Submission by the Realising Transition Pathways Consortium 'Engine Room'[1] to the discussion paper concerning Non-traditional Business Models

Submission co-ordinator: Stephen Hall

Telephone number: +44(0)1133432663
Email address: S.Hall@leeds.ac.uk

Authors: John Barton, Damiete Emanuel-Yusuf, Stephen Hall, Victoria Johnson, Noel Longhurst, Áine O'Grady, Elizabeth Robertson, Elaine Robinson, Fionnguala Sherry-Brennan

Contributors: Marko Aunedi, Lacey-Jane Davis, Sarah Higginson, Sikai Huang, Francis Li, Eoghan McKenna, Alaa Owaineh, Evelina Trutnevyte

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This discussion response draws on the findings of the Realising Transition Pathways 'Engine Room' research group report Distributing Power[2]. The EPSRC-funded Transition Pathways (TP) and, more recently, Realising Transition Pathways (RTP) projects have both argued that multiple logics of governance, ownership, and control of the electricity system can be followed to address the energy trilemma. This work has developed three transition pathways for the UK energy system, each driven by different governance patterns. Each pathway has a specific technological mix, institutional architecture, and societal drivers. These pathways are:

> **Central Co-ordination:** Central to this pathway is the role of the nation state in actively delivering the transition.
> **Market Rules:** After the creation of a broad policy framework, the state allows competition and private companies to deliver sustainable, affordable energy.
> **Thousand Flowers:** This pathway is characterised by a greatly expanded role for civil society in delivering distributed low-carbon generation.

Ofgem's NTBMs discussion reflects growing interest, from a range of stakeholders, in the potential of distributed low-carbon electricity generation in delivering a low-carbon energy system. Yet there are still significant gaps in understanding, particularly regarding the feasibility of scaling-out distributed generation from technological, governance, regulation, policy, and financial perspectives. The aim of this response is to address a single discussion question within the NTBM discussion paper: **How could NTBMs potentially transform the energy market and what fundamental challenges to regulatory arrangements could this entail?**

The RTP Engine Room (2015) distributing Power report aimed to scope the fundamental institutional changes that a move to a distributed energy system might mean for the institutions of UK energy governance. The 'Engine Room' was established to facilitate interdisciplinary work across the

[1] This document has been prepared to enable results of on-going RTP work to be made rapidly available. It has not necessarily been subject to review and approval, and may not have the authority of a full Research Report or published paper.

[2] Attached to submission as Appendix A. Also available online at:
http://www.realisingtransitionpathways.org.uk/publications/FINAL_distributing_power_report_WEB.pdf

consortium and consists of research fellows and doctoral researchers from different fields in the nine partner institutions. This discussion response based on the Distributing Power report is an output of a series of interdisciplinary Engine Room workshops held throughout 2013/14 which also drew on contributions from energy industry stakeholders. These workshops brought together the current research and cumulative findings of the Realising Transition Pathways consortium, to examine the consequences of a transition from a centralised energy system to one where distributed generation plays a much greater role (50% of final electricity demand), and is delivered by a civic energy sector. Clearly, this is a speculative investigation of long term change on the institutions of UK energy governance, yet it is a useful exercise in questioning the suitability of current system regulation and governance from a future scenario perspective that is backed by robust technical forecasts. The proliferation of non-traditional business models from now until 2050 was a key consideration of this work, and as such we feel a focussed response to the specific discussion question in section 5 above will best represent the findings of the research group.

A major driver behind the Thousand Flowers pathway is the step-change in civic participation in energy futures. In this pathway civil society at individual, organisational, and local state levels, plays a much more active role in generation, distribution, and supply. The report scopes 'institutional scenario' where a growth in distributed generation leads to a number of new institutions, and changes to existing structures in the energy sector, that would have an impact on system regulation. These consist of:

Local Energy Schemes (LES)

Currently less than 1% of electricity generation is from local energy schemes (LES) within the UK's civic energy sector; the Thousand Flowers pathway demonstrates the potential for this to grow to a 50% share by 2050. Evidence from other European nations demonstrates that the levels of civic energy generation defined in the Thousand Flowers pathway are possible if the right mix of institutions, resources, finance, and expertise can be developed at the local level. Civic ownership and participation in energy assets can accelerate the deployment of renewable and low-carbon energy generation.

MO-ESCos: A new supplier relationship

MO-ESCOs (Municipally-Owned Energy Service Companies) are publically-owned energy service companies that would provide institutional support to local energy schemes. Toward 2050, they may become sole suppliers of energy services within a defined geographic boundary. MO-ESCos facilitate civic generation by becoming the main purchaser of electricity generated by the local energy schemes. They also lead the development of distributed generation within their territories to meet supply requirements, purchase supply shortfalls from the wholesale generation market, and are incentivised to supply and reduce the energy demand of their customers. MO-ESCos would also have a core function to provide energy services and have a statutory duty to address fuel poverty and equity in energy provisioning.

OFGEM+: A regulator with a dual focus

The current system of regulating transmission level assets and utilities would continue initially as is, but over time move to a capacity auction model under a **National Energy Programme (NEP)** which is

responsible for delivering capacity for system balancing. There is an expanded function of 'OFGEM+' operated through **Regional Energy Partnerships (REP),** which enable and regulate distributed energy from Local Energy Schemes (LES) and regulate local suppliers (MO-ESCos)**.**

Regional Energy Partnerships: The LES enabler and regulator

Regional Energy Partnerships (REPs) are new institutions which foster the new municipal ESCos and local generation schemes. REPs have legal responsibility for working with: all local energy generation schemes, local authorities, distribution network operators (DNOs), other statutory bodies, and civic energy actors. They set targets for energy generation and consumption, and communicate with the national level of OFGEM+ to co-ordinate the scaling-out of distributed energy. Importantly, the REPs would develop **strategic energy plans** for their regions, focusing on maximising distributed capacity. The REPs also regulate **Local Energy Schemes** and **Municipally-Owned Energy Service Companies (MO-ESCOs)**, thus reducing the burden on the national regulator.

Transmission Level Generation

A distributed generation future would mean a diminishing market share for the large utility business model in both generation and supply markets. Under this scenario, market-led approaches are unlikely to deliver the investment required to construct the necessary transmission level assets for system balancing. The implications of expanded distributed energy provision on the national capacity auction system are considered; we find that deep penetration of distributed energy assets would mean the capacity auction system operating for base load as well as peaking transmission level assets. In this future, new ways of securing transmission level generation need to be investigated, and may mean new roles for the state.

Smart Grids

This institutional architecture will facilitate greater municipal and civic engagement leading to new business models and institutional arrangements for cost sharing and planning in the physical distribution networks. These developments have the potential to accelerate the deployment of smart grid solutions in the UK, but may require new business models for distribution infrastructures. The detailed options facing the distribution system under a distributed future are presented in the report.

The headline messages from this work, which are relevant to the fundamental challenges of NTBMs, are:

1 **A distributed energy system opens up new avenues for financing the energy transition, but challenges incumbent utility business models.**

A system based on many small- and medium-sized producers reduces dependence on very large scale finance and investment in centralised generation. This opens the energy system up to investment from citizens, municipalities, SME's, and other forms of finance. This increases the types of capital available to the energy system. At the same time, traditional utility business models face challenges from increased renewable generation and decreased supply market share.

2 **It is possible to meet 50 % of electricity demand using distributed generation by 2050, but new infrastructures and emerging technologies are still necessary.**

The energy transition is reliant on smart grids, virtual power plants, and new household generation sources. The use of biomass gasification, widespread use of in-home fuel cells, and the operation of virtual power plants at the local level, are emerging technologies that would require intensive adoption.

3 **All projections of the UK's energy future rely on some level of international interconnection and a distributed energy future is no different.**

Moving to a largely distributed generation system has traditionally been thought of as a step towards energy independence. However, this analysis of a distributed energy future has shown that high levels of distributed generation in fact make it necessary for higher levels of interconnection at regional, national, and international levels. This is true for the physical electricity system - which requires more interconnectors to move energy around regions as well as to/from regions, and its governance and regulation– which requires new institutions to ensure the system evolves to complement regional resources and inform transmission level investment decisions.

4 **The Thousand Flowers pathway relies on strong demand reduction and demand side participation and management.**

Along with distributed generation technologies this pathway relies on significant per capita demand reduction. This requires effective changes in end-user behavioural patterns and a significant uptake of energy efficient measures alongside energy efficient technological diffusion. A civic energy sector features novel forms of citizen participation where the energy system is no longer an almost anonymous entity, but a critical infrastructure in which all actors play a role. These successful initiatives equip the system with greater flexibility, allowing the nation to make the most of its renewable resources.

5 **A local and regional approach to distributed energy is vital.**

In order to move to a distributed approach, regional energy strategies and local capacity building will be essential for city regions, municipalities, communities, and citizens. This means complementing our national energy planning with regional and local support for a civic energy sector. This may mean a system of transmission level capacity auctions and contracts and regional level energy strategies and regulation.

The realising Transition Pathways Consortium Engine Room is happy to discuss these messages in more detail and is able to draw on expertise across the consortium to answer any specific questions Ofgem wishes to raise regarding the messages outlined above. It should be noted again these messages relate to the investigation of a pathway in which significant demand is met locally. However, paying attention to these system stresses early, understanding the process of issue identification and management using a multidisciplinary approach, and considering appropriate regulatory and policy responses is a useful exercise.