energy technologies institute

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Creating an affordable energy system for the UK

Prepare and **Innovate**

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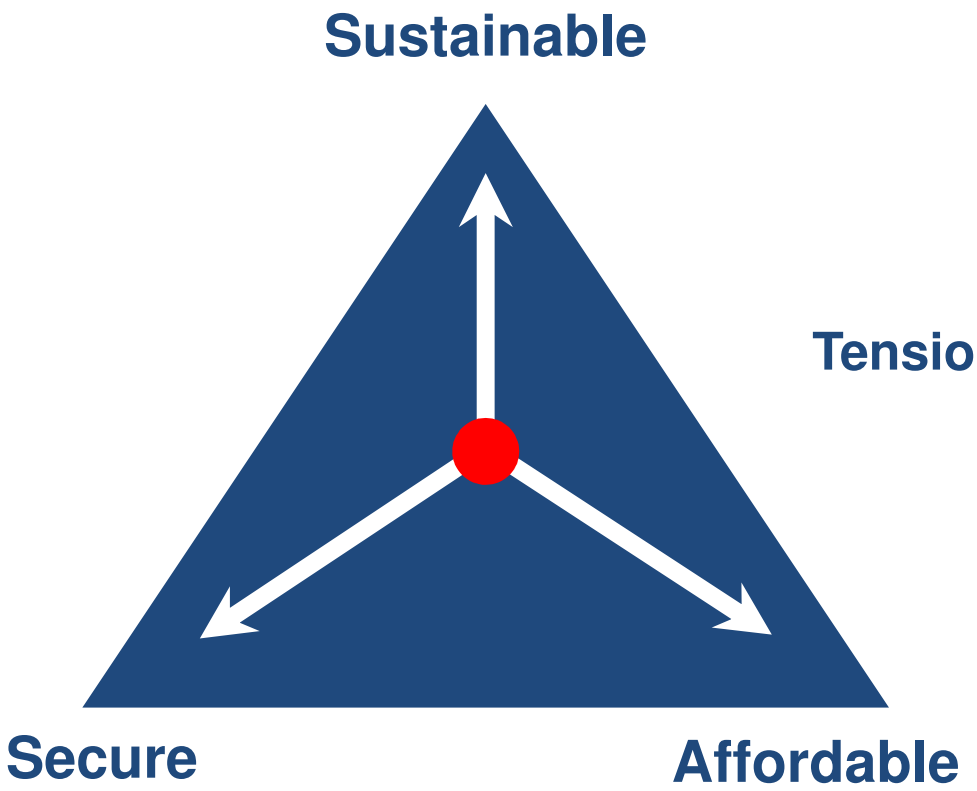
the UK energy challenge ....

Demand is growing, assets are aging, prices are rising
….. irrespective of a CO2 reduction target

- 62m people ..... growing to 77m by 2050
- 24m cars ..... growing to 40m by 2050
- 24m domestic dwellings ..... 80% will still be in use in 2050
  total dwellings 38m by 2050
- Final users spent £124bn on energy in 2010 .... 9% of GDP
- 2.4m English households in fuel poverty ..... average 'fuel poverty gap'
  £438 and increasing
- Over 90GW generation capacity ..... from 1MW to 3.9GW
- Over 200 'significant' power stations ..... average age >20 years
- 50% of power generation capacity …….. in 30 powerplants
  average age 30 years

the UK energy challenge ....

Demand is growing, assets are aging, prices are rising
….. irrespective of a CO2 reduction target



Tensions are increasing …..

Q : "how much are we prepared to pay to meet carbon reduction targets?"

A : **We need to be prepared to pay at least 1% of GDP and we need to optimise the system or that rises quickly…..**

What do we need in developing the UK energy system for the future .....

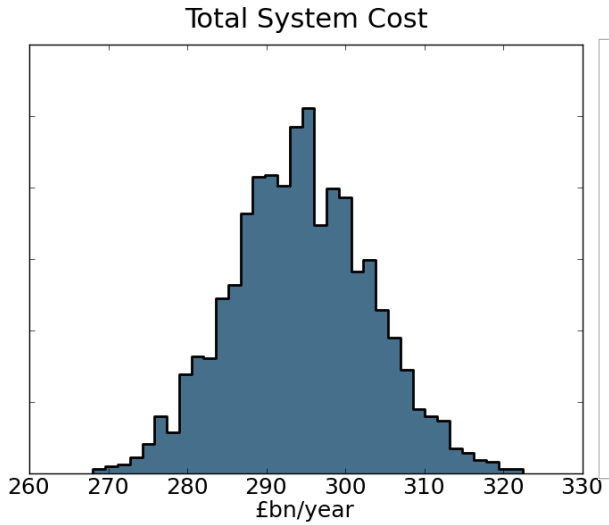
- Understanding of the drivers on future development
  - Costs
  - Supply capability and capacity (in a global market)
  - Infrastructure needs
  - Investor requirements
  - .....
- Clear market and value opportunities for investors and consumers
- Supportive and stable policy
- Consumer support

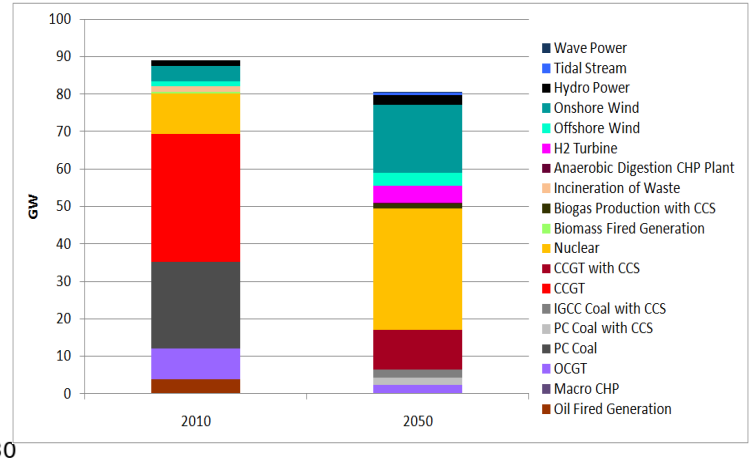
but …. the future remains uncertain and we need an energy system design that allows for this

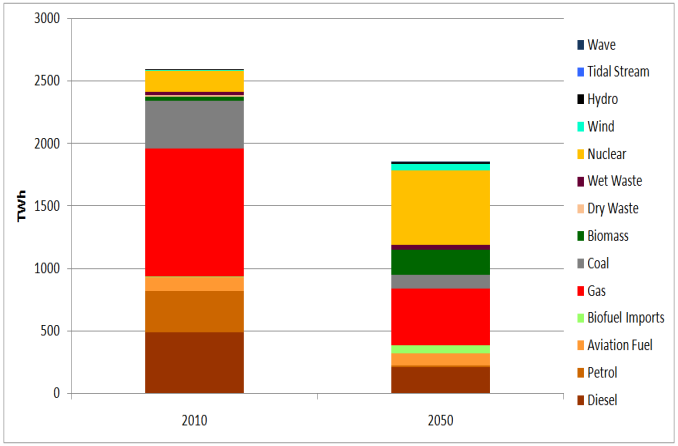
- **We need to design and prepare a system that creates and retains optionality**
- **We need innovative incentives for industry to invest in the UK**

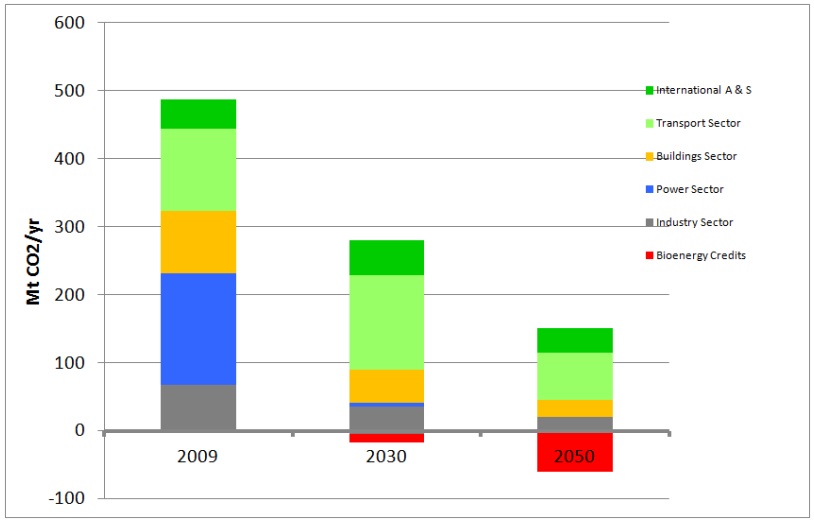
ESME – ETI's system design tool ....

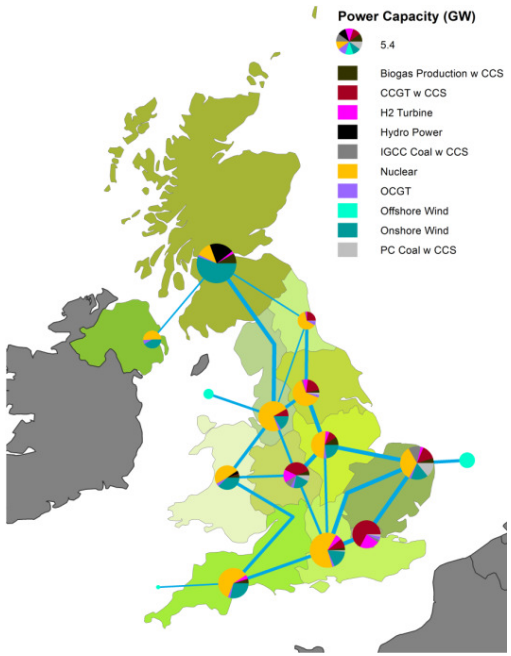
integrating power, heat, transport and infrastructure providing national / regional system designs for lowest cost

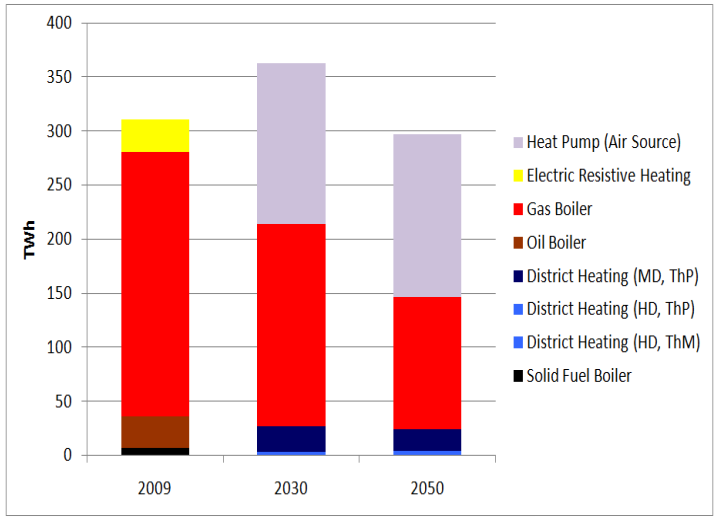












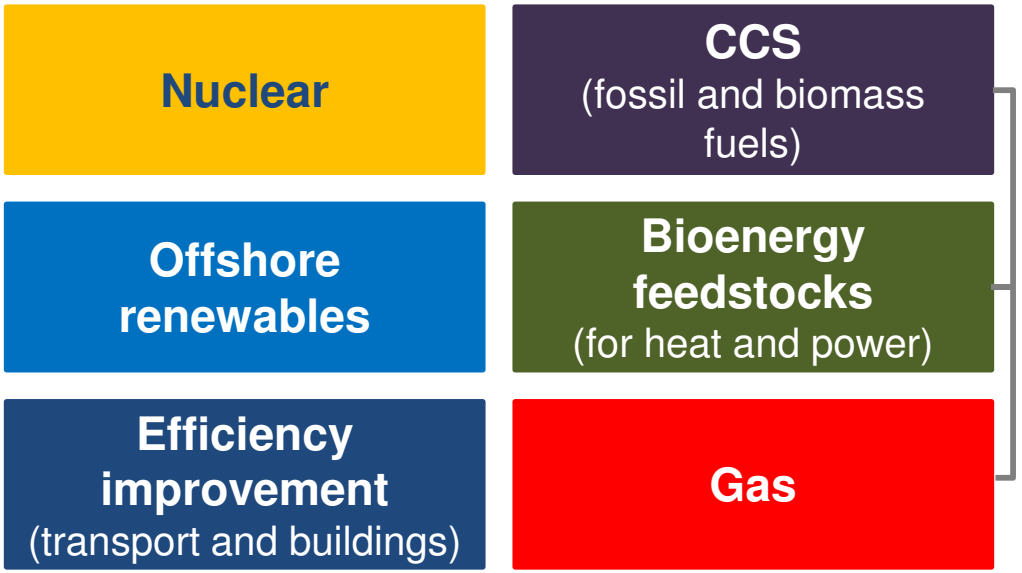
Example ESME charts

Good design of the UK Energy System - reduces costs and simplifies transition

but …. expect continued upward pressure on UK energy prices – irrespective of "green taxes"

- Driven by the need to renew aging infrastructure

There are logical asset replacements (technically and financially) that ensure security, sustainability and lowest system cost



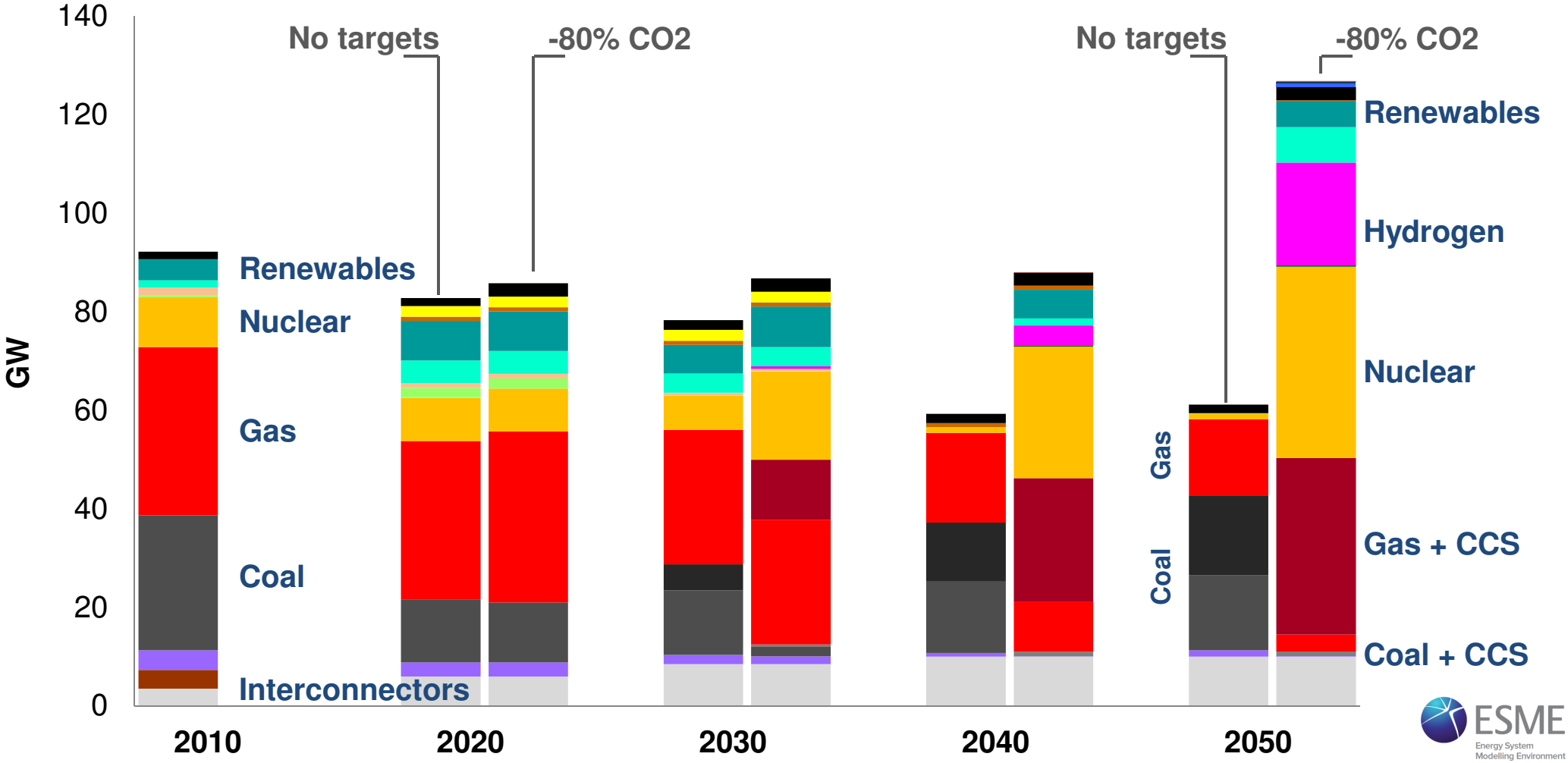
all "no regrets" choices for the next 10 years

Ensuring cost effectiveness and affordability of a future energy system means …..

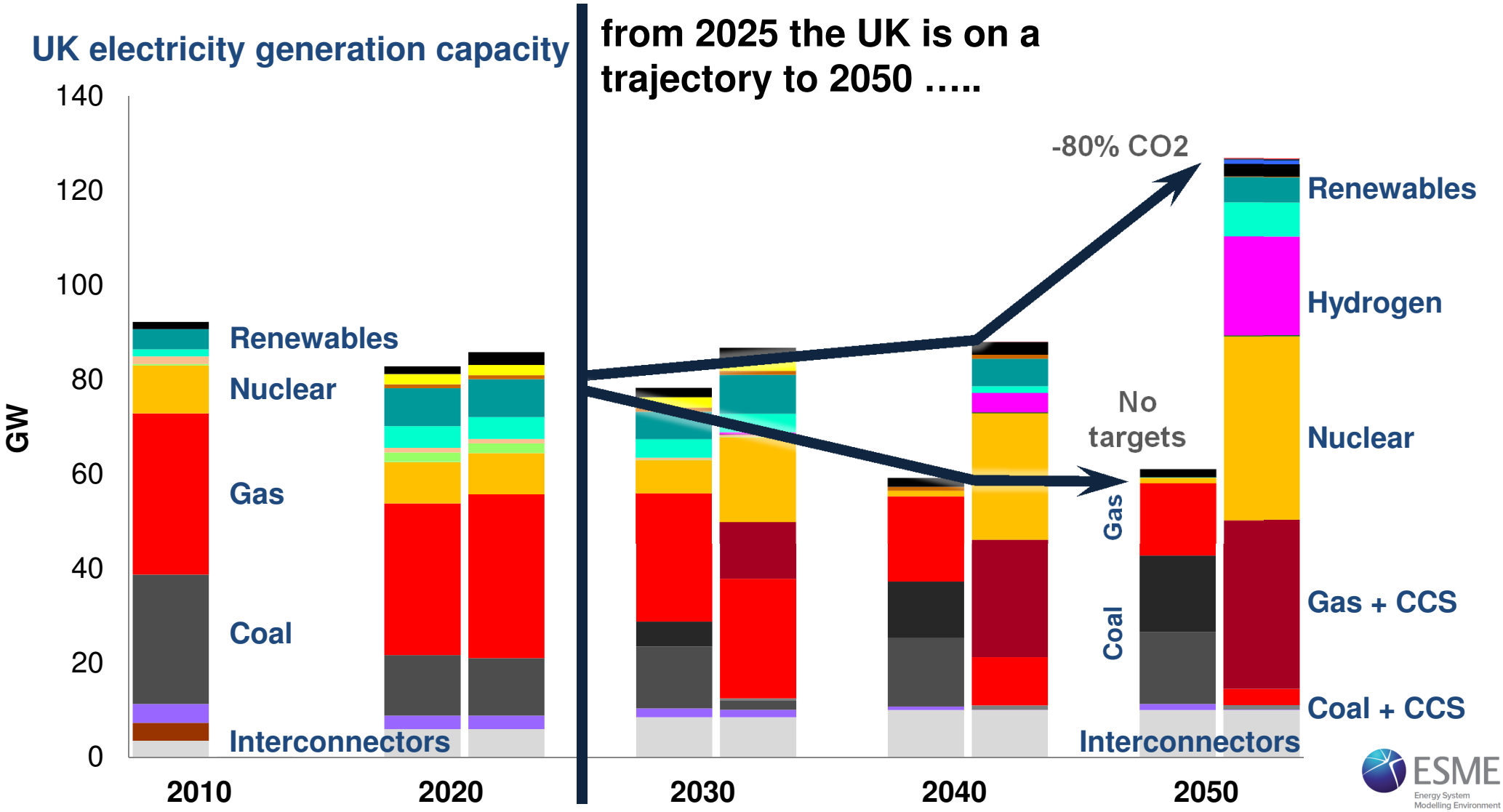
- Making informed choices
- Avoiding duplication (optimising the system)
- **Preparing** for investment in a wide scale infrastructure roll-out
- **Innovating** to drive down cost (technology and business models)

"No emissions targets" and "-80% CO_2 in 2050" are very different worlds ……

UK electricity generation capacity

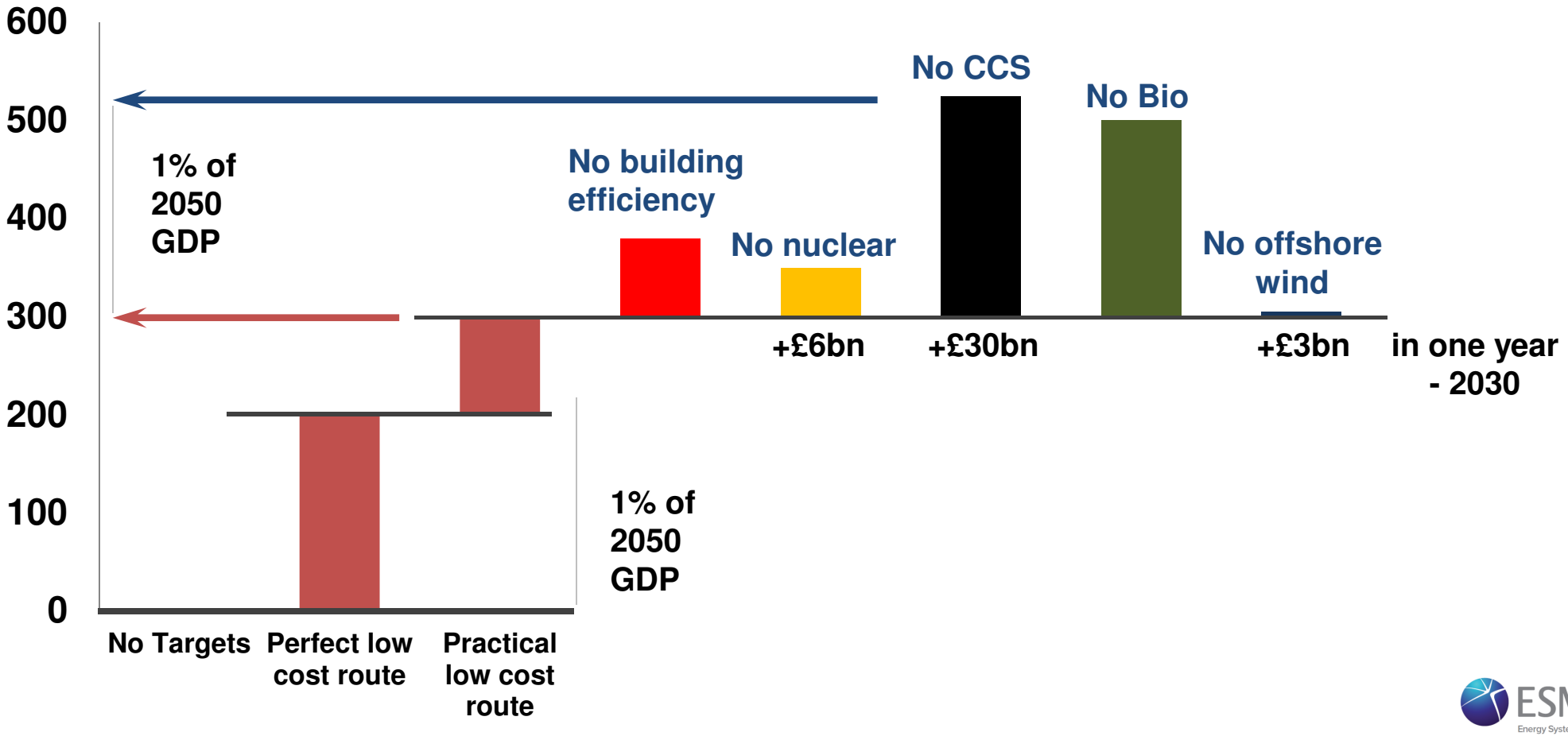


As long as we prepare NOW, decisions on 2050 can wait …… but not for long



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

Additional cost of delivering -80% CO2 energy system
NPV £ bn 2010-2050



Key decisions and cost implications

- Direction change between “no targets” and “-80% CO2” polarises in mid 2020s

- Key electricity decisions are national policy led programmes
  - **Nuclear new build**
  - **CCS**

- plus …. local and individual consumer decisions on other critical areas - with major implications for distribution level infrastructure
  - **Heat delivery**
    (gas, electricity, biomass, district heating)
  - **Transport**
    (liquid fuels, electricity, hydrogen)

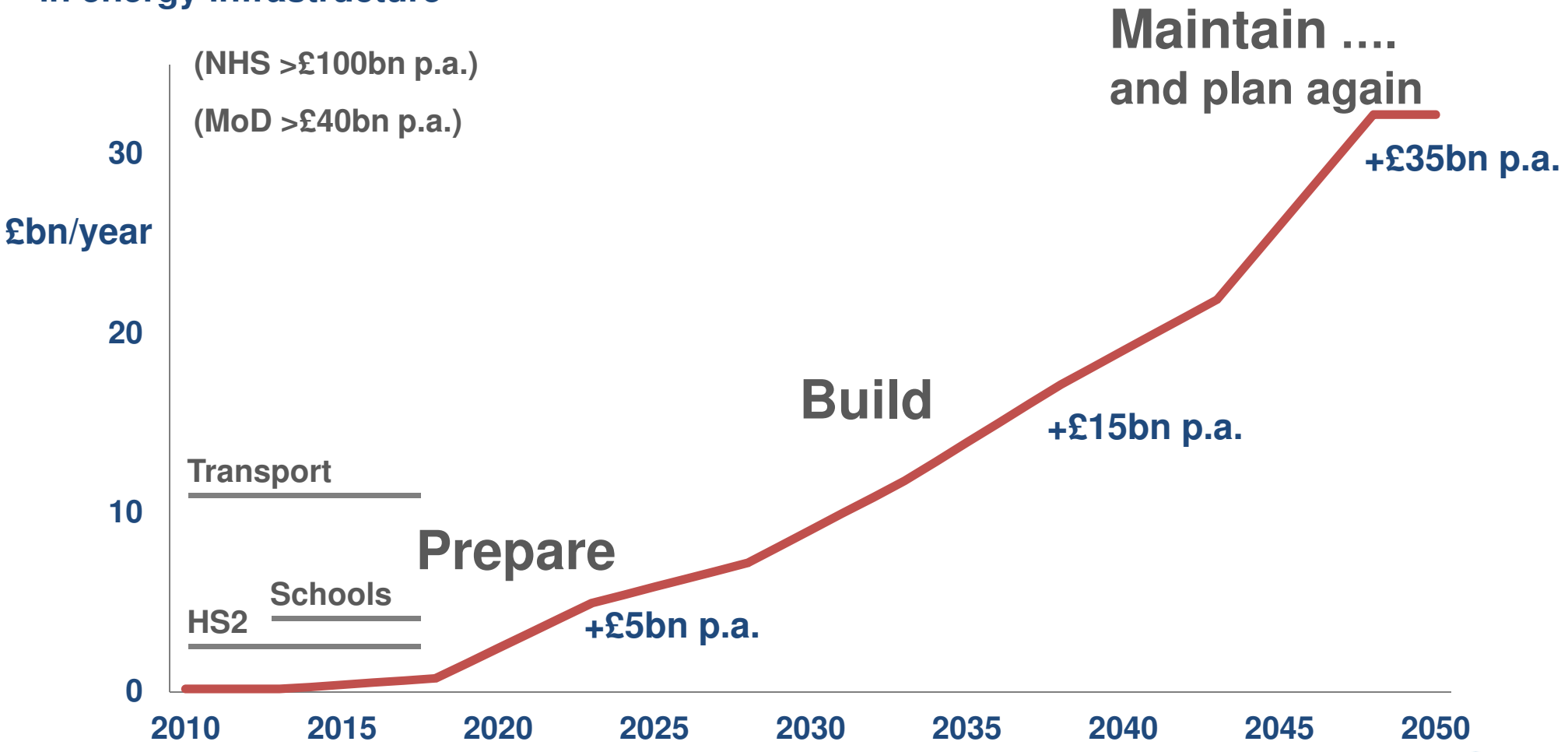
Additional system cost of meeting targets is ~£300bn npv to 2050 or ~£40bn in 2050

(+15% or +1%GDP)

Delay in launch of major build programmes beyond mid 2020s **leads to cost increases of ~£5bn p.a.** as more costly alternatives are built

Prepare over next 10 years
creating platform for infrastructure roll-out and growth

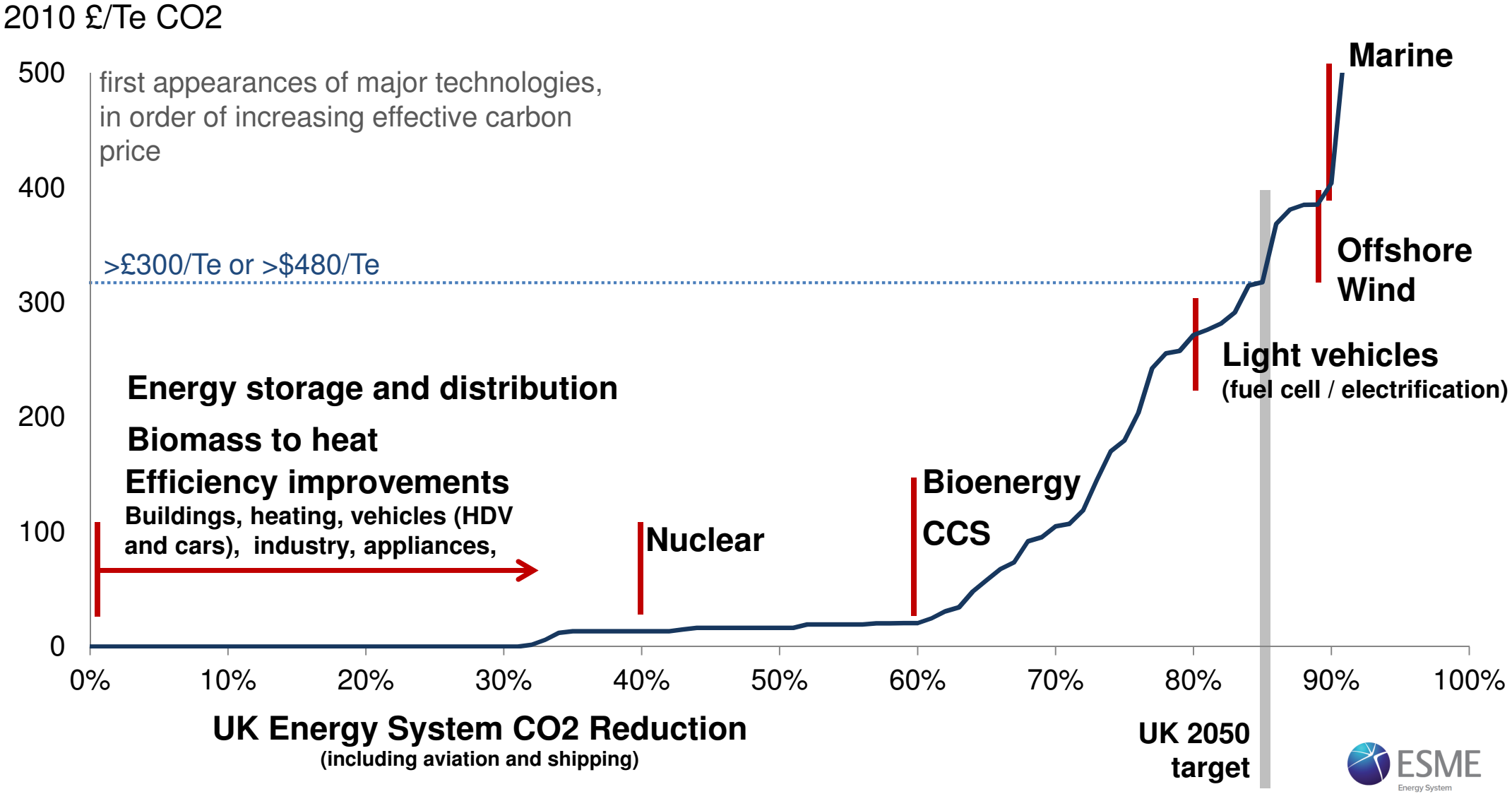
Incremental capital investment in energy infrastructure



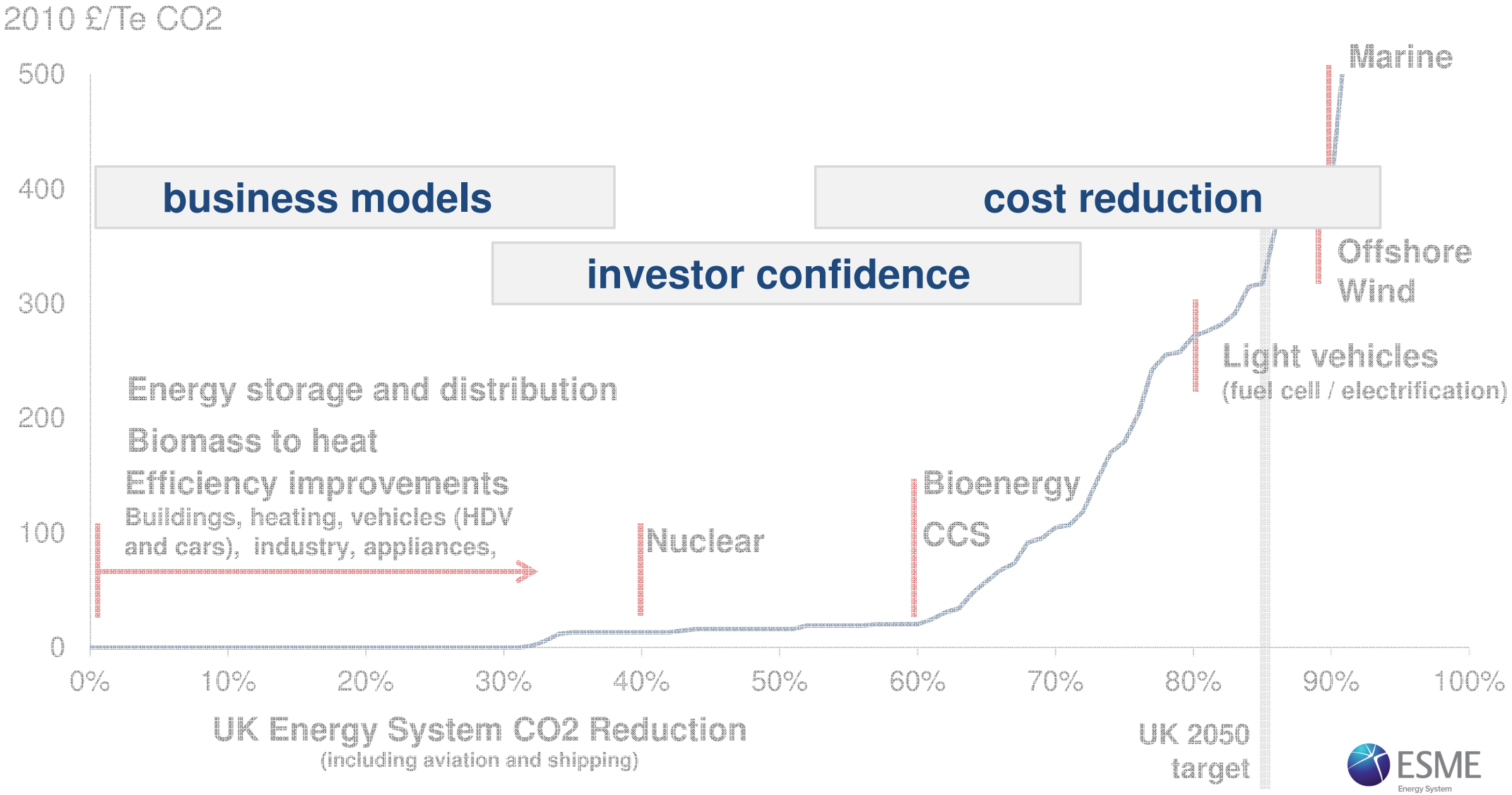
Q : " can radical technological innovation reduce the cost of supply?”

A : **Yes, but we need to target our innovation support …..**

Prepare - eliminating technology options means using more expensive alternatives …..



Innovate - 3 key challenges



Key actions and cost implications

keep options open for future delivery of electricity
requires government, industry, financiers and academia to work together

- **Prepare** finance to meet the 2050 targets - recognising early cost commitments are comparatively low
  - **Keeping the decision window open to 2025 requires +£5bn p.a. capex**
- **Prepare** policy and investors to deliver key national programmes that enable meeting 2050 targets
  - **Nuclear new build programme (not just Hinkley C)**
  - **CCS readiness (led through DECC commercialisation projects)**
- Target integrated support at critical **innovations**
  - **Technology**
  - **Business models**
  - **Consumer engagement**

Additional cost of meeting targets is ~£40bn in 2050 or ~£300bn npv to 2050

Delay in launch of major build programmes beyond mid 2020s **leads to cost increases of ~£5bn p.a.** as more costly alternatives are built

Innovation to reduce both technology costs and the overall system cost **delivers a saving of >£600bn** npv to 2050

ETI – supporting preparation, delivering innovation

Reducing costs

Creating investor confidence

Establishing new business models

SMARTtide

WaveDyn

GL Garrad Hassan

Wet-mate Connector

CO_2 Stored

CO_2 Stored

Fault Current Limiter

Offshore Wind Test Rig

ReDAPT

IDCORE

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