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Energy System Modelling Environment

What Models Do and Don't Tell Us

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Overview



- Overview of ESME and its uses
- Key insights from our modelling
- Limitations and constraints (multi dimensional aspects)

Energy System Modelling Environment - overview

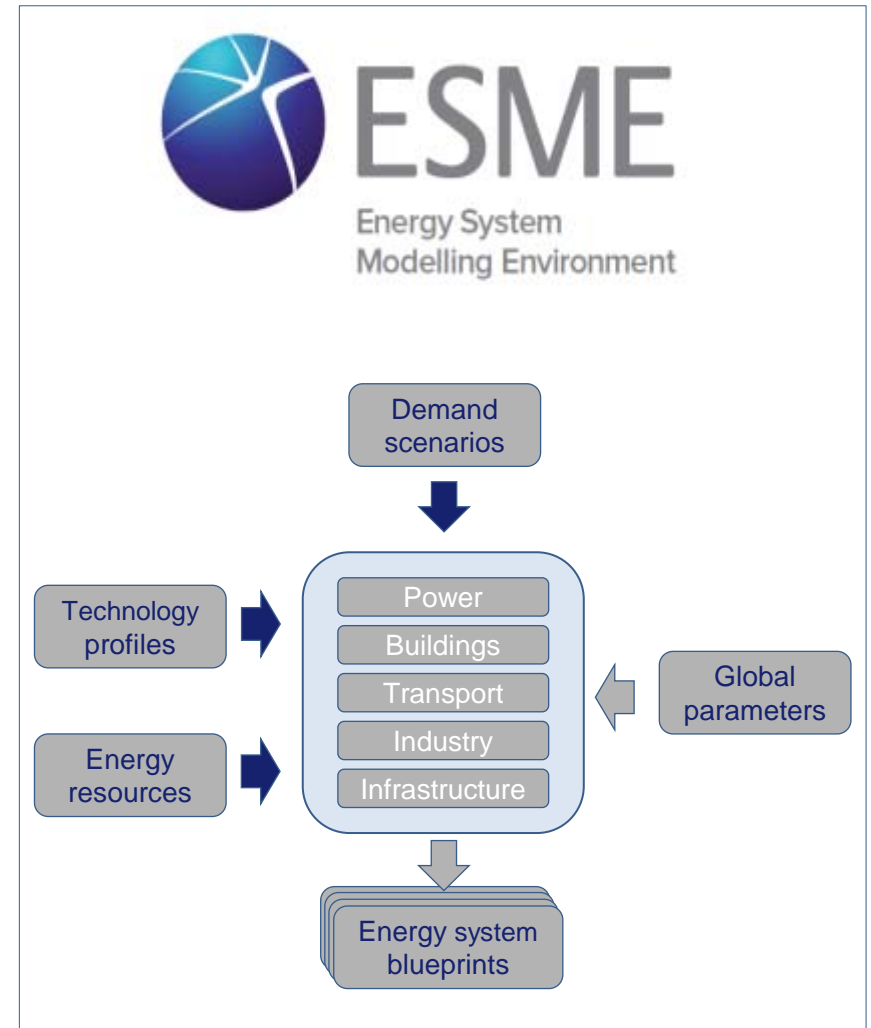
A national energy system design tool, integrating power, heat, transport and infrastructure

Modelling approach

Least cost optimisation (policy neutral)
Back-casting from 2050
Probabilistic treatment of uncertainty
Spatial & temporal factors

Informed by ETI members/advisors

Internationally peer reviewed



ESME: in use by the ETI, it's members and partners



- ESME developed to inform technology development choices and targets
- ESME used to inform policy work by DECC and CCC on a range of issues
- Individual Members are developing own versions for specific countries of interest
- Members have requested ETI to develop an EU prototype
- Academic research projects ongoing



Why might system modelling be useful for energy policy?

Why model? Why not simply set a carbon price and leave it to the market?

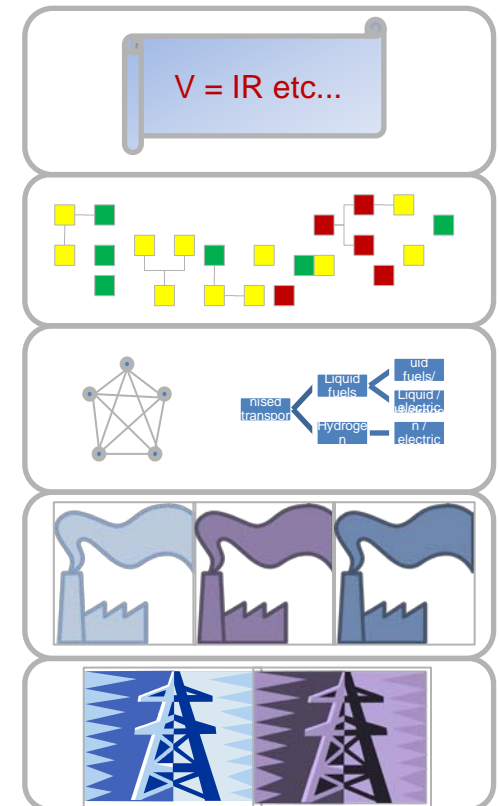
Well understood physical laws

Competing and interacting energy sources and vectors

Network effects and path dependency

Importance of externalities & policy intervention

Scale of investment & change



Practical use of modelling to inform policy making?

Picking contenders

- Focus on the key robust technologies

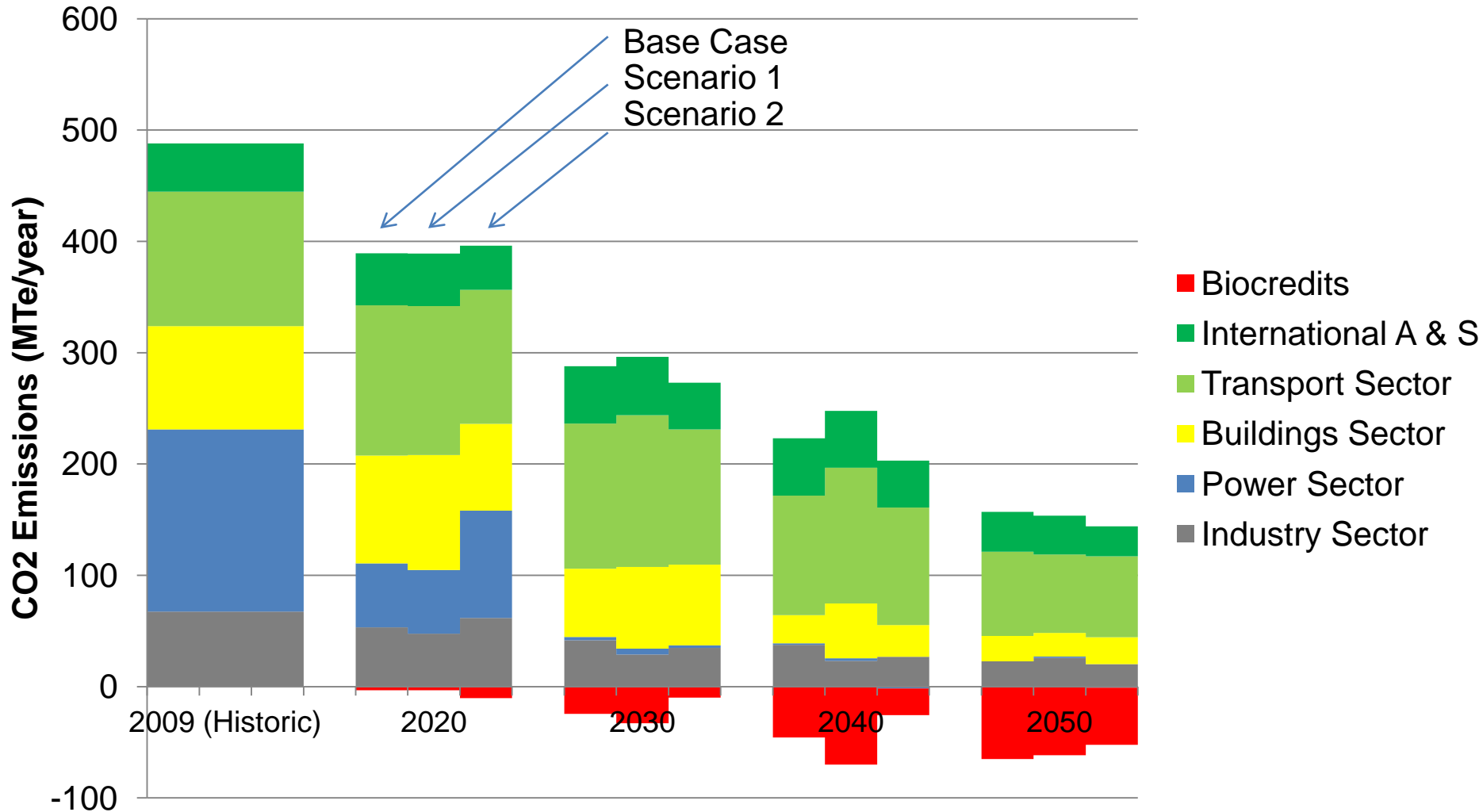
System insights for market & policy design

- Technologies compete and complement in non-obvious ways

Pathways insights

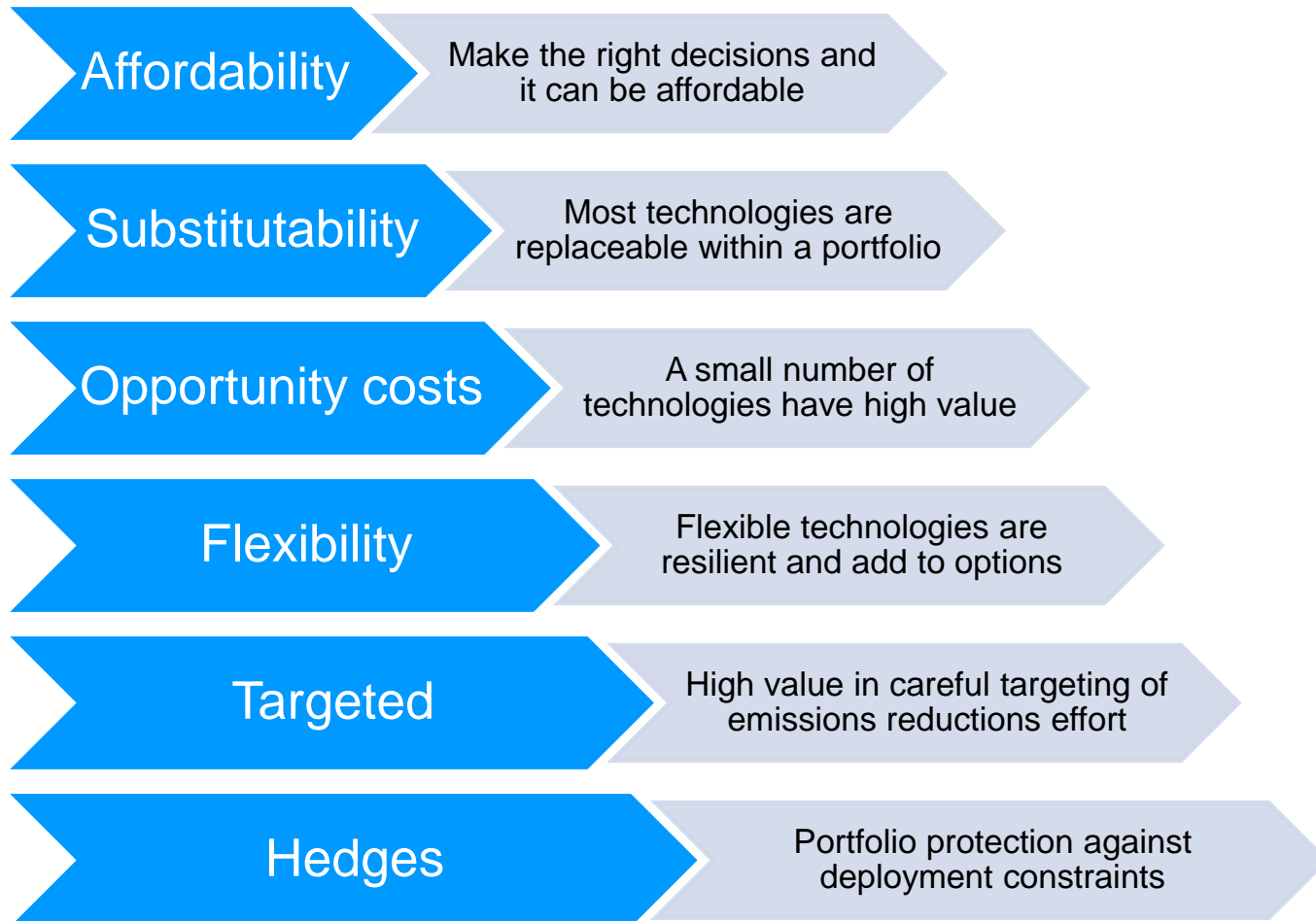
- Cautionary tales – how much will inertia cost?
- What do we need to do now?

Shift from identifying 2050 solutions to understanding pathway and transition issues for multiple scenarios

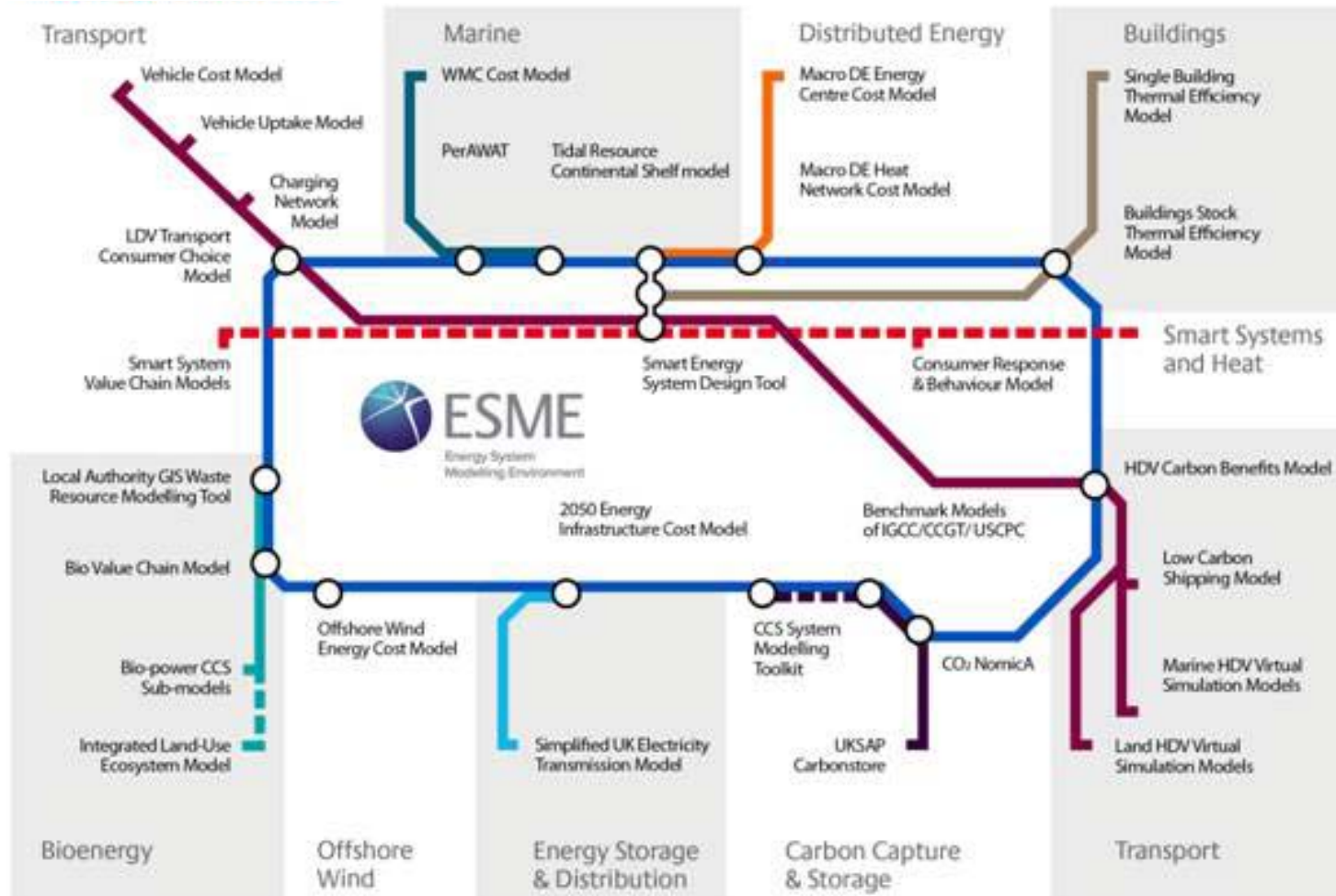


Low carbon

...what is modelling telling us?..



Granularity limitations: ESME integrates knowledge across ETI programme areas



Some economic limitations



Perfect foresight

Simplified cost functions

Demand responsiveness

Investability

Discounting issues

Other multi-dimensional limitations



Environmental

Land / water use & competing demands
Land use change
Air quality

Macro-economic

Energy security
Jobs and wealth creation
International markets and competitiveness

Societal

Consumer behaviour
Public perceptions
Social benefits

Other

Embedded carbon
Critical materials

Conclusion



- Energy system modelling provides valuable insights that would not be derived from sector specific models
- Energy system modelling can inform technology strategy, RD&D prioritisation and policy development
- There is no model panacea
 - All models have their merits and limitations
 - Different models can provide an alternative lens on a problem
- Real world thinking cannot be replaced by models



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