

Response to Energy and Climate Change Committee Call for Evidence on Local Energy

Summary

1. The Energy Technologies Institute (ETI), a public-private partnership between global energy and engineering firms and the UK Government, believes the UK can have an affordable, secure and sustainable energy system in the future. However, it is important that the right steps are taken to ensure the cost of carbon reductions are affordable in the context of sustaining UK economic growth and industrial development.
2. The ETI carries out two key activities – (1) modelling and analysis of the UK energy system to identify the key challenges and potential solutions to meeting the UK's 2020 and 2050 targets at the lowest cost to the UK, and (2) investing in major engineering and technology demonstration projects which address these challenges with the aim of de-risking solutions – both in technology and in supply-chain development – for subsequent commercial investors.
3. The ETI has invested over £200m in projects across nine technology programme areas, including distributed energy and smart systems and heat.
4. In responding to this call for evidence the ETI has considered the scope of Local Energy as Combined Heat & Power (CHP) systems and large scale Heat Pumps with a District Heating Network (DHN). Both are inherently local energy solutions, compared to small scale wind, solar etc which need to compete with larger-scale low carbon generators benefitting from significant economies of scale and located in areas of high quality resource.

Specific questions raised in the consultation

What contribution could medium-sized energy projects (5-50MW) make to the UK's climate change, energy security and energy affordability objectives?

5. The economics of District Heating are governed by constraints on carbon emissions and the ETI considers that the socially and economically optimum level of provision of space and water heating through DHNs by 2050 will lie in the range 5-40% of the total. While we are confident in these limits, the factors which determine the optimum range between them are complex and currently under investigation as part of our Smart Systems & Heat Programme.

6. We anticipate that District Heating Networks will initially be installed in the most attractive locations at a scale of 5-50MW of Combined Heat and Power generation. In the longer term, the impact of rising carbon prices will make it less economic to provide the heat from fossil fuels without Carbon Capture and Storage. This would make bio-energy and hydrogen more attractive as energy sources at this scale, along with connecting the network to larger thermal power stations.
7. While it is cost-effective to transport low grade heat over reasonable distances from thermal power plants, with around 30 miles typically being considered feasible, the planning and co-ordination required presents a significant barrier without a supportive strategic and market framework.
8. Connecting smaller DHNs together over time will build larger networks. The dynamics of this will depend on the policy and strategic environment as it has in other countries with major heat network investments, such as Denmark.
9. From this design work it is clear that District Heating Networks have distinct advantages as a component of future UK heating systems:
 - a. They enable the efficient re-use of low grade heat from power generation.
 - b. They provide future flexibility to use a wide variety of locally available heat sources, such as waste, bio-energy, industrial waste heat, large scale heat pumps etc.
 - c. They can incorporate shared heat storage to smooth the typical daily peak heat demands and avoid the need to build a very large low carbon heat supply system to meet peak demands. Otherwise much of this system would only be used for a small percentage of the year.

The extent to which heat pumps can be combined with storage facilities will determine the economic proportion of each

10. The ETI produced a cost breakdown for a notional DHN for an example urban area as part of an ETI Macro DE study into the potential for Local Energy supply. The DHN system was cost optimised and assumed energy (power and heat) was generated from a CHP plant using gas.
 - a. The area was chosen where district heating may be the right strategy for the future.
 - b. Costs were estimated for supply to 19,900 residential dwellings and 3,800 commercial buildings in a single area, supplying 50,000 residents.
 - c. Peak heat demand in the area to be met by the GHN is 155 MW. There is a surplus of 170 GWh a year of electricity generated by the notional CHP scheme, which is then exported from the area.
 - d. The installed capital cost is £315M, of which 80% is piping and connections to buildings and the rest is energy centre equipment, including thermal storage and pumping. This amounts to £13,300 per building on average.
 - e. The overall economics depend on how the DHN is financed and how the locally supplied and the exported surplus electricity are valued.

11. CHP systems have a significant efficiency advantage over the status quo. The recently published HMG Strategy *The Future of Heating, Meeting the Challenge* has a diagram on page 16 which illustrates how CHP can produce the same heat and electricity outputs with 30% less fuel by reusing waste heat.

12. The capital cost of a heat distribution network is a significant barrier to delivering this increase in efficiency as the UK has a limited but intense heating season. Demand increases by over six times from summer to winter. Our current gas based heating system has a typical average capacity utilisation of around 15% over the year. The network assets have a long life, which makes them hard to finance privately, and the potential for slow initial customer uptake also affects their attractiveness to investors.

What types of financing model are most suitable for small- and medium- scale projects? Do these differ from the financing models used for larger-scale projects?

13. Project finance arrangements which involve detailed contractual and risk mitigation arrangements are more suited to larger scale projects.

14. Many financial institutions have minimum transaction values. Therefore, this model is not easily accessed for the smaller type energy projects. There are however a small number of financial institutions which have captured the small – medium scale projects market enabling a project finance type model to be delivered to funding of ~£1m+. However the cost of debt is generally above markets rates which lenders assess through their risk/reward calculations.

15. Other types of recent funding models for types for small to medium scale projects have included:

- Asset leasing / asset finance – this has been typically used in areas of CHP technology, where the plant is installed in return for a lease payment from the end customer or user. These are generally most suited where there are no upfront development risks and the level of revenue is predictable which makes the transaction low risk.
- Infrastructure funds – have been used as a facility to fund smaller type energy projects. This is generally where there is a more certain profile and pipeline of future projects with a certain market place. These would also generally be construction or operational-ready, avoiding any pre-development risk. These funds have acted as full funding or to support equity, debt or subordinated debt.

16. Financing mechanisms for small and medium-scale projects need to be adapted to the needs of this market segment. The issues here include:

- the smaller scale of individual transactions, which may justify some kind of aggregation mechanism
- the need for specialist support in addressing risk and financing, as well as in negotiating the market access environment and policy support mechanisms

- the different ownership and management structures of small and medium-scale project entities
- the need for higher risk forms of finance (mezzanine) which can facilitate/enable access to more conventional sources of commercial debt finance
- the varied technologies (some not yet proven at scale) and particular risks associated with each.

Is there any evidence that medium-scale energy projects are more likely to be accepted by local communities?

17. This answer is based on knowledge gained from recent visits to twenty local authorities across the UK as part of the ETI's Smart Systems and Heat programme. There appears to be an appetite for local community schemes in both rural and urban areas. Community acceptance of medium-scale energy projects is derived from the presence of local community development teams, a robust community engagement programme and the perceived benefits accruing to the local community such as enhanced energy security, employment opportunities and the creation of a local revenue stream. In many communities it is the local authority rather than a private sector company that are seen as the 'trusted provider of energy.'

What appetite is there among UK local authorities to invest in their own medium-scale energy projects?

18. This answer is based on knowledge gained from recent visits to twenty local authorities across the UK as part of the ETI Smart Systems and Heat programme, as well as in-house experience.
19. Local authorities vary in their ambition, capacity and capability in relation to investing in their own medium-scale energy projects. Some are keen to invest in their own medium-scale energy projects but most would use other funding streams and shared public-private sector partnership mechanisms.
20. Local authorities were able to sell electricity following changes to legislation in August 2010. From our work, there are between 15-20 local authorities across the UK with strategic intent in this area. However, funding remains an issue with approaches differing across local authorities.
21. Medium scale energy projects require an element of initial development funding to develop the project to a stage of increased value – such as planning consent stage. It is this initial funding that is often a barrier for local authorities wanting to develop energy projects of their own.
22. Some local authorities want to be the principal partner or sole owner of energy generating activity and use the income to support council service delivery, others are incorporating decentralised energy generation and distribution into their local plans to support community regeneration and provide increased energy security.

What are the barriers to medium-scale energy projects in the UK?

23. Approximately 75% of the UK's demand for heat comes from the existing domestic (~55%) and commercial (~20%) sectors. Medium-scale energy projects should be capable of addressing that market. However, attractive propositions across the differing housing stock, ownership models (such as private-rented) and customer-base remains a challenge for the UK. There is a risk that medium-scale energy projects will be limited to particular niches, such as social housing or new-build, or focussed on the commercial sector. Incentives need to be created to stimulate demand from privately owned and occupied, as well as privately rented, buildings for local energy supply.
24. Barriers to consumers include concerns about monopoly supply, disconnection policy, contract duration, charging policy (based on usage or fixed charge), lack of consumer protection, lack of understanding of the benefits of local energy and inevitable disruption caused by installation.
25. For those looking to supply heat efficiently at a local level there are several barriers:
- the complex design of the local energy system. The ETI is exploring these issues within its Smart Systems and Heat programme.
 - the up-front capital cost of heat networks is a major barrier, as is the uncertainty of the extent and stability of the customer base. The through-life economics of the local energy scheme is exacerbated further since under tightening carbon constraints, the heat-generating technology will transition from fossil-fuel based to be replaced by a low-carbon alternative.
 - Regulatory uncertainty will increase the cost of capital. Heat networks are currently not part of the Ofgem regulated environment. The cost of capital also increases due to uncertainty around the performance of some low carbon heating technologies.
 - the DECC document "*The Future of Heating*" provides further examples of barriers including availability of heat demand data, lack of technical design standards, no common contracting frameworks etc.

How effective are current Government policies in encouraging local and medium-sized energy projects? Could they be improved in any way?

26. Concerns about uncertainty of policy is a significant barrier to investment as businesses are unable to plan appropriately before achieving any form of planning consent or value.
27. The policy environment is complex and difficult to negotiate for the small and medium project sector, without specialist support and advice.
28. Suggested focus areas include:
- improving the availability of data, technical advice and project development support to the range of different project developers of different project types
 - developing standardised contractual templates and consumer protection type arrangements which can provide a reference point for adoption and adaptation by small and medium scale projects, reducing transactions costs and allowing lessons

to be shared (we note for example that DECC has announced that it will endorse an industry-led consumer protection scheme for heat network users)

- support to building capacity in local authorities to provide technical advice and financing advice
- as small and medium project sub-sectors mature, the Green Investment Bank should consider extending its areas of priority focus
- understanding and addressing the particular access to market issues faced by local and medium-sized projects.
- Considering the case for some geographic targeting of support measures, in the context of a broader strategy for developing the future market for particular small and medium project categories. For example, favourable conditions for heat networks, or biomass projects will be geographically specific.