

SUBMISSION FROM NORDIC ENTERPRISE TRUST

Background

I am a Director of Nordic Enterprise Trust, which is a Linlithgow-based Scottish social business which promotes Scottish-Nordic economic and cultural interaction and I am also a Senior Research Fellow of the Institute for Security & Resilience Studies, University College London.

At a strategic or macro level, I advise governments internationally in relation to strategic energy policy. At a micro level, and on the principle that if resilient micro is networked, then the outcome is resilient macro, I am conducting action-based research with Nordic Enterprise Trust, the ***Linlithgow Natural Grid*** project. This initiative has been seed financed by European funding through the Smart Accelerator programme of the Edinburgh Centre for Carbon Innovation. It concerns the development of community-based financing & funding of energy infrastructure with the aim of energy independence - and hence energy security and resilience - for Linlithgow.

In support of this work I have 30 years' experience of the regulation and development of enterprises, markets and financial instruments, including, among other innovations, the UK Natural Gas Balancing Point futures contract, as a Director of the International Petroleum Exchange.

In the course of my UCL ISRS research I have carried out firstly an international review of strategic energy policy, and secondly a historical review in relation to legal and financial structures and instruments, in order to establish whether legal agreements/models and financial instruments of the past may be relevant to the energy requirements of the future. The following tentative conclusions inform my action-based research and my response to this enquiry.

Firstly, in the international context, I believe that the over-riding strategic economic principle of ***least carbon fuel cost***, which Denmark has successfully demonstrated in practice over the past 40 years, should be generally applied. ie for a given output of heat, electricity and power, Scotland should mandate the minimum possible consumption of non-renewable carbon fuel.

Secondly, in the historic context, in order to finance development and fund operation of such least carbon fuel cost infrastructure I believe it is necessary to apply collaborative enterprise agreements and prepay credit instruments, both having origins which pre-date modern finance capital.

If rather than using conventional equity or debt, a long term funding method of 'energy loan' investment through prepay energy credits is used, then renewable energy and energy efficiency projects increase in profitability proportional to the increase in prices of finite carbon fuels.

Supply - and whether there is sufficient generation to meet demand, in particular to the end of the decade. *What role will new generation that is under construction, or has been consented play?*

Current plans for centralised large scale generation envisage a top down choice between large scale onshore and offshore wind energy, with all that this implies in relation to system stability and the need for new domestic and international grid infrastructure. By way of back up, large scale CCGT natural gas fired generation, or coal with CCS are envisaged

such as at Peterhead, and elsewhere, typically at redundant previous generation sites.

Such a policy implies firstly, wastage of heat energy from carbon-fuelled power generation, since there is no means of capturing it, and secondly, significant distribution and transmission losses.

In addition to accessing large scale offshore renewable energy resources, Scotland should adopt, as does Denmark, a policy of distributed local energy generation, and the creation of local heat infrastructure including heat storage, local power generation, and use of heat pumps, in particular water sourced heat pumps, including heat from waste water. Every Scottish location where there is an electricity sub-station adjacent to a gas supply is a potential candidate for distributed generation using combined heat and power.

The Scottish Government aims to have a “largely decarbonised electricity system by 2030”. What does this mean in practice, and are there sufficient tools in place to bridge the move from fossil fuels to renewables?

The solution is already robustly evident in Denmark. Scotland should rapidly build out at community and neighbourhood level- as is the purpose of Linlithgow Natural Grid - distributed carbon-fuelled heat and power generation and associated heat storage and distribution. In addition to this existing technology, and leap-frogging Denmark, Scotland should develop and integrate energy storage and transfer tools including heat batteries; air source, water source and ground source heat technology; building upon Scotland's magnificent engineering heritage, academic and skills base. In addition, Scotland's carbon fuel use and distribution may be addressed through 'smart' policy initiatives across many fields, particularly freight transport & personal mobility.

To facilitate this, I recommend a new cross-cutting energy policy initiative – **Scottish Heat** . This would not be yet another organisation, but would be a partnership framework agreement bringing together Scottish Water; Gas suppliers; power generators & service providers; and academics, to the common purpose of Heat Independence for Scotland through the application of the Danish Least Carbon Fuel Cost operating principle. Proofs of concept of the policy initiative could be promoted in suitably chosen, urban, rural and semi urban locations such as Linlithgow.

How predictable peak demand is at present, and how is this likely to change in the coming decade. In particular, what impact will the development of demand side response have? What could be done to improve developments in this area?

As work practices change in an increasingly connected society it is likely that demand peaks will reduce in magnitude but that demand will be more spread out, much less predictable, and event-related. Developments in battery technology will allow intra-day smoothing of power demand, but the greatest requirement by far is for distributed heat storage and heat batteries which are capable of storing energy for much longer periods at a fraction of the cost of power storage.

A number of new transmission network projects are currently under construction or being planned. What role will these have in securing electricity supplies, and where should future investment be directed? What role might the distribution network, and a single European electricity market play in securing supplies?

Existing legacy high tension AC National Grid infrastructure should be supplemented by more efficient marine and river based grid connections including international connections.

Renewable energy from offshore wind off the Western Isles, and from Iceland and the Faroes should be connected by HVDC links. Almost all such **Natural Grid** infrastructure, which monetises nil input cost energy, may be optimally self-funded by energy loans.

A single European spot electricity market platform is essential for optimising production and use of electricity, but such a spot market must connect producers and consumers directly, with no place for middlemen/intermediaries. These market participants will become service provider members of the market platform which reduces capital requirements to those necessary for operating costs.

A number of significant changes to the electricity market have recently been finalised and are being put in place to ensure competition and cost reflective prices for consumers. Are policies such as the Capacity Mechanism under Electricity Market Reform adequate, and what other long term signals might be necessary to ensure security of supply?

The ongoing UK Electricity Market Reform and its market instruments and interventions are in my view fundamentally flawed, since the presence of market intermediaries competing 'for shareholder profit' is incompatible with the need for investment in new infrastructure. Market participants driven by the profit motive will always tend to extract value from existing infrastructure and will not collaborate with competitors other than by government mandate.

I recommend the development and implementation of complementary agreements and instruments which will enable the costs of capacity and new infrastructure to be shared between stakeholders. In particular, the financial forward markets in electricity and new contracts for difference may be replaced by regional and local markets in generic electricity prepay credit instruments, which also act to enable direct 'energy loan' funding of local infrastructure.

Any other matters concerning security of supply that you would like to bring to the Committee's attention.

I recommend that the Scottish & UK Governments should explicitly adopt a stated aim of **Energy Independence for Scotland** since this leads to energy security and to resilience as a society.

Moreover, I recommend the adoption by the Scottish & UK governments of an overarching economic principle for energy investment of **Least Carbon Fuel Cost** – that is to say, that for a given production of heat, electricity and power, Scotland should mandate the minimum possible use of carbon fuel.

The current global oil and gas market architecture is evolving as conventional oil and gas intermediary companies are squeezed between:

- Market price cap – the result of massive high cost fuel reserves (eg US shale oil) and new technologies which at high prices will substitute supply and act to reduce demand; and
- Market price collar - inexorably rising exploration & production costs.

There is a trend away from oil & gas as a commodity towards oil & gas as a service. Another way of seeing this is as a trend from competitive sale transactions to collaborative supply relationships.

The Scottish Government may therefore act firstly to create a complementary framework – ***Petro Scotland*** – as a Scottish oil & gas legal and financial market platform which enables cost sharing through developing the existing North Sea LOGIC platform, Master Deed protocol and otherwise.

Secondly, in terms of security of supply, the Scottish Government may encourage Scottish energy consumers to enter into supply agreements with oil and gas producers who seek security of demand, with a preference for 'least carbon fuel cost' supply arrangements as distinct from 'least \$ cost' sales of commoditised oil and gas..

Thirdly, the Scottish Government may act to facilitate engagement by communities with major global manufacturers of technology such as wind turbines on the basis of the supply of 'turbines as a service' under energy production sharing agreements, rather than the sale of turbines as a commodity to developers.

In other words, and to conclude, Scotland may aim to achieve energy resilience by deploying an intellectual and manufacturing heritage of engineering innovation to the extremely profitable business of mining the cheapest energy of all - oil and gas savings - rather than undertaking contentious exploitation of unconventional oil and gas with all that this implies.

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