Delivering the Energy Transition

In theory and practice..

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Part 3: Policy integration, valuing and conclusions

Part 1: The Triads of Energy Policy
Part 2: Electricity technology trends and UK experience
Part 3: Policy integration, valuing and conclusions
- UK Pillar I & III policies – sketch
- Technology trends – renewables and systems
- UK Energy Market Reform
Reprise 1: The Energy Trilemma

Security
- System resilience, concentration, geopolitical risk

Affordability
- Fuel poverty, disconnected, ‘industrial energy prices’

Environment & Sustainability
- Air quality, climate change, minerals extraction and water

Transformation policy & valuation
For problems which span from
- the inattentive decision-making of seven billion energy consumers, to
- long-term transformation of vast and complex infrastructure-based techno-economic systems

To date, far more progress on energy efficiency and technology / renewables etc policy than carbon pricing
No policy pillar on its own offers credible solution
– nor offers a politically stable basis for policy

- Energy efficiency policy on its own limited by:
  - Scale of intervention required
  - Growing scale satisficing behaviour
  - .... Leading to large Rebound effects

- Pricing on its own limited by:
  - Blunt nature of impacts First and Third Domain impacts
  - Rising political resistance to rising fuel bills
  - .. and competiveness concerns

- Innovation on its own limited by:
  - Lack of demand pull incentives
  - Scale & risks of investment costs
  - Political failures in absence of rising market feedbacks
Planetary Economics, Ch 12 conclusions: Fig. 12.3 Public and private returns in the 3 domains

Different pillars have complementary roles

- **Pillar I**: Smarter choices
  - 1. Private returns >> public returns but not realised
  - "Standards and engagement"

- **Pillar II**: Cleaner products and processes
  - Markets and prices to align private and public returns
  - Faster innovation makes Pillar I policies more important and facilitates Pillar II

- **Pillar III**: Innovation and infrastructure
  - 3. Public returns (including innovation, security & environment) >> private returns
  - "Strategic investment"

Resource Use / Energy & Emissions vs. Economic Output / Consumption
Spanning the innovation chain..

Money =========⇒

At rising scale (Pillars II and III)

Low innovation, little connection between innovators and markets
R&D intensity < 1% (eg. energy & construction)

PE Figure 9.7. Innovation intensity & the broken chain

⇒ ======== Markets
Pillars I and II (strategically growing)

• We have gained extensive experience of policies to span innovation chain
• Need integration between public and private, & strategic investment and markets
• Infrastructure important as the technologies expand – need to overcome lock-in
• International technology cooperation can enlarge the market and amplify the benefits
Need to integrate across all three pillars:
- Enhanced efficiency
- Cleaner products
- Innovation and infrastructure

And harness this for *social and industrial strategy*
- Lower resource costs
- Proper valuation of energy and materials with a longer term view
- Accelerate innovation for competitiveness

**An integrated package**

**POLICY PILLARS**

- Standards & Engagement
- Markets & Prices
- Strategic Investment

**Values, pull & preferences**

- Manage bills, increase responsiveness
- Revenues, revealed costs, strategic value
- Attention, products & finance
- Technology options & competitiveness
- Education, access & control

Planetary Economics Chapter 12: Figure 12-4 Potential joint benefits in energy and climate policy
First and Third Domains have important characteristics in common

- *Non-linear* responses
- Not inherently optimising
- Substantial divergence between private and public returns
- In energy sector, changes dependent largely on government policy
- Progress largely irreversible (for implications of this, see Annex to book)

But they are very different in:
- Underlying processes and key actors
- Timescales & Scale of investment risks
Alignment between Three Domains

.. and many other works eg. *New Climate Economy* & evolutionary econ

- **Suggest multiple routes to ‘co-benefits’**

<table>
<thead>
<tr>
<th>Domain &amp; Pillar</th>
<th>Co-Benefits</th>
<th>Integration</th>
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</thead>
<tbody>
<tr>
<td>Standards &amp; engagement for Smarter Choices</td>
<td>Enhance efficiency, Indoor and local health, Increased resilience to resource volatility</td>
<td>Resource Efficiency</td>
</tr>
<tr>
<td>Prices and markets for Cleaner products and processes</td>
<td>Stabilise investor confidence, revenues, air pollution &amp; energy security</td>
<td>Motivate Stabilise Coordinate Finance</td>
</tr>
<tr>
<td>Strategic investment for Innovation &amp; Infrastructure</td>
<td>Accelerate Innovation in weak sectors, coordinate supply chain &amp; infrastructure</td>
<td>Sustainable economic progress</td>
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*Planetary Economics Chapter 12: Figure 12-4 Potential joint benefits in energy and climate policy*
The ‘narrative’ around carbon pricing ... 

Must change!

• Not an abstract (externality pricing) but an *instrumental* rationale
  – Investment as well as operational incentive
  – A source of funding for energy efficiency and innovation programmes
  – A political narrative based around stability of energy expenditure

• More tools in the toolbox, including carbon-backed contracts, reference and internal carbon pricing

• Key design elements for market carbon pricing
  – A price corridor on emissions trading
  – Linked with technology strategy
  – Energy-intensive industry, carbon leakage concerns potentially addressed through trade linkages and/or carbon pricing on material consumption
  – ‘carbon leakage’ increasingly offset by ‘clean technology diffusion’

*With a basis in international strategy / coalition implementation of PA*

• A coalition of countries strengthening their NDC commitment in 2020?
• Coordination of price, technology investment and trade approaches?
A rising base carbon reduction value *could* contribute *across* Domains:

| 1. Attention effects and funding | • rising steadily enables efficiency to keep pace and stop much rise in total bills  
|                                | • efficiency programmes can counter regressive concerns |
| 2. Rising price differential     | • steadily reduce use of coal in power generation without huge asset stranding  
|                                | • help to move renewables over time from transitional subsidies into mainstream market |
| 3. Long term visibility and leverage | • increased investment stability  
|                                  | • time and leveraged funding for innovation, infrastructure and tech transfer programmes |

.. To help drive the *risk transition* from clean on to dirty fuels
Conclusions: Theory

• The answer to Laurence’s question is that economics helps when applied within the boundaries of a given theory, but can hinder when it tramples across them.

• Fully understanding the Three Domains inevitably must draw also on other disciplines:
  - **Social and psychological** dimensions of risk perceptions and First Domain behaviours.
  - **Engineering and physical determinants of** Third Domain innovations and infrastructure.
  - The **regulatory and institutional** dimensions of both.

• And there is a wider analogy to be drawn ..
Conclusions: Practice

- 21st Century energy systems will be radically different from 20th Century
- Understanding transition on this scale means broadening economic horizons to all three domains and associated pillars of policy
- Transition is already under way, so far driven far more by the non-pure-market policies
- Aggregate cost impacts (eg. Germany) pushed to the limit of this approach, but resulting technology cost reductions place the transition within reach of global development and more balanced policy packages
- Clear policy direction can shift risk and lower finance costs
- ... including new roles and narrative for carbon pricing
Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development

1. Introduction: Trapped?
2. The Three Domains

Pillar 1
• Standards and engagement for smarter choice
• 3: Energy and Emissions – Technologies and Systems
• 4: Why so wasteful?
• 5: Tried and Tested – Four Decades of Energy Efficiency Policy

Pillar II
• Markets and pricing for cleaner products and processes
• 6: Pricing Pollution – of Truth and Taxes
• 7: Cap-and-trade & offsets: from idea to practice
• 8: Who’s hit? Handling the distributional impacts of carbon pricing

Pillar III
• Investment and incentives for innovation and infrastructure
• 9: Pushing further, pulling deeper
• 10: Transforming systems
• 11: The dark matter of economic growth

12. Conclusions: Changing Course

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http://climatestrategies.org/projects/planetary-economics/
6-page ‘Highlights’ paper available

for further information #planetaryeconomics