Chemical Sciences Scotland: Energy Strategy Consultation.

Chemical Sciences SCOTLAND

Chemical Sciences Scotland response to the Scottish Government consultation on the Future of Energy in Scotland

Background to Chemical Sciences Scotland (CSS).

CSS was established in 2007 to bring together the chemical sciences sector in Scotland to be a voice for the sector and to facilitate collaborations and partnerships between chemical companies, the research base and the broader public sector. CSS has been the catalyst for many new initiatives including the formation of the Industrial Biotechnology Innovation Centre (IBioIC) in Glasgow, which has helped put Scotland at the forefront of a global transformation, the joint Life and Chemical Sciences (LCS) Manufacturing Strategy (Scottish Life and Chemical Sciences Manufacturing Strategy) and the recently approved Grangemouth Vision, the partnership strategy for growing this important national asset.

The Scottish Chemical Sector is truly ***international***; it is a major exporter that delivers outstanding Gross Value Added (GVA) and has shown remarkable resilience in turbulent economic times. The sector in Scotland is second only to food and drink and as a whole is the UK's largest manufacturing exporter; with the most recent ONS statistics showing that the Scottish sector maintained double digit export growth between 2014 and 2015, even before the recent weakening of the pound. This however also means the sector is acutely sensitive to the imposition of any tariffs and other barriers that will make exports less competitive and is exacerbated by the common need to import raw materials.

As outlined above the sector is a significant source of employment with over 10,000 people employed directly and in the region of six times that number indirectly. In terms of ***inclusivity***, this includes a range of jobs from R&D, manufacturing, sales and marketing through to logistics. R&D expenditure by businesses (BERD) in Chemical sciences (including pharma) accounts for 33% of all Scottish manufacturing BERD and 19% of all Scottish BERD. Scottish Government figures indicate that on average jobs in manufacturing secure 30% higher salaries than those in the Service sector (Re-Industrialising Scotland for the 21st Century, 2014: http://www.gov.scot/Resource/0045/00453082.pdf)

The sector ***invests*** heavily in capital assets, the most recent figures indicate investment within Scotland of over £1 billion, most notably from leading multi-nationals Ineos and GSK (but underpinned by many other smaller companies). With annual investment for the UK of over £4 billion this ensures that the UK is a leading global chemical and pharmaceutical producer.

CONCLUSION: The Chemical sector in Scotland is second only to food and drink in terms of exports. It is a source of highly skilled, well paid jobs and has invested heavily.

The Chemical Industry, a global context.

It is estimated that the annual turnover of the global chemical industry is in the region of €3.6 trillion (by way of comparison that of the automotive industry is €2.3 trillion). The European Chemical industry is responsible for about 20% of this turnover, employing 1.2 million people directly and approximately 7 million people indirectly, (European Chemical Industry Council, *Facts and Figures 2016 of the European chemical industry*, Published October 2016; http://fr.zone-secure.net/13451/186).

The Chemical/Pharmaceutical sector is massively significant to the UK; the most recent figures from the Chemical Industries Association (CIA) indicate that the chemical and pharmaceutical industry adds £14 billion of value to the UK economy every year from a total annual turnover of around £40 billion. The sector employs around 160,000 people directly and supports around half a million jobs in total. This means that this is also a high productivity sector having increased productivity by 10% between 2008 and 2014 and delivering a value add per employee of around £100,000.

CONCLUSION : The Chemical Sector is very important globally, nationally and locally

The Chemical Industry: - part of the energy solution

The Chemical industry continues to ***innovate*** to meet market expectations for example between 1990 and 2014 the sector reduced energy input per unit of output by 56%. In this regard it has consistently outperformed the overall manufacturing sector, where the reduction over this period was 37% (Eurostat and Cefic)

Over the last two decades, the chemical industry, including pharmaceuticals, has made an enormous effort to minimise the environmental impact of its production. Greenhouse gas (GHG) emissions per unit of energy consumption fell by 48 per cent between 1990 and 20 14. GHG intensity – the GHG emissions per unit of production – fell by 77 per cent from 1990 to 20 14. According to data from the European Environmental Agency (EEA), the EU chemical industry, including pharmaceuticals, emitted a total of 131.6 million tonnes of CO2 equivalent in 20 14, down from a total of 324.5 million tonnes in 1990. This 59.4 per cent decrease clearly illustrates how much importance the chemical industry attaches to **sustainable development** and emphasises its **central position** in a modern, globally responsible manufacturing industry.

The environmental benefit is not limited to energy and GHG savings, an independent study by McKinsey (https://www.icca-chem.org/wp-content/uploads/2015/08/Innovations-for-Greenhouse-Gas-Emission-Reductions-Executivce-Summary.pdf) indicated that the energy used in manufacturing chemical products is saved more than twice over during the lifetime of the products by virtue of improved product attributes (versus alternatives) such as being lighter weight, lower friction, more insulating and also by enabling improved productivity e.g. improving agricultural yields.

CONCLUSION: The Chemical sector has consistently improved performance leading to a massive reduction in energy intensity and GHG emissions.

1. A 2050 Vision for Energy

The Chemical Industry in Scotland welcomes the development of a revised Energy Strategy for Scotland that will hopefully provide clean, low carbon energy at a cost that will allow the Scottish Economy to be competitive in the global market place.

A new 2030 'all energy' target for the equivalent of 50% of Scotland's heat, transport and electricity consumption to be supplied from renewable sources, is a very ambitious target especially when set against the progress within the rest of the UK and globally.

It is recognised that the Scottish Energy Strategy will need to sit alongside any UK requirements either existing or proposed and there needs to be a clear explanation as to how this will be demonstrated. Most companies within our sector will already be part of the UK Climate Change Agreement framework and other UK-wide schemes such as the EU Emissions Trading Scheme (EUETS). Failure to meet these expectations could cause significant financial penalties

The strategy recognises that significant changes in the energy supply system have already started to happen with a movement away from the historic centralised model. This movement towards micro grids makes it more difficult to predict future energy needs and a focus on flexibility and agility within the Energy Strategy is seen as key to future success.

A Stable Managed Energy Transition is required to ensure consistent national / global pricing to support key industries such as the Chemical sector within Scotland otherwise the gains made in terms of increased employment in the low carbon and renewable energy economy in Scotland could be lost from established industry sectors.

The strategy document provides a useful framework for the development of an overall route map that will help to deliver consistent sustainable energy to everyone in Scotland including key industries such as the Chemical Industry and we look forward to working with the Scottish Government to deliver a secure and cost effective energy future.

2. Understanding Scotland's Energy System

The description of Scotland's Energy System highlights both the opportunities and the concerns regarding the attainment of the new 2030 'all energy target'.

Oil price volatility and the impact of shale gas technology - the document stresses the fact that Scotland is largest oil producer and 2nd largest gas producer in Europe (p16, para. 28), but this needs to be taken in context. The consequential reduction in the price of oil from >$90/barrel to current levels ~$52/barrel (driven by shale gas production in the USA, economic factors in Asia and political factors in middle East), has seen the elimination of 10-15,000 jobs from Scotland's oil industry in the last 2 years, in addition to a significant reduction in oil investment activity as projects become financially unattractive to pursue. It is generally accepted today that such projects are unlikely to be reinstated while oil prices remain below $73/barrel. In order to continue support for the oil and gas industry the model needs to embrace these global trends.

One of the key messages from the section is the recognition that it is the pattern of energy changes that will drive the overall design of any future supply network and the challenges that will be faced if we centralise our energy strategy on the existing electricity network (Para. 43)

Much play is made within the document about the decarbonisation of electricity and yet only 22% of the energy demand is focussed on electricity generation with 53% on domestic heating which is very much still Hydrocarbon focussed (79%).

One of the key areas for the proposed transitional energy strategy with an increasing focus on electricity as the driver for a low carbon economy is the capacity, and the reliability of the network to cope with these changes. Diagram 12 would tend to suggest that the UK already has one of the highest pence per kwh charges in Europe (on a tax free basis). The strategy document does not provide a lot of detail as to how the system can be upgraded in a cost efficient manner. On energy unit basis (kwh) it would also appear that electricity is already three times as expensive as gas even before the changes proposed under this strategy document.

The document also stresses the practicality and benefits of needing to operate within a single GB Energy Market. Does the UK (or GB?) have an aligned strategy that supports the same energy supply considerations that are included in this proposal?

The strategy document makes reference to the UK situation in Europe and the possibility of changes within the Brexit framework. Lack of access to the European internal energy market could have a significant impact on the proposed strategy. Therefore we would ask if the Scottish Government will consider holding a second consultation following the conclusion of Brexit negotiations.

Information and Statistics

The document uses a variety of information sources that move between the concepts of total energy for electricity generation, heating fuel, and household consumption which can be confusing in trying to display actual figures and details. For example diagram 3 (Electricity generation in 2015, GB and Scotland), determines that 43% of generation in 2015 was from renewable sources. However diagram 4 (Electricity generated (GWh) from renewable sources, Scotland, 2000-2015) seems to suggest that the figure for 2015 “Renewable Generation as a % of gross Consumption” is 60%. Whilst both of these graphs may be true the link between the figures is not clear.

One other area of uncertainty can be introduced by switching between capacity and usage figures (for example GW and GWh in para 35)

Many of the information sources used in this section also relate only to domestic users. It is difficult to ascertain whether the inclusion of the energy demand picture for industry would change the overall pattern of usage.

3. Meeting our energy Supply Needs

The overall approach centred on a balanced combination of energy sources, which are flexible and adaptable to changing market conditions appears reasonable on a macro scale. Whether this new structure can be in place to meet the targets for 2030 is not so certain.

The chemicals industry supports unconventional oil and gas, as part of a balanced energy portfolio, and it is difficult to how a full strategy can be developed without an answer to this question. The advantages seen by the chemicals industry to UOG are as set out in the Chemical Sciences Scotland draft response to the government consultation on UOG.

The commercial development of both new energy sources and commercially attractive Carbon Capture and Storage (CCS) along with the more novel CO2 Utilisation (CCU) will be critical and yet no plans are currently in place to deliver these key elements of decarbonisation**.**

Another element of the successful delivery of CCS is whether Scottish Government would support the use of the cluster model, e.g. all Grangemouth industrial sites routing to a single CC plant? However it does need to be recognised that carbon capture in itself is an energy intensive process which also requires the use of significant volumes of chemicals.

Key Points

It is appreciated that as stated (Para 65.) the Scottish Government have recognised the uncertainties of defining the transition of the energy supply picture and the fact that a flexible approach must be taken. This recognition of the need for a balanced combination of energy sources seems to be at odds with the fact that currently 35% of Scottish energy generation comes from Nuclear and yet no mention is made of how we will transition out of this technology without placing extreme stress on the energy generation system.

It is appreciated that the Scottish Government recognises the important interaction between the energy system and the tax regime and the part that business rates plays in this equation. The proposals listed for 2017-2018 appear to be in contradiction with the current increase in business rates (in some cases of the order of 10%).

It is also mentioned that new thermal electricity generation capacity will be required (Para 20.) but no detail is given as to what this will be, how it will be funded and on what time scale this will be delivered.

There are also specific references to the place that will be played by new technologies such as the use of Hydrogen, the development of wave energy technology and the question whether unconventional oil and gas is to be part of the solution are still to be decided. Operational carbon capture and storage is another area where significant development is still required to determine actual commercial feasibility never mind actual successful large scale technical demonstration. Given the length of time taken to develop these 'new technologies' compared with the progress of electric infrastructure for vehicles makes it appear doubtful that these technologies can be successfully delivered in time to meet the defined strategy.

Nowhere in the strategy document is the question of the balance of the generation portfolio mentioned alongside how these new / traditional sources of energy will be merged together into a grid system that delivers energy to consumers in a consistent reliable way. For example (Para. 107) a study from BREF into the costs for renewable technologies seems to show that there is a potential for onshore wind, offshore wind and solar PV to produce electricity at a lower cost per MWh than the proposed Hinkley 'C' nuclear development. What the paragraph fails to mention is that all of the renewable technologies mentioned are transient generation sources dependent on environmental conditions that will therefore require additional reserve generation capacity or storage infrastructure that the nuclear continuous generation option does not.

The report recognises the grid constraints for distributed power generation and the need to work with suitable authorities to address these constraints. Scotland however is in the position of having

extended areas where this work will entail extensive capital costs. It is wondered whether a strategy of using differentiated local solutions 'such as Orkney's 'Surf and Turf' and BIG HIT projects would be more appropriate than trying to extend an upgraded distribution grid to these remote areas.

It also needs to be recognised that the majority of chemical manufacturing site operate 24/7/365 and therefore require constant energy sources. These sites will not be able to react to or benefit from demand-side initiatives such as increased manufacturing during nights.

4. Transforming Scotland's Energy use

A balanced approach that reflects the actual energy usage patterns must be developed if targets are to be met. Much of the current focus has been on decarbonisation of the electricity network (22%) and the areas of heating (53%) and transport (25%) now also need a suitable delivery plan.

Energy reduction programmes such as Scotland's Energy Efficiency Programme (SEEP) will be key as energy efficiency moves to the domestic arenas.

As stated above the chemical industry is already in the vanguard of improving the energy efficiency of manufacturing with a reduced energy input per unit of output by 56% from 2009 to 2014. In this regard it has consistently outperformed the overall manufacturing sector, where the reduction over this period was 37% (Eurostat and Cefic). However the chemical industry operates on a global basis and failure of other major economies to meet the Paris Agreement will threaten the competitiveness of Scottish sites with increased potential for offshoring or closure.

Many manufacturing sites both in Scotland and in the UK already have onsite electricity and heat (usually steam) generation. Any loss of the effectiveness of this embedded generation capacity under current charging proposals from Ofgem may affect the overall competitiveness of the industry.

CSS agree that the setting of targets is one way of driving improved energy efficiency as long as there is a fair playing field for all participants. Given the uncertainties around Brexit as well as America's current uncertain stance on climate change it would perhaps be prudent to wait until there is more clarity before signing up to a new EU based energy efficiency target. If such a target has to be imposed then a flexible target which takes account of the effects of economic cycles, energy prices and weather related changes would be seen as advantageous.

It is interesting to note that Scotland's Final Energy Demand has fallen from 2008-2014. It might be helpful to understand the specific areas in which these reductions took place. For example in the referenced period chemical manufacturing sites from both BASF and DOW reduced production and closed and similar reductions in other industries may exaggerate claimed efficiencies.

Energy efficiency targets for manufacturing really need to be framed in terms of energy intensity ratios, rather than absolute reductions since most manufacturing plants have a high base energy load so maximum efficiencies are gained by a combination of both reducing this baseload, and increasing throughput (while holding the baseload constant). This is the type of efficiency required to keep the Scottish economy thriving. A recession would significantly reduce manufacturing energy use, but clearly is not the desired outcome as it does not reflect actual efficiency or productivity

gains. This is in contrast to domestic housing and also potentially to commercial buildings energy use, where absolute energy reduction targets may be appropriate.

There are additional underlying energy usages which may require agreement across several functions within Scottish Government for the most effective solutions to be delivered. For example a significant element of carbon footprint from chemicals sites can be the transport required for moving waste materials as currently there are no hazardous waste treatment facilities in Scotland. New initiatives to reduce industrial transport related carbon footprints may need to consider the availability and proximity of these type of facilities (waste incinerators and chemical recovery plants.)

Is there a possibility to explore funding from Scottish government for replacement of ageing / non energy efficient equipment (similar to scrappage scheme for diesel cars)?

5. Delivering Smart Local Energy Systems

The concept of "Smart, Local Energy Systems" especially given Scotland's number of remote communities is likely to be a differentiating factor in the delivery of a Low Carbon economy.

As already stated previously the geography of Scotland provides unique challenges to the upgrading and extension of the grid network. Building on the legacy of community energy projects in Scotland may allow a different picture of energy infrastructure to be developed.

However the challenge of delivering the "non-traditional" business models including the concept of shared ownership should not be underestimated. The framework that moves these innovative local one off projects into a coherent overall strategy is one where the Scottish government must play a major part.

One of the major challenges for the effective use of heat from community schemes is usually the infrastructure required to distribute heat to customers. This is generally cost prohibitive and improved mechanisms will need to be developed and supported by local councils or Scottish Government.

The proposal for a government owned energy company (GOEC) and the possibility of using the concept of Renewable Energy Bonds would seem to offer the support and co-ordination that will be required to deliver the wholesale changes required for targets to be met.

6. Delivery, Monitoring and Engagement

The changes proposed in this document will require a different way of thinking if the energy strategy is to be delivered successfully. As previously mentioned Scotland has a sound base of Enterprise and Skills agencies but how these agencies link to both larger and smaller companies will be critical to the delivery of the targets listed in this proposal.

CSS recognise the key role of the Energy Technology Partnership (ETP) in tapping into the existing research and innovation facilities but further support is required to help translate this into higher technology readiness level projects with key energy related companies in order to develop a 'real' partnership approach.

As proposed the strategy needs to be monitored through an agreed and transparent set of metrics that are easily understandable by the general public as well as the energy community.

Engagement of the public will be key to moving forward with this proposed strategy since the largest portion of the efficiencies to be made reside in the domestic area.

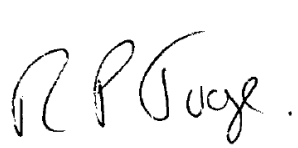
Final Comments

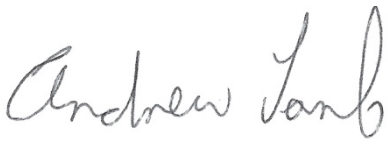
The document sets out a framework for the delivery of a low carbon economy in Scotland but there are several questions around the feasibility of the strategy where key questions still remain including:-

- What is Scottish Government position on Unconventional Oil and Gas (UOG)?
- How will the strategy align with UK initiatives?
- How is stable base load electricity generation capacity to be delivered without using coal, oil, and gas or nuclear as fuels?
- Key areas such as CCS do not yet have a defined implementation strategy.
- What will be our access to European Energy Markets following Brexit and at what cost?
- There is significant potential for strict energy reduction targets to lead to, "carbon leakage" (moving energy intensive manufacturing to other countries), resulting in Scottish economic activity reduction and job losses, how will Scottish Government ensure that any energy efficiency initiatives will not inadvertently drive this outcome?

Given all of the above considerations CSS would ask Scottish Government to consider a redrafting and subsequent re-consultation at an appropriate point.

For and on behalf of **Chemical Sciences Scotland,**





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