Environment, Climate Change and Land Reform Committee

Inquiry into air quality in Scotland

Written submission from Scottish Hydrogen & Fuel Cell Association

The Scottish Hydrogen & Fuel Cell Association would like to submit the following evidence for consideration in the forthcoming Inquiry into Air Quality in Scotland.

We would firstly like to put on record that SHFCA is very grateful for the support our sector has received from the Scottish Government, Transport Scotland, and other public sector bodies. Public funding support enabled the original £22.5m Aberdeen Hydrogen Bus Project to proceed, and to successfully deploy Europe’s largest fleet of zero-emission hydrogen buses in March 2015. These buses are now part of a wider fleet of true zero-emission vehicles in Aberdeen which include ten of the Toyota Mirai fuel cell vehicles. These vehicles all use ‘green’ hydrogen produced from renewables, and are improving air quality in Aberdeen.

This Aberdeen project has achieved wide recognition for HFC activities in Scotland, and been followed by others such as the Levenmouth Community Energy Project in Methil and BIG HIT in the Orkney Islands. These all demonstrate the clear links between Renewables and low-Carbon Transport using hydrogen as a ‘zero emissions’ transport fuel. These exemplar projects are leading the way in the use of constrained and variable Renewables such as wind for production of hydrogen, and also clearly set out the aspiration for the use of ‘green hydrogen’ as the main source of future transport hydrogen fuel in Scotland, which delivers zero carbon emissions at the tailpipe and improves air quality.

Scotland has great potential to develop significant economic markets and value from hydrogen and fuel cells. The transition from oil to renewables-derived hydrogen for transport can reduce transport fossil fuel dependency, eliminate harmful exhaust emissions, and create local employment.

Our following comments are based on the suggested topic areas.

**Does Scotland have the right policies (Clean Air for Scotland Strategy), support and incentives in place to adequately tackle air pollution?**

Local Policies are needed to tackle NOx emissions. There is a link between the emissions produced in an area and the local concentrations, but this depends strongly on the type of pollution. Analysis in London suggests that 25% of particulate matter (PM) pollution in Greater London is attributable to sources within the city, and 75% to sources outside the city. By contrast, NOx is a far more localised problem, with 82% of London’s NOx pollution generated within the city and only 18% brought in from elsewhere. Effective policies to tackle NOx air pollution as a priority will therefore need to identify and focus measures on the abatement of local sources of NOx emissions. Sources of NOx emissions for Central London and Greater London are shown in Fig 1 and Fig 2 below, taken from the Policy Exchange report ‘Up in the Air’ (2016)
Fig 1. NOx Emission Sources in Greater London

Road transport is the main source of NOx emissions in Central London, at 48% of total, but NOx from heating is not far behind at 38% of total. The NOx levels in London are also shown graphically as a concentration map in Fig 3 (from London’s Environment Strategy Evidence Base, 2016). London is one of the few cities in the UK which have been successful in implementing planning guidance for low carbon commercial buildings. This has resulted in the deployment of large scale fuel cell combined heat & power (CHP) in developments such as Quadrant and Walkie-Talkie, which can deliver the required carbon reduction at lowest cost. Fuel cells use a catalytic process rather than high temperature combustion, which eliminates NOx and particulate pollution and can deliver significant local air quality improvements.
Similar detailed data for NOx emissions for Scottish Cities does not appear to be readily available. The measurement and reporting of NOx emissions on a national level for Scotland may not properly reflect local concentrations and the consequential health impacts of NOx. There is an illustration in ‘Cleaner Air for Scotland’ (CAFS, Scottish Government, November 2015) reproduced as Fig 4, which shows NOx measurement trends for four locations in central Dundee. This Dundee data clearly shows that progressively tougher emissions standards have not yet delivered predicted real-world benefits in reduction of NOx levels, especially true for diesel Euro-5 and Euro-6 light vehicles. Real-world NOx emissions from diesel vehicles seem to be one of the key reasons why the expected reductions in NOx concentrations at the roadside have not materialised. This is further compounded by growth in the proportion of diesel vehicles in the car and light van segments.

CAFS will address the major air pollutants that affect human health, and rightly focuses on the two main pollutants: nitrogen dioxide (NO2) and particulate matter (PM10 and PM2.5). CAFS provides tabular data for pollutant emissions by sector in Scotland for 2013, with Transport accounting for 38.5% of overall NOx. It is however worth noting that ‘Energy Industries’ in Scotland accounted for 34.6% of NOx emissions in 2013. The recent closures of Cockenzie (in March 2013) and Longannet (in March 2016) coal fired power stations will significantly reduce the NOx

Fig 3. London NOx Concentrations Map (2013)  
Fig 4. NOx trends for Central Dundee, 2006-2014
contribution from this sector, and result in proportionately higher NOx emissions from Transport as % of the overall NOx emissions for Scotland.

CAFS also identified the need to work with key partners to investigate the use of hydrogen as a transport fuel, as well as exploring wider environmental and economic opportunities of using hydrogen for energy applications – especially in promoting renewables, energy balancing and storage. The benefits of zero-emission vehicles (ZEVs) are set out in Switched on Scotland (Transport Scotland, November 2013) and Switched on Scotland Phase 2 (June 2017) which sets out actions for ZEV user growth.

**How does the Scottish policy fit with the UK and EU policy on air quality?**

Overall there appears to be reasonable alignment between Scottish policy and UK/EU policy on air quality priorities.

The focus on addressing impact of transport related emissions is important, but should not neglect the growing contribution from stationary sources to NOx levels. Particular attention should be given to stationary sources which are unabated, such as power generating sets (gensets) increasingly used for grid balancing at MW scale.

EU regulations on emissions from non-road mobile machinery (NRMM) have come into place, and will progressively reduce gaseous and particulate pollutant emissions of engines used in mobile machinery for domestic and professional use. Progress with implementation and compliance in Scotland should be kept under review, as NRMM can contribute up to 10% of overall NOx levels in urban areas.

Governance of transport emissions in order to meet air quality targets needs to address gaps at Scottish, UK, and EU level in existing regulation of emissions from road vehicles. One of the gaps is the lack of regulation of non-motive auxiliary power units, such as the diesel ‘donkey engines’ used on most chilled and refrigerated lorries (see Fig 5 for graphic illustration of exhaust pollution from one unabated small engine).
Fig 5. Particulate / soot emissions from ‘reefer’ engine (you can’t see the NOx)

PM and NOx emissions from one small unregulated ‘donkey engine’ in the chiller unit can be many times more than the emissions from the large diesel Euro VI lorry engine used to haul the truck and its load.

These examples of non-road and unabated/unregulated emissions warrant specific attention, and measures should be put in place to address any current gaps in Scottish regulation.

**Are the policies sufficiently ambitious?**

The Scottish Government has decided to replace the existing Scottish PM objectives with the World Health Organisation (WHO) guideline values for PM10 of 20 μg/m³ and PM2.5 of 10 μg/m³ guideline values. These values are considerably more stringent than the equivalent EU and UK targets, but reflect an increasing body of evidence which suggests that fine particulate matter (PM2.5) is the most significant fraction of particulate pollution in terms of health impacts.

Recent research by University of Edinburgh (Miller, 2017) indicates that even smaller PM (nano-particles) may have significant adverse impacts on health. The measurement of these nano-PM levels is very difficult, but it will be important to collect and understand trends in nano-PM, as the ongoing trends towards higher efficiency petrol and diesel injection combustion engines can sway PM emissions towards smaller particle sizes, and these nano-PM emissions may then require more sophisticated exhaust particle filters to reduce any potential health impacts to acceptable levels.

Air Quality policy should take the latest research in this area into account, and also consider where current gaps in knowledge may need to be addresses. This may be an opportunity for greater involvement of Scottish universities and SEPA in structured work programmes for air quality improvements.

The Switched On Scotland Plug-In Vehicle Roadmap established a vision that by 2050 Scotland’s towns, cities and communities from the damaging emissions of petrol and diesel fuelled vehicles. This is a worthy goal, but the timescales should be more ambitious and must also include hydrogen fuel cell vehicles as an integral part of planning for delivery of zero-emission transport.

**Are the powers and resources of Local Authorities and SEPA to address air pollution adequate?**

Traffic related air pollution is a major source that can be reduced through local and regional action, but there will need to be sufficient Local Authority and SEPA resources in place to introduce and implement access control options, and to identify and drive down background levels of preventable air pollution.

For areas requiring sophisticated measurements, such as nano-PM, there may be justification to develop a centralised SEPA resource with skills and equipment to efficiently support local authorities.
Are the policies and delivery mechanisms (support and incentives) being effectively implemented and successful in addressing the issues?

See earlier comments about effective implementation of planning guidance, specifically for new buildings.

Is Scotland on target to have a pilot low emission zone (LEZ) in place by 2018 and should there be more than one LEZ pilot?

No comment

How should the improvement of air quality be prioritised in areas where there have been persistent breaches of NO\textsubscript{2} limit values?

Resources and deployment should be prioritised on basis of overall improved health outcomes.

Is adequate consideration given to air pollution from agriculture?

Probably not. Agriculture is identified as the principal source of Ammonia, contributing 86.6% in 2013, with a reduction of only 28% since baseline 1990 levels (SPICe Briefing, Air Quality in Scotland, May 2016). This ammonia can subsequently react with other disperse air pollution, such as SO\textsubscript{2} to form PM. The closure of the Cockenzie power station in March 2013 and Longannet power station in March 2016 will reduce Scotland’s SO\textsubscript{2} emissions, and as a consequence this may also help reduce ‘indirect’ PM levels.

In 2013 agricultural activities in Scotland were identified also contributing 21.1% of overall PM. Both the PM and ammonia will be from disperse sources and contribute to overall background air pollution levels.

Are there conflicts in policies or barriers to successful delivery of the air quality objectives?

In general the objectives to reduce carbon emissions are also delivering air quality benefits at a national level, for example with the replacement of coal powered generation by wind and solar renewables.

However at a local level there may be areas of conflict. The use of biomass for heat can result in significant local PM unless particle filters and stack design are considered. Similarly the move towards higher diesel/petrol engine efficiencies can result in higher NO\textsubscript{x} and nano-PM with adverse health impacts.

A key barrier to the delivery of air quality objectives will be the financial justification. For instance how can future savings in health budgets be quantified, and the required investment in low emission infrastructure be justified and supported in the short term?