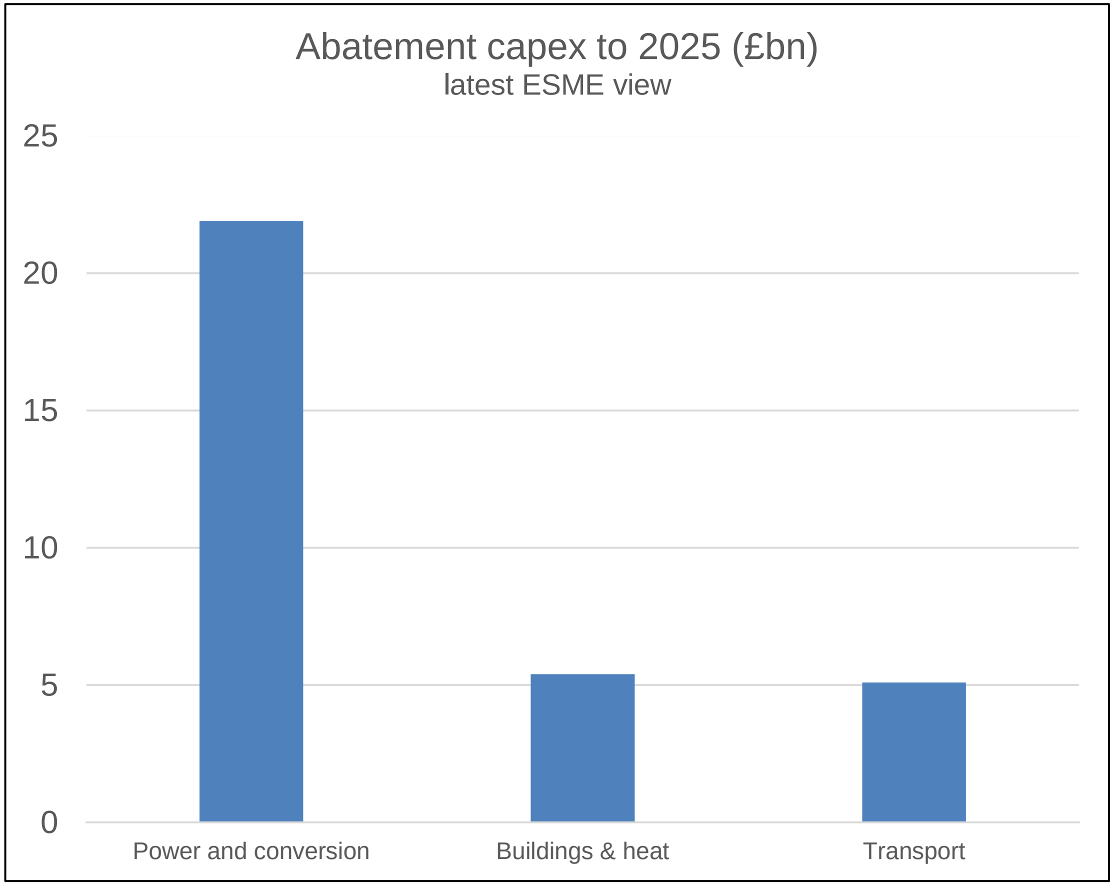
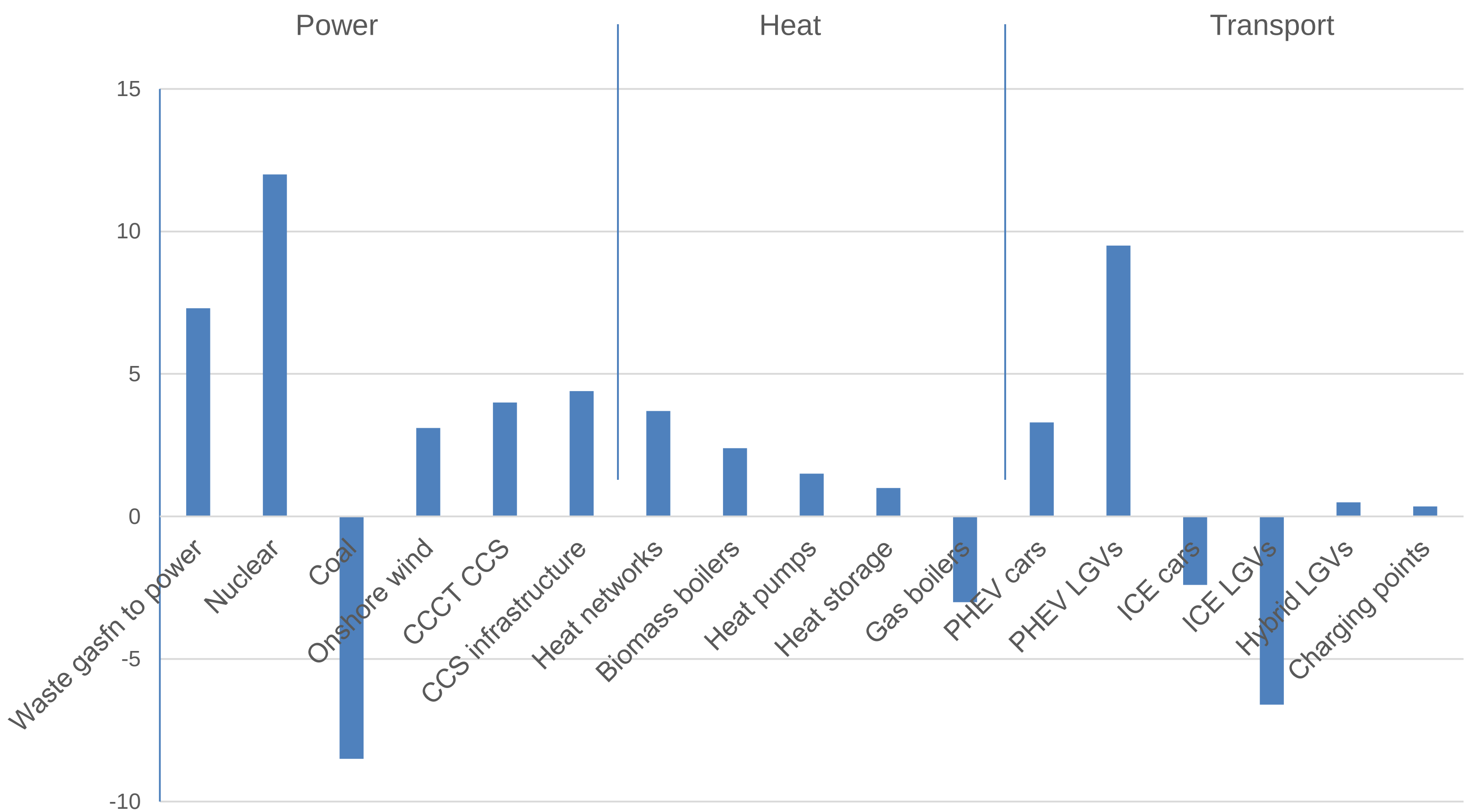
Modelled view of investment to 2025



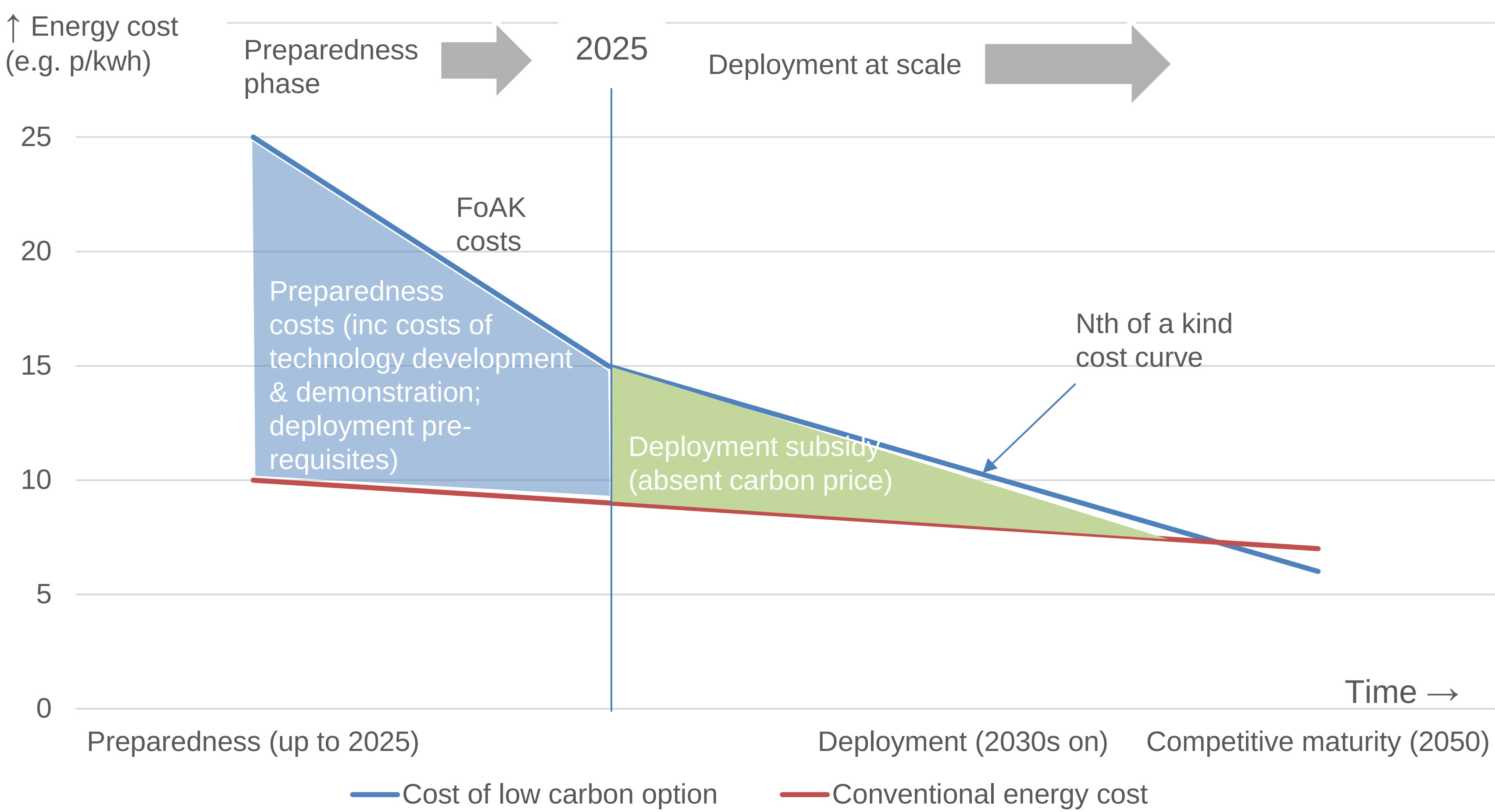
But … modelling does not account for practicalities of early deployment and proving

Breakdown of modelled view to 2025

Incremental abatement capex to 2025 £bn



Costing concepts



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- **Spending wisely?**

Assessing practical preparedness

For each technology…

What needs to be done by mid 2020s to develop & prove technology options:

- 1. Technology development and proving
- 2. Early demonstration and deployment (learning and cost reduction / demonstration at scale ie. activity required to get onto a NOAK cost curve)
- 3. Business model development (public / private, risk sharing, contracting, value chain)
- 4. Supply chain (what & how much volume of activity needed to create a ‘growable’ capacity to deliver wider deployment?)
- 5. What needs to be done to test consumer / social acceptability

How much will this cost?

What are the key market, policy and regulatory issues which will need to be addressed to create an enabling environment for deployment?

Developing ETI view of preparedness needs

Early thinking…

New Nuclear

- 2 major programmes implemented and in commercial operation by 2025,
- each site involves multiple reactor units providing NOAK schedule and cost improvement opportunities, and
- proving of sustainable and secure supply chain solutions to inform realism of nuclear expansion scenarios

Carbon Capture and Storage

- full chain CCS in operation by 2020,
- capture from CCGT proven
- multiple aquifer appraisal – CO_2 ready storage,
- Storage liabilities less arduous/resolved,
- Industrial capture proven & incentivised

Offshore wind

- Deployment of 10+GW including demonstration in deeper water and more productive and challenging environments
- Tether Leg Platform concept design brought towards full-scale proving and industrialisation
- Very Large Blades, over 75m long, powering a high-power demonstrator and developing the manufacturing processes

Spending limited resources wisely

- A relatively low cost preparatory phase ahead of a major step up in investment, infrastructure decisions and rollout out of new technologies from the mid 2020s
- Ultimate economic burden of decarbonisation - shaped by choices needed by the mid/late 2020s, and by the quality and readiness of technology options for deployment then
- In the preparatory phase public policy leadership (and expenditure) will be critical to enable private sector investment and to overcome market failures
- Limited financial resources and political appetite, so it makes sense to identify and target resources on the actions needed to prepare the key technologies
- The levy control framework and contracts for difference dominate the implicit budget to 2025, and room for manoeuvre is shrinking. CFD allocation is therefore crucial but current focus is on £/MWh cost-competition, rather than strategic value
- Other public policy and expenditure decisions should be considered against broader decarbonisation preparedness objectives (e.g. agricultural subsidies, housing investment, transport infrastructure)

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