Review of proposed amendments to RTFO Guidance

How to respond

We are seeking views on our proposed amendments to the RTFO Guidance. The deadline for responses will be the **30th January 2019.**

Please use this form to provide your response, which should be emailed to carly.whittaker@dft.gov.uk.

When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of a larger organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.

Our questions:

1) Do you agree with our proposal to account for the GHG emissions from displacement of renewable electricity when existing renewables are used to provide the process energy for RFNBO production?

   Yes ☐ No ☒

Please provide comments to support your response

The Year 11 RTFO guidance on GHG calculations for RFNBOs has been in place for nine months. Businesses have relied on this guidance to commit resources to develop hydrogen production projects (while hoping for more constructive amendments). These businesses will now suffer financial losses as a result of the proposed changes. In addition, changing the guidance has the potential to reduce the credibility of the RTFO, which would make it harder to raise funds for renewable fuel projects (an effect that could have knock on effects on the financing of other types of renewable projects).

On the other hand, it is necessary for guidance and legislation to evolve over time and for mistakes to be corrected, and if this is done in a sensitive manner with industry support, such changes can help build investor confidence.

The amendment to the RTFO was much delayed, and the political climate at the time meant the REA was acutely aware of the risk that the legislation would not materialise. We were concerned at some aspects of the policy, but our over-riding desire was to support it, lobby hard to ensure it reached the statute books and address any underlying concerns at a later date.

The development fuels sub-target is, by definition, a very new policy objective and the definition of these fuels is unique to the UK. We envisage there may be more issues over how the development fuel policy operates, and feel that there may be

merit in delaying things a little in order to take stock of the operation of the whole development fuels sub-target, as opposed to making piecemeal changes.

At present there are no qualifying development fuels, the sub-target is now in operation and obligated parties are concerned about their ability to meet their obligation. The sub-target comprises fuels of vastly differing nature, subject to very different market signals. Some (the waste based fuels) are resource-constrained, whilst fuels of non-biological origin are constrained by the rules governing eligible power inputs. All have significant strategic long-term importance and should be nurtured. RFNBO hydrogen is unique in that the rules surrounding qualifying electricity have a huge bearing on the cost of the hydrogen produced, and there is potential for this to flip and for the costs to come down rapidly. Having RFNBO H_2 in the same basket a fuel such as waste based bio-jet, is likely to cause problems. Some members have expressed concerns about the ability of some development fuels to flood the market, reduce dRTFC prices, and make it difficult for them to finance their projects.

In our view, the damage to the credibility of the RTFO from a number of piecemeal changes to the guidance, outweighs the risks from continuing to support hydrogen in the way set out at present. We instead propose a comprehensive examination of the policy, with the aim of positively amending it to ensure it meets DfT's policy objectives (which we share). We therefore recommend leaving the guidance as it is for the moment. The comprehensive review should be done swiftly, and REA is happy to assist.

We recommend leaving the guidance as, it is whilst the review is undertaken, because:

a) There is very little chance of significant and rapid increase in renewable hydrogen production, because of its cost and constraints on availability of vehicles and fuelling infrastructure.

b) The proposed approach misses important GHG benefits of hydrogen and does not follow the methodology used elsewhere by Government.

c) Hydrogen is a strategically important fuel, with huge potential for air quality benefits as well as GHG savings, and the development fuel sub target within the RTFO is best placed to play an important role in bringing it to market.

d) Non-grid connected and constrained electricity are highly unlikely to be able to produce hydrogen cost-effectively.

Each of these is explored in more detail below.

Likely Growth in Hydrogen for Transport

The most recent RTFO statistics do not show any use of renewable hydrogen in transport. Overall numbers are low and are constrained by the availability of vehicles and stations. There are only around 10 hydrogen filling stations and 100 hydrogen fueled cars in the UK. Hydrogen buses are being used in Aberdeen and will be used in London, Birmingham, Brighton, Liverpool and Dundee.

Evidence from REA members show that buses require a hydrogen price of around £5 per kilogram to compete with diesel. This could be broadly achieved if support from the RTFO delivered a value of around £7/kg. The capital costs of hydrogen buses remain significantly more than diesel buses, but a hydrogen price of around

£5/kg would send a strong signal encouraging manufacturers to gear up production and realise cost reductions.

An additional constraint on hydrogen is the availability of vehicles. There are three hydrogen cars on sale in the UK, aimed at the top end of the market and unlikely to be adopted widely. Hydrogen buses are available from suppliers such as Van Hool and Wrightbus, but less than 100 are operating in Europe at present. No large manufacturers are offering hydrogen heavy goods vehicles, although Toyota and Hyundai have models that are close to production.

It takes many years to develop the capability to mass produce vehicles and the UK will often lag behind the US and mainland Europe because our vehicle market is far smaller than theirs. Even if hydrogen was available at a low cost, it will be a decade before a large number of hydrogen vehicles are used in the UK.

These constraints are reflected in forecasts of hydrogen transport[1] use. National Grid's Future Energy Scenario forecasts at most 6,690 hydrogen vehicles, which would consume around 48m kilograms of hydrogen, (around 2TWh of power consumption). This equates to approximately 0.8% of transport fuel consumption, far lower than the 2.4% development fuel target for 2030.

Trains and ferries are more attractive prospects for fueling with hydrogen, and could make a great contribution to GHG reductions and improved air quality. There is interest in developing these, but the RTFO as it stands creates no market pull. This is a missed opportunity. Fuel cell trains are not encompassed within the definition of Non Road Mobile Machinery (although less efficient internal combustion engine trains are), and vessels which "normally operate at sea" are not eligible end uses for the RTFO. Furthermore commercial operations on inland waterways are also excluded. Amending the obligation to include these transport modes, would be helpful in creating other opportunities for hydrogen consumption.

Problems with Methodology

The consultation claims that diverting power from the grid to hydrogen production will increase GHG emissions. However, the analysis ignores the medium-term impact of hydrogen and uses a consequential GHG methodology that is unusual for the RTFO and other Government GHG assessments.

A key benefit of electrolytic hydrogen production is that it provides a base electricity price for variable renewable generation. This reduces the risk profile of wind and solar projects and allows greater investment in the sector. The medium-term impact of supporting electrolytic hydrogen for transport would be to increase the amount of renewable generation capacity, helping to decarbonise the both the grid and transport. This benefit is ignored in the short-term marginal approach proposed by the DfT.

The proposed GHG methodology set out in the new guidance uses a consequential approach that is unusual for the RTFO, which generally uses an attributional approach. For example, waste feedstocks are not assigned the GHG impact of

[1] https://www.parliament.uk/documents/post/postpn_383-carbon-footprint-electricity-generation.pdf

alternative uses to which they could have been put, such as power production. Deciding to use a consequential approach just for RFNBOs feels very arbitrary. If the DfT wishes to move away from an attributional GHG methodology towards a consequential GHG methodology, it should be applied consistently across all sectors, entailing a major impact on which pathways meet the GHG threshold.

Strategic Importance of Hydrogen

Hydrogen produced from renewable electricity is likely to have an important role to play in a low or zero carbon economy.

The recent Climate Change Committee report on hydrogen concludes that although H_2 from electrolysis is expensive at present, it is the only pathway that is capable of producing very low carbon hydrogen at a large scale. It states that "If hydrogen from gas with CCS is deployed in very large quantities, the emissions savings may be insufficient to meet stretching long-term emissions targets".

The report notes that hydrogen has important role to play in decarbonising heat and providing grid-balancing services and will be required to decarbonise some modes of transport (e.g. HGVs, buses, shipping and trains). The CCC suggests Government should "continue to focus on developing hydrogen refuelling station and vehicle technology, by building an initial network to allow wider roll-out later in the 2020s. Government funding in support of hydrogen refuelling stations should prioritise those bids which allow a variety of vehicles, including HGVs or buses, to refuel. This will enable SMEs and manufacturers to develop the early market for hydrogen HGVs."

Whilst the DfT's Road to Zero focuses on electrification, it is positive about hydrogen, particularly when making comparisons with other fuels. It talks of taking steps to ensure that "the UK retains its position in the forefront of the adoption of zero emission vehicle technologies". More than £20m of funding has been provided to encourage the adoption of hydrogen for transport.

However, these programs will only be successful if the cost to consumers and businesses of transport hydrogen results in a total cost of ownership that is close to diesel. The RTFO has an important role to play in bridging the economic gap between innovative low carbon fuels and established fossil fuels.

Decarbonising transport relies on new vehicles, new filling infrastructure and new fuels. All of these must be developed in parallel for progress to be made. If hydrogen cannot be delivered at a price that makes sense, it won't be possible to develop a hydrogen transport economy. The development RTFO can play an essential role in helping hydrogen achieve its potential.

Constrained and non-grid connected electricity

Connecting directly to a non-biomass renewable source of electricity (i.e. onshore wind or solar) that is not grid connected means that the GHG test can be met. However, the intermittency of renewable production means the electrolyser has low utilisation, increasing production costs. In addition, production does not match demand so that alternative sources of hydrogen must be found or very large (expensive) stores fitted at refuelling stations. It is very challenging to find a cost-effective hydrogen production solution for a facility that is not grid connected.

Offshore wind has a higher load factor but will always be connected to the grid.

Constrained generation suffers from similar issues. The absolute volume of constrained electricity generation in 2017 (from any source) was only 479 GWh and this was predominately located in the North of Scotland. Curtailment isn't recorded in distribution grids, but is happening frequently. This information is difficult to quantify, but the main observation is that only running an electrolyser during the hours in a year when power cannot be accepted onto the grid would not be economical because it would be a poor use of capital and there would be a mismatch between supply and demand.

There may be circumstances where a particular project is regularly constrained (such as a wind farm in the far north of Scotland), however, this would probably entail the electrolyser being directly connected or very close geographically to the project – which may not be desirable because of hydrogen transport costs. A further problem is that the guidance does not clearly define what constitutes "constrained" output.

The most promising routes for hydrogen production

The challenges around grid electricity, islanded generation and constrained capacity imposed by the current rules, mean that the only practical route is production of hydrogen using electricity from grid-connected projects which are also directly connected to the electrolyser. Offshore wind is the main contender, due to its higher load factor. The hydrogen would be produced onshore, and trucked to hydrogen refilling stations. It is these projects that the proposed changes to GHG methodology will undermine.

However, it is not ideal to produce hydrogen centrally and truck it to numerous stations that are dispensing small amounts of hydrogen per day, which for several years will be the characteristic of the emerging hydrogen mobility market. This is a very niche scenario, and a far more flexible and logical approach is needed if hydrogen in transport stands any chance of reaching its potential.

It is better to have a distribution of electrolysers at stations offering balancing services from within electricity distribution networks that are integrating increasing amounts of renewables, because they can deliver these services without causing CO_2 emissions (unlike conventional balancing techniques) and help reduce curtailment levels. We would like to see DfT focus on enabling this to happen, (which we acknowledge needs a change in the legislation and more time). Once more rational and cost-effective routes to hydrogen production are enabled, they would naturally take over as the preferred option.

2) If you do not agree with the proposal, do you have alternative proposals to how we can ensure that RFNBO production of hydrogen from existing renewables does not lead to a net increase in GHG emissions due to a shortfall in generation in the wider grid?

Please provide your comments below

The REA feels that the change is not necessary because hydrogen will only be produced in very small quantities for the foreseeable future. Furthermore if a move to a consequential

GHG analysis is applied in this instance, it should be applied to the whole the RTFO rather than just one pathway. Therefore, we propose that the attributional approach proposed in the original guidance continues to be used.

However, we acknowledge the second problem set out in the consultation; if the use of hydrogen in transport grows strongly then costs of production will reduce and there is a risk that it will drive out other development fuels.

This not a problem unique to hydrogen and is a consequence of having all development fuels in the same sub-target, with the same buy out price as described earlier. The costs of production of any development fuel that is successful will fall through economies of scale and learning effects. There is a risk that any successful fuel will drive out those that are harder to develop.

This issue can be addressed by setting up another obligation(s) for the less developed fuels or by moving the new plants producing the successful fuel to the standard RTFO while grandfathering older facilities. Both of these approaches will require new legislation and we recommend that the DfT explores them.

Hydrogen producers have suggested that they may be willing to accept that if the use of hydrogen in transport grows quickly, it could be moved into the main obligation. The REA is keen to work with the DfT to explore all options, including linking development fuel status to progress rates or hydrogen volume levels. There needs to be a way of supporting hydrogen, while protecting other development fuels from being swamped if hydrogen is successful. RFNBO H_2 has unusual economics in that costs are relatively low compared to other development fuels and can be funded through equity. However, there are still significant economies of scale so that a production facility relying on development RTFCs in its early years will not require the same high level of support if hydrogen demand grows.

The REA suggests that the DfT does not make any changes to the guidance at present but continues to engage with industry in order to find ways for renewable hydrogen to be brought to market without damaging other development fuels.

3) Can you provide your views on how and whether PPAs could be used to meet RTFO objectives in the future?

Please provide your comments below

The REA strongly supports the use of PPAs to transport renewable electricity to hydrogen electrolysers. A more flexible approach is desirable in order to bring the costs of renewable hydrogen down and to allow it to assist in integrating increasing amounts of variable renewable generating capacity onto the system.

There are risks that PPAs could be viewed as a book and claim system rather than mass balance. The mass balance rules were created in order to assist agricultural supply chains, and whilst they may a legal requirement when it comes to looking at electricity inputs for RFNBO H_2 production, there is no read-across regarding the logic.

Allowing renewable electricity to follow contractual flows on the half hourly basis used in electricity settlement ensures a contractual relationship between the renewable power producer and the hydrogen producer.

The benefits of allowing PPAs are to increase the number of sites available for hydrogen production, to allow larger facilities buying electricity from multiple suppliers and to allow production to be located closer to filling stations.

The use of PPAs will help renewable electricity generators find a market for off peak electricity. This will improve their business cases and eventually increase the supply of renewable power.

The recently agreed recast of the Renewable Energy Directive (RED II) states that the Commission should develop a methodology for grid transport of renewable electricity that ensures that is a contractual relationship between the renewable producer and hydrogen producer. An approach modelled on the accepted method of gas grid balancing is likely to meet these requirements.

A key issue is the timescale the "mass balance" operates under. Electricity is typically settled on a half hourly basis while the Renewable Transport Fuel Obligation works on a monthly or quarterly basis. Allowing the "mass balance" to operate on a quarterly basis could allow intermittency issues to be overcome to a large extent. For example, the power injected into the grid by a solar installation during daylight could be allocated to an electrolyser across the whole day. It's not clear whether this is permitted under current rules.

Finding a methodology that allows grid transport of renewable electricity will increase the production of renewable fuel and of renewable electricity, helping the UK to meet its Climate Change Act commitments.

Whilst it is beyond the scope of the current consultation, it is worth noting that the use of REGOs could be perfectly consistent with DfT's high level policy intent for encouraging additional new renewable capacity and actually have greater flexibility and utility in that respect. However, it would be important to explore this concept outside of the agenda of mass balance.

Please provide evidence to support your views.

A comment on Annex B, which sets out DfT intentions on bio-hydrogen.

Bio-hydrogen is made by consuming biomethane in the process of producing hydrogen. The biomethane qualifies for ordinary RTFCS, whilst the resulting hydrogen would qualify for dRTFCs. The DfT is signalling its intention to make this route for production of hydrogen ineligible as a development fuel.

By way of contrast, reacting CO_2 with hydrogen to produce RFNBO methane consumes hydrogen which qualifies as a development but results in methane which does *not*. Although seen as desirable in the guidance, it makes no sense commercially to use high value development fuel status hydrogen as an input for producing lower value non-development fuel status RFNBO methane.

The process of making this RFNBO methane absorbs CO_2, does not use land in the growing of biomass, and the resulting gas has a higher energy density and more transport end demand at present. It is also new technology, with the potential for synergies with other biofuel production processes such as anaerobic digestion, biomethane upgrading and fermentation all of which produce biogenic CO_2.

In the REA's opinion it is an anomaly that RFNBO methane does not qualify for development fuel status.