energy technologies institute

www.eti.co.uk

Sustainability in Turbulent Times

Mike Colechin

ETI10 TEN YEARS OF INNOVATION 2007 – 2017

Energy Technologies Institute

The Energy Technologies Institute is a partnership between global energy and engineering companies and the UK Government.

Our role is to act as a conduit between academia, industry and government to accelerate the development of low carbon technologies.

We bring together engineering projects that develop affordable, secure and sustainable technologies to help the UK address its long-term emissions reduction targets as well as delivering nearer term benefits.

We make targeted investments in a portfolio of technology programmes across heat, power, transport and the infrastructure that links them.

ETI members

bp

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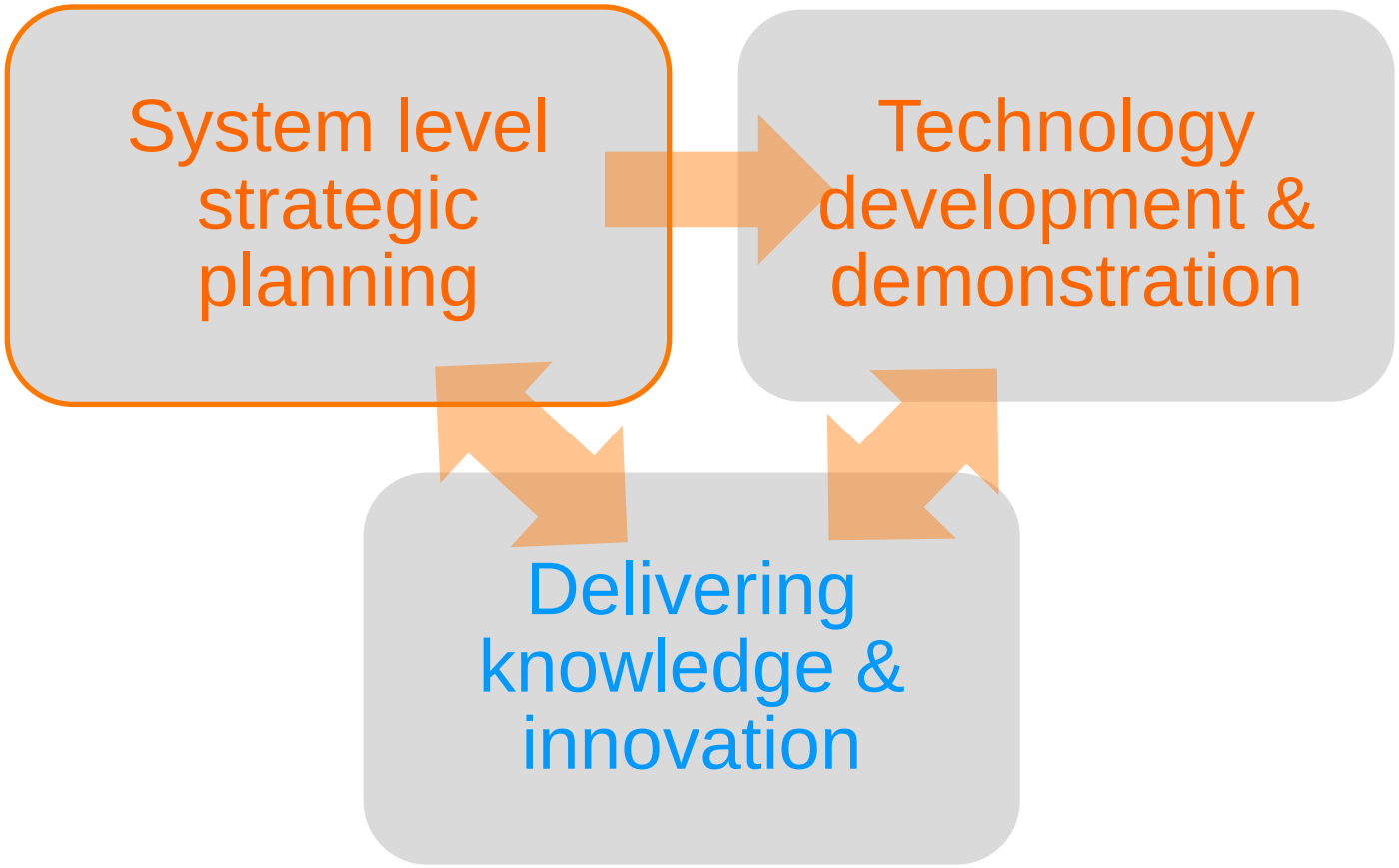
EPSRC Pioneering research and skills

Innovate UK

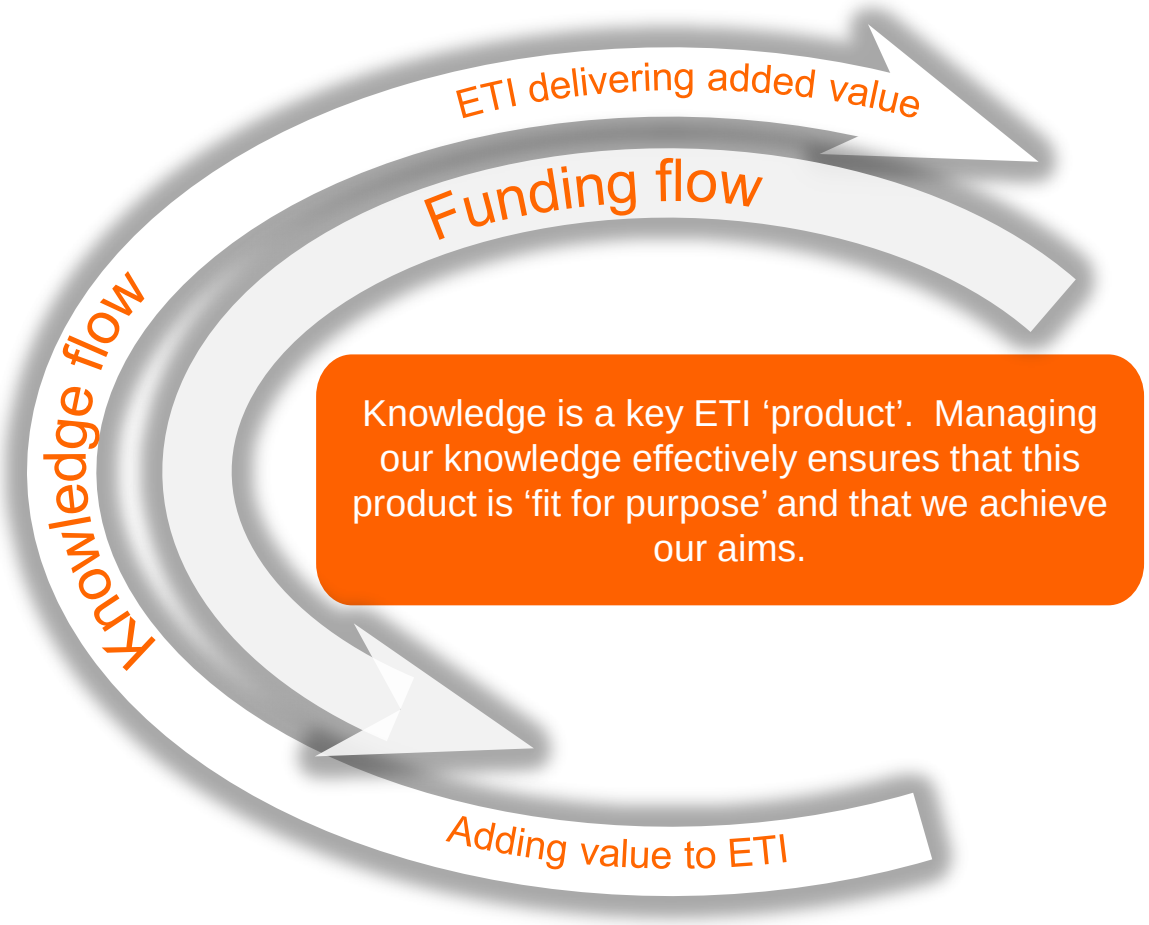
ETI programme associate

HITACHI Inspire the Next

What is the ETI?

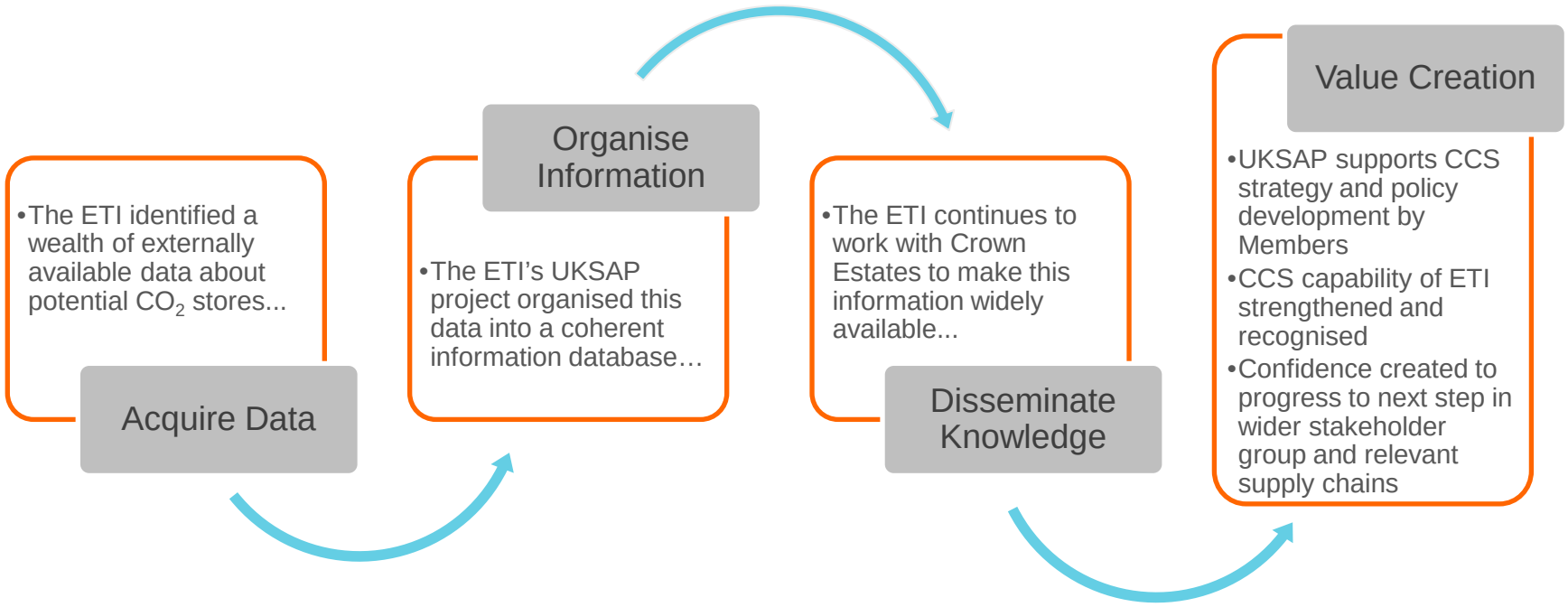


Knowledge is key to the way ETI operates

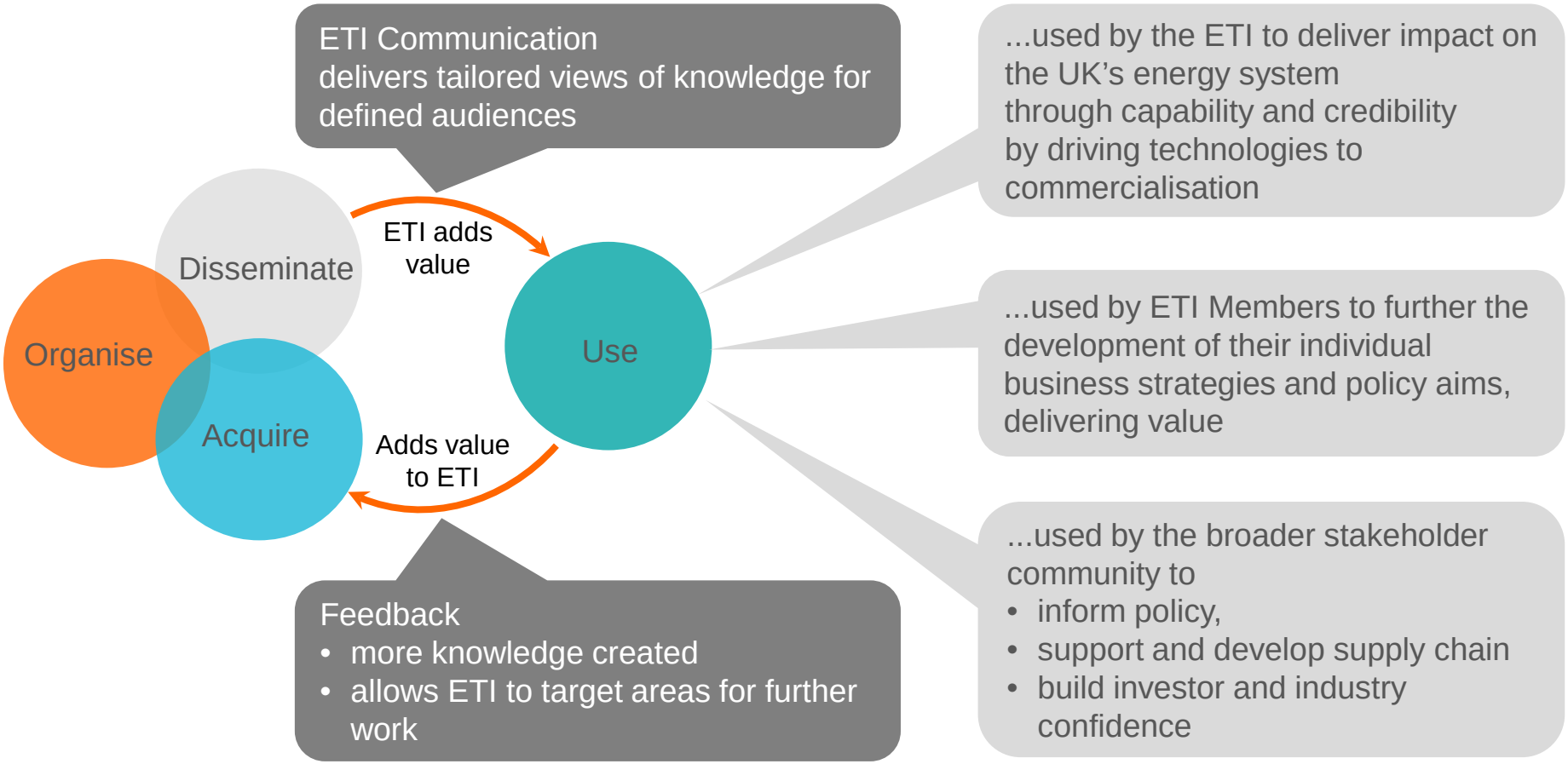


Knowledge is a key ETI ‘product’. Managing our knowledge effectively ensures that this product is ‘fit for purpose’ and that we achieve our aims.

CO_2 Storage Appraisal as an example of ETI knowledge as a product…



‘Closing the loop’ to deliver the ETI’s outcomes



Preparing for the Energy Transition: Context

- **Increasing demand to 2050**
  - Population: 65 to 77-79 million
  - Vehicles: 24 to 35-43 million cars
  - Housing: 24 to 38 million houses,
    (80% of current stock still in use in 2050)

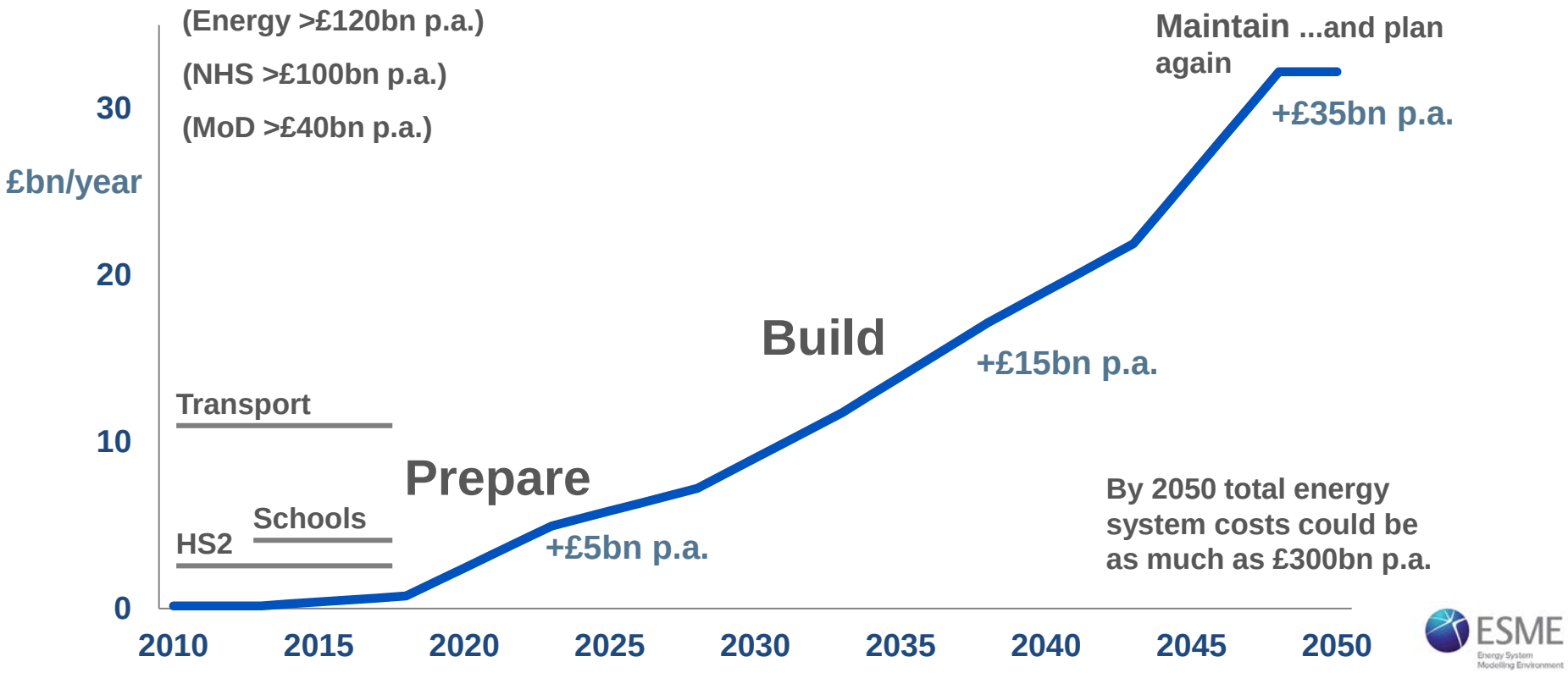
- **Action to date**
  - Beginning to decarbonise power sector
  - Increasing energy efficiencies (especially in cars)

- **UK energy system is a unique and complex set of interlinked assets and infrastructure**
  - Ageing power plants need replacing
  - Significant wind (and marine) energy potential
  - Significant offshore CO2 storage potential
  - Significant opportunity for UK biomass
  - Reasonable public support for all low carbon options
  - But, poor housing stock and a very significant heating challenge

Prepare over next 10 years

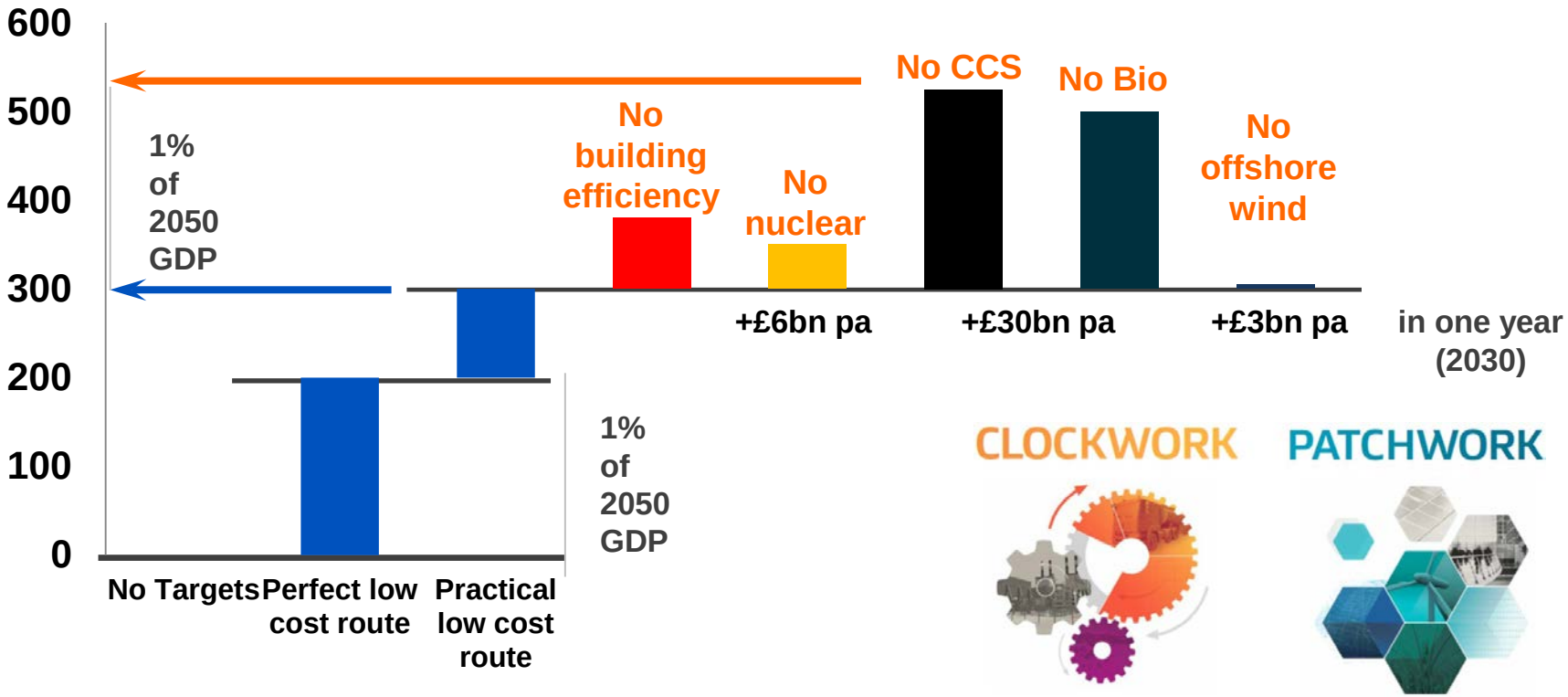
creating platform for infrastructure roll-out and growth

Incremental capital investment in a ‘low-carbon’ energy infrastructure



The UK can achieve an affordable transition (1-2% of GDP) - system optimisation is key

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



The next decade is critical in preparing for transition

- The UK can implement an affordable (~1% of GDP) 35-year transition to a low carbon energy system by developing, commercialising and integrating known - but currently underdeveloped - solutions

- We need to focus deployment on a basket of leading contender technologies - efficiency of vehicles, efficiency and heat for buildings, Nuclear, CCS, Bio, Offshore Wind, Gases

- There is enormous potential and value of CCS and bioenergy

- To avoid wasting investment, crucial decisions must be made about the design of the future energy system, driven by choices on infrastructure

Conclusion: Opportunities exist NOW to invest and develop solutions

Opportunities – Waste Gasification

THE UK GENERATES AROUND 330 MILLION TONNES OF WASTE EACH YEAR

Existing waste to energy plant are on a very large scale and serve larger conurbations and energy users

EUROPEAN LEGISLATION INCENTIVISES THE DIVERSION OF WASTE FROM LANDFILL.

These plant are generally large footprint, high cost and low efficiency, generally requiring waste from more than one region to be economic.

Opportunity:

- Smaller, highly efficient waste gasification plants (5-20MW) - providing low carbon energy for small towns and industrial estates.
- Could unlock 10GW of additional energy resource in the UK from 90million tonnes of waste per annum at a highly competitive cost.

Opportunities – Heat

OUR CONSUMER RESEARCH HIGHLIGHTS PEOPLE WANT BETTER CONTROL OF TIME, EFFORT AND MONEY

Few consumers are presently engaged to change their heating systems to combat emission reductions

£100 BN COST OF COMPREHENSIVELY RETROFITTING SEVEN MILLION HOMES

Eliminating emissions from buildings is more cost-effective than making deeper cuts in other sectors

TWO PRINCIPAL PATHWAYS FOR DE-CARBONISING DOMESTIC SPACE AND WATER HEATING

1. Individual home systems using electric heat
2. Local area schemes using heat networks

30% CARBON ABATEMENT COSTS

Carbon abatement costs increase around 30% if electric heat systems are not used in any transition

Opportunities:

- Advanced integrated Home Energy Monitoring Systems (HEMs)
- Cost effective home energy retrofitting solutions
- District heat networks
- Heat Pumps (Air source, ground source etc.)

Opportunities – Energy Storage and Distribution

Problem	Solution
The intermittent nature of many renewable energy sources puts increasing pressure on the network operators to balance supply and demand	New approaches to distribution scale energy storage are needed. The ETI has supported the development of Pumped Heat Electricity Storage (PHES) technology. It converts electrical energy to heat, stored in low cost gravel storage vessels with an achievable round trip efficiency of ~75%.

Opportunities:

- A wide range of opportunities from home-scale to distribution scale
- Distribution scale storage needs to be large capacity, high efficiency and rapid response – but cost effective

On-Going ETI Project:

- Study of consumer behaviour with electric cars and the impact on infrastructure requirements - **indicates that Smart Systems for Demand Side Management can be key in reducing system costs and allow for viable Aggregator Business Models**

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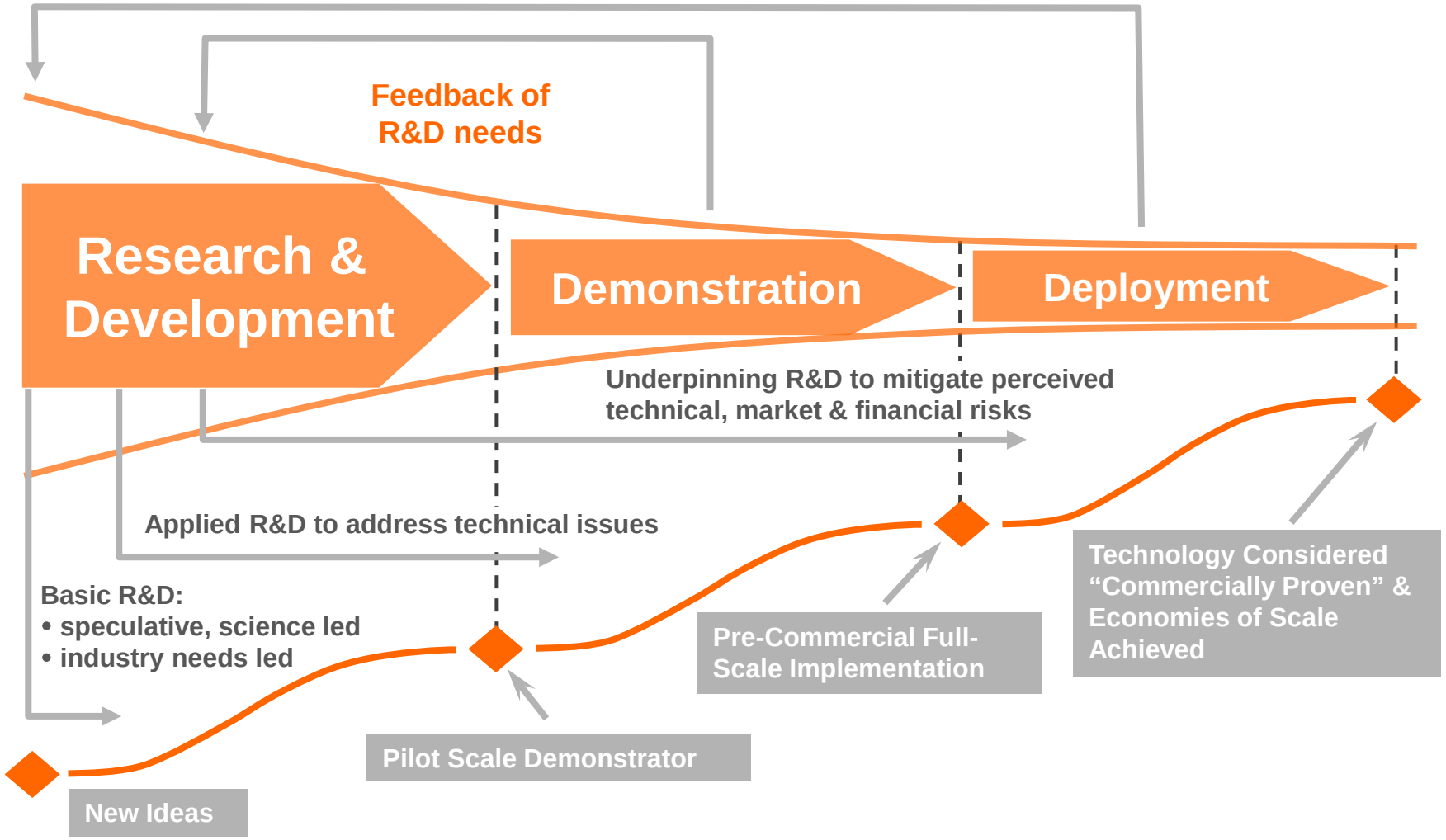


Accelerating Low Carbon Energy Innovation In The UK

The UK needs innovation to help it meet its carbon targets

Successful innovation has several critical components: market confidence, finance, public policy and the capability to innovate

Collaboration and shared understanding is required to help the innovation process

involving interactions across science, business and government to facilitate knowledge transfer and learning

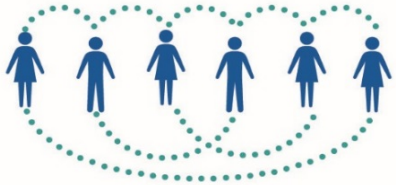
it is easier to achieve a transition with a shared understanding of the drivers of new low carbon energy technologies

Most low carbon markets are almost entirely driven by public policy but delivered by private sector firms.

Policy interventions are required to drive innovation in energy and low carbon

business needs certainty so policy stability matters

Successful innovation systems often involve open and iterative processes, which are complex



They depend on multiple interactions between different actors

Successful innovation in low carbon energy requires new technology capabilities, new markets, new business models together with appropriate changes to the regulatory framework

The slower the pace of energy innovation

the less time the UK will have to transition to a low carbon economy and the more expensive it will be to do so

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The ETI can also be followed on Twitter @the_ETI

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