Scotch Whisky Industry
Environmental Strategy
Report 2012

SWA 2nd Report to Stakeholders

Scotch Whisky and our Environmental Performance

Registered Office of the Association
20 Atholl Crescent Edinburgh EH3 8HF
t: 0131 222 9200 **f:** 0131 222 9237
e: contact@swa.org.uk
w: www.scotch-whisky.org.uk

London Office
14 Cork Street, London W1S 3NS
t: 020 7629 4384 **f:** 020 7493 1398
e: london.office@swa.org.uk

SWA Foreword

The Scotch Whisky industry's environmental strategy, launched in 2009, is founded on a strong commitment to long-term sustainability. It stems from a desire to realise our members' green ambitions to take Scotch Whisky production to a stage beyond compliance. The Strategy sets out the vision for collaboration on sustainability across the industry.

This is our second stakeholder report on the industry's progress. In these early days of a long-term strategy, the industry is making good steps towards its goals. We are proud of the leadership the Scotch Whisky industry has shown in the environmental arena. As the Strategy progresses, the level of detailed, up-to-date information available constantly improves.

The industry has made an excellent start on its journey to shift to non-fossil fuel use. A number of major capital investments are currently under construction and, coupled with more recent announcements, we are confident the industry is well on track to meet its medium and long-term energy ambitions. Distillers are becoming ever more energy efficient – despite the complex, and sometimes costly, climate change policy landscape facing the industry.

We now have a clearer picture of actual water use by the industry. This report sets out how we have improved our water data so we can better measure future progress.

On packaging, our companies are close to meeting some of the targets set back in 2009; others will be tougher to achieve. There is more to do. Global consumer demand for premium packaging and high-end 'luxury' Scotch can sometimes be difficult to square with reductions in packaging weight. Innovation is needed in packaging design and technologies. Great progress has been made recently with a leading Scotch Whisky producer, Edrington, committing to a lightweight bottle for all its UK sales of Famous Grouse. You can read more about this achievement, and several others, in the case studies at the back of this report. Such examples of good practice demonstrate innovation in the industry and the long-term commitment to the environment that have been sustaining Scotch for decades.

We are only three years into a 40-year plus programme. We are committed to being open and transparent about our progress and engaging actively with our stakeholders. We listen and act on issues that our results highlight and we communicate the benefits to the environment and industry of progress made. Collaboration helps build resilient supply chains, reduces costs and ensures efficiencies can be shared.

We wish to thank all those organisations and individuals who have helped shape our environmental sustainability work and those who follow our progress. I hope you find this report interesting and useful.

Julie Hesketh-Laird
Director of Operational and Technical Affairs
Scotch Whisky Association

Foreword

Message from the Scottish Government

People rightly recognise that one of the major challenges the world faces is climate change. This summer has ably demonstrated how our weather can impact on our lives and businesses.

The Scotch Whisky industry has been quick to recognise the importance of an industry that can deliver sustainable economic growth in a literally 'changing environment'. Indeed, this sector has shown true leadership to other industry sectors by being the first to align itself with the Scottish Government's climate change targets.

The large scale investments being made by the Scotch Whisky sector towards achieving the renewable energy targets they have set themselves, amply demonstrate their commitment to drive environmental sustainability into the heart of their business and will, I have no doubt, reap the benefits of such investments in future years.

It is important that everyone within the supply chain recognises that they too have a role to play to ensure environmental sustainability. I particularly welcome the Scotch Whisky sector's commitment to work along with its supply chain to encourage the adoption of the highest environmental standards the industry itself seeks to achieve. Through working in partnership, opportunities will exist for environmental improvement right across the industry.

I wish the Scotch Whisky Association and its supply chain partners every success to deliver environmental sustainability across the industry, which as we all know, is so vital to the economy and people of Scotland.

Richard Lochhead MSP
Cabinet Secretary for Rural Affairs and Environment

Delivering our Targets

Progress reported here is based on comprehensive data collection by the SWA across the industry, including both members and non-members. Our first public report, using data from 2008, sets the baseline to measure our progress towards our 2020 and 2050 goals.

All data in this report refers to the 2010 calendar year unless otherwise indicated. Production in the Scotch Whisky industry tends to be cyclical, though with an underlying trend for growth. 2010 was a time of some consolidation for the production side of the Scotch Whisky industry; distilling production was down around 16% when compared to 2008 volumes. This largely reflected the global economic uncertainty at that time. Production is now on the up and in recent months there have been several announcements made by companies about further investments in production.

We have worked hard to improve the data collected in 2008 to make it more comprehensive and detailed. Amendments made reflect structural changes in the industry - such as new sites coming online and others changing ownership - and more comprehensive data from our member companies. This report sets out, where appropriate, our revised 2008 data and the reasons for the amendments. Our data, to our knowledge, is the most detailed published for any single industry. The industry-wide picture of performance will help us plan for the future and target our resources on key areas.

At a Glance *In 2010*

- **101** malt and **7** grain distilleries operational
- **990,000 tonnes** of cereals (malted barley and other cereals such as wheat and maize) were used to make Scotch Whisky. Over **93%** of the malted barley used was Scottish.
- Total industry CO_2 (equivalent) emissions from energy use: around **698,000 tonnes** (down **14%** on 2008 levels)
- Primary energy usage: **3,367,178,455 kWh** equivalent to **0.13%** of total UK primary energy consumption
- Non-fossil fuel energy use: **6%** (up from **3%** in 2008)
- Industry total water usage: **37,024,340m^3**
- **79%** of water used in malt distilleries, on average, is returned to the environment
- Average weight of packaging materials: **6.61kg** of packaging per 9 litre case
- **32%** of packaging materials made from recycled materials
- **97%** of our packaging reusable or recyclable
- **7%** of industry packaging waste from packaging operations sent to landfill

Reducing Greenhouse Gas Emissions and Reliance on Fossil Fuels

Reducing greenhouse gas emission and increasing the use of non-fossil fuel are the cornerstones of the Scotch Whisky industry's efforts to make manufacturing more sustainable and support a low carbon economy.

Energy efficiency is expressed as the amount of primary energy used to produce either new-make spirit in our primary production facilities - distilleries and maturation warehouses - or cased goods in our packaging operations. This is known as Specific Energy Consumption (SEC). The **average SEC for primary production is 6.86 kWh/lpa**. In our **packaging operations, the average SEC is 3.3 kWh/9 litre case** equivalent.

Our Commitment:

We will continue to mitigate our greenhouse gas emissions to the atmosphere and to increase our energy efficiency in the production process, through innovation and adoption of relevant technologies.

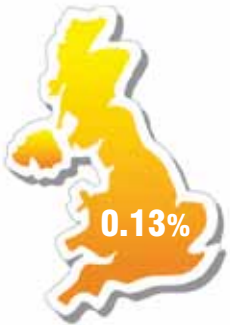
Our Commitment:

By 2020 we will ensure that 20% of the industry's primary energy requirements will be derived from non-fossil fuel sources, with a target of 80% by 2050, thereby reducing greenhouse gas emissions from fossil fuel sources to a minimal level.

Progress Made:

Reducing Greenhouse Gas Emissions and Reliance on Fossil Fuels	2008 (amended baseline reflecting improvements in our data since our 1st report and industry structural changes)	2010
Primary energy use	3,943,904,986 kWh	3,367,178,455 kWh
Greenhouse gas emissions	812,651 tCO_2e	698,219 tCO_2e
Primary production energy efficiency	6.79 kWh/lpa	6.86 kWh/lpa
Packaging energy efficiency	3.69 kWh/9l case equivalent	3.30 kWh/9l case equivalent
Non fossil fuel primary energy use	3%	6%

The industry used **3,367,178,455 kWh** of primary energy in **2010**.



of the UK's total primary energy consumption

9%

of the food, beverages and tobacco sector energy consumption

of the UK's total industrial energy consumption

Our total use is 15% less than our 2008 use. We also emitted 14% less greenhouse gases in 2010 than in 2008.

Packaging energy efficiency **improved by 11%**.

2008 TO 2010

Energy efficiencies for both malt and grain distilling have improved, by 0.5% and 4% respectively. However, the overall energy efficiency figure has declined slightly by 0.6%. This is due to changes in product mix - the proportion of new-make grain whisky spirit in relation to new make malt spirit altered in favour of the latter which is more energy intensive to produce than grain. This change in product mix partly reflects the increased global demand for malt Scotch Whisky.

It is inevitable that energy efficiency is better when production levels are highest. A small relative drop in efficiency would be expected at times of lower overall production. We will focus on improving overall energy efficiency and our members will be considering a range of improvements at a site level as they enter into the next phase of the UK Climate Change Agreements.

Climate Change Agreements

The spirits industry has a proud history of continuous improvement. The SWA manages the industry's Climate Change Agreement (CCA) with the UK Government on behalf of the whole spirits sector.

The UK Department of Energy and Climate Change (DECC) announced in October 2011 that participants in the spirits sector scheme, the majority of which are Scotch Whisky producers, improved their energy efficiency by 25% since 1999. This achievement beat the UK Government's target for the sector by 3%. This improvement has been achieved by investments in energy saving techniques and technologies, including the construction of new distilleries and investments in energy savings measures at existing sites.

CCAs have proved effective in incentivising efficiency in energy intensive industries and we welcome the Government's announcement that CCAs will continue until 2023 at least.

It is regrettable that DECC has confirmed that the rules of the current CCAs which prevent the Scotch Whisky industry's large-scale packaging sites, an integral part of our production process, from being included in the spirit sector's CCA will continue. Other food and drink producers operating integrated production facilities, including packaging, are eligible to join a CCA and are incentivised to make efficiency savings. This anomaly has created a competitive distortion within the food and drink industry. We are disappointed that the UK Government has not taken the opportunity of the wholesale review of CCAs to change its treatment of bottling halls to create a fairer playing field for the Scotch Whisky industry in comparison with other sectors. We are continuing to urge the UK Government to review its stance on eligibility of bottling halls and end this unfair anomaly.

Move to Renewable Energy

Natural gas accounted for 54% of the industry's total primary energy use in 2010. The vast majority (87%) of the heavy fuel oil used in the industry was at malt distilleries where the gas grid is not accessible due to their relatively remote location. Distilling accounted for 84.5% of total energy use. Electricity was 22% of total industry energy use.

Our non-fossil fuel target is by far the most stretching of our aims. In 2008, fossil fuels accounted for 97% of our total primary energy requirements. The remaining 3% was from non-fossil fuel grid electricity sources. By 2010, the amount of the industry's fuel derived from fossil sources was reduced to 94%. Of the 6% non-fossil fuel input, around 1% of total primary energy was generated and used by the industry and the remainder came from grid green electricity sources.

The Scotch Whisky industry's considerable investment in renewable energy is a long-term programme. By 2010, little of the new renewable capacity of distillers was up-and-running so the benefits of these schemes are yet to feed through. We are confident that the next progress report will reflect recent investments in renewable technologies.

The highest profile renewables investments so far in the Scotch Whisky industry use by-products as fuel sources. Since 2008, over £160 million has been invested at five sites alone in renewable energy schemes, such as large-scale anaerobic digestion (AD), biomass and renewable combined heat and power (CHP). Scotch Whisky investments remain the biggest in renewables in Scotland outside the utilities sector. We are confident those projects and other investments will help us to meet our 2020 target.

The North British Distillery is using anaerobic (AD) digestion technology to fire its boilers

Wm Grant & Sons Girvan site uses anaerobic reactors to produce steam power and hot water for use on site and electricity, some of which is exported to the grid

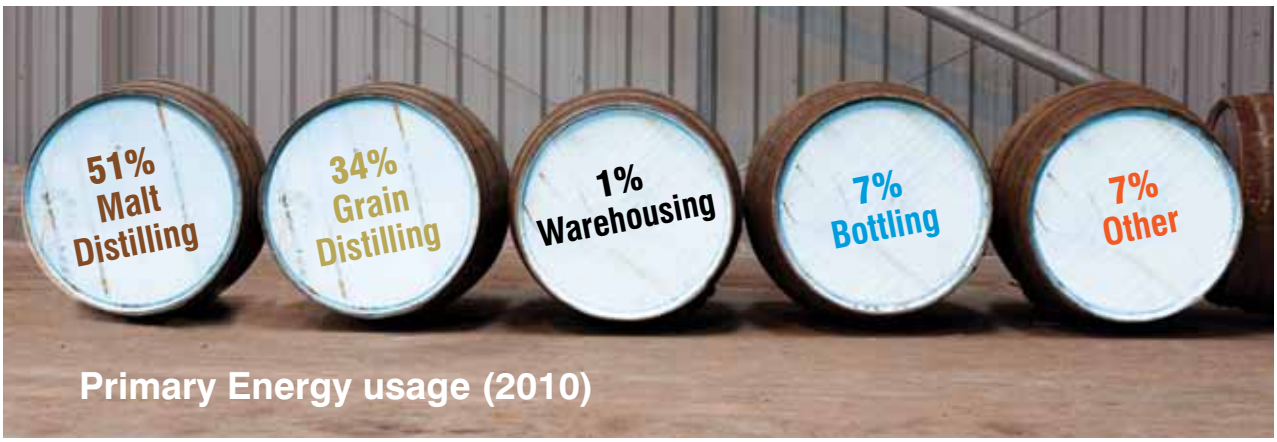
Joint venture, Helius CoRDe (Combination of Rothes Distillers) Ltd in Morayshire will convert distillery co-product into 7.2 MW of energy, enough to power a town the size of Elgin (commissioning underway)

Cameronbridge

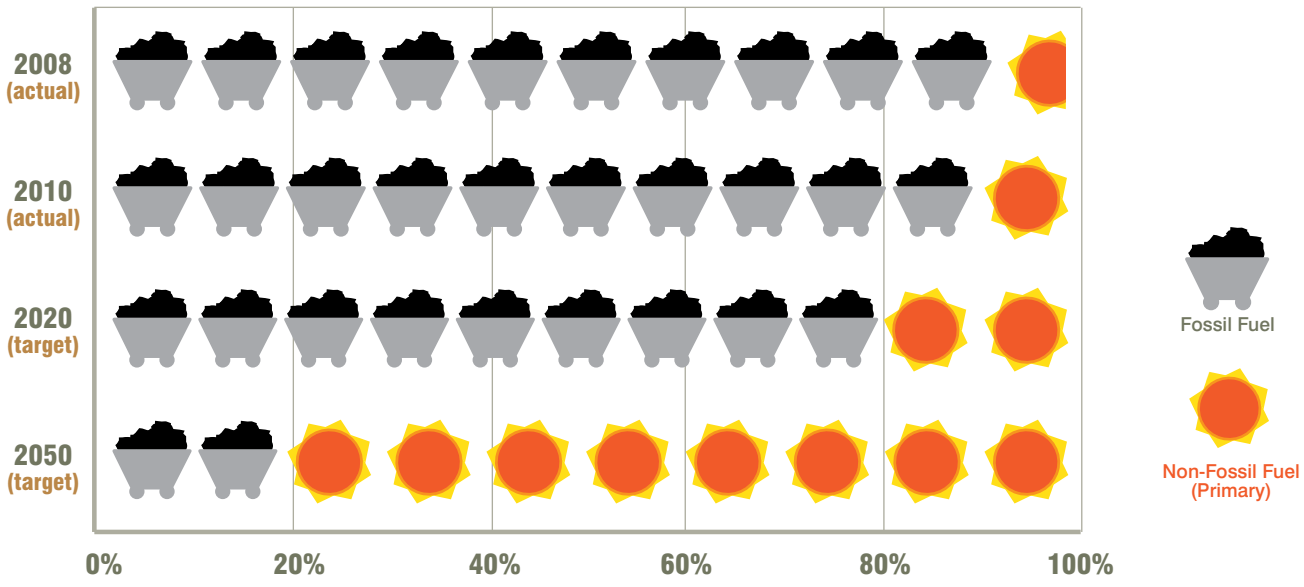
Diageo's Cameronbridge site plans to use AD and biomass to provide 98% of the thermal steam and 80% of electrical power used at the distillery. Similar technology was installed at its new Roseisle Distillery on Speyside. The company is investing around £1bn in production facilities in Scotland which includes investments in other bioenergy facilities on Speyside

Move to Renewable Energy

We are working with Carbon Trust Scotland to develop guidance for the Scotch Whisky industry to assist in appraising the most appropriate local options for all known renewable technologies. A key achievement from this project is a detailed online tool that will take account of a range of assessment criteria, including local environmental conditions, payback times for projects and sustainability of financial incentives. The tool is designed with small to medium sized malt distilleries in mind but the principles can be applied to all sizes and types of facilities.



Primary Energy usage



Challenges in Energy

The challenges faced by the industry in realising its energy ambitions are wide-ranging. Some are internal and faced by all industries, such as ensuring sufficient understanding of technical and environmental matters to allow boards to adjust their investment decisions.

Fortunately, the Scotch Whisky industry takes a long-term view. This has made discussions around challenging traditional financial return on investment models more straightforward than perhaps in other industries with shorter planning cycles.

Many distilleries are located in remote parts of the country, away from the gas grid and rely on heavy fuel oil. Distillers might in future be able to access alternative fuels to fire their boilers. For this to become a long-term reality, supply chain issues, such as certainty of supply, need to be resolved. There remains potential for technological development in the area of alternative renewable fuel supplies and we are aware of a number of initiatives aimed at offering new fuel types. We watch the development of these with interest and try to assist such initiatives wherever possible.

A range of further external challenges also exist, including:

- Planning
- Access to finance
- Lack of incentives
- Access to proven technologies
- A complex and burdensome energy policy framework

Water Management

The implementation of the Water Framework Directive has driven a comprehensive monitoring programme and investment in water meters across the industry since 2008. This means the industry holds more accurate figures on water usage compared to our first stakeholder report published in 2010.

The industry's total water input in 2010 was 37,024,340m^3, a decrease of 40% from 2008 which is largely explained by the installation of water meters.

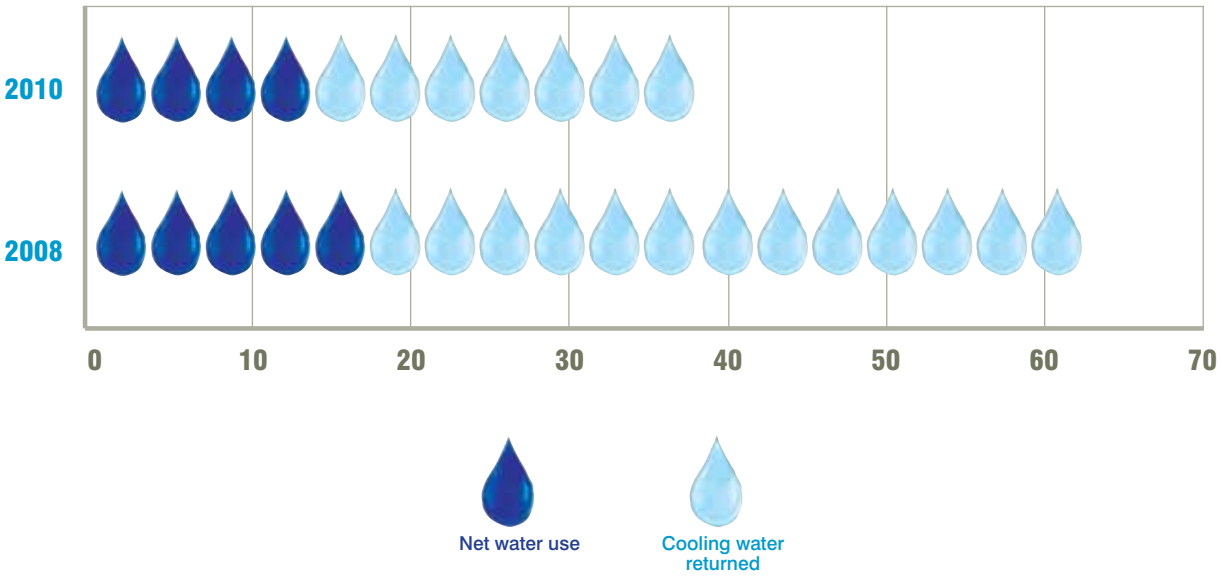
Net water use (i.e. net after excluding cooling water returned to the environment) in 2010 showed a 20% volume decrease on 2008.

Cooling water returned from malt distilleries accounted for 75% of total water input in 2008 and 66% in 2010, with the difference largely explained by more accurate data available.

Our Commitment:
We will manage our water requirements effectively.

Our Commitment:
We will engage actively with SEPA and other relevant authorities in the development of Scotland's River Basin Management Plans to ensure that a sustainable and good quality water supply, on which the industry critically depends, is maintained.

Water use m^3 (2008 & 2010)



Packaging Materials and Waste

Since we published our first stakeholder report, we have extensively refined our packaging baseline figures as more accurate data has become available. This changed the 2008 figure of 4.44kg of packaging per 9 litre case to a more realistic 6.67kg per 9 litre case. In 2010, the average weight of packaging materials was 6.61kg per 9 litre case. This is a 1% improvement on 2008.

The recycled content of our packaging materials has dropped to 32% in 2010 compared to a 2008 baseline of 37%. This apparent worsening in performance of recycled content has largely been influenced by the way companies have reported their glass measurement. We are amending the way we collect data in future to disallow the reporting of 'mixed glass'.

The recycled content of glass supplies to distillers and bottlers is something that we can influence but cannot directly control. We are working with organisations such as The Waste and Resources Action Programme (WRAP) and Zero Waste Scotland to encourage increased use of recycled content in clear (flint) glass. For example, WRAP is identifying ways of segregating and recovering high quality waste glass from packaging operations to return back to glass manufacturers for reuse.

The amount of packaging materials we use that are recyclable has remained static at 97%. It will be a challenge to eliminate the remaining 3% of non-recyclable packaging materials as this 3% is largely made up of non-returnable anti-counterfeiting pourers and corks.

The amount of packaging waste we send to landfill from our packaging operations has fallen from 17% to 7%. This is due to ever improving waste collection and segregation activities at bottling halls.

Our Commitment:
By 2020 we will reduce by 10% the average unit weight of our product packaging materials.

Our Commitment:
By 2020 we will ensure that 40% of our product packaging will be made from recycled materials.

Our Commitment:
By 2020 we will ensure that all our product packaging will be reusable or recyclable.

Our Commitment:
By 2020 we will send no packaging waste from our packaging operations to landfill.

Casks

The Scotch Whisky industry mostly uses wood brought in from other drinks businesses, such as Bourbon and Sherry.

This means our casks have already been put to use and are effectively already recycled. This does mean, however, that we are not directly in control of the sourcing of our cask wood. We will be undertaking research this year to map out the wood supply chain for the industry and establish gaps in our knowledge. We will then work to fill these gaps.

Our Commitment:
We will seek to ensure that in future all casks brought into the industry are made from oak sourced from sustainable forests.

Working in Partnership with our Supply Chain

The industry and Association continue to work closely wherever possible with our supply chain. We hold regular meetings with 'sister' trade associations and employers organisations such as the Maltsters Association of Great Britain, the National Farmers Union of Scotland, British Retail Consortium, Food and Drink Federation and Food Drink Europe to share best practice and explore ways of working together to improve the environment. We also work closely with support bodies such as Carbon Trust, WRAP and Zero Waste Scotland to identify direct opportunities for improvement, identify supply chain efficiencies and to learn from others' best practice.

In 2011, we contributed to the Hitrans (the Highlands and Islands Transport Partnership) Whisky Logistics Study. Around 85% of all malt Scotch Whisky is distilled in the Hitrans area. The study helped expose some of the constraints distillers face when transporting raw materials and finished product in Scotland and identified options for transport efficiencies to drive a reduction in environmental emissions. In 2012 Hitrans will lead a £200,000 project - 'Lifting the Spirit'- to demonstrate the potential for a shift from road to rail for moving Scotch and we are working to secure industry partners for the project.

In 2009 the Association and the industry joined the £7.06 million Crop Improvement Research Club as funding partners. This is a five-year collaboration between Biotechnology and Biological Sciences Research Council, The Scottish Government and a consortium of leading companies to support innovative research into the development of improved crop varieties. The club supports work on barley and wheat, major raw materials for distillers. Sustainability is a key theme of the collaboration.

We were supporters, together with the Scotch Whisky Research Institute, of the collaborative five-year 'Green Grain' project (Genetic Reduction of Energy Use and Emission of Nitrogen through Cereal Production) which reported in late 2010. The tangible results of the collaboration are set out later in this report in a case study.

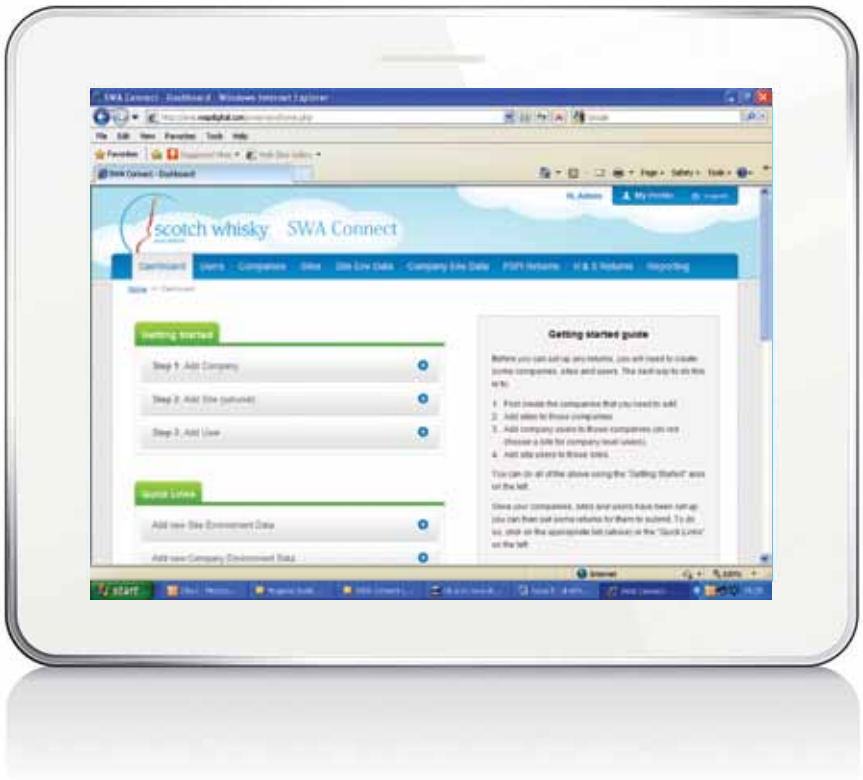
Our Commitment:

We will work with our supply chain stakeholders in areas not under our direct control (e.g. maltings, glass manufacture and transport/ distribution) to encourage high environmental standards, the use of relevant sustainable practices and agree partnership targets and other opportunities for environmental improvement to minimise the total environmental impact of the Scotch Whisky industry.

Reporting to our Stakeholders

This second report to stakeholders shows the industry has made progress in the early years of meeting our 2020 and 2050 targets. A major learning from company reporting and SWA analysis of the 2010 dataset has been around the accuracy and consistency of data supplied. We will be looking to tighten further our company reporting requirements ahead of 2012 data collection.

To ease reporting for participants and analysis by the Association, in 2011 we developed 'SWA Connect'. Connect is a sophisticated and secure online data capture tool/database for all participants of the Strategy – members and non-members alike. This tool offers participants enormous potential to manage their performance data, benchmark across company sites and compare their performance with their peers but most importantly ensure ongoing consistency of data capture and reporting.



Our Commitment:

We will report annually to our stakeholders on our progress to demonstrate how we are meeting our commitments and delivering against our targets.

Additional Information

As part of our environmental data gathering we also collect more general supply chain information from participants.

Cereals Use: In 2010, the industry used around **0.9mt** of cereals (malted barley and other cereals such as wheat and maize).

Around 93% of malted barley used in the industry was Scottish Quality Cereals accredited.

By-Product Production: The Scotch Whisky industry produces a plentiful supply of high protein and nutritious by-products, many of which may be used directly as animal feeds or compounded into distillers dark grains and sold to farmers as feed.

The Scotch Whisky industry is committed to the sustainable supply of animal feed to the farming community. There will be growing volumes available to farmers in Scotland as Scotch Whisky increases its production to meet overseas demand.

In 2010, the industry produced around **860,000** tonnes of moist by-product that was made available for animal feed.

The Scotch Whisky Association

The Scotch Whisky Association (SWA) is the trade association representing over 90% of the Scotch Whisky industry. SWA members are distillers, blenders, bottlers and those engaged in the wholesale and export trade in Scotch Whisky.

Companies (member and non-member) participating in the Strategy data collection:

Beam Inc
Chivas Brothers
Combination of Rothes Distillers
Diageo
Edrington
Glenmorangie
Inver House Distillers
John Dewar and Sons
Morrison Bowmore Distillers
North British Distillery Company
Whyte and Mackay
Wm Grant & Sons

Case study

The Ardnamurchan Distillery, from Adelphi

Adelphi Distillery Limited is an independent bottler of single casks of rare Scotch Malt Whisky. To meet international demand for its products in diverse markets including New Zealand, Taiwan, Japan, Europe, the US and Canada, and to return the company to its distilling roots, Adelphi has significant plans in place to produce its own Scotch Whisky at a new distillery in Ardnamurchan. Adelphi plans to secure its own spirit supply sustainably by building a distillery self-sufficient in energy. It will also secure high-value tourism and jobs in a remote region of Scotland.

Planning permissions for Ardnamurchan Distillery, warehousing and a visitor centre were approved in April 2012. These buildings will be as sympathetic as possible to the beauty of the local area, environmentally sustainable and in keeping with the surrounding architecture.

The new distillery will start producing around 100,000 litres of high quality new-make spirit each year, rising to 250,000 litres by year five. In line with plans for quality, the company will also aim for the highest production and environmental standards.

Wherever possible, local supplies will be used to make spirit.

Around half of the barley will be sourced from a family farm in West Fife, and will be malted and kilned at the distillery itself. Excess heat from the maltings will be reused.

Water for mashing the malt and for use at the visitor centre will be predominantly drawn from local spring water and the nearby Glenmore River, and the site will utilise 'grey-water' - water re-circulated or re-used.

Ardnamurchan Distillery

The distillery will use a wood-chip fuelled biomass plant as the only source of heat energy to drive the stills. The two woodchip fuelled boilers (<1MW) will produce low pressure steam for the distilling process. Wood will come from the extensive and sustainable woodland on site. In a first for modern Scotch Whisky distillation, all fuel will be supplied by tractor and trailer from a woodchip plant less than two miles from the distillery, reducing HGV movements. Boiler flue gases may also be employed indirectly for peat and woodchip drying.

Furthermore, all electricity demand will be provided by a hyrdo-electric turbine on the Glenmore River.

Plans are also afoot to support small-scale biofuel production and demonstrate the feasibility of using the by-products of distillation to produce a biofuel to be used on-site.

'Draff' – a by-product from the distillery - contains valuable protein, fibre and carbohydrates and will be fed directly to local cattle and sheep in winter. In summer it will be stored for winter feeding.

Ardnamurchan Distillery will provide up to 10 new, long term jobs and will support up to 100 local construction jobs. Building is expected to commence imminently.

ADELPHI Distillery LIMITED

Case study

William Grant & Sons

William Grant & Sons produce some of the world's best known brands of Scotch Whisky, including Glenfiddich, The Balvenie range of handcrafted single malts and Grant's.

The family-owned premium spirits company was the first Scotch Whisky producer to generate energy from whisky by-products at its Girvan site. The site is strategically important to William Grant & Sons, producing grain whisky that forms the heart of the popular Grant's blended whisky, Ailsa Bay Malt Whisky and Hendrick's Gin. It also houses offices, a cooperage and over 40 warehouses.

The ground-breaking energy initiative, commissioned in 2009, produces power in the form of steam and hot water for use on the 380 acre site and electricity, some of which is exported to the grid.

The 2009 anaerobic reactor (AR) plant forms part of the company's five year energy management plan which includes annual targets for site energy reduction.

The AR plant allows the residual organic matter in the distillery by-products to be converted into biogas by the presence of microbes. This gas is burned in turbines to produce renewable energy in the form of 25MWh of heat and 60MWh of electricity per day. This significantly reduces the site's reliance on fossil fuels. The scheme has the added benefit of improving the quality of the site's effluent, with the chemical oxygen demand of the site's effluent discharge being significantly reduced.

The site at Girvan, Ayrshire

The anaerobic reactor

William Grant & Sons' multimillion investment in anaerobic technology and the combined heat and waste power plant was recognised in May 2010 when it was highly commended by the Carbon Trust's Energy Efficiency in Manufacturing Award. It remains the largest investment of this sort outside of the utilities sector.

WILLIAM GRANT & SONS
INDEPENDENT FAMILY DISTILLERS SINCE 1887

Case study

‘GREEN Grain’

Collaborative supply chain research is powerful in achieving shared environmental benefits for the Scotch Whisky industry. The success of the five-year project ‘Genetic Reduction of Energy Use and Emission of Nitrogen through Cereal Production’ - GREEN Grain, completed in 2010, illustrates such benefits.

The Edinburgh-based Scotch Whisky Research Institute (SWRI) provides a centre of scientific excellence dedicated to the needs of the distilled beverage industry. SWRI led the distilling industry interest in the £2 million project. The GREEN Grain project was jointly funded with the UK Government under the auspices of the DEFRA Sustainable Arable LINK programme. GREEN Grain brought together an impressive partnership across the wheat supply chain, involving SWRI, Scottish Crop Research Institute, ADAS, FOSS, Wessex Grain, Syngenta, Green Spirit Fuels, Nottingham University, HGCA and Grampian Country Foods. This combination of genetic, agronomic, analytical and process knowledge led to significant scientific advances and commercial return with the introduction of a new wheat variety - Denman - whose potential was identified during experimental trials.

The new Denman wheat variety

Wheat is used in the production of grain spirit – a key constituent of Blended Scotch Whiskies. Good quality distilling wheat will have low nitrogen (N) levels as higher levels of starch will be converted into alcohol. The N level in the grain is determined by a combination of genetic and environmental factors, especially the amount of N fertiliser applied by the grower. While N fertilisers promote the crop yield, they are one of the most significant costs to the grower.

The project studied the genetics, physiology and agronomy of wheat to produce a new wheat type with a high energy grain suited to both distilling and livestock feeding, but with low N fertiliser requirements.

GREEN Grain’s central conclusions:

- It is possible to use currently available wheat varieties, with no toned for novel developments, to produce a variety needing 40% less N application.
- A reduction in fertiliser use limits the potential for run-off into water courses and high nitrate levels in groundwater. This would result in a reduction in greenhouse gas emissions of 33%. This represents the large amounts of energy required to make and transport N fertilisers which make a significant contribution to the carbon footprint of the wheat supply chain.
- The benefits would be financial as well as environmental, with improved alcohol yields and lower input costs.

The project also developed analytical tools to help early identification of promising wheat varieties in the plant breeding process to speed up their development to approval and commercialisation. Denman emerged from a range of new wheat varieties from the Syngenta breeding programme included in the GREEN Grain trials. SWRI found Denman to have a high alcohol yield potential, as well as strong agronomic performance. In late 2010, after further independent testing, Denman made it to the Home Grown Cereals Authority’s Recommended List as a fully approved variety.

The significance of Denman is not the commercial success of one variety, but whether it is the first from a range of varieties with improved GREEN Grain characteristics. The work demonstrates that it is possible to breed wheat varieties with reduced N requirements using traditional plant breeding techniques. There is now a need for further variety testing by plant breeders.

Follow-on work is underway with many of the original partners, including SWRI, to validate how varieties can be fairly compared in terms of savings in N application and to optimise the agronomy to produce them. This continuing research should help the distilling industry and the rest of the wheat supply chain achieve their sustainability goals.

Case study

The Famous Grouse – Edrington

Edrington, the company behind quality brands such as The Famous Grouse, The Macallan and Highland Park, is acutely aware of its responsibilities to the environment. It is an active participant in the Scotch Whisky Association's ambitious drive to reduce the impact of packaging on the environment.

Edrington has already achieved its ambition of reducing the average weight of The Famous Grouse packaging by 10%. It has re-written the rules of glass design to produce a bottle setting new standards for environmental improvement in the Scotch Whisky industry.

Its goal was to make, fill and successfully ship a bottle with all the existing features of a premium design, including embossing and label protection at a much lower weight than was thought possible.

This project was an extension of Edrington's continuous improvement programme. The Famous Grouse pack had already been engineered to just 395 grams, while continuing to present the correct quality image and survive the rigours of the supply chain. This weight was less than almost all premium competitors. Until now the industry believed this was the minimum weight for a bottle which requires to be orientated by 'mechanical spotting', ensuring the label always faces the front.

Working with Zero Waste Scotland and O-I, a key bottle supplier, Edrington agreed a new target weight of 340 grams. This was a substantial reduction of 14% on top of the lightweighting. The design retained the existing diameter, allowing expensive line changeparts to be retained but was reduced in height by 7mm. The 14% weight reduction leads to around the same reduction in CO_2 in percentage terms. In general, a 395g bottle would produce 0.229kg CO_2e per bottle, while a 340g bottle would create 0.197kg CO_2e per bottle.

The bottle was trialled twice at the O-I Glass manufacturing site in Alloa and the new glass wall thickness passed all strength and impact tests with flying colours. Samples were filled by Edrington on the fastest bottling line for Scotch Whisky, running at up to 600 bottles per minute. Bottles were packed in lightweight cases and shipped through the UK and to Taiwan and the Nordics. It was a stern test for the bottle, but it ran successfully through all of the processes without any hitches or breakages.

The lightweight, wraparound outer case contains over 70% post-consumer recyclate and all case material is FSC accredited.

Edrington is initially rolling-out the new lightweight container across all The Famous Grouse production of 70 cl and litre packages for the UK market. This amounts to around 11 million containers in the first year and a weight reduction of around 600 tonnes. Assuming the pack continues to meet all performance requirements, Edrington will widen the scope of this far-sighted initiative in pursuit of its ambitious sustainability goals.

EDRINGTON

Case study

Diageo targets zero-waste-to-landfill

Diageo is a global drinks company behind an array of world-renowned Scotch Whisky brands, including single malts, such as Talisker and Lagavulin and the iconic Johnnie Walker premium Blended Scotch. With over 50 sites in Scotland, ranging from malt and grain whisky distilleries to warehousing, from coopering to coppersmiths and from office buildings to major packaging plants, Diageo's operations are extensive and varied.

And it is inevitable that such wide-ranging operations also produce extensive and varied amounts of waste. Because of this, in 2007 Diageo decided to take radical and decisive action to reduce the impact of its day-to-day operations on the environment and a key target was to reduce dramatically waste to landfill across its Scottish sites.

In the five years since, through a process of setting strong targets and by engaging employees in the drive towards sustainability, Diageo has reduced the amount of waste it sends to landfill by 97%, achieving an overall reduction from 2,735 tonnes per annum to 85 tonnes.

At 30 June 2012 a third of Diageo's sites in Scotland had achieved a full year with zero waste being sent to landfill. These sites included many with complex and varied waste streams such as Diageo's Leven packaging plant in Fife, its corporate HQ in Edinburgh, Cambus Cooperage and Abercrombie's Coppersmiths in Alloa. It also includes malt distilleries, such as Glenkinchie near Edinburgh. In 2008 the sites which are now zero-waste-to-landfill had sent a combined total of 620 tonnes to landfill.

For the rest of Diageo's sites the vast majority of waste produced is also now recycled with only a small amount of waste going to landfill where it is absolutely unavoidable. Every site remains firmly focused on achieving zero waste to landfill. To achieve this level of reduction, Diageo focused across all of its sites on clearly identifying waste streams and working in the first instance to reduce the amount of waste and then on ensuring any unavoidable waste was recycled rather than sent to landfill.

Key to the success which has been achieved so far is the high level of employee engagement, with Diageo staff at all sites taking a proactive role in reducing the amount of waste produced and taking pride in reducing their environmental impact.

DIAGEO

Case Study

Burn Stewart Distillers

Deanston Distillery in Doune, which is part of Burn Stewart Distillers, combines Scotland's engineering heritage with industrial re-invention, showing that renewable energy and sustainability are not new to the Scotch Whisky making process.

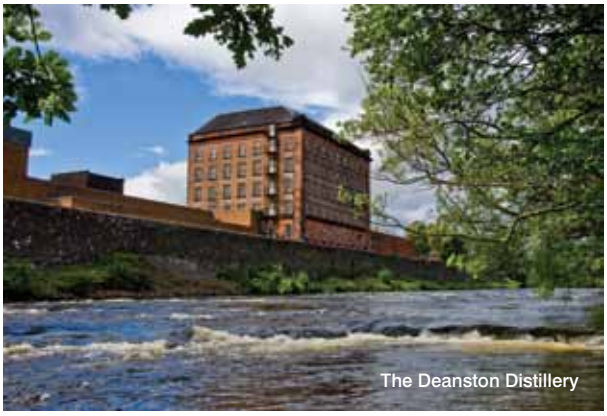
Established in 1966, Deanston Distillery, producer of the hand-crafted Deanston Highland Single Malt Scotch Whisky, occupies a former cotton mill on the banks of the River Teith. It has achieved the rare status of being self-sufficient in electricity, with power generated by the on-site hydro-energy facility.

The system, driven by the fast running water of the Teith, was introduced in the 18th Century to drive the world's first water-powered spinning frame - an invention by the mill's original designer, Richard Arkwright. At 36 ft 6 inches in diameter and 11 ft wide, Hercules, one of four colossal waterwheels powering the mill from 1833, was the largest waterwheel in Europe and the second largest in the world.

The wheels were replaced with two turbines in 1937 which produce a combined output of 400kW.

By 1965, changes in the world market for cotton forced the closure of the mill but it was converted for use as a distillery, reopening nine months later in 1966.

Burn Stewart Distillers bought Deanston in 1990 and committed to retaining and developing the hydro-energy capacity of the distillery. The original turbines are still fully functioning. Modern switchgear equipment was installed but the original 1937 switchgears remain. They may be viewed as part of Deanston's new Visitor Centre experience charting the social and industrial history of the site from 1785 to the present day.



The Deanston Distillery

The two turbines produce on average 48,000kWh a week. Depending on production levels, the Distillery uses 10 – 14, 000kWh a week with the surplus energy being exported to the national grid.

On average, Deanston delivers 1,300,000kWh pa of hydro-generated electricity to the national grid every year. This is enough energy to power 394 homes all year, based on average usage.

The hydro-energy project at Deanston Distillery is managed by the Wemyss Development Company.

Burn Stewart Distillers Limited is a fully integrated Scotch Whisky producer and brand owner with three single malt whisky distilleries and a strong portfolio of Scotch Whisky brands.

Burn Stewart
DISTILLERS LTD

Case study

The Glenlivet expansion

Chivas Brothers

Chivas Brothers is the Scotch Whisky and premium gin business of Pernod Ricard. The company produces, exports, and markets some of the world's best known Scotch Whisky malts and blends, including Chivas Regal, Ballantine's, The Glenlivet and Royal Salute.

Chivas Brothers is committed to continually improving the energy efficiency of its malt whisky distilleries by adapting and improving the technologies used around the distillation process. The current programme of plant upgrades and refurbishments is delivering significant reductions in steam energy demand by installing thermo-compression units on its wash stills.

The improvements form part of a wider and long-running energy strategy to reduce demand by taking an integrated approach to heat recovery. The first generation of technologies concentrated on three main components:

- Hot water and flash steam recovery to preheat still charges and mashing water
- Installation of thermo-compressors on wash stills
- Use of excess low-grade heat to produce animal feed by the evaporation of pot ale

All three of these techniques have been in place at Chivas' Aberlour distillery for over 25 years.

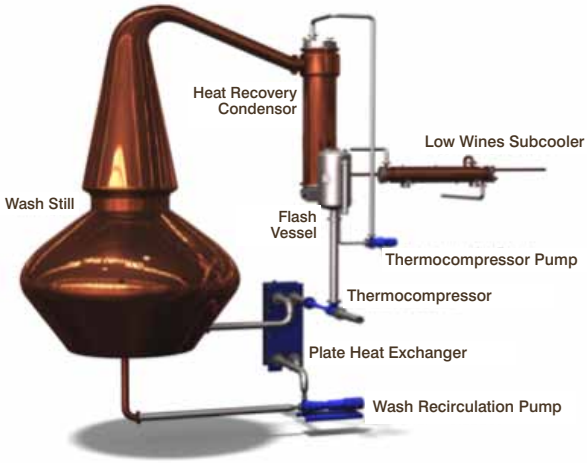
Thermo-compression units are designed to convert low pressure steam from the flash vessel and hot condenser to a higher pressure to allow reuse for heating purposes. The technology is able to reduce steam demand to a wash still by at least 40%.

Thermo-compressors are a known technology but are only appropriate in certain distilleries, such as those running hot condensers. The technology may not be practicable at sites with space restrictions, horizontal condenser configurations, or cool condenser technology, such as worm tubs.

Chivas Brothers undertook a careful analysis of its sites and the suitability of thermo-compressors, to guard spirit quality before implementing its rolling programme to retrofit the technology at some of its distilleries with existing heat recovery systems – a programme in place since 2005. The technology was included in Chivas' expansion of The Glenlivet distillery in 2009, where the new still house uses 20% less energy than the existing part of the site. Benchmarking of distillery performance has confirmed these savings. All distilleries employing thermo-compressors now use between 10% and 20% less energy per unit of alcohol than would be expected for their size category.

The actual carbon savings vary by distillery size and fuel type. For example, in distilleries within at least six stills, average annual reductions of 1,750 and 2,000 tonnes of CO_2 have been achieved, for gas and oil fuelled sites respectively.

Chivas Brothers views energy efficiency as a continuous process of improvement, with further work planned to review emerging technologies and pilot the potential application of thermo-compressors to spirit stills.



Third generation energy efficient wash still

Chivas Brothers
Pernod Ricard

Registered Office of the Association
20 Atholl Crescent Edinburgh EH3 8HF
t: 0131 222 9200 **f:** 0131 222 9237
e: contact@swa.org.uk
w: www.scotch-whisky.org.uk

London Office
14 Cork Street, London W1S 3NS
t: 020 7629 4384 **f:** 020 7493 1398
e: london.office@swa.org.uk