

Across Scales in Energy Decision Making (ASCEND)

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The Ascend Edinburgh workshop involved an invited audience of over 50 people from across policy, research, business and third sector organisations, and from local, Scottish and UK-wide organisations. A detailed agenda and speaker presentations are available from: <http://www.climatechange.org.uk/reducing-emissions/across-scales-energy-decision-making-ascend-workshop>

Session 1 – Model linking across scales

Energy research and modelling activity in the UK has proliferated over the past decade, and a similar expansion is now being seen in Scotland. Each new model and research initiative brings new insight, but also adds to an expanding evidence and expert base, at a time when the Scottish Government is seeking an integrated and managed approach to the energy transition. This session considered how national ‘whole systems’ modelling can be linked to local & city scale modelling, and to more detailed sectoral models for power, transport, gas and heating.

The questions addressed were:

- *Why do we need to link models across scales and sectors? What are the relative strengths and weaknesses of whole systems models, local / city models and sectoral models?*
- *What are the key enablers and barriers to effective model linking across scales (model design, data availability, etc.)?*
- *What emerging research is being carried out on model linking across scales? What represents good practice for model linking across scales?*

There was general support for efforts to link energy system models across scales (ideally, using the same model type and data):

‘there does need to be links across scale ... [with] common assumptions in the different locations’

‘[it’s] good to capture dependencies across sectors’

However, this general support was conditional on an awareness of the deep challenges involved, and also, the need for an explicit upfront statement of the *aims and rationales* involved in model linking efforts:

‘there needs to be a goal or purpose if [model] linking is to be carried out’

‘there needs to be a link between the interdependencies and the critical issues. What is the question the modelling is there to help us answer?’

The divides and challenges involved are *political and institutional* as well as *technical and economic*. For example, the Scottish Government is keen to develop its own sense of the integration of the Scottish energy system, with the rest of the UK energy system defined as outside the primary system (referred to as a ‘Scotland first’ approach).

‘what is optimal for Scotland might not be optimal for [the] UK [and] EU’

A number of comments noted the likely significant differences between the analytical (perhaps techno-economic) logics of modelling integration across scales, compared to the policy-political-institutional logics.

For some, a divergence was also apparent between (independent) researcher and policy-maker perspectives, with researchers tending to represent a holistic view of energy system integration across scales which doesn't well reflect policy and political divides (and responsibilities) across scales.

One general issue was finding a balance between on-model and off-model analysis and policy development, with models *informing* policy formation but not *dictating* the terms of policy formation:

'models [are] tools to help inform policy, [not] drive policy'

'it's about directing discussions not dictating what should happen'

Within government, others noted the differing interests and approaches of *analytical* and *delivery* teams, and also, of national and local government.

'Decision makers are not expert in the outputs of models ... there needs to be better communication between those using models to make decisions, and those affected'

Perhaps inevitably, different parts and levels of government have different sets of policy priorities, and these cannot be reflected by a single model logic or an agreed imperative around energy system integration

'Those that are doing modelling at government level are a step away from the actual 'doing' (delivering projects, investing)'

'National and local modelling will get different results'

'[a single] 'Super model' doesn't feel like the right answer ... a number of different models would be better'

'If we try to cram too much into models, they lose their purpose'

The challenges of divides across different scales of government are especially acute in Scotland at the moment, in the context of local heat planning initiatives running alongside national energy strategy development – with local planning being developed around economic growth and social equity drivers, with decarbonisation perhaps playing a less dominant role. Many – though not all – of the workshop participants highlighted the need for analysis which better reflected local priorities.

'on the local level, social issues become more relevant than technical'

'can we get to a stage where we have models that help in more local challenges?'

'[the] GB perspective might look at net costs across the country, as opposed to equality across and within groups; to what extent is equality a [modelling] principal?'

In terms of *good practice* in systems modelling and model-linking, a series of related observations and recommendations were made, including:

(i) The need for more explicit attention to the *specific strengths and weaknesses* of different models, especially TIMES-based whole systems modelling:

'We need to be aware of our model's weaknesses before linking across scales; understanding of weaknesses is beginning to increase'

'TIMES is seen as magic black box, and magic bullet; its replete with weakness ... it misses whole swathes of cost, such as local level grid replacement'

'TIMES can't answer every policy question: for fuel poverty, [it] says nothing about who pays for what'

(ii) An often poor treatment of uncertainty in using prevalent TIMES system models:

'Lots of modelling frameworks are now pretty outdated [in that they are] optimised and linear; MARKAL was born some time ago'

(iii) The difficult balance between complexity and simplicity in systems modelling, with a concern that a tendency toward more data and more model complexity may make analysis less transparent and more resource demanding:

'the more complex [the model] and the better the data, the more resources that are needed'

'a larger model makes it more difficult to understand the world'

'Data inputs need to be high quality, not necessarily high quantity'

'[there's] no point building something that will be too expensive to maintain; ultimately finance [for modelling support] is a fundamental issue'

Systems models were also seen by some as being poorly equipped to address shifting policy agendas, including decentralisation / localisation, social acceptance and an increasing emphasis on energy demand and efficiency in overall system change:

'demand is harder to model than supply'

'in the world of increased energy efficiency there is more uncertainty'

Session 2 – National Heat Strategy and Local Heat Planning

Heating for buildings has become a priority area for UK energy policy, and this has been especially the case in Scotland. However, there is as yet little agreement on the future of heat: a range of solutions are proposed, varying across timescales (shorter or longer term change), geographic scales (national and local), vectors (electricity, gas-based and heat networks), and relative focus on demand-side and supply-side change. The key questions addressed were:

- *How should Scottish strategies be developed alongside UK strategy, and international and local developments? Who are the appropriate 'system planners' for the heat transition?*
- *How should responsibilities and resources be distributed within Scotland, between national and local / city authorities?*
- *What represents good practice in this area? Does international experience suggest a way forwards for Scottish and UK contexts, given different starting points and governance capacities?*

Discussion reflected the perceived differences between Scottish and UK Governments in developing their heat strategies, and the varied ambitions and accountabilities involved:

'[The] Scottish Government wants to be seen ambitious – but there are doubts whether they can really ... come up with a new approach. There is an accountability factor ... the Scottish Government may be ambitious and blame on the UK Government if they don't manage to deliver on their targets.'

'BEIS [is] potentially determining what happens [in Scotland] with the grid ... [is there] any way to shift further powers here [in Scotland]?''

'[There is] tension between UK and Scottish Governments in energy strategy ... [we need] common projections ... [to see] what might happen across whole system'

'Scottish decision-makers [are] 'waiting' for UK [policy on heat]'

'Costs would be higher if Scotland is the only one pursuing [the heat transition]'

At the same time, there was also recognition of the systematic uncertainties of the low carbon heat transition, across the UK as a whole and Scotland in particular. Ordering these uncertainties and priorities is a formidable challenge, both analytically and politically. Politically, there was concern about the cost and affordability (and therefore the political feasibility) of the proposed Scottish heat transition:

'There's not enough in the [Scottish energy] strategy on affordability: [it's] taken the old place of heat as something said but not done anything about'.

'District Heating is part of the solution, but it is not at the top of the hierarchy. A lot of this is politically driven – that is often the driver.... If we say to people if you come to Scotland you have to use a certain type of fuel, what implications does this have for economic issues?'

Compared to electricity and gas, which are highly regulated at a UK / GB level, heat (and heat networks) are seen by some as an opportunity for a more Scottish-based approach to the heat transition:

'The fact that currently no one is responsible for heat regulation is an opportunity to re-discuss roles and rules'

Analytically, one challenge is seen as understanding the pros and cons of more radical versus more incremental pathways for heating:

'few [models] have gradual change; [we] need to account for abrupt changes and tipping points'

'we need to base [heat futures] on what we know about technology today. The solutions may be different, but we just have to base on what we know'

'Gas network operators are scared of a future with under-utilised [assets], which would have substantial implications for how the gas grid is funded'

There was some concern about the apparent lack of public awareness about heat energy policy, and the prospective transformation of UK buildings heating over coming decades. For some, this represents a significant policy risk, and something that needs to be addressed before robust analysis and policy can be established:

'consumers not even aware that these conversations are taking place.'

'Hydrogen, and maybe other technologies, haven't reached the public discussion phase, and when they do their future may be altered'

'From a systems-modelling perspective, [there are] challenges in modelling consumer engagement'

Different workshop participants drew different lessons from this lack of consumer / public awareness. For some, it suggested the need to pursue a heat pathway which involved minimal disruption to households:

'Hydrogen makes sense because there is no difference for the householder between the current set up'

Others argued for making the issues more visible, especially at the local level, in order to build citizen awareness and support

'Fuel poverty is quite a local issue ... because the consequences are locally visible'.

'you see clusters of [change] ... people go 'oh!' ... Send leaflets about how people are doing in your area'

Much of the discussion in this session addressed the appropriate role of local authorities in heat strategy and heat planning – and the links between local and national strategy. There were some suggestions that heat strategy was an inherently local-scale matter, best addressed (analytically and politically) at a local scale:

'Heat has a dependency on local issues'

'Clearly much of the delivery has to sit with local authorities'

'[we need] better understanding at the local level ... [but] are there the resources – finances, expertise and legislative power? ... support programs from higher levels of government are crucial'

At the same time, there were also suggestions that localisation of the heat problem was not desirable, and could create new inequalities and added costs:

'Things can be pushed too far down to local authorities. Some decisions need to be local, but tools need to be national, if nothing else to support consistency.'

'Big changes to the heat system are not necessarily suitable for local authority control'

'By having local and national roles are we duplicating costs?'

'Centrally planned solutions might bring more equitable solution[s]. Heat decarbonisation needs centralisation'

'To reach climate targets, the city could be the cheapest way to do it and ignore the rest of the country. [it's] effectively neglecting large groups of the population'

'if decisions made locally, will authorities be competing for limited resources'

'there are big difference between ability of city local authorities and some smaller, rural authorities'

Some saw an alignment of national and local interests and resources as the best way forwards:

'[heat planning] is better [given] to Local Authority business structures, but capacity and funding? It should be two way: support from Scottish Government [and] initiative from Local Authorities'

'Local authorities are part of the solution, but the resource has to be scaled'

Session 3 – System Pathways and Local Pilots

Heating for buildings in the UK has seen relatively incremental change since the switch-over to natural gas in the 1960s and '70s (although carbon emissions from buildings heating have reduced significantly over the past 20 years). Heating may see more dramatic changes in the coming decades, and a number of pilot and demonstrator studies are getting underway on low carbon heat systems. The key questions addressed were:

- *Given that pilot and demonstrator studies are generating new evidence and insights on the future of heating, how can long term plans and pathways be reconciled with a changing evidence base?*
- *What is the balance between 'keeping options open' and making strategic choices around 'decision points' on the future of heat infrastructure?*
- *What represents good policy practice in this area?*

The discussion in this session revealed different objectives of pilot studies: for example, either helping decide which options to pursue among a set of alternative possibilities, or learning how best implement a particular solution? There are also a range of technical and social opportunities for learning from pilot studies:

'How do you decide if a pilot has failed? In relation to energy efficiency, reduced carbon emissions and energy use is an obvious proxy, but there is a decision to be made in terms of objectives – is carbon reduction more important or social issues?'

'what is the most important thing from a pilot? [optimal] climate change solutions? [or] the acceptance of the people?'

Some criticised a lack of rigour in pilot evaluation, both technically and socially:

'Evaluation and dissemination is not built in'

Social evaluations and trials are important, but [they are] usually treated as secondary evidence'

'The learning process from pilots must also extend to users and practitioner communities'

From a system (and system modelling) view, a key challenge from pilot study evidence is understanding 'scalability' – i.e. the implications from local trials for system transitions, and the complex interdependencies between local pilots and existing national infrastructure:

'The difficulty with a small scale pilot is the scalability issue'

'things [are] very dependent on geography; different places may use different kinds of gas, for example.'

'regarding electricity sector [transition], [we] need to align with transport – for example, electric vehicle uptake'

There was some difference in terms of the desirability and feasibility of drawing on local pilot evidence for system-wide analysis and modelling:

'local pilots don't tend to get picked up by national modelling'

'[you] can't extrapolate [from] pilots to national levels'

'learning from demonstrators can be built into models – for example, hydrogen [trials]'

There was also discussion of the challenges of identifying pathway 'decision points' in a fast-moving technical and economic (as well as political) context, and the limited ability of pilot studies to ameliorate this problem. Identifying decision points was seen as more feasible in some areas (such as efficiency and refurbishment) than others (such as low carbon heat infrastructure):

'To manage uncertainty you want to leave those decisions as late as possible to avoid making a bad decision. Carbon budgets can push the timescales for that.'

'The pace of technological change is a major barrier to upscaling pilot projects'

'You need to look at taking the best decision within the uncertainty ... 'keeping options open' means you may not know when to take a decision'

'When will you know when to go on hydrogen?'

'Some decision points are well known – domestic energy efficiency fits with renovations'

Finally, there was also some concern that pilot studies were often designed on a non-commercial basis, perhaps setting up unrealistic expectations within policy-making on commercial uptake, and also, for creating dependencies on public funding for non-commercial technologies:

'[there's] government and policy on one hand [and] commercial and private sector on the other; what government is thinking about what it wants to do ... might not be what business wants.'

'Commercialisation ... is what worries me. Scottish Government fund a lot of pilot demonstrators at the moment ... There is pressure to keep doing this, but there are only so many projects that can be funded. Not all the projects are going to work ... Scottish Enterprise don't even think about this problem. Businesses are coming back asking for more money to replicate their success.'