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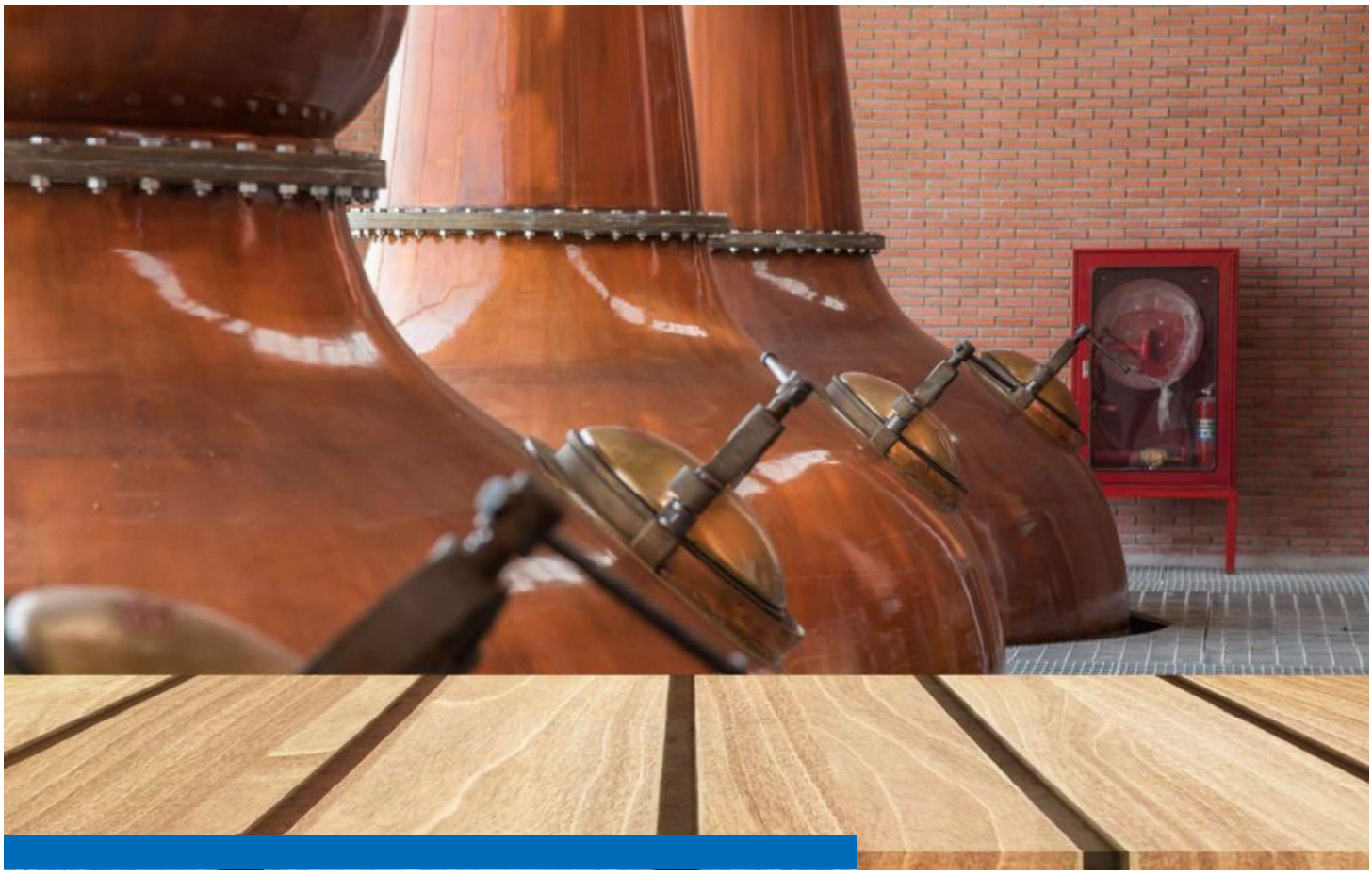

Scotch whisky pathway to net zero

Report for Scotch Whisky Association

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Executive summary

The Scotch Whisky Association (SWA) commissioned Ricardo Energy & Environment to explore how the sector could meet the Scottish Government's ambitious commitment to net zero emissions by 2045. The SWA's interest in net zero is driven by its members desire to minimise their contribution to climate change, consumer expectations for more sustainable products and the Scottish Parliament's legislative emission reduction targets.

Background

The Scotch Whisky industry launched its first Environmental Strategy (the 'Strategy') in 2009, with a set of ambitious targets driving sustainability. The SWA has reported biannually on the sector's progress against the Strategy targets. The 2018 publication is the fifth progress report and relates to the sector's performance in 2016.

The industry has made significant progress in a number of areas, and the 2018 Report details how the 2020 non-fossil fuel target has been achieved four years early – in 2016. The industry surpassed its 2020 target and achieved 21% of primary energy use from non-fossil fuel sources, up from 3% in 2008 (the base year) with absolute greenhouse gas emissions reduced by 22% during that period.

The SWA is committed to reviewing the entire Strategy. It is actively considering replacing the non-fossil fuel target with one to achieve net zero emissions by 2045. The review of the targets began with a workshop with members in June 2019. The recommendation from the workshop was for the industry to investigate the possible adoption of a net zero target.

Net zero in the whisky sector

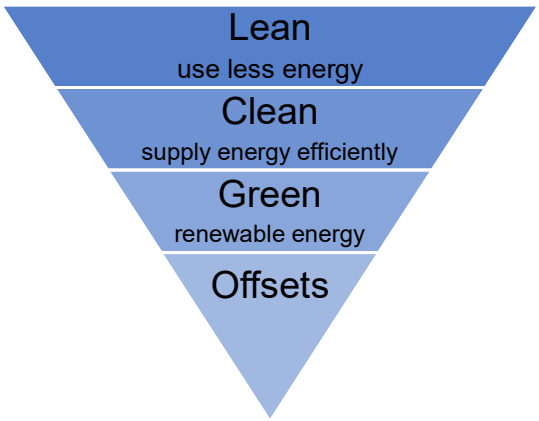
Achieving net zero requires deep reductions in emissions, with any remaining sources offset by removals of CO_2 from the atmosphere (e.g. by afforestation). Net emissions, after accounting for removals, must be reduced by 100%, to zero.

The scope and boundary establish the emissions that the scotch whisky sector currently take responsibility for reducing to zero. They have been set to comprise emissions over which members have direct control and where baseline data has been collected.

This includes all operations of Scotch Whisky production including maltings (owned and operated by distillers, not third-party maltings), distillation, maturation, blending and bottling and warehousing but excluding transportation and all business travel

The approach to developing net zero scenarios for the scotch whisky sector has been guided by a hierarchy of energy measures, which prioritises more sustainable measures and ensures that offsets are only used once all other options have been exhausted.

Energy measure hierarchy



Residual emissions are those that cannot be reduced to zero using lean, clean and green energy measures. Offsets are intended to create an equivalent carbon reduction elsewhere in compensation. There are recognised industry standards for the offsets, which must meet three criteria: additionality, perpetuity and verifiable. This ensures that the offsets are credible and deliver genuine savings. It is a critical tool for net zero strategies that can address the hardest to treat sources of emission.

There is no set definition of offsets within the context of net zero. This allows some flexibility in what options are considered acceptable. While this creates opportunities, it also presents risks to the robustness of offsets and the confidence that emissions are removed from the atmosphere.

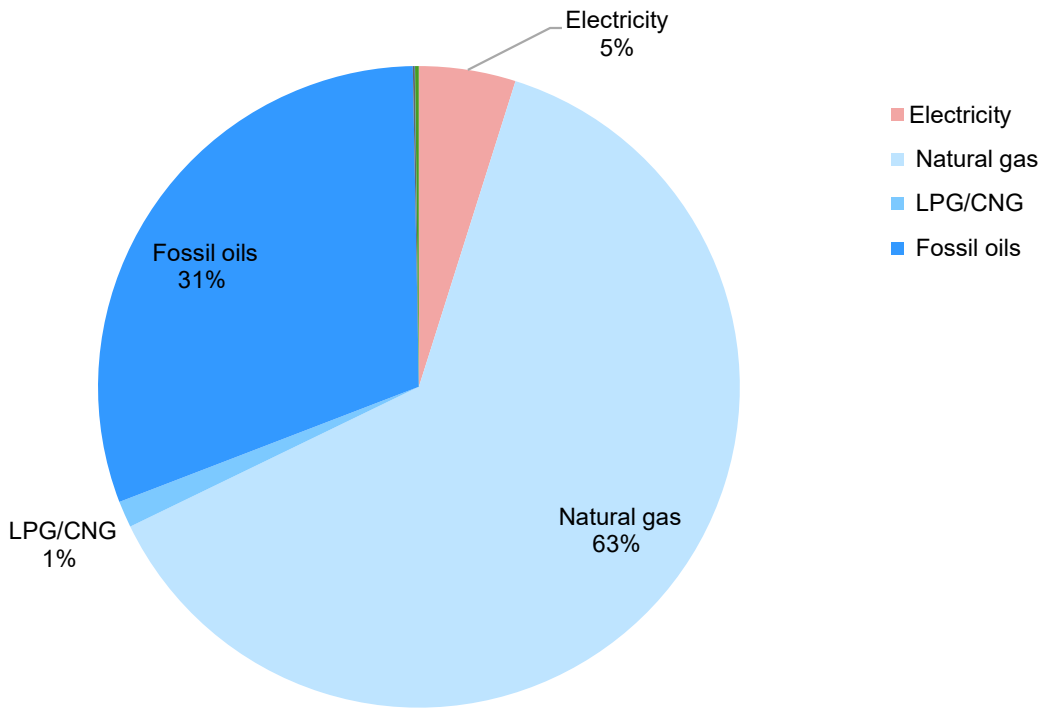
We have defined a broad hierarchy of offsets types, which safeguard the integrity of the offsets. It favours measures that are within the defined boundary and scope, followed by on-site measures which are associated with whisky production and near site measures that are aligned with the operational boundary before considering other options.

Emissions baseline

2018 energy and production data provided by the SWA was used as the baseline data and forms the basis of energy and emissions projections and scenario modelling. The data covers 127 sites including 70 malt distilleries, 5 grain distilleries and 11 packaging sites.

Under the greenhouse gas accounting methodology used to prepare the net zero study, the emissions baseline is 528,792 tonnes CO_2e/year. Fossil fuels dominate the emissions inventory, with 63% from natural gas and 31% from fossil-based fuel oils. Around 5% of emissions are from electricity use with smaller fractions from other fuels, including bioenergy.

Baseline greenhouse gas emissions by fuel 2018



88% of total emissions are related to activities at distilleries, with 11% from non-distilling production sites and around 1% from offices and warehouses.

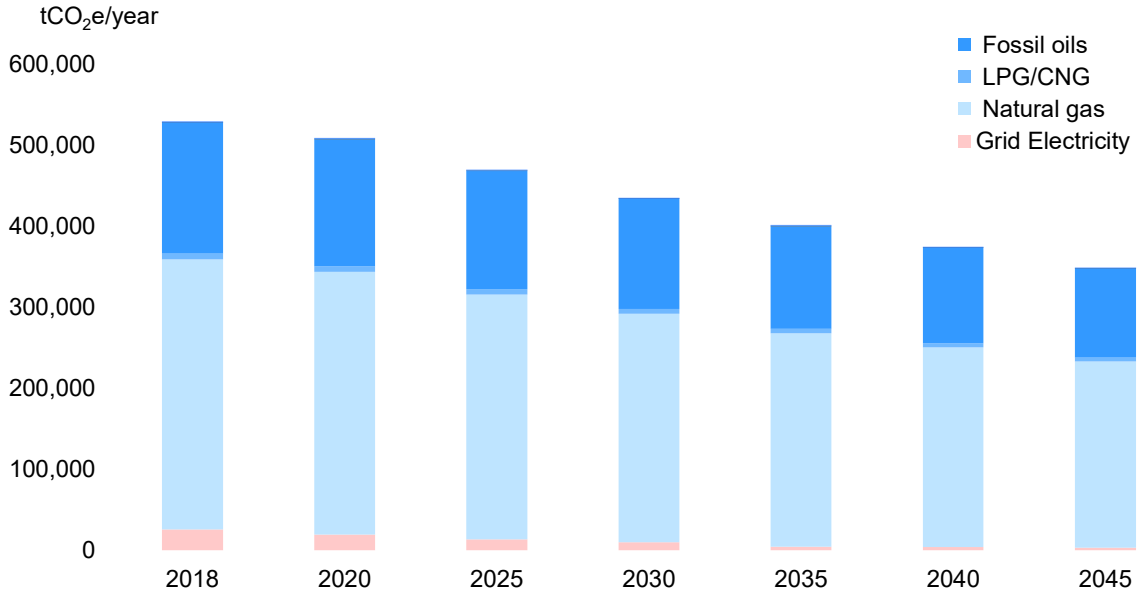
Baseline emissions projections

Understanding the likely sources of emissions in 2045 is central to developing a set of measures that can reduce those emissions to zero. An emissions pathway based on the 2018 baseline data has been developed. A series of assumptions are applied to reflect the key factors which will influence how the sector's emissions are expected to evolve in the absence of new energy measures. These are:

- Changes in the GHG emissions intensity of electricity generation
- Underlying energy efficiency improvements
- Changes in sector production

The baseline emissions projection is illustrated below at 5-year intervals. Total emissions in 2045 are estimated to be 348,481 tCO_2e/year, a 34% reduction on 2018.

Baseline emissions projections to 2045



The falling electricity emissions factor further increases the prominence of process heat in the emissions inventory, with 98.8% of emissions from direct use of fossil fuels and 91% from distilleries sites in 2045. As a result, our assessment of energy measures and scenarios focuses on process heat technologies.

Scenario modelling

We have modelled seven scenarios to explore the net zero gap and to identify viable pathways to 2045. The three types of scenarios are set out below:

1. Planned progress is an enhanced baseline scenario which includes planned energy measures and sustained energy efficiency improvements.

2. Three scenarios explore the maximum potential of individual heat technologies, which helps to understand the contribution they could make. These are:
   - Anaerobic digestion-max
   - Biomass-max
   - Heat pump-max

3. Scenarios that present a route to achieving net zero. They combine complimentary technologies within their maximum potential, in order to meet all member energy demands. These are:
    - Green gas
    - Electrification
    - Balanced

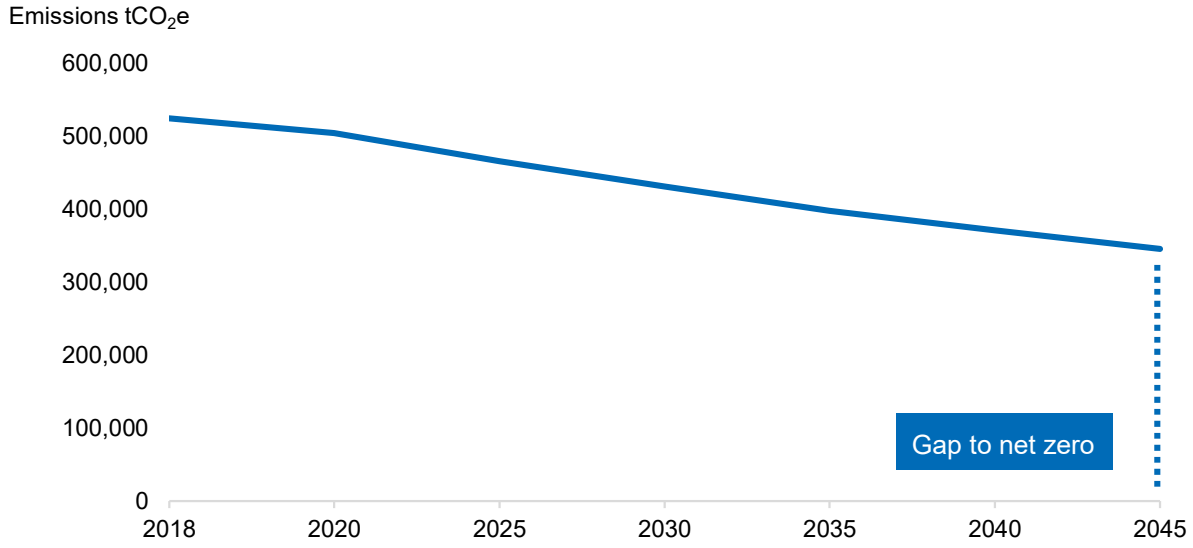
Together these scenarios provide an analysis which sets out the boundaries for the technology pathways as well as credible routes to achieving net zero. The figure below highlights the key technology assumptions that are applied in each scenario.

Net zero technology scenarios matrix

	Energy efficiency	Gas & LNG/CNG	Anaerobic Digestion	Biomass	Heat pumps	Hydrogen	Offsets
Planned progress	3%	Replaces fossil heating by 2025	Planned growth	Planned growth			
Anaerobic digestion-max	3%	Replaces fossil heating by 2025	**Max potential**	Planned growth			
Biomass-max	3%	Replaces fossil heating by 2025	Planned growth	**Max potential**			
Heat pump-max	3%	Replaces fossil heating by 2025	Planned growth	Planned growth	**Max potential**		
Green gas	3%	Replaces fossil heating by 2025	**20% by-product potential**			Meets remaining demand	Yes
Electrification	3%	Replaces fossil heating by 2025	20% by-product potential		**90% of technical potential**	Meets remaining demand	Yes
Balanced	3%	Replaces fossil heating by 2025	20% by-product potential	**80% of potential**	**50% of process heat pot.**	Meets remaining demand	Yes

In each case, the focus is on closing the gap between the baseline pathway and zero in 2045 as illustrated in Figure 13.

Figure 1: Baseline scenario



Net zero technology pathways

The study has identified the key energy technologies that can reduce emissions from whisky production to net zero. Generating heat for distillation is the primary source of emissions and the key technical challenge.

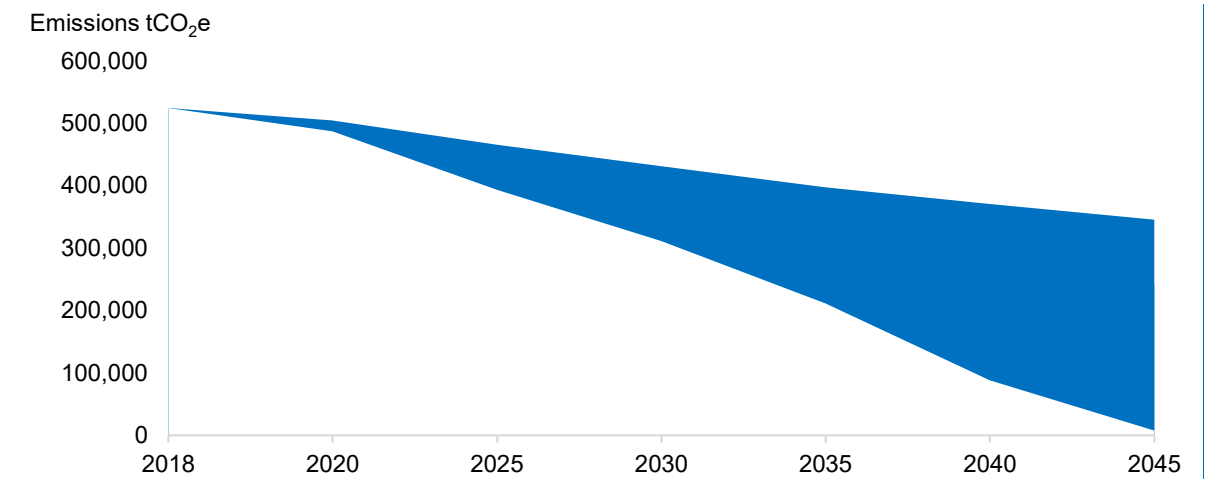
The scenarios looked at how anaerobic digestion, biomass, hydrogen & high temperature heat pumps could be deployed across the industry. Our analysis indicates that there are a range of credible pathways to net zero, making use of each technology to varying degrees within their maximum technical potential.

The option to deploy multiple technologies, such as through the balanced scenario, provides important flexibility to members, with each site able to use the technology most suited to their operations and constraints. At the sector-level, it means that the changing viability of one technology could be compensated for by another.

The balanced net zero scenario

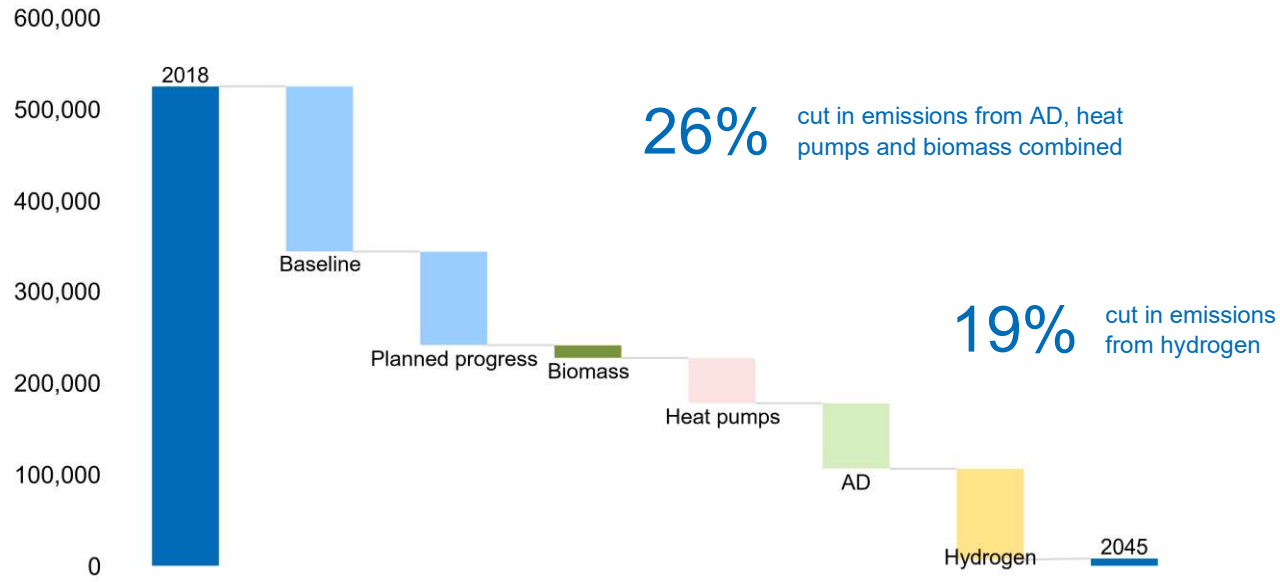
The balanced scenario applies a combination of the key heat technologies well within their maximum technical potential and achieves net zero emissions in 2045. It was seen as the most credible of the options presented to SWA members at a workshop in February 2020.

Balanced scenario emissions projections



The waterfall chart below shows the contribution from each measure. Heat pumps (9%), biomass (3%) and AD (14%) together are responsible for 26% of emissions reductions, with hydrogen accounting for 19%.

Balanced scenario - emissions reduction by measure



The Balanced scenario demonstrates that there are pathways to net zero which sit well within the maximum technical potential of the key heat technologies.

Policy Recommendations

With COP26 in Glasgow, the new Westminster government's and also the Scottish government's strong stance on climate change and the legislative backlog caused by Brexit, this is an important time for the SWA to be actively engaged in shaping net zero policy.

A series of policy recommendations have emerged from our analysis and through discussion with the SWA and members. This includes policy and regulatory changes that are necessary if members are to achieve net zero. The policy options related to a specific technology are categorised by the type of intervention proposed.

1.1.1 A net zero commitment, emissions measurement and reporting

1.1.1.1 A net zero commitment

The SWA should make a public commitment to net zero by 2045. This should include all Scope 1 and 2 emissions, including those that are not currently included in emissions reporting.

The SWA should commit to a regular review of progress and should have a mechanism which enables ambition to be ratcheted up in future. This could be used to incorporate Scope 3 emissions or bring forward the target date.

1.1.1.2 Net zero definition

Net zero currently doesn't have a formal definition and the standards that will define how GHG emissions are measured, reported and offsets accounted will have an impact on the energy measures that can be used to meet industry targets.

This will also define the sector's options for offsetting its residual emissions. Peatland restoration is a highly credible negative emissions measure that should be possible to count towards industry targets, which isn't currently the case with Carbon Neutrality under PAS2060.

1.1.1.3 Standardised emissions reporting

The GHG methodology review included a series of recommendations for improving the SWA's emissions reporting. These include:

- Fully adopting GHG Protocol Corporate Standard / ISO14064
- Clarify scope and boundary
- Use UK Government emissions factors and update them annually
- Report using both location based & market based approach
- Define net-zero and the GHG accounting measures that will be used to measure it

The recommendations are described in more detail in the methodology report under separate cover.

1.1.2 Policy & regulation

1.1.2.1 UK and Scottish industrial decarbonisation strategy

The policy framework for decarbonising industry is out of date and is no longer consistent with net zero. The Committee on Climate Change are currently looking at an industrial decarbonisation strategy in more detail and are clear that concerted effort needs to start now in order to bring forward viable technology options in the 2030s. With the expectation that multiple energy solutions will need to be used, the SWA should promote a policy and regulatory framework that is technology agnostic.

The SWA should engage with policy makers to ensure that industrial policies and incentives are consistent with net zero, including energy taxes, incentives and innovation funding.

1.1.2.2 Scottish government bioenergy action plan

The Scottish government are preparing a bioenergy strategy and the SWA should continue to engage in its development. AD is a consistent feature of the net zero scenarios developed and further expansion of installed capacity will need to be made consistent with regulations around the treatment of residues and by-products.

1.1.3 R&D and demonstration

Some of the key heat technologies identified require further R&D before they can be deployed by members at scale.

High temperature heat pumps for industrial use may be the least mature of the technologies identified. On-going R&D efforts will need to be scaled up in order to prove the technology, reduce costs and increase efficiency. Operation of high temperature heat pumps will need to be demonstrated at distilleries in the UK.

The relative immaturity of hydrogen technology, including strategic uncertainty about its role, production methods and distribution mean that continuing R&D will be crucial. In the build up to the anticipated wider adoption in the 2030s, pilots and demonstrations in related industrial sectors will be required.

Anaerobic digestion is a relatively mature technology which is already in use in the whisky sector. However process and operational efficiency improvements can be expected from further R&D.

1.1.4 Implementation and price signals

The RHI is coming to an end and is due to close 31st March 2021. The Government has not announced how it will encourage low carbon heating after this. In January 2020 the Prime Minister stated that the Government was "looking for successor arrangements to the renewable heat incentive" during PM's Questions[1]. No further information is available. The RHI's successor should be established in time to provide continuity of subsidy with mechanisms to support industrial switching to fuels consistent with net zero.

1.1.5 Infrastructure

It is clear that hydrogen has a central role in all our net zero scenarios and in the CCC's proposals for industry. Hydrogen distribution is a major known barrier to deployment, with the optimal production and delivery configuration highly uncertain. This will require the development of national supply infrastructure and the SWA should work with government to ensure that it is in place in the 2030s.

The whisky sector already makes use of shared AD infrastructure, which takes distillation by-products from multiple sites. This allows the AD plant to run at higher efficiencies and increases the options for using the fuel, including upgrading to biomethane and injection to the grid. The SWA can support efforts for more shared AD capacity to be developed and could encourage partnerships beyond the whisky sector, potentially engaging with government on national biogas infrastructure.

[1] https://hansard.parliament.uk/commons/2020-01-22/debates/6B6FAD67-CA8C-4AF2-9CC9-07F6175ABC4C/Engagements