

A UK Perspective on Energy Transitions and 'Green Growth'

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Transitions in Energy*

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The UK Low Carbon Transition: A Timeline

- ◆ 1940s: energy utilities (coal, gas, electricity) nationalised
- ◆ 1987-1994: utilities privatised; 'dash for gas' (CCGTs)
- ◆ 2008: Department of Energy & Climate Change created
- ◆ 2008: *Climate Change Act* (all-party support)
 - State commitment: cut GHG emissions to 80% of 1990 levels
 - Independent *Committee on Climate Change* recommends 5-year carbon budgets (caps), 15 years into future
- ◆ 2009: *Low Carbon Transition Plan*; 2011: *Carbon Plan*
- ◆ 2013: *Energy Bill* – includes *Electricity Market Reform*:
 - UK carbon price floor for electricity
 - Feed-in-tariffs (CfDs) for low carbon electricity
 - Capacity market (auctions for new capacity, inc. storage & DSR)
 - Emissions performance standard for new fossil stations

Where next?

Transition Pathways: Consortium & Aims

◆ Interdisciplinary University Consortium

- Universities: Bath, Cardiff, East Anglia, Imperial College London, Leeds, Loughborough, Strathclyde, Surrey, UCL
- Funded by EPSRC & E.On UK (2008 - 2012)
- ‘Realising Transition Pathways’ (2012 –16), EPSRC funded

◆ Aims:

- Develop three *transition pathways* to a ‘more electric’ low carbon future in the UK, including heat & transport
- *Integrated ‘whole system’ assessments* of pathways’ technical, economic, social & environmental implications
- Inform thinking/ decisions on low carbon transitions & ‘how to get there from here’

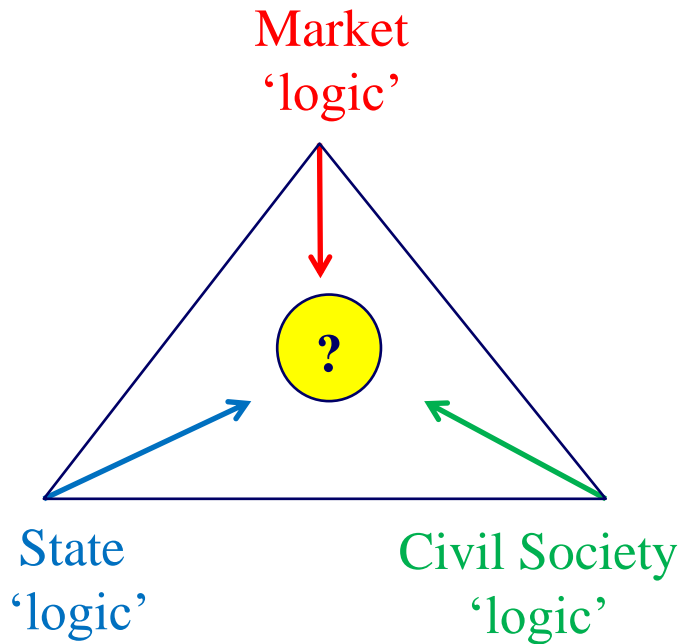
◆ Approach

- Pathways reflect ‘co-evolution’ of technologies, institutions, strategies/policies & user practices

Focus on Actor Groups & Governance

- ◆ How three actor groups formulate energy system visions & interact across the *energy action space*.
- ◆ **State, Market & Civil Society** groups follow different 'logics' that frame their views of the world & of other actors; they seek to 'enrol' others into their way of thinking:
 - *Central Co-ordination* sees a dominant role for state actors to co-ordinate energy systems to deliver policy goals
 - *Market Rules* says energy policy objectives are best achieved by market actors competing in a high-level policy framework
 - *Thousand Flowers* sees citizens playing a leading role in how the energy system operates & is governed
- ◆ We used this to explore low carbon transition pathways to 2050; each pathway built around a logic.

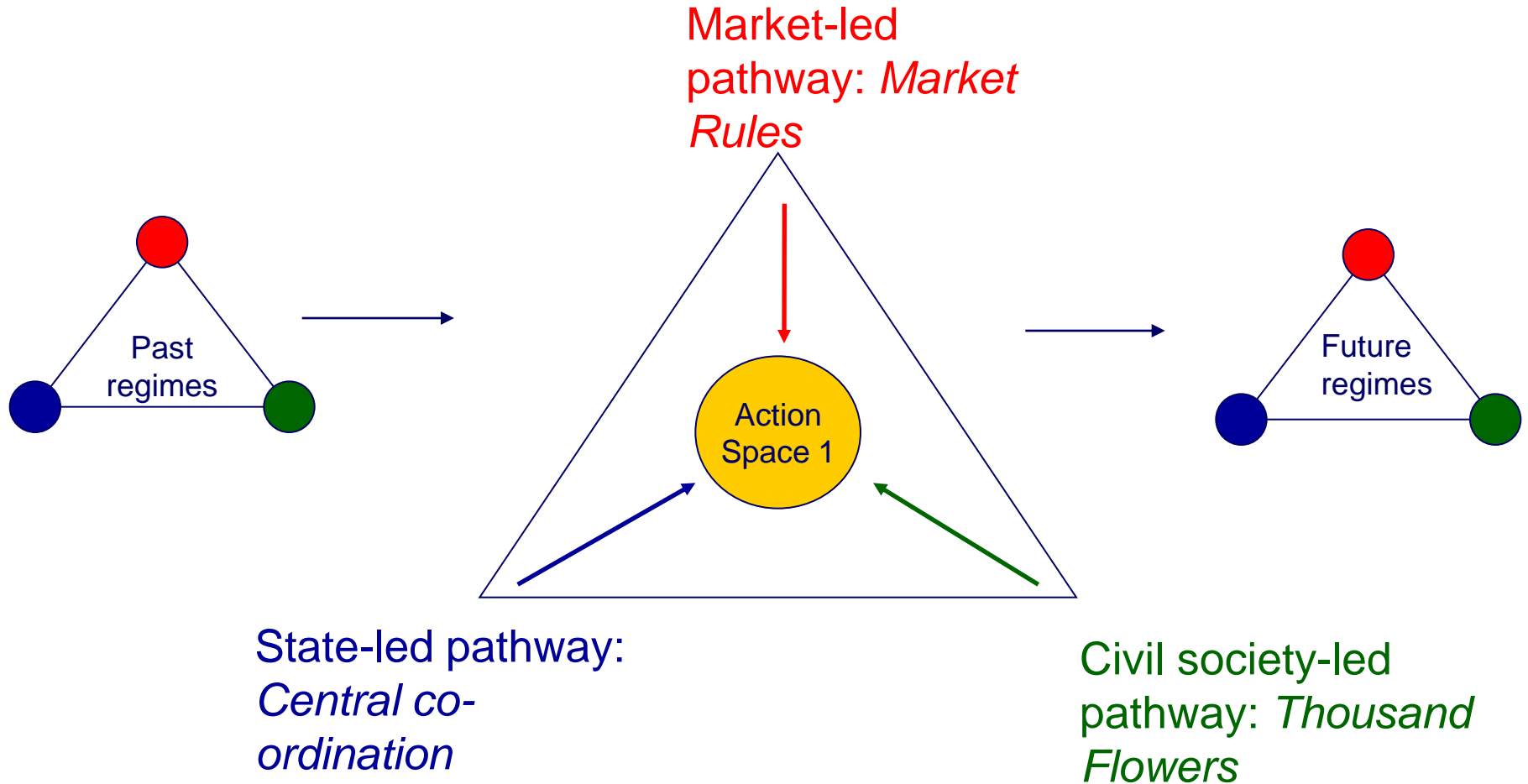
Action-Space Approach to Governance – 3 Key Actor Groups: State, Market & Civil Society



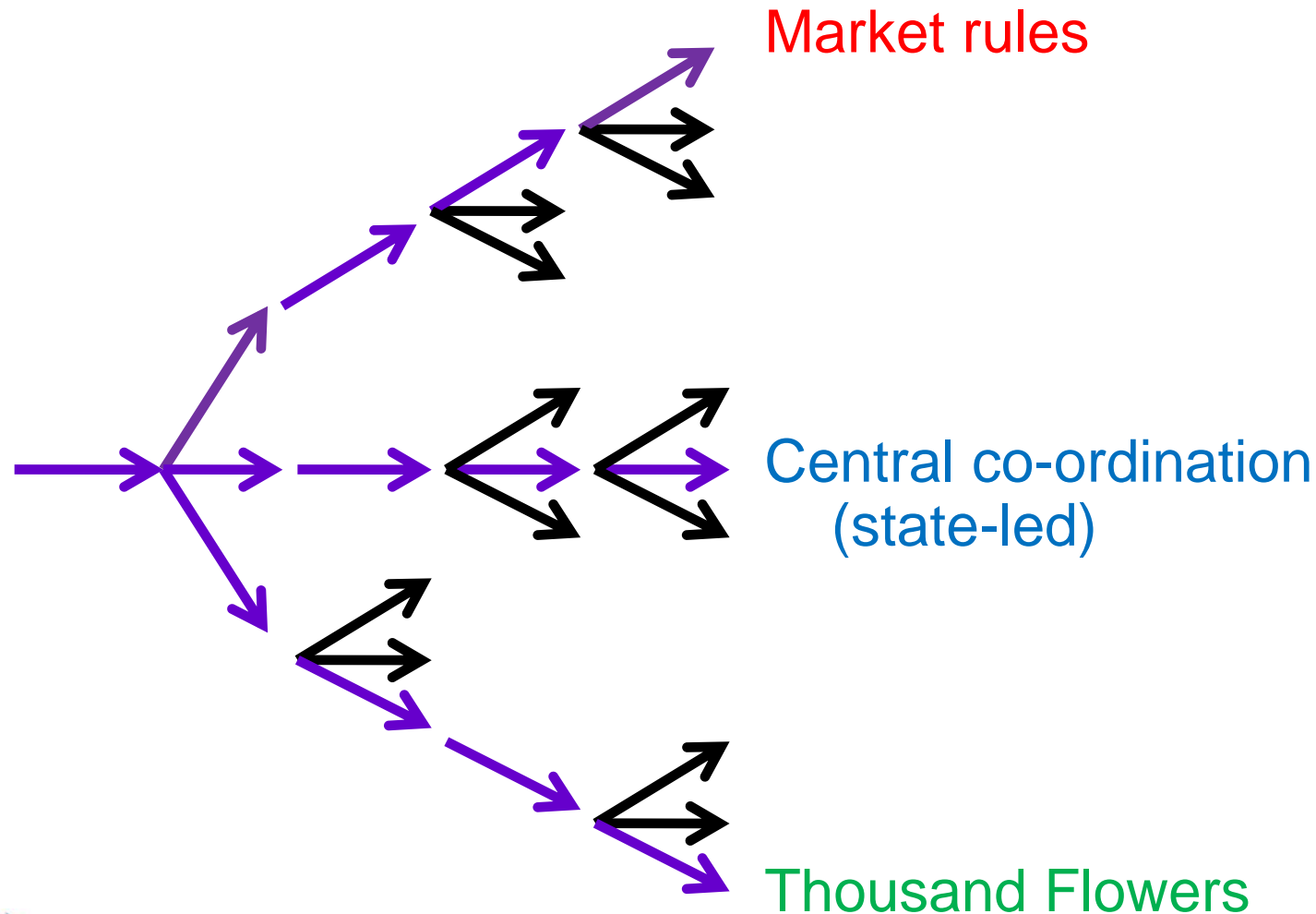
Source: Jacquie Burgess & Tom Hargreaves –
Transition Pathways Project (see Foxon, T.J.
2013)

- ◆ Choices depend on actors' competing 'logics': messy, dynamic, interactive
- ◆ Action-space maps shifting relationships
- ◆ Via their *interactions*, each actor tries to 'enrol' the others in their logic
- ◆ The dominant actor – i.e. best 'enroler' - defines that period's action-space
- ◆ Influencing the pathway & its branching points
- ◆ UK recent move from the market towards the state logic – a 'hybrid'
- ◆ With questions about civil society's role, especially in low carbon heat transition

The Action Space for Transition Pathways



Three Core Pathways & Governance Modes



Three Transition Pathways for UK Electricity

1) *Market Rules*

- Limited interference in market arrangements; high carbon price
- Large companies dominate; big technologies in 'highly electric' future – inc. coal/gas with CCS, nuclear power, offshore wind
- 80% generation linked to high-voltage in 2050: grid reinforcement

2) *Central Co-ordination*

- Central government & Strategic Energy Agency commission tranches of low-carbon generation from big companies
- Via large-scale centralised technologies
- Cooperation & tensions between key actors

3) *Thousand Flowers:*

- More local, bottom-up diverse solutions led by ESCOs (big & small), local communities & NGOs: closer engagement of end-users
- Local leadership in decentralized options (50% share)
- Key technologies: onshore & offshore wind, renewable CHP & solar PV; 'smart grid' technologies to handle power flows

High level challenges for the UK Transition

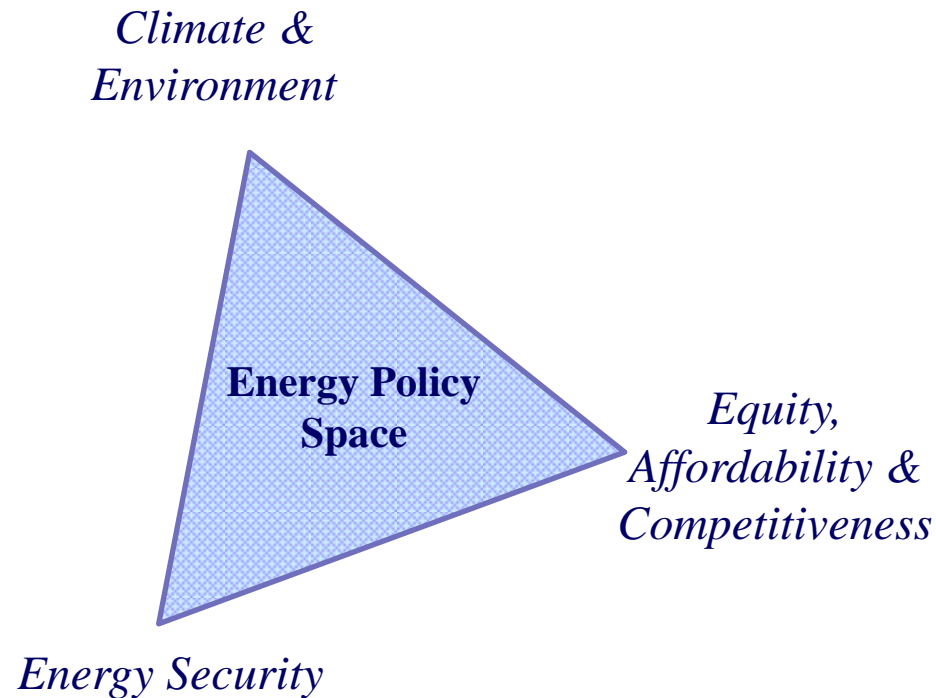
- ◆ **Balancing the Policy Trilemma:**
 - Reduce carbon emissions (UK territorial & life-cycle)
 - Maintain energy security (supply-demand balance, supply diversity)
 - Affordability, equity & competitiveness of energy services (investment & system costs; customer bills; trade)
- ◆ **Systemic factors:**
 - Technical feasibility
 - Institutional Flexibility
 - Social acceptability
 - Environmental impacts
 - Economic impacts - Who benefits? Who pays?
- ◆ **Evolving governance: where will the current State/Market hybrid go?**

A Perspective on Energy Transitions & 'Green Growth'

- ◆ Energy transitions & 'green growth' depend, inter alia, on the interplay within & between 3 'trilemmas':
 - Energy system governance trilemma
 - » The roles of the market, the state & civil society
 - Energy policy objectives trilemma
 - » Climate & Environment; Energy Security; Equity, Affordability & Competitiveness
 - Technology & growth trilemma
 - » Technological dynamism; wide range of general uses; users improve own technologies, find new uses
- ◆ The interplay of these trilemmas will exert major influences on energy transition & 'green growth' pathways & outcomes.

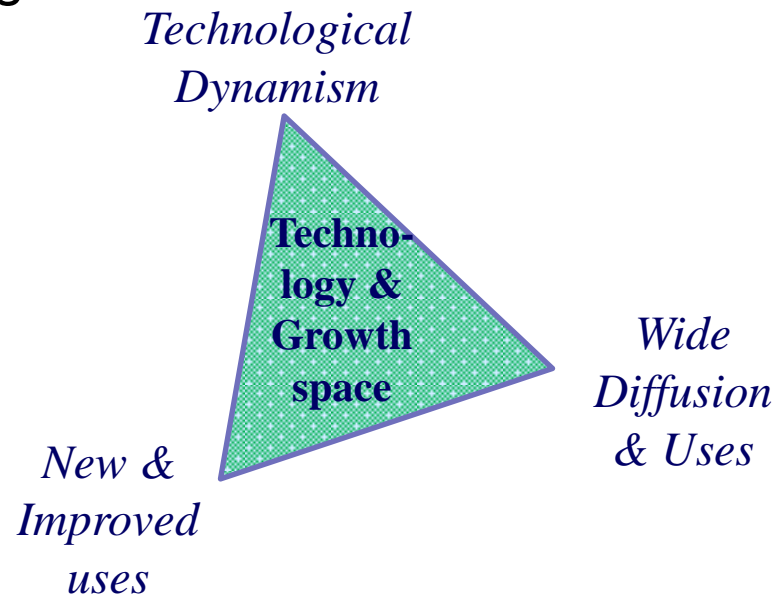
The Energy Policy Trilemma

- ◆ In the UK & other countries we have seen & will see changing priorities between these three objectives



The Technology & Growth Trilemma

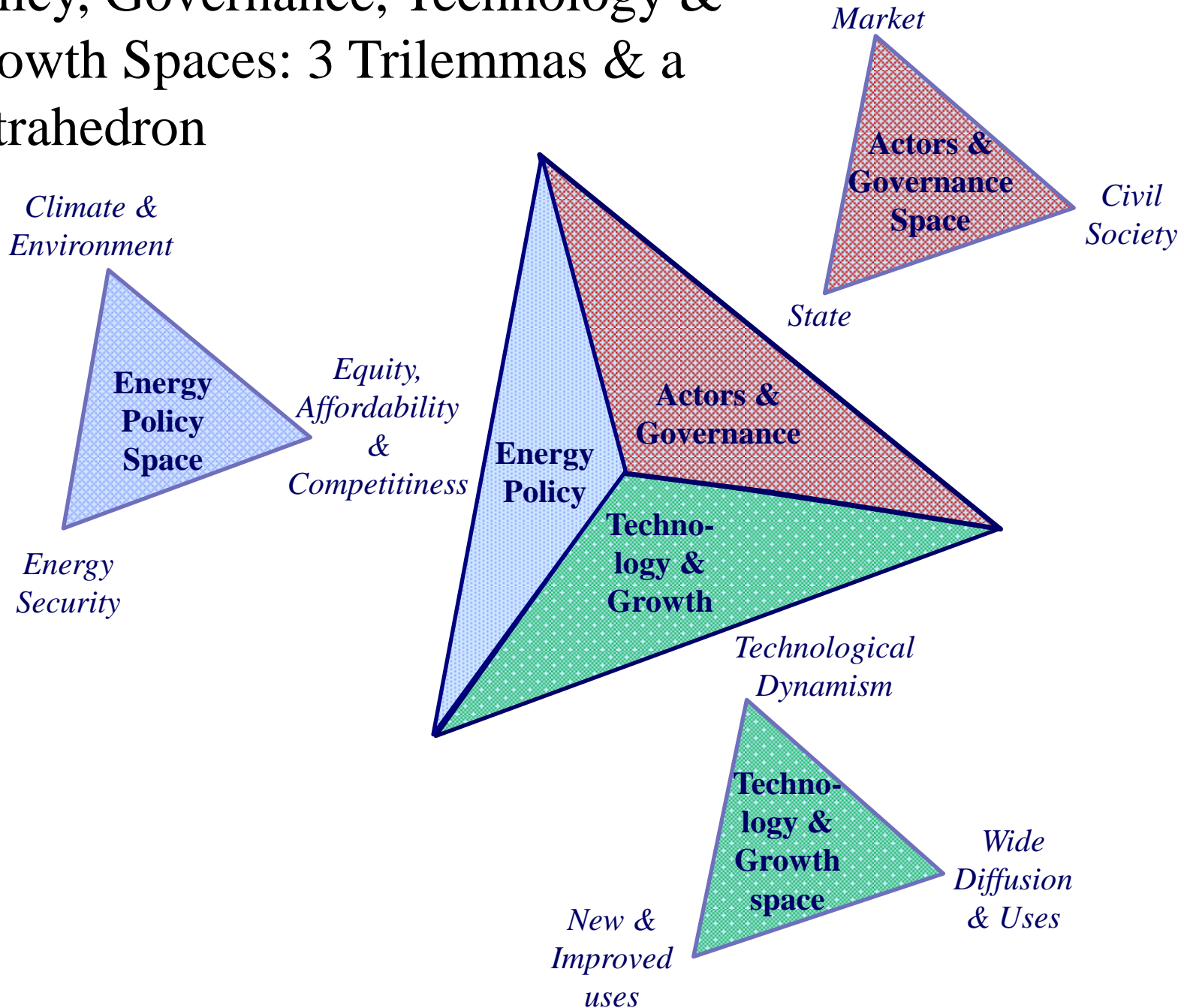
- ◆ General Purpose Technologies (GPTs) led to the sustained technical progress & growth of past industrial revolutions
- ◆ 3 attributes of GPTs (e.g. steam engine, electricity, ICE, ICT)
 - *Technological dynamism*: continued innovation - costs fall/quality rises
 - *Pervasiveness*: widely diffused & with many general uses
 - *Innovational complementarities*: users improve own technologies/find new uses



Bringing the trilemmas together

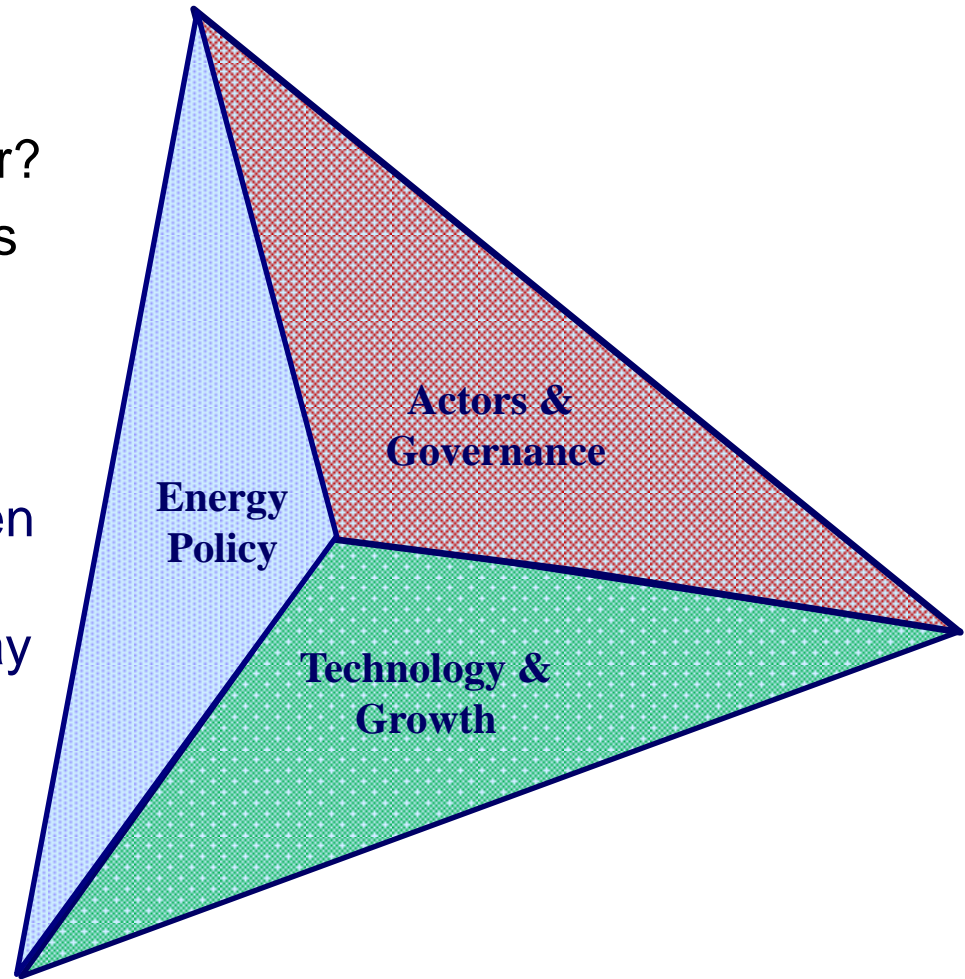
- ◆ Successful energy transitions & ‘green growth’ will be influenced by how a country handles these trilemmas
 - The ranking of its energy policy objectives
 - The logic & mode of governance it chooses & how it engages with key actors
 - The attributes of the energy supply & use technologies & practices it develops
- ◆ And by how these three elements interact with & feed back onto each other

Policy, Governance, Technology & Growth Spaces: 3 Trilemmas & a Tetrahedron



Policy/Governance/Technology Space

- ◆ This reminds us to think about
 - What should policies aim for?
 - Who aims & with what forms of governance?
 - With what technologies & practices?
- ◆ How might the interplay between energy policy, governance, technology & ‘green growth’ play out (locally, nationally, globally) in future pathways?



Conclusion

- ◆ Energy transitions & ‘green growth’ depend, inter alia, on the interplay within & between 3 ‘trilemmas’:
 - Energy system governance
 - » Roles of market, state & civil society
 - Energy policy objectives
 - » Climate & Environment; Energy Security; Equity, Affordability & Competitiveness
 - The attributes of energy technologies
 - » Technological dynamism; wide range of general uses; users improve own technologies, find new uses
- ◆ The trilemmas will exert major long-term influences on energy transition pathways & their outcomes
 - With implications for energy policy & industrial policy

Note: This presentation draws on research by the author & colleagues in the *Realising Transition Pathways project*, funded by EPSRC (Grant EP/K005316/1) <http://www.realisingtransitionpathways.org.uk/>. He is responsible for all views stated.

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