Professor Karen Turner Economy wide effects: the macro economic impacts of energy system changes Smart Energy Forum Glasgow, 7th October 2016

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EPSRC EUED project 'Energy saving innovations and economy-wide rebound effects' http://cied.ac.uk/research/impacts/energysavinginnovations

Rebound effect? Economic responses to increased energy efficiency reduce *actual energy savings* relative to *potential* from a engineering perspective.....key issue: result of 'multiple benefits of energy efficiency' (IEA, 2014)

Project partners: EUED CIED centre at Sussex and Fraser of Allander Institute; external collaborators on different WP



FRASER OF ALLANDER INSTITUTE



Centre on Innovation and Energy Demand



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GHG

Energy

security

Energy

delivery

Energy

prices

Macro-

economic

impacts

Industrial

productivity

Multiple benefits?



IEA (2014), Capturing the Multiple Benefits of Energy Efficiency, OECD/IEA, Paris.



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Modelling multiple outcomes and benefits

- Multi-sector economy-wide models
- Energy Saving Trust input-output (IO) models to estimate ripple or multiplier effects in economic output and job creation resulting from investment in *making* energy efficiency improvements
- Scottish Government wider use of IO models to consider multiplier effects of range of investments and demand changes
- Scot Govt. and HM Treasury embed IO data in more sophisticated computable general equilibrium (CGE) models to consider fuller economic and fiscal implications of wider range of changes in economic conditions
- Our project CGE modelling to consider
 - Productivity-led expansion of increased efficiency in industrial energy use
 - Demand-led expansion of increased efficiency in household energy use



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Energy efficiency has lasting stimulatory effects

- Our recent policy brief <u>http://strathprints.strath.ac.uk/57955/</u> and blog -<u>https://www.strath.ac.uk/research/internationalpublicpolicyinstitute/ourblog/</u>
- Scottish Government inclusion of investment in energy efficiency in post-Brexit economic stimulus package
- Initial focus output and job creation triggered by building activity to make homes and public buildings more energy efficient
- Our research shows that further, and lasting, economic stimulus generated by what happens once increased efficiency takes effect
- Increased disposable household income
- Savings from lower energy bills can be spent on other things

Increased efficiency in household energy use



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'Positive'

- Likely GDP ↑
- With employment ↑ unemployment↓
- Household income and expenditure ↑
- Government revenues likely to ↑
- Gross investment/ capacity likely to ↑
- But change in composition of demand may involve lasting 'crowding out'

'Negative'

- Productivity unchanged
 - Though reduced wage demands may mimic through reduced (labour) input costs in production sectors?
- Prices? competitiveness?
- Exports?
- Domestic demand 'crowding out' export production and value-added in some sectors?
- Potential energy supply 'disinvestment'
- Rebound in macro-level energy use and associated emissions (possibly dissipating over time)

Increased efficiency in industrial energy use



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'Positive'

- GDP ↑
- Employment ↑ Unemployment↓
- Household income and expenditure ↑
- Government revenues[↑]
- Productivity ↑
- Prices ↓ competitiveness ↑
- Exports ↑
- Change in composition overall activity, but
- Gross investment/capacity ↑ (possibly crowding out if capacity constraints even if only short-run)

'Negative'

- Potential 'disinvestment' in type of energy supply affected
- Rebound in macro-level energy use and associated emissions (possibly dissipating over time)



But a broader argument.....

- Crucial to recognise that energy supply related activities are economic service activities
- Too often assessed only in terms of technological characteristics and (often high) costs of introducing
- A real handicap when competing with other demands on public budgets/support in policy environment of multiple competing priorities
- CCS Commercialisation Competition as an example of a recent casualty?

Turner and Race (2016) UKCCSRC Bi-annual conference



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"HM Treasury raised concerns about the merits of the carbon capture and storage competition given fiscal constraints"

'Briefing for the House of Commons Environmental Audit Committee' by the National Audit Office, July 2016 (page 7)

Analysis:

It is considered that this decision was reached because there were key omissions in the information provided to Treasury:

- The wider economic and fiscal case not made
- The near-term benefits were not argued *e.g.* employment in developing infrastructure
- The longer term benefits of establishing an economic service activity were not considered

How can we do this:

- Need to consider case for CCS via *social* cost benefit analysis
- Need to include carbon capture, transport and storage as economic service activities
- Need to inform wider economy models with techno-economic data of the CCS system

'Power cable will generate £640million'

Economy: SSE hails creation of jobs

BY STAN ARNAUD

Construction of a new power transmission cable linking Caithness and Moray will boost the UK economy by more than £640million – according to a report published by the company behind the project.

Power giant SSE says the

nomic contribution made by the project, SSE says $\pounds 643.5$ million – almost two-thirds of the total investment – will be spent with UK-based suppliers and contractors.

Of this, £265.5million will be contributed to the Scottish economy.

In total, the company





Changing the narrative:

CCS as an economic service activity?

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We need to think about CCS as more than a costly technology: Can we look at capture, transport and storage as economic service activities? Economic sector(s) where CCS treated as a 'cleansing' industry.

CCS as a form of waste disposal for CO2

- * How do capture, transport and storage activities link to each other and other industries (inputs to/outputs from CCS sectors)?
- * Input-output model of Leontief (1970) applied to waste disposal by Allan et al (2007)



- * Distinction waste collection, management and disposal of an existing industry. Standard industrial classification (SIC)
- * Further potential analogy recycling of waste \leftrightarrow utilisation of CO2?



Conclusion

- Need to recognise and communicate a full range of wider economic and fiscal benefits of developments in energy supply....
-and in enabling more efficient energy use
- At both infrastructure development and 'operational' stages
- Optimisation is not enough!
- And it is not the whole story in any case
- HM Treasury recognising investing in developing their CGE model to better consider energy system issues in the wider context of the economic system



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Contacts, web-sites

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EPSRC project web-site (including Policy and Research Briefing downloads): http://cied.ac.uk/research/impacts/energysavinginnovations

CEP web-site:

https://www.strath.ac.uk/research/internationalpublicpolicyinstitute/centreforenergypolicy/

IPPI policy papers:

https://www.strath.ac.uk/research/internationalpublicpolicyinstitute/ourpolicypapers/

IPPI blogs: https://www.strath.ac.uk/research/internationalpublicpolicyinstitute/ourblog/