

*'If it hasn't been done in Aberdeen, it's not worth doing':
Governing Change in Urban Energy in a Northern UK City.*

Janette Webb

*University of Edinburgh Institute of Governance,
School of Social and Political Science.*

Jan.Webb@ed.ac.uk



International roundtable seminar, Gif-sur-Yvette, Paris, 16-18
September 2013

'If it hasn't been done in Aberdeen, it's not worth doing': Governing Change in Urban Energy in a Northern UK City.

Abstract

This paper uses a case study of urban energy governance in a northern city to examine the challenges and schisms integral to concerns over climate change and clean energy, in the liberal democracies characteristic of Anglo-American consumer capitalism. Aberdeen, North East Scotland, is known for its role in the global exploitation of North Sea oil and gas, but it also has a local non-profit, energy company supplying heat and power to social housing and public buildings. This is exceptional in the UK context where liberalised energy and complex state regulation on the one hand, and the deregulation of finance and globalisation of markets in technology and fuel supplies on the other, have created extremely challenging circumstances for development of independent, low carbon urban energy suppliers. How then can the apparent anomaly of a community energy company be explained? Its development is not the outcome of planned systemic low carbon transition. Neither is it attributable to the local political economy of a city with global oil and gas industry investors. Indeed the industry is instrumental in the high levels of inequality which make Aberdeen the most unequal city in Scotland. Neither is there a cohesive regional commitment to a low carbon economic transition.

The phenomenon of Aberdeen urban energy is hence far from a predictable outcome of cohesive top-down, or even bottom-up, carbon and energy transition planning. Rather it is simultaneously the product of civil society social movements, intersecting multi-level governance institutions and their disparate politics, emerging climate protection policies and chance coincidence. The sociology of situated practice, improvised learning and bricolage are used to interpret the process of project development. In conclusion, the paper reflects on the scope for urban actors to shape the transformation of the high carbon energy system in ways that give significance to public goods of social justice, resilience, and mitigation of climate change.

Introduction

The recent development of locally-owned and controlled energy services in the Scottish city of Aberdeen offers a means to examine the political-economic schisms and social dynamics which characterise urban plans for energy saving and development of low carbon energy in the face of climate change. It highlights questions about energy governance, and resulting shares of costs and benefits, in the liberal democracies characteristic of Anglo-American neo-liberal capitalism.

Aberdeen is a small city (population 220,000) in North East Scotland, with a long history in merchant shipping, food processing and fishing industries, now much reduced in significance. Reconstruction of the urban centre and harbour area as a business services centre for global exploitation of North Sea oil and gas overlays the historical traces of decline of its modern era shipping and fishing economy. The oil and gas industry has brought very significant financial investment to the area, but the wealth has been highly concentrated, contributing to Aberdeen becoming the city with the highest levels of inequality in Scotland. Fifteen per cent of households live in relative poverty, and the poorest are concentrated in multi-storey public housing, the majority of which is council-owned. In Seaton for example, one of the city's 43 districts, 80% of housing tenants receive welfare benefits. Aberdeen is thus a Scottish example of the contemporary city of finance-oriented capitalism, which is simultaneously a place with its own locally-stratified population, history, culture, and geography, and a dis-embedded trading hub in global markets, serviced by mobile expertise.

Its role in global oil and gas markets is the subject of significant research and investment (Kemp, 2011). Much less well-known is the presence of a locally-embedded non-profit energy company, Aberdeen Heat and Power Ltd (AHP), which supplies heat to the city council's social housing, and some of its key public buildings and community facilities. This small enterprise may seem unremarkable, unless you understand how extraordinary the presence of an urban energy business for local generation of heat and power anywhere in the UK has become. Although the first generation of energy suppliers were typically small municipal companies, urban authorities have had very limited roles in energy services for almost a century. The centralisation of electricity and gas supplies, driven first by regional rationalisation, then nationalisation in 1948, and subsequently by 1990s privatisation, has resulted in an energy system owned and controlled by a small number of large-scale, vertically-integrated corporations¹. The regulatory framework has prioritised short-term cost

¹ Known in the UK as the 'Big 6', these are British Gas Centrica, EDF Energy, E.ON, Scottish and Southern Energy, Npower and Scottish Power. They have a 98 per cent share of the household gas and electricity markets. Five are owned by transnational entities headquartered elsewhere.

efficiencies, with guaranteed returns on investment for transmission and distribution companies, but long-term issues of energy security and innovation for a low carbon economy are unresolved, and possibly made more recalcitrant under the current institutional structures (Bolton and Foxon, 2011; Meek, 2012; Mitchell, 2008).

While political commitment to substantive market reform at UK government level remains unresolved, urban authorities have been identified in policy making as significant intermediaries in the development of a clean, efficient and secure energy system (Hodson and Marvin, 2010). Their powers of government are for example evaluated as critical to achieving 2020, and longer term, carbon budgets (UK Committee on Climate Change (CCC), 2012)². Their particular contribution is typically identified with reference first to improved building energy efficiency standards, and second to potential for low carbon heat network infrastructure for communal supply of heating and hot water in densely populated urban centres:

‘Local authorities are critical players in increasing the deployment of heat networks as they can create a supportive environment... and support or sponsor specific projects’ (UK DECC, 2013: 50).

District heating (DH) and distributed power generation from combined heat and power (CHP) are established energy and carbon saving technologies in much of northern Europe, and their value is increasingly recognised in UK energy policy as a solution for low carbon heat in densely populated urban areas (DECC 2011; 2012; 2013). Deregulation of finance, and globalisation of markets in technology and fuel supplies, combined with UK regulatory and institutional structures designed to support private investment in centralised generation of high value electricity with no heat capture, and in mains distribution of gas, position the economics of CHP/DH as marginal (Kelly and Pollitt, 2010). Unsurprisingly, the development of decentralised energy businesses has thus far remained small scale and uneven.

² UK Committee on Climate Change (CCC) *How Local Authorities Can Reduce Emissions And Manage Climate Risk* <http://www.theccc.org.uk/reports> May 2012

Conceptualising UK Urban Authorities as Actors in Sustainable Energy Development

In addition, UK political economy is marked by long-standing divisions and low trust between state and local governments, and by political divergence between central government in London and the English regions, as well as the devolved governments of Scotland, Wales and Northern Ireland. Successive bureaucratic and fiscal reforms have progressively centralised budgetary control over local governments and restricted activities to those permitted by statute. Since the 1980s, UK governments have pursued a neo-liberal political project intended to make society approximate to the mainstream economics model of an efficient market (Crouch, 2011). This has been managed by increasing privatisation of large-scale public service infrastructures, and on-going marketisation of public services (Harvey, 1989; Ingham, 2008). Public-private partnerships and requirements of competition for shares of targeted funds and for private investment in prestige urban infrastructures have been established as the norm. Local powers of comprehensive territorial planning and regulation, and capacity to realise locally-defined collective goals and common goods are correspondingly circumscribed. Although UK devolution of government in 1999 decentralised powers over local government³, local finance and statutory duties continue to be tightly controlled by the respective governments in England, Scotland and Wales. The absence of significant statutory powers over energy services means that most authorities have little or no technical expertise, or capacity for governance of energy, and hence no established process where, for example, optimal area-based energy and spatial strategy is planned. Is it feasible then for *urban authorities* in the UK to shape distinctive strategies, in response to the complex web of sustainable energy, climate change and societal governance issues?

Two significant strands of theory have shaped the wider academic debate. The first is informed by a neo-Marxist analysis of the power of mobile finance capital in universalising and standardising processes of urban development around priorities of private capital. From this perspective, cities operate increasingly as

³ The fiscal settlement known as the Barnett Formula governs public spending in Scotland and Wales

nodes in a network of disembodied flows of expertise (Castells, 2000), disciplined by competition for mobile capital (Lefevre and d'Albergo, 2007). Carbon control becomes little more than a new discursive variant of branding and boosterism (Jonas et al, 2011). A second strand of debate, drawing on interpretative aspects of neo-Weberian theorising, explores the scope for locally-differentiated social interaction to contest, as well as reproduce, macro-economic change in modes of capital accumulation. This perspective conceives of the history and culture of different places as continuing to shape society and the distribution of resources. The continuing diversity of arrangements across European cities, Le Gales (2002) argues, represents different 'modes of governance' which characterise distinctive forms of coalition between market, civil and political interests, and correspondingly distinctive objectives. From this perspective, constrained powers and the inertia of existing socio-technical infrastructures are the circumstances which frame action potential for urban authorities, but such locales are not reduced to homogeneous spaces for capital.

The latter perspective suggests that any local energy initiatives are however likely to develop unpredictably, and there is evidence that local action has centred on incremental energy saving, rather than more radical innovation. In their UK/Germany comparison of local governance of climate protection, Bulkeley and Kern (2006) identified four modes of governing. In the UK most effort was concentrated on energy saving for the local authority's own buildings and transport; secondly some provision of energy efficient insulation for social housing had been developed; thirdly promotional and advisory activities were in place, and lastly building standards had been raised to improve energy efficiency. This suggests, in line with Jonas et al's (2011) conclusion that, although some urban authorities have prominent sustainable energy plans, these remain largely aspirational and may serve as little more than a variant of branding in competition for private investment.

It is however easy to elide the dominance of neo-liberal instruments of governance in recent UK administrations with an over-determined model of societal change. Urban social movements and local political coalitions have contested the claimed efficiencies and shared benefits of a market society, and

established the damaging impacts of competition and privatisation policies on social cohesion and economic stability. In addition, environmental politics has increasingly interacted with social democratic goals to contest the valorising of unlimited economic growth as a measure of the common good. Much of the political challenge to central state policies has been located with urban authorities across the UK. The Labour government elected in 1997, which largely followed the political-economic programme of its predecessor Conservative administration, was also responsible for some significant shifts in the balance of priorities between market, civil society and state domains of governance. Notably civil campaigns for participative democracy through devolved government were recognised in the establishment of a Scottish Parliament and Welsh and Northern Irish Assemblies. The societal harms of intensifying resource exploitation and corresponding environmental degradation were also formally established in the enactment of climate change legislation at UK and Scottish Government levels, with ambitious carbon reduction targets and penalties for carbon emissions.

In academic debate, an emerging 'urban political ecology' framework (Monstadt, 2009) has given greater prominence to research on the scope for local divergence from the economic status quo, in the context of 'complex geometries of power relations cutting across multiple scales' (Hodson and Marvin, 2009: 194). In the UK, central government may wish to maintain strategic control over local authorities, but they are simultaneously reliant on action at urban scale. Without mandates, and associated finance, for direct energy developments however, there is likely to be an impasse between local and central state authorities. Even in cities such as Berlin, with considerably more local powers than UK comparators, Monstadt (2007) concludes that officers struggled to identify and develop the necessary capacities: 'urban governance of energy systems in Berlin is characterised by... an institutional void: a lack of generally accepted rules, procedural norms and organisational capacities guiding policy-making to protect the public interest' (Monstadt, 2007: 340). Coutard and Rutherford (2010) document the struggles of the Ile de France regional authority in strategic planning for local sustainable energy and economic resilience, in the

face of established commitments to high-carbon economic growth, embedded in state governance and international markets. Nevertheless, Hodson and Marvin (2009) conclude from their case study of the London Hydrogen Partnership (LHP) that local actors played a role in mediating conflicting expectations and competing objectives of a progressive/inclusive local politics on the one hand, and a business-led 'exogenous' model of the city as a showcase for mobile capital on the other. In their recent analysis of the Manchester city region plans for low carbon energy transition, they conclude however that the apparent translation of local plans into a vehicle for delivery of the economic growth priorities of state and business interests is likely to prioritise capital accumulation over local shared benefits (Hodson and Marvin, 2012). To what extent are the forces of capital accumulation determining of emerging local clean energy projects? Or in their materialisation through particular practices and processes of social change, is there potential for governance diversity with different distributions of costs and benefits?

What Scope for Divergence in UK Urban Energy Governance

A sociological perspective on situated practice offers some insight into dynamics of social change against the grain of dominant political-economic structures, and associated hierarchies of value. My focus here is on the locally-particular divergence from a 'naturalised' high carbon political economy, social order and material infrastructure which marginalises localised (and low profit) energy and carbon saving technologies.

In the context of the UK variant of a liberalised energy system, an energy project which develops from the bottom up, and is led by end users rather than established suppliers, seems likely to be reliant, at least at early stages, on practices of community governance. When the legitimacy of action is uncertain, and governance through formal, codified technique, rules and contracts is lacking, then community governance remains as a non-monetised source of power and action capabilities (Bowles and Gintis, 2002; Tura and Harmaakorpi, 2005). The concept encompasses the potential for improvised learning through interaction (Portes, 2000): urban 'end users' of energy develop subordinated

forms of practice-based knowledge to engage with the formal abstract rules and rationalities of energy economics exercised by dominant market actors. This is a devalued form of knowledge in a monetised economy, because of its limited potential for significant financial returns (in this case for example in comparison with energy market investment for top-down, large scale technology-led innovation). Improvised knowledge requires the presence of relevant 'communities of practice' (Wenger, 1998) or 'social worlds' (Strauss, 1978) where formal and informal organisations and social movements intersect in mutually-acknowledged joint enterprise, with some repertoire of communal resources, and some sense of shared perspective. The concept of 'community of practice' has been coopted to serve a multiplicity of purposes, many of them losing sight of the original concern with understanding the formation of knowledge through applied reason, use and interaction (Amin and Roberts, 2008); here the intention is to use the concept to capture the emergent qualities of a project network (Law and Callon, 1992) where material change in energy provision requires the successful interweaving of locally-embedded 'knowing in action' with the necessary formal financial, legal and technical expertise.

The improvised learning and knowledge development entailed in generating such a network entails forms of activity compared by Karl Weick (1998) to the skilful extemporisation displayed in powerful jazz performances. As in jazz improvisation, the discipline of existing rules, routines and procedural controls are the necessary bedrock for creative accommodation to constraints, producing embellishments on, and reinterpretations of, legitimate action. In moments of opportunity, such performances may move into the sphere of bricolage, drawing more extensively on the repertoire of memory, experience and resources for knowledge formation, and possibly a radical change of direction. 'Bricolage' characterises practically (as opposed to formally) rational activity, based on the creation of a latticework structure emergent from sequences of indeterminate events (Levi-Strauss, 1966). It entails reasoning situated within concrete circumstances, relational thinking and a logic derived from a web of interconnecting events (Turtle and Papert, 1992). Bricolage is treated by Levi-Strauss as a parallel means of knowledge formation to that of formal scientific

rationality, which commences from theoretical structures intended to predict and control events. To those trained in Anglo-American techniques of analytic reason, bricolage may appear incoherent and limited in potential, but in a comparison of technological innovation in the wind energy sector, the Danish bricolage model was found to be more effective, at least in early stages of development, than the formalised rationality of a top-down 'break through model' pursued in the USA (Garud and Karnøe, 2003; Hendry and Harborne, 2011). Counter-intuitively, the distributed agency of multiple interconnected small scale developers in this case proved more productive than greater top-down powers with more resources.

As a meso-scale energy user, improvised learning, and knowing in action, by Aberdeen council officers and politicians, and their cross-sectoral horizontal and vertical connections, resulted in innovative local energy provision. This has to some extent disrupted the conventional passive user relationship to, and understandings of, the existing energy system, creating further potential for new forms of knowledgeable actors to emerge.

Methodology

The analysis of urban energy development in Aberdeen is based primarily on qualitative data, derived from in-depth interviews with participants engaged in the development of plans for local heat and electricity provision, and the setting up and operation of Aberdeen Heat and Power (AHP). These are the lead council officer, two AHP Board members, one district energy consultant who was also the second Chair of the Board of AHP, the AHP general manager, three representatives of the accountancy firm involved in establishing the financial model, and one representative of the legal firm advising on business structure, governance framework agreements and contracts. Continuing contact has taken place through district energy network events, industry conferences, meetings where AHP representatives have advised other urban actors on business development, and lastly joint researcher- and practitioner-led knowledge exchange workshops with UK local authorities. Observation and participant observation in Scottish and UK government meetings have provided additional

data on multi-level governance of district energy policy processes and models for enactment.

Developing Low Carbon, Affordable Energy in Aberdeen

Aberdeen council shares with others in the UK a self-description as an entrepreneurial actor, strategically positioned to secure and advance the economic status of the region, in global competition for private and public finance. Referring both to the prosperity of its oil- and gas-oriented regional economy, and to the need for future growth beyond oil and gas, Aberdeen's regeneration strategy focuses on attracting mobile global investment through infrastructure 'propositions' in relation to property, cultural and environmental assets (Aberdeen City Centre Regeneration Scheme: *A New Level Of Ambition For Aberdeen's Economic Future*, 2012). One of the themes in the economic strategy is the extension of skills from oil and gas into renewable energy. Through a cross-sector partnership, the current expression of this ambition is captured through the symbolism of the 'hydrogen economy', which will in the short term provide a pilot trial for a hydrogen fuel cell, storage and fuel supply for 10 buses. European, Scottish and UK government funding for the project has already reached significantly higher levels than that for Aberdeen's CHP and heat networks, indicating the 'prestige' status of such technology-led innovation, despite its limited reach.

The urban CHP and district heating systems emerged not out of strategic aspirations for a new techno-economic formula for growth, but from the city's housing team, and their more prosaic problems of improving the returns on 1970s multi-storey housing stock, occupied by people on low incomes, struggling to stay warm. While exploitation of oil and gas produces surplus capital which largely accrues to a cosmopolitan elite, Aberdeen Heat and Power (AHP) Ltd is a non-profit company, with a volunteer Board, whose primary purpose, stated in its legal documents, is to work for the benefit of the citizens of Aberdeen. Since 2002, when the city council established the company under a fifty-year framework agreement⁴, AHP has developed three gas-fired CHP energy centres,

⁴ This is governed by a *Teckal* exemption which provides that, in certain circumstances, the award of a

supplying heating and hot water to around 1500 flats in 24 of the city's 59 multi-storey housing blocks, as well as a school and an increasing number of public facilities. Some of the co-generated electricity is supplied via private wire to the school; the remainder is sold into the public network. A one-off £1M grant from Scottish Government has recently enabled extension of the network into the city centre, with connections to nearby NHS facilities and the city's Town House.

Precursors: Urban Politics and Multi-Level State Relations in the UK

Treating the establishment of urban combined heat and power and district heating (CHP/DH) in Aberdeen as a niche experiment would lose sight of the multi-level governance dynamics and disjunctures which framed the potential for decentralised energy infrastructure, and which gave particular governance structure and direction to the project. Aberdeen's CHP/DH provision developed out of indeterminate interaction between long-standing urban anti-poverty politics in the UK, the tactical delineation of a depoliticised 'niche' campaign against 'fuel poverty', and a locally-specific configuration of Aberdeen anti-poverty action. The latter's objectives focused on what could be directly controlled, and hence achieved, by the Aberdeen version of a 'coalition of the willing', signifying not the military metaphor with which that phrase has become associated, but the voluntaristic, locally-determined ambition to exploit the partially contradictory forces of political economy in order to carve out some capacity to change the status quo.

During a period of UK history where public debate over the politics of wealth redistribution has become increasingly obscured, the concept of fuel poverty has operated as a device to command general political support for issue-based action. Eradicating 'fuel poverty' could be presented as a manageable policy goal, when a long period of UK Conservative government (1979-1997) marginalised direct

contract by one public body to another separate legal person will not fall within the definition of 'public contract', with the result that EU law will not require the contract to be put out to tender. The exemption comprises both a 'control test' and a 'function test'. (1) The local authority must exercise similar control over the contractor to that which it exercises over its own departments, and (2) the contractor must carry out the essential part of its activities with the controlling local authority or authorities.

critique of increasing inequality and concentration of wealth. It aligned Conservative interests in the votes of property-rich/income poor older constituents and Labour interests in tackling poverty among its core support. The fuel poverty campaign was picked up by the more environmentally-oriented UK Association for the Conservation of Energy (ACE), who sought legislation to reduce both household energy costs, and environmental damage from rising consumption of fossil fuels. In UK Parliament, a chance by-election in 1993 resulted in election of Diana Maddock as Liberal Democrat MP for Christchurch. In a constituency with a high percentage of pensioners, she faced a Conservative government plan to introduce VAT on fuel at 17.5%; consequently she advanced the argument for a Home Energy Conservation Act (HECA) to reduce household energy bills. The campaign succeeded with the 1995 introduction of the HECA by a Conservative UK government. Climate change, and the need to reduce energy use, were factored into the debate such that the Act required local authorities to report on both energy consumption and CO2 emissions from housing stock. Authorities had to identify cost effective and practical measures for a target reduction of 30% in home energy consumption (with resultant reduction in CO2 emissions), over a ten-year period (1997 to 2007), and to report on progress.

HECA reporting was not however strongly enforced, dedicated resources were not made mandatory and action at local level was uneven, but in Aberdeen the legislation chimed with fuel poverty actions on-going since at least the 1980s⁵, and gave these new material from which to crystallise further anti-poverty projects. Aberdeen politics have long centred on the art of the possible, with a three-way split between support for Labour, SNP and Liberal Democrats, in the face of declining support for the Conservatives (See Appendix 1). Forming an administration therefore necessitates coalition between two of the parties, and although there are always areas for dissent, cross-party support for action to address poverty has not been in contention. Indeed it is a way of demonstrating distinction from 'the south'. Urban politics, and commitment by the Director of

⁵ A key organisation, SCARF (Save Cash and Reduce Fuel), was set up in the 1980s as a registered charity with financial support from the council under the Urban Aid programme and was one of a number of inter-connected anti-poverty projects.

Housing and others inside the council, therefore created legitimacy for dedicated investment. A Home Energy Co-ordinator and Administrative Assistant were appointed in 1998 with responsibility for implementation of HECA strategy. The Coordinator, who was an outsider, came from a background in community development, rather than a technical background in housing services or other local government functions. This combination of circumstances laid the ground for a more radical appraisal of options than emerged in other places (including other Scottish cities).

An Affordable Warmth Strategy was adopted in early 1999, again with a resolution to direct action, this time in the use of housing capital to improve the least thermally efficient stock, which was high-rise flats, where it was estimated that 70% of households lived in fuel poverty:

‘Aberdeen City Council will, through direct intervention and partnership, enable householders across all tenures to have access to affordable warmth and a healthy home, whilst reducing the use of energy and CO2 emissions by 30% by 2007.’

http://www.aberdeencity.gov.uk/HousingAdvice/hoa_hes/hoa_home_energy_conservation_act.asp (accessed 17/03/11)

The strategy both aligned with UK legal requirements, and subtly differentiated Aberdeen from them through a primary focus on addressing urban poverty. A wider Scottish political consensus on poverty as a societal, rather than individual, issue meant that this also marked a distinction from the perceived political pursuit of individualism vested in the neo-liberal policies of recent UK governments.

Affordable Warmth as a ‘Boundary Object’ to Mobilise Local Support for Urban Energy Development

There is of course no necessary connection between support for the principle of affordable warmth and the establishment of new energy provision. The latter requires radical departure from locally controlled, socially accepted, incremental energy-saving measures for households, into direct engagement with energy market and regulatory regimes. The question of translation from ‘affordable warmth’ to particular action is indeterminate: there is no clear formula for

achieving 30% energy and carbon savings in households. The very fuzziness and ambiguity of the concept seems to have proved useful, suggesting that it worked as a boundary object (Bowker and Starr, 2000), bridging differences between interested parties, while maintaining some sense of shared purpose. Boundary objects serve as a weakly structured means of building cooperation; precisely because their ambiguous meanings enable negotiation across the boundaries of different specialist interests, without having to achieve precise consensus on ends and means.

They rely however on intermediaries able to interpret and reinterpret the potential for differing interests to be served. The Home Energy Co-ordinator was one of those in this role; she characterised her actions as finding out what it was that interested different council service groups and inter-agency planning bodies, and interpreting the meaning of affordable warmth and its significance accordingly. Established routines were adapted as a means of testing the responsiveness of potential strategies to different interests; different strands of work embellished on the core concept of affordable warmth, including a survey of local house conditions, assessment of National Home Energy Efficiency Ratings (NHER) of council stock, a new affordable warmth scheme for low income owner-occupiers, regular updates geared to building local political capital, and thermal imaging of the city as a means to garnering agreement around areas of investment.

An embryonic coalition of the willing, backed by the Chief Executive, Director and Assistant Director of Housing, and an environment officer committed to action on climate change, gave rise to improvised action through a council conference on climate change mitigation in 2002, and the drafting of a first Energy Policy 'in the pub'. The visibility of ecological and social issues increased, renewing commitment to integrated social, environmental and economic objectives in a further articulation of fuel poverty strategy: 'The environmental aim of reducing CO₂ emissions, and the social aim of eliminating fuel poverty, have consistently been viewed as two sides of the same coin by Aberdeen City Council' (*Fuel Poverty Strategy* 2002 p.3). The council signed up to a Carbon

Trust 'Pathfinder' programme, with a Carbon Management Plan adopted in the same year.

Action for affordable warmth coalesced around plans for investment in regeneration of electrically-heated tower blocks as a way to bridge differing internal objectives: tackling poverty, saving energy and carbon, and improving economic returns to council from housing stock. A technical appraisal was commissioned to identify the best means to achieve combined objectives of:

- A substantial improvement in the National Home Energy Rating (NHER) of the city's multi-storey flats;
- Affordable warmth for tenants;
- Reduction of carbon emissions.

Appealing to the attributed authority of external technical expertise may have defused internal tensions surrounding potential uses of the politically significant housing capital budget. The economic proviso was however that any spending commitment had to be affordable within the parameters set by that budget. The resulting consultancy report concluded that the lowest (short-term) cost solution was refurbished electric heating. Under the normalised interpretation of 'best value' in local government spending, the lowest cost principle dominates. Commitment to the Affordable Warmth objective, combined with carbon saving requirements, however, meant that it was possible to override the cheaper electric heating option, because of its high *cost in use* to tenants, and high carbon. This decision is itself evidence of the political mobilisation generated around the principle of affordable warmth, and its value in breaking down the abstract economic calculus of cost and reconfiguring it instead in terms of the practical economics of households. The lowest 'cost in use' recommendation favoured over-cladding the towers and installing CHP/DH, but the high capital cost of the cladding, relative to the small additional saving for tenants, resulted in a preferred option for CHP/DH without cladding⁶. The formal technical expertise of the consultant report conferred authority on this recommendation, but

⁶ Note that in practice many of the tower blocks have been over-clad as part of regeneration, with part or full cost covered by successive variants of the carbon saving obligation placed by government on the utilities suppliers, which requires them to invest in measures such as building insulation.

considerable obstacles to actual investment in CHP/DH remained, not least the lack of local capacity, technical, commercial and legal expertise, and access to finance.

An Emerging Project Network

High levels of anxiety, doubt and scepticism surrounded the recommendation to install district heating with CHP. The council lacked expertise in relation to energy, and lacked funding to commission external expertise. Local intervention in energy markets is deeply unfamiliar territory, despite urban authorities' established capacities for infrastructure planning and development. Contemporary CHP and DH technologies are also unfamiliar in the UK, adding to doubt over their efficacy. Local politicians were divided and some officers and locals were deeply opposed to any departure from business as usual: 'If it hasn't been done in Aberdeen, it's not worth doing'. Tenants were cautious (many had fuel debts and used self-disconnection to control spending); they were however interested in affordable and effective heating, as long as this was married with a fixed charge with rent in order to budget on low incomes. Such a solution entailed risk to council finances, hence incurring opposition from finance officers. Those who had bought flats in tower blocks, under the UK government 'right to buy' scheme, were also worried about the cost of installation and on-going maintenance.

Consent to further action hence relied on further intensive intermediary work. An emerging project 'lattice-work', connecting local politicians and officers from specialisms in Housing, Environment and Infrastructure, Planning and Resources, Highways and Finance, mobilised action in the interstices of statutory service domains. Lengthy negotiation between and within specialist teams and committees placed corresponding pressure on the professional reputations of lead officers, who drew on tacit understandings of wider social welfare to legitimate working beyond conventional remits. The Home Energy Coordinator characterised the multiple set backs as 'hurdles' rather than 'barriers', a subtle but meaningful differentiation: as she explained, a hurdle can be got round or over; a barrier may seem impenetrable. Working on evidence to address the

multiple concerns of tenants, politicians and officers, she 'knew that it would work', to the extent that she was willing to make promises to householders and to take responsibility for formal evaluation of impacts on tenants and on council revenues.

The UK Home Energy Conservation legislation had provided funding for an officer network, which created one of a number of channels for extending the Aberdeen local project network to external sources of development funding, and formal knowledge and expertise: multi-level government bodies such as the Carbon Trust, Energy Services Programme and Energy Saving Trust (EST), and cross-sectoral community energy practitioner groups with links to specialist technical, legal and financial expertise in energy systems. The Aberdeen coordinator met the vice chair of the HECAction committee. His biography in third sector anti-poverty action, as well as the commercial expertise developed through his commitment to community energy, led to his involvement in discussions about finance and governance structures to embed civil society priorities. These interactions contributed to articulation of 'affordable warmth' into decisions to prioritise a non-profit business, with local control over system design and development, and ownership of energy assets.

The developing, albeit loosely configured, geographically diffuse and fragmentary project network was hence critical to establishing the legitimacy and substantive value of local energy. The anti-poverty focus of the Aberdeen political coalition, combined with what was in 2002 a Labour-Liberal Democrat Scottish government, maintained social objectives at the fore, but the flexibility of the proposed CHP/DH solution as a means of serving multiple local political interests was critical. Improved financial returns from housing stock had to be made congruent with any formula for addressing fuel poverty; carbon reduction had to be delivered; tenant support was oriented to a fixed price for heat, and it was reduced energy costs to council which persuaded finance to support the strategy, and to bear the risk of tenant non-payment under the tenant-preferred heat with rent formula.

Sufficient momentum was gathered for council agreement to contribute to the cost of a technical feasibility study of CHP/DH for a sample cluster of tower blocks. The coordinator acquired matched funding from EST, but lack of council expertise, and a limited supply of expert labour, made the evaluation of bidders tricky. The local project network provided a means to discriminate between tenders, but the existence of an officer with some sectoral knowledge was a matter of serendipity rather than design. The practical and technical knowledge, as well as 'moral support' for the lead officer, embodied in the consulting engineer subsequently appointed, further consolidated the project network. His expertise combined formal analytic techniques for specifying and costing systems, with practical reasoning in the form of 'many hours walking the streets' (coordinator) to secure confidence in the feasibility of infrastructure routes and configurations, and hard bargaining with suppliers to reduce the costs of system components.

The Practical Economics of Urban Energy Assessment

Despite policy acknowledgement of its substantive value in carbon and energy saving, the conventional risk calculus of UK centralised energy markets and sunk investments in grid infrastructures, situates urban CHP/DH as a risky proposition with formally marginal economics. Financial 'bricolage' has hence been critical to 'making the finances stack up' in Aberdeen. Each piece of necessary funding was assembled 'without revealing to anyone what amounts other bodies were giving' (coordinator). Carbon savings were construed as a tradable currency offered to the 'highest bidders' from among the utilities, in exchange for project finance. But a changed governance conjuncture proved to be a critical moment in fixing the latticework structure of events which led to the formation of Aberdeen Heat and Power. The 1997 election of the first UK Labour government since 1979 was followed by devolving power to Scotland, Wales and Northern Ireland and increased momentum around carbon and climate change politics. When short-lived (2002-2006) UK low carbon Community Energy Programme (CEP) funding became available, Aberdeen council's affordable warmth strategy, technical options appraisal and outline feasibility study were already in place. The feasibility study gave the first formal costings for a sample

CHP/DH project for one cluster of tower blocks. A pragmatic definition of what was 'affordable to council' was adopted as equivalent to the notional cost of installing gas central heating in each household. This was calculated as 60% of the total cost of CHP/DH. An application for CEP funding produced an offer of close to 40% contribution to capital costs, bridging the gap between what the council declared itself willing to invest and the total cost of the system. Aberdeen eventually became the lead UK recipient of funding under the CEP, receiving two further capital contributions for systems in Hazlehead and Seaton.

Practical economics extended to the tactical choice of the first scheme at Stockethill, which was selected because the tower blocks were in reasonable condition, justifying the cost of improvements, and because tenants were expected to understand the benefits of the scheme and to be effective ambassadors for later developments. Setting the heat tariff for tenants was also based, not on conventional market formulae, but on household economics. The affordable warmth rate, plus electricity costs, was calculated as a proportion of minimum income, and this sum was set against the cost of fuel to AHP plus system running costs. In this way, heat prices were cost- rather than market-based, with the low cost of heat supply maintained by revenues from sale of electricity to the wholesale market via a third party. The original model had included the preferential sale of electricity to tenants, but the formulae used under UK regulated networks make the distribution use of system (DUoS) charges for small generators prohibitively expensive. Despite this setback, it was reasoned that the local business would contribute to retaining revenues in the local economy.

The final decision to proceed required full agreement of council, supported by Environment and Infrastructure Committee, Housing Committee and Planning and Resources Committee. The council was required to consider the legal advice, which was against proceeding, given the financial risk. The deputy council leader, a Labour councillor and incomer who had moved north for the oil industry, chaired the key committee: 'At the founding meeting he said "we are obliged to seek the advice of the council's solicitor, but we are not obliged to take it.

Therefore it is noted.” So he put it to one side. So he had the political courage’ (member of AHP Board and district energy practitioner).

This decision resulted in establishment of AHP Ltd, and the first CHP/DH development at Stockethill. A loan from the Cooperative Bank was secured, and underwritten by the council, in order to finance the construction. The loan was repaid from the Council’s housing capital programme, as funding became available. The subsequent evaluation showed that the system had provided affordable warmth and carbon saving, legitimating further capital investment, this time managed via direct council borrowing from Public Works Loan Board, with further capital contributions from the UK CEP.

The third and most ambitious project at Seaton proved most contentious, but has also provided the key to subsequent expansion of the network. An application was made for CEP funding on the basis of contracted carbon saving from connection of 11 multi-storey housing blocks via a new energy centre. Poor fabric condition of a number of blocks resulted in their unplanned withdrawal, risking loss of capital funding, which had to be spent to a centrally-determined tight timetable. Aberdeen council beach leisure complex was selected as an alternative means of meeting the carbon savings target, but at additional cost for pipework. The relatively inexperienced board of AHP, with tenuous commercial or technical expertise, felt that they had been uninformed, if not somewhat misled, about the change of plan, and the consequential financial liability which board members feared would fall on them, should the business fail. Crisis and dissent followed, with resignations strongly threatened: ‘They just didn’t seem to want to move forward under their own volition. Paralysed by the threat.’ (member of AHP Board and district energy practitioner). In the earlier phase of the business, finance management had been conducted by the council’s own team, with some concern among board members about the adequacy of the arrangement. The route out of the crisis was itself a source of dissent, eventually resolved through recourse to the authority of external financial advice, by the AHP Chair. The accountant identified the main issue as one of short-term cash flow, which could be managed by an overdraft facility underwritten by Council. Once this was understood and in place, the Board adopted a greater degree of

independence, retaining the services of the external accountant, who worked to improve financial controls. Despite the crisis, the oversizing of pipework in this project subsequently allowed the network to be extended into the city centre, using further *ad hoc* funding from the Scottish government, by then under the control of the Scottish National Party.

Explaining Aberdeen Urban Energy Development

How can the apparent anomaly of a community energy company, which had, by its tenth anniversary, expanded to supply 24 of the city's 59 multi-storey housing blocks, as well as supported housing and increasing numbers of public facilities, be explained? Although shaped by the increasing prominence of climate politics, its development is not explicable as the outcome of planned systemic low carbon transition, having pre-dated UK and Scottish Climate Change legislation by several years. Neither can it be attributed to the political economy of an affluent city with a global oil and gas industry. The latter remains entirely separate from local energy systems. City Council finances themselves were precarious: a 2008 Accounts Commission report found that the City needed to secure spending reductions of circa £50 million. Neither is there a cohesive regional political and social commitment to a low carbon economic transition. The Council Carbon Management Plan is ambitious in relation to energy saving from its own buildings and public housing, but is silent on carbon emissions from its strategy for economic growth, and from the offshore oil and gas industry, as are Scottish and UK government plans for carbon reduction. Indeed the oil and gas industry is central to the multi-level UK state's pursuit of economic competitiveness, with favourable tax policies to stimulate investment in increasingly risky marine environments (Paterson and Gordon, 2013). In addition, there are divided views on urban regeneration, exemplified in continuing division over priorities embedded in city centre regeneration projects, and in relation to decarbonising transport and travel, with construction of a new 46 kilometre Aberdeen city by-pass being contested up to the level of Appeal to the UK Supreme Court.

The phenomenon of Aberdeen urban energy is hence not a matter of cohesive top-down carbon and energy transition planning, but neither is it a stand-alone

niche experiment; its logics and its application of practical reasoning are enmeshed in the multi-scalar and shifting dynamics of the UK devolved state and the web of powerful energy market interests. Those involved in the project were part of a loosely networked community of practice which challenges the prevailing orthodoxy of energy systems:

'I thought, and still do, that the current structure of the energy market has failed on all counts - carbon, energy security, affordability and competition. These are supposedly the aims & objectives of UK energy policy' (Member of AHP Board and district energy practitioner).

In practice then AHP is simultaneously the indeterminate product of civil society social movements, multi-level governance institutions and their disparate politics, the varying fortunes of climate protection policies and chance coincidence of the collisions of a number of 'practical idealists'. Like many cities in the UK, Aberdeen has a strong cultural residue of 'civic pride' in independent-minded adaptation to circumstances. In Aberdeen, this is reinforced by geographical distance from other cities, and above all by suspicion of the 'central belt' (Fraser and Lee, 2000), and there are similar assemblages of local cultural belief in other places. AHP's creation owed something to this 'cultural capital' and its enabling of the fortuitous combination of momentary circumstances: a coalition of officers and politicians committed to addressing urban poverty, a particular appointment to a newly created local authority role, the short-term availability of component public funding, the discovery of sufficient knowledgeable district energy business and technical experts, and so on. It required intermediaries to mobilise support from local officers, politicians and householders and to manage anxieties, uncertainties and opposition. Project developers in turn had to acquire significant knowledge about energy technologies, markets and project finance, as well as the socio-technical and physical design, construction and operation of combined heat and power energy services, which are built into the urban landscape, both physically and symbolically.

The counterparts to these socio-technical factors are the intersecting structures of multi-level governance in which AHP's creation was embedded, and which on this occasion gave varying degrees of momentum, at different points, to the willingness of an urban authority to establish a new business, disruptive of the energy status quo, as follows. A Conservative UK Government passed legislation on home energy conservation; the Labour Government, elected at the 1997 UK Parliamentary election, and more responsive to environmental movements, brought climate change mitigation objectives more centrally into political debate, and linked these with dependence on energy from fossil fuels, and rising household bills. This resulted in some short-lived government funding under the programme for carbon savings from community energy, proving timely financial 'glue' for emerging local plans. The UK devolution referendum and establishment of a Scottish Parliament, with a first Labour-Liberal Democrat government, in 1999, further cemented Aberdeen Council anti-poverty strategy. Furthermore, the increasingly urgent need to regenerate poor quality public housing stock was a wider structural issue, backed by both Scottish and UK policy, and played into immediate Council interests in improving economic returns from housing rentals.

In conclusion

What is the scope for urban actors to shape change in energy systems while maintaining goals of social justice, mitigation of climate change and sustainable use of resources? The intersecting, and internally contradictory, processes exemplified here mean that the trajectory of urban energy governance, in conditions of global political and economic uncertainty, is likely to be marked by uncertainty, cul-de-sacs and partial and shifting alliances, with uncertain results. A key implication of the Aberdeen energy project is however that it is not inevitable that any such developments are governed by solely by imperatives of capital accumulation, with limited public accountability. The Aberdeen mode of governance has prioritised locally-defined interests in affordable energy for low income households, and combined these with wider public interests in reducing environmental damage. This has been established by a Council which is structurally obliged to compete for private investment to secure its future, and hence is not internally unified around the goals of a sustainable society built on

sharing of available resources.

Could such small-scale urban energy projects become scalable models for low carbon, affordable, and locally-accountable urban energy? The Aberdeen project struggled to gain a precarious grasp on energy finance and expertise, with high personal costs and risks for those involved. Unlimited working hours, few resources and burdens of responsibility without authority are not however inherent in the nature of such projects, but result from the absence of consistent policy and regulatory support for a more decentralised, energy saving and resilient low carbon energy system. Current piecemeal change is the outcome of a lack of necessary local powers, continuing UK political dissent over the future of energy systems and the continuing search for new techno-ecological fixes for economic growth. Public investment and subsidy remain focused on new forms of fossil energy such as shale gas, and new oil and gas exploration.

Demonstration projects such as that in Aberdeen lay the groundwork for better-informed public debate about the potential trajectories of energy systems transformation. AHP networks have continued to develop in scale, delivered estimated average carbon savings of 45% and average fuel cost savings to council tenants of 45-50%, as well as reducing Council energy costs. The total network length is now 14Km and annual heat supply approximately 34MWhr. Economic return to the Council from its multi-storey housing has also improved and there are waiting lists for housing in tower blocks which used to be subject to high turnover. Local stories have it that people now have warm, damp-free houses, they can 'bath the kids', use the space fully and still pay the bills. Plans and agreements are in place for the connection of a further 11 tower blocks; the connection of further heat sources is being discussed, and the company could in principle move into commercial heat supply. Although these are plans not certainties, a city 'heat main' has long been the imagined long term goal, characterised by those involved as the 'ring of fire' and drawn as a red line on city maps pinned to the wall in the office of AHP. That ring main is now not so far from reality. In 2013 AHP received a global district energy award from the combined boards of the International Energy Agency, International District Energy Association and Euroheat and Power. Its trajectory suggests that a small

scale, largely improvised innovation, which commenced with a £1.8M pilot scheme connecting four 1970s tower blocks to a gas-fired CHP engine, may yet deliver an urban-scale non-profit, locally owned and operated heat network. This will be far from straightforward unless there is a shift in the regulatory regime to recognise the value of decentralised low carbon energy systems.

Such reconfiguration of UK regulatory regime is likely to be dependent on a new conjunctural opportunity oriented to a social systemic, rather than technology-led, model of innovation, underpinned by an area-based economics of energy and carbon saving. This would enable locally-situated knowledge about energy provision to evolve into a 'community of practice' with capacity to interact in formulation of policy and funding pathways. How would such a conjuncture develop? Although institutional change in the public sector has driven systematic changes in favour of governance through competition, there is evidence that it has not homogenised underlying values, beliefs or local cultures (Le Gales and Scott, 2010). There is potential for urban 'coalitions of the willing' to emerge as catalysts for change, particularly if local authorities are increasingly responsible for addressing the consequences of central state withdrawal from welfare provision. Such coalitions come about, as in Aberdeen, through the political alliances necessary to holding power, and include local activists as well as the city officials charged with the multiple obligations of reducing carbon, cutting costs, regenerating the local economy and addressing the local ills associated with welfare restructuring. They include the devolved governments, who look for political capital gained from aligning themselves with what seems to work, and what adds to a sense of distinction from a centralised state.

Market regulation and taxation powers however largely remain with the UK government, which limits authority and capacity at devolved and regional levels. There is also powerful opposition to structural reform of the liberalised energy market, which constrains effective policy response to the accelerating climate risks of high carbon energy: 'to admit that a free economy generates a vast global external cost is to admit that the large-scale government regulation so often proposed by hated environmentalists is justified. It is far easier to deny the relevance of the science' (Wolf, 2013). There is a chance however that heat

policy may work as a kind of ‘boundary object’ to create potential for conjunctural change in UK energy policy and politics. Despite the fact that the end use of energy for heat is ‘the single biggest reason we use energy in our society’ (UK DECC, 2012: 5), it received limited consideration when energy policy re-appeared on the UK political horizon in the early 21st century. Urban heat network projects such as those in Aberdeen and other UK cities have established the viability and legitimacy of a decentralised energy supply model. Such projects are components of a reassessment of energy governance, which is feeding through into policy. At the UK District Energy Vanguard Workshop in Sheffield in 2013, the DECC officer’s presentation stated ‘we want the heat policy paper to re-emphasise why heat is important... and to explain why decentralised solutions will be important’. This introduces scope for improvised policy learning, as well as opening up space for divergence in energy governance across the UK: heat policy has perhaps been devolved ‘by omission rather than by decision’ (UK DECC officer). Scottish government has for example created the framework for a coordinated approach under its District Heating Action Plan and Heat Network Partnership structures. UK DECC has funded district energy pilot projects in ‘pioneer cities’ and is setting up a Heat Networks Delivery Unit under its 2013 strategy. Although finance remains in contention, the political and policy contradictions in relation to energy, climate change and economic growth are likely to become more prominent, and productive of change, as bricolage activity unfolds. Hence practice-based knowledge and the practical economics of end use of energy are key means to ensure informed public participation in shaping a resilient and socially accountable clean energy system. Low carbon urban energy is now being done in Aberdeen, so it must be worth doing.

Bibliography

- Amin, A. and Roberts, J. (2008) ‘Knowing in action: Beyond communities of practice’ *Research Policy* 37 (2008) 353–369
- Bolton, R. and Foxon, T. ‘Governing infrastructure networks for a low carbon economy: co-evolution of technologies and institutions in UK electricity distribution networks’ *Competition and Regulation in Network Industries*, 12: 2-26.

- Bowker, G. and Star, S. L. (2000) *Sorting Things Out: Classification and Its Consequences*. MIT Press.
- Bowles, S. and Gintis, H. 2002. Social capital and community governance. *Economics Journal* 112 (Nov.), 419–436.
- Bulkeley, H. and Kern, K. (2006) Local Government and the Governing of Climate Change in Germany and the UK. *Urban Studies* 43, 2237 - 2259.
- Castells, M (2000) *The Rise of the Network Society*. Oxford: Blackwell
- Coutard, O. and Rutherford, J. (2010) Energy transition and city–region planning: understanding the spatial politics of systemic change. *Technology Analysis & Strategic Management* 22.6, 711–727.
- Crouch, C. (2011) *The Strange Non-Death of Neoliberalism* Cambridge: Polity
- Downe, J., Grace, C., Martin, S. and Nutley, S. (2010) Theories of public service improvement: a comparative analysis of local performance assessment frameworks. *Public Management Review* 12.5, 663–678
- Fraser, H. and Lee, C. (eds) (2000) *Aberdeen: a new history, 1500-2000*. Tuckwell Press.
- Garud, R., Karnøe, P., 2003. Bricolage versus breakthrough: distributed and embedded agency in technology entrepreneurship. *Research Policy* 32: 277–300.
- Harvey, D (1989) *The Condition of Postmodernity*. Oxford: Blackwell
- Hendry, C. and Harborne, P. (2011) ‘Changing the view of wind power development: More than “bricolage”’, *Research Policy* 40: 778–789.
- Hodson, M. and Marvin, S. (2009) Urban Ecological Security: A New Urban Paradigm? *International Journal of Urban and Regional Research* 33.1, 193–215.
- Hodson, M. and Marvin, S. (2010) ‘Can cities shape socio-technical transitions and how would we know if they were?’ *Research Policy* 39: 477–485

- Hodson, M. and Marvin, S. (2012) Mediating low carbon urban transitions? Forms of organization, knowledge and action', *European Planning Studies*, 20: 421-439.
- Ingham, G. (2011) *Capitalism* Cambridge: Polity Press.
- Jonas, A., Gibbs, D. and While, A. (2011) 'The New Urban Politics as a Politics of Carbon Control' *Urban Studies*: 48, 2537-2554.
- Kelly S. and Pollitt M. (2010) "An assessment of the present and future opportunities for combined heat and power with district heating (CHP-DH) in the United Kingdom" *Energy Policy* 38: 6936–6945.
- Kemp, AG. (2011). *The Official History of North Sea Oil and Gas, Volume 2: Moderating the State's Role*. Whitehall Histories: Government's Official History Series, vol. 2, 1st edn, Routledge.
- Law, J. and Callon, M. (1992) The Life and Death of an Aircraft: A Network Analysis of Technical Change in Bijker, W. and Law, J. (eds) *Shaping Technology / Building Society: Studies in Sociotechnical Change* MIT Press.
- Le Gales, P (2002) *European Cities. Social Conflicts and Governance*, Oxford, Oxford University Press.
- Le Gales, P. and Scott, A. (2010) 'A British bureaucratic revolution? Autonomy without control or "freer markets, more rules"?' *Revue Francaise de Sociologie*, 51: 117-143.
- Lefèvre C, d'Albergo E (2007) 'Why cities are looking abroad and how they go about it' *Environment and Planning C: Government and Policy* 25: 317 – 326.
- Levi-Strauss, C. (1966) *The Savage Mind* Oxford University Press.
- Meek, J. (2012) 'How We Happened to Sell Off Our Electricity' *London Review of Books* 34 (17): 3-12 <http://www.lrb.co.uk/v34/n17/james-meek/how-we-happened-to-sell-off-our-electricity>
- Mitchell, C., 2008. *The Political Economy of Sustainable Energy*, Palgrave Macmillan, Hampshire.

- Monstadt, J. (2007) Urban governance and the transition of energy systems: institutional change and shifting energy and climate policies in Berlin. *International Journal of Urban and Regional Research* 31: 326–43.
- Monstadt, J. (2009) Conceptualizing the political ecology of urban infrastructures: insights from technology and urban studies. *Environment and Planning A* 41: 1924 -1942.
- Portes, A. (2000) The two meanings of social capital. *Sociological Forum* 15.1, 1–12.
- Strauss, A (1978) 'A social world perspective' *Studies in Symbolic Interaction* 1: 119-28.
- Tura, T. and Harmaakorpi, V. (2005) Social capital in building regional innovative capability. *Regional Studies* 39: 1111–1125.
- Turkle, S. and Papert, S. (1992) 'Epistemological pluralism and the revaluation of the concrete', *Journal of Mathematical Behavior* 11: 3-33.
- UK Committee on Climate Change (CCC) (2012) *How Local Authorities Can Reduce Emissions And Manage Climate Risk* <http://www.theccc.org.uk/reports> May 2012
- UK Department of Energy and Climate Change (DECC) (2011) *UK Electricity Market Reform White Paper*
http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx
- UK DECC (2012) *The Future of Heating: A Strategic Framework for Low Carbon Heat in the UK.*
http://www.decc.gov.uk/en/content/cms/meeting_energy/heat_strategy/heat_strategy.aspx
- UK DECC 2013 *The Future of Heating: Meeting the Challenge*
<https://www.gov.uk/government/publications/the-future-of-heating-meeting-the-challenge>

Weick, K (1998) Improvisation as a mindset for organizational analysis, *Organization Science*, 9: 543-555.

Wenger, E., 1998. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press, Cambridge.

Wolf, M. (2013) 'Why the world faces climate chaos', *Financial Times*, 14 May
<http://www.ft.com/cms/s/0/c926f6e8-bbf9-11e2-a4b4-00144feab7de.html#axzz2b6EY8Una>

APPENDIX 1 - LOCAL ELECTIONS IN ABERDEEN CITY 1995-2012

	2012	2007	1999**	1995**
	Seats (vote share*)	Seats (vote share*)	Seats (vote share)	Seats (vote share)
Lab	17 (30%)	10 (25%)	22 (32%)	30 (42%)
SNP	15 (31%)	12 (29%)	3 (25%)	1 (18%)
LibDem	5 (15%)	15 (27%)	12 (25%)	10 (24%)
Cons	3 (10%)	5 (14%)	6 (17%)	9 (15%)
others	3	1	0	
Ruling group	Lab+Cons+Ind= 23/43	LibDem+SNP= 27/43	Lab (22/43)	Lab (30/50)

*share of 1st preference vote (STV)

**elections by traditional first-past-the-post

Comment: local government election method changed by Scottish Parliament from First Past the Post (which gave overall control to party with minority share of vote), to Single Transferable Vote (STV). Previous to that, Labour was in power in Aberdeen with overall control. (No elections were held between 1999 and 2007 while new STV system was introduced). Elections in 1995 were first under unitary authorities, the Conservative government having abolished two-tier local government in Scotland under the Local Government (Scotland) Act of 1994.

In recent years, Aberdeen politics have been characterised by a three-way split between Labour, SNP and LibDems, with Conservatives falling away. Who forms an administration depends on coalition-building, if only to keep out the main opposition (thus current Lab coalition with Conservatives and Independents to keep out SNP). Overall, Labour and SNP compete for working class wards, and Conservatives and LibDems for middle class suburban wards.

APPENDIX 2 - GOVERNANCE AND OWNERSHIP OF URBAN ENERGY IN ABERDEEN

Council lead objective	Affordable warmth for social housing
Organisation structure	Company limited by guarantee and by membership, under local ownership and control, with asset lock
Business model	Non-profit ESCo; any surplus reinvested or used to lower cost of heat to housing tenants
Governance structure	Volunteer board of directors including councillors, community and business organisations and former council officers
Heat tariffs	Cost-based
Main customers	Public housing tenants
Other customers	Community sport, leisure and education facilities
Finance	UK and Scottish government grants, city housing capital, prudential borrowing, bank loan and overdraft
Risk mitigation	Loans guaranteed by city council; council long term contract for purchase of energy

APPENDIX 3 ABERDEEN PROJECT DEVELOPMENT TIMELINE

1980s-1990s SCARF (Save Cash and Reduce Fuel) set up as registered charity to promote energy efficiency, alleviate fuel poverty and create sustainable employment and training opportunities; financial support from Aberdeen City Council under Urban Aid programme; representation on Board by two Councillors and Director of Community Services

1995 Introduction of UK Home Energy Conservation Act (HECA)

1997	Election of first UK Labour Government since 1979
1997	UK devolution referendum
1998	Aberdeen City Council appointed two full time staff – a Home Energy Co-ordinator and a full time Administrative Assistant - responsible for implementation of HECA strategy
Feb 1999	Aberdeen City Council formally adopted principle of affordable warmth for all citizens of Aberdeen
1999	Local House Condition Survey
March 1999	Average NHER of council housing stock assessed as 4.5
July 1999	Re-establishment of a Parliament in Scotland
Oct 1999	Aberdeen Affordable Warmth Scheme established. Targeted at low income owner occupiers living in expensive to heat homes. Linked to Aberdeen Care & Repair; managed by Castlehill Housing Association; jointly funded by Communities Scotland and Aberdeen City Council. Systematic assistance to upgrade energy efficiency of house, including organising and overseeing agreed works through local contractors.
March 2000	Introduction of quarterly bulletin to up-date councillors on HECA and fuel poverty activities
Feb 2001	Aerial thermal image of city, held on the Council's GIS system, to assist identification of least thermally efficient areas, and house types
2002	Fuel poverty strategy report. Inter-service HECA Task Team charged with ensuring co-ordinated approach to issues relating to home energy efficiency and fuel poverty. External bodies are also members (i.e. SCARF and the Aberdeen Affordable Warmth Scheme). Fuel poverty reduction integrated into: - Community Plan; - Joint Health Improvement Plan; - Business Plan (Council Stock); - Community Regeneration Strategy; - Private Sector Housing Strategy
2002	Council signs up to Carbon Trust Pathfinder Programme and adopts first Carbon Management Plan
2002	Report commissioned to review structural, land conditions and energy requirements of multi storey and sheltered housing stock. Objectives set were to identify most appropriate energy saving measures, taking account of requirements to achieve affordable

warmth, to minimise CO2 emissions, and to be affordable for the Council. Recommended installation of Combined Heat & Power (CHP) and district heating in those clusters of multi storey and sheltered blocks in which there are no structural defects.

- 2002 Independent, not-for-profit company, Aberdeen Heat & Power limited by guarantee, established by the Council to develop and manage Combined Heat & Power (CHP) projects, linked to clusters of multi-storey blocks.
Board includes two councillors and provision for tenant representation.
- March 2003 Average NHER of council housing stock 6.51
- May 2003 First CHP project linked to 4 tower blocks with 228 flats in Stockethill. One of 8 “pathfinder projects” receiving financial assistance (40% capital costs) from UK government through the first round of Defra Community Energy Programme grants.
- 2003 AHP commences detailed feasibility study for second cluster of multi storey blocks covering 1149 flats in the Seaton area of the City.

APPENDIX 4: AHP DEVELOPMENT FINANCE FOR CHP/DH

1. Stockethill Total cost £1.8M

53% Housing Capital

40% of capital costs (£736,000) from the UK government Community Energy Programme;

7% contribution from energy utility Energy Efficiency Commitment (EEC)

2. Hazlehead Total cost £1.6m

53% Housing Capital

40%, (£600,000) from the Community Energy programme,

7% contribution from energy utility Energy Efficiency Commitment (EEC)

3. Seaton Total cost £3.3M

60% of phase 1 funding from Housing Capital

40%, (£1.3 million) from the Community Energy programme.

North Seaton extension funded by Council Housing Capital Programme and energy utility CESP.

Acknowledgements

I am particularly indebted to all of those involved in the development of AHP Ltd, some of whom have spent many hours patiently answering research questions, and sharing their hard-earned knowledge with great generosity. Thank you also to all of the members of the UK District Energy Vanguard network, with whom we work as a research team. My colleagues on the RC-UK *Heat and the City* team have contributed a great deal to the research reported here; particular thanks to David Hawkey, Research Fellow, for in-depth socio-technical knowledge of energy systems, and David McCrone for knowledge of Aberdeen election statistics and politics. The research would have been impossible without funding from the Research Councils' UK *Energy Programme*, under the Energy and Communities initiative.