Pathways to Zero

The RYA's Vision for a Zero Carbon Recreational Boating Sector by 2050

Background Paper

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RYA Carbon Pathway to Zero Background Paper.pdf

Contents

Figures

Introduction

The RYA's Vision is for a Zero Carbon Recreational Boating Sector by 2050.

The RYA's Sustainability Strategy (RYA, 2020), which was developed to deliver on our Environment Policy, requires the organisation to develop a pathway to zero carbon for the RYA and the wider recreational boating sector. This Pathway to Zero report delivers on that requirement and puts forward an action plan to deliver on our commitments.

Key to success is for the RYA to prioritise action on its own significant impacts, and to be flexible in its priorities as new and better data and science feed into our understanding of those impacts. The RYA prides itself on being evidence-led, and this programme is no exception.

This report is a "look ahead," in some cases beyond what is currently technically and economically feasible, to help recreational boating to plan for the future. Not all technologies are available at reasonable cost right now, but by planning for their introduction, educating and informing our members and partners, and asking challenging questions of the boating industry, we make achieving our vision more likely.

Taking Action

We have developed an action plan, and will be working with our members, affiliates, partners, and the wider industry to deliver on this vision. We will communicate our plans, our progress and our challenges along the way and ensure that we take recreational boating along with us on the journey.

While there are nearly 100 actions listed in this paper, most require policy changes, information provision and changes of approach rather than implementation as individual projects. Policy development and review will be undertaken under the Environmental Management System, which will provide the underlying plan-do-check-act cycle of implementation, review and change in order to deliver on the Objectives.

Opportunities and Benefits

The technological and behavioural changes that are required to address the climate emergency offer opportunities for businesses and for our sport beyond reducing the impacts of climate change including:

- For boaters: new propulsion systems bring reduced noise and vibration, reduced maintenance costs, and increased reliability and responsiveness
- For the RYA and the boating industry: the appeal to members of making a positive contribution to the climate emergency, demonstrating that our sport can be carbon neutral and sustainable, investment opportunities, innovation, and new technology development, and "just transition" jobs and new businesses to support green technologies.
- For boaters, the wider public and the environment: improved health; improved air and water quality, increased biodiversity, and, overall, a more pleasant, healthy, and relaxing experience on the water.

The RYA encourages all boaters and the wider recreational boating sector to support this vision for a low carbon, clean and healthy future for our sport.

Context: The Climate Emergency

The two most significant global environmental issues of the moment are climate change and biodiversity loss. These were recognised in the RYA's Sustainability Strategy, published in June 2020. The scientific consensus is settled on both issues. Either on its own represents an existential threat, at the very least to our civilisation and potentially to humanity. While this document focuses on the climate, the two issues are closely related and taking action to address the climate emergency will also have positive impacts on biodiversity through reducing pollution, waste, noise, the risk of changing weather patterns and improvements in land management. While recreational boating's impacts are relatively small compared to many other sectors, they impact directly on the environment in which we spend our leisure time. Besides, everyone will need to take action if the world is to achieve carbon net zero in time to meet the targets of the Paris agreement, to limit global temperature rise to 2C, with a desire to limit the rise to 1.5C.

Global Action

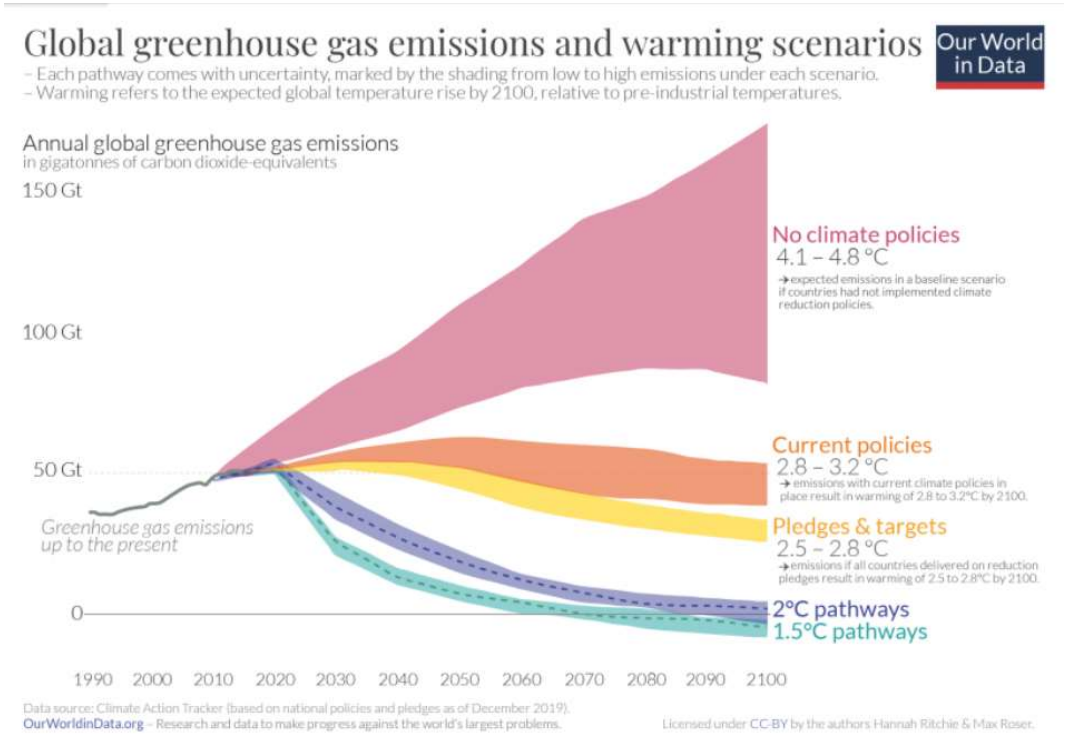
The Paris Agreement, the latest global agreement under the UN Framework Convention on Climate Change (UNFCCC), sets global targets for carbon dioxide emissions reductions, alongside other greenhouse gases.

What are the main aims of the Paris deal?

- To keep global temperatures "well below" 2.0C (3.6F) above pre-industrial times and "endeavour to limit" them even more, to 1.5C.
- To limit the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally - beginning at some point between 2050 and 2100.

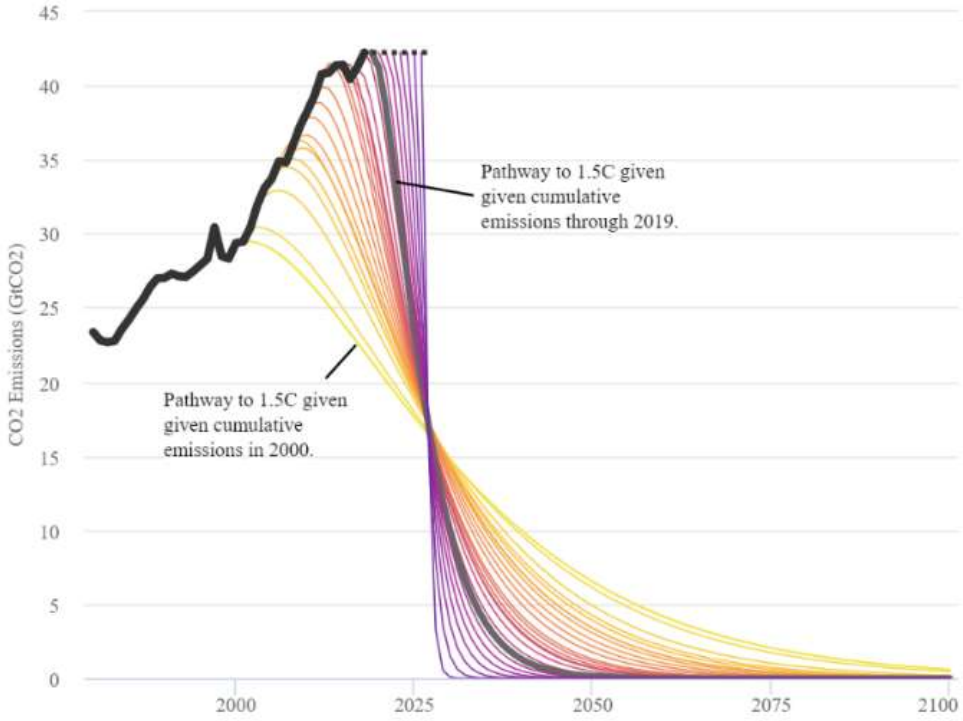
Current national policies, pledges and targets collectively fail to meet the 1.5C pathway, so the next Conference of the Parties (COP 26) in Glasgow, 2021, is critical to getting on track.

Figure 1: Emissions and Warming Scenarios (Our World In Data, Rev. August 2020)



The longer the world waits before dramatically cutting emissions, the more dramatic the required action to achieve the Paris agreement objective of less than 1.5C global average temperature rise. Note that in this context when scientists say that "a pathway achieves a 1.5C maximum temperature rise" they mean "there is a better than 2/3rds chance of achieving a 1.5C maximum temperature rise". Risks increase with every year that passes without significant emissions reductions. The graph below shows the changing trajectory for a 1.5C pathway over time. The line becomes significantly steeper for each year that passes with insufficient climate action.

Figure 2: The Climate Emergency – the scale of the problem (Carbon Brief, 2019)



COP 26

The overall objective of the 26th Conference of the Parties of the UNFCCC, Glasgow 2021, is to "secure global net zero by mid-century and keep 1.5 degrees within reach"

UK Government and Parliament Objectives

Net Zero 2050

The Climate Change Act 2008 committed the UK to an 80% reduction in carbon emissions by 2050, compared to a 1990 baseline. In June 2019, secondary legislation was passed that extended that target to "at least 100%" (Institute for Government, 2020). This legally-binding target will increasingly influence legislation as the path to net zero becomes more challenging with the passage of time. The "at least 100%" formulation suggests going beyond net zero or even true zero carbon to become a carbon negative economy.

Climate Emergency

On 1st May 2019, the UK Parliament declared a Climate Emergency. While the declaration does not bind the Government to specific actions, the Opposition Day debate was notable for the cross-party support that the proposal received.

Resolved, that this House declares an environment and climate emergency following the finding of the Inter-governmental Panel on Climate Change that to avoid a more than 1.5°C rise in global warming, global emissions would need to fall by around 45 per cent from 2010 levels by 2030, reaching net zero by around 2050 (Hansard, 2019)

Such declarations are a useful political tool. The challenge is to translate this into real action that delivers the necessary changes to the way we generate and efficiently use energy.

Clean Maritime Plan

The Department for Transport's Clean Maritime Plan was published in 2019 and stated:

By 2025 we expect that: All vessels operating in UK waters are maximising the use of energy efficiency options. All new vessels being ordered for use in UK waters are being designed with zero emission propulsion capability. (Department for Transport, 2019)

The term "zero carbon capable" is not defined, so it is expected that many boats will continue to be sold with internal combustion engines that are certified for use with biofuels. Current Government consultations suggest that the supply of biofuels will be restricted (Department for Transport, 2021), given the potential impact on land area of widespread use.

The UK Sixth Carbon Budget and the Government's Response

Following the publication of the Climate Change's Committee's Sixth Carbon Budget, the UK government has set an additional interim target of a 78% reduction in emissions by 2035 compared to 1990 levels. This equates to a 60% reduction from now, and is one of the few national targets that is in line with the IPCC's 1.5C pathway. As yet there is no clear strategy to achieve this, but legislation will likely follow to achieve the target.

The Boating Sector

International Olympic Committee (IOC)

The IOC launched its sustainability strategy in October 2017. This was in response to sustainability being one of the three pillars of the Olympic Agenda 2020, their strategic roadmap for the Olympics movement.

World Sailing

World Sailing published its Sustainability Agenda 2030 in 2018. More recently they launched Challenge 2024, which aims to reduce the number of coach boats with combustion engines at Olympic Class events by 50% by 2024.

UNFCCC Sports for Climate Action (S4CA) and Race to Zero Campaign:

The RYA is signed up to the S4CA programme, which is working with national governing bodies and others to accelerate climate action.

The RYA

The RYA published its Sustainability Strategy in 2020, including a commitment to prepare this carbon pathway to zero.

British Marine

British Marine recently published its *National Environmental Roadmap* (British Marine, 2020). The report lays out how marine businesses will need to respond to legislative and regulatory changes over the next decade on the pathway to 2050 net zero.

Inland Waterways Association (IWA)

The IWA has produced a report, *"IWA Vision for Sustainable Propulsion on the Inland Waterways"* (IWA, 2020). The report provided useful source material for this document. Their key focus is on the use of hydrotreated vegetable oil (HVO) as a transition fuel, and ultimately the electrification of inland waterways craft with batteries and hydrogen as fuel stores.

The Carbon Trust

Shortly before publication of this document, the Carbon Trust issued their *"Roadmap for the Decarbonisation of the European Recreational Marine Craft Sector"* (Carbon Trust, 2021). The report includes significant research and technical details for the whole sector, and its conclusions are broadly in line with the RYA's Carbon Pathway to Zero.

UNFCCC[1] Sports for Climate Action (S4CA) and Race to Zero Campaign

The RYA is signed up to the S4CA programme, which is working with national governing bodies and others to accelerate climate action. Other key participants include World Sailing, the Ocean Race, 11th Hour Racing and other international bodies in the boating sector. The programme requires participants to consider all scopes of carbon emissions and to set science-based targets. Carbon offsets are only to be used for unavoidable emissions.

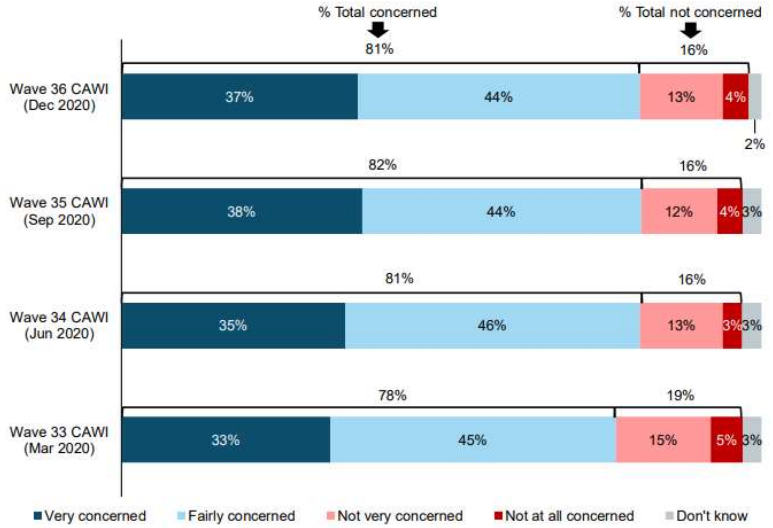
The UNFCCC has noted that the target of a 45% reduction by 2030, still recognised as a requirement to meet the 1.5C Paris aspirational limit, was originally based on a 2010 baseline. They recognise this is now an unrealistic starting point, so S4CA participants are encouraged to use the most recent baseline year possible. The RYA is taking 2019/20 as the baseline year.

[1] UN Framework Convention on Climate Change.

Views of the General Public

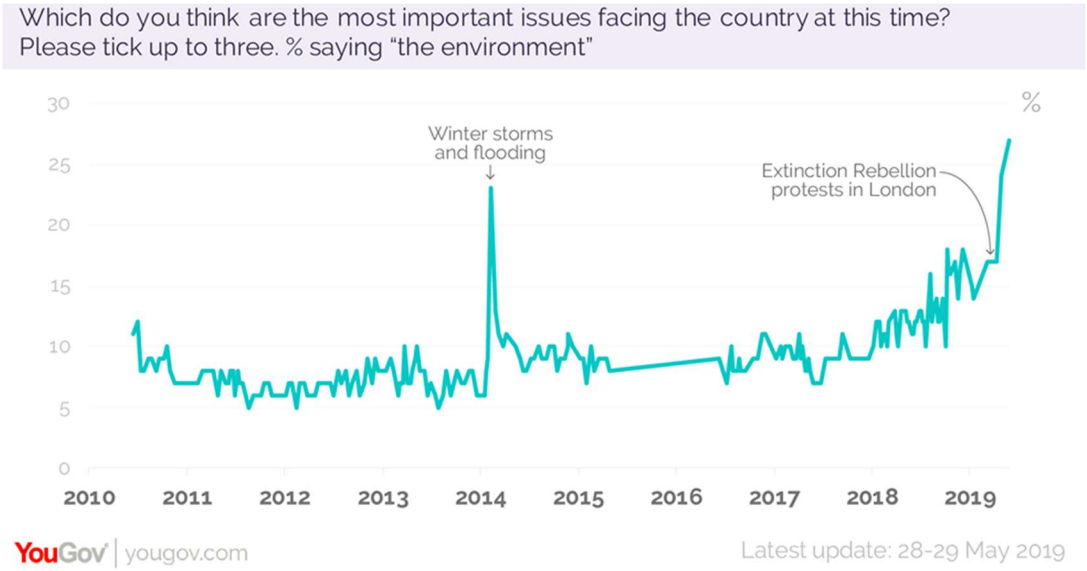
The UK's Department of Business, Energy, and Industrial Strategy (BEIS) has run public attitude surveys on environmental issues since 2012. The latest survey in December 2020 (BEIS, 2021) shows that over 80% of the UK population has concerns about climate change, and 78% support the use of renewable energy. The following graph is from the latest report:

Figure 3: Public Concern about Climate Change, March 2020 to December 2020



The trend in wider concern about the environment is evident in YouGov polls. When this data is broken down further, it is clear that younger generations have higher levels of concern that will feed through into RYA membership over the coming 5-10 years.

Figure 4: Public Concern about the Environment, 2010-2019[2]



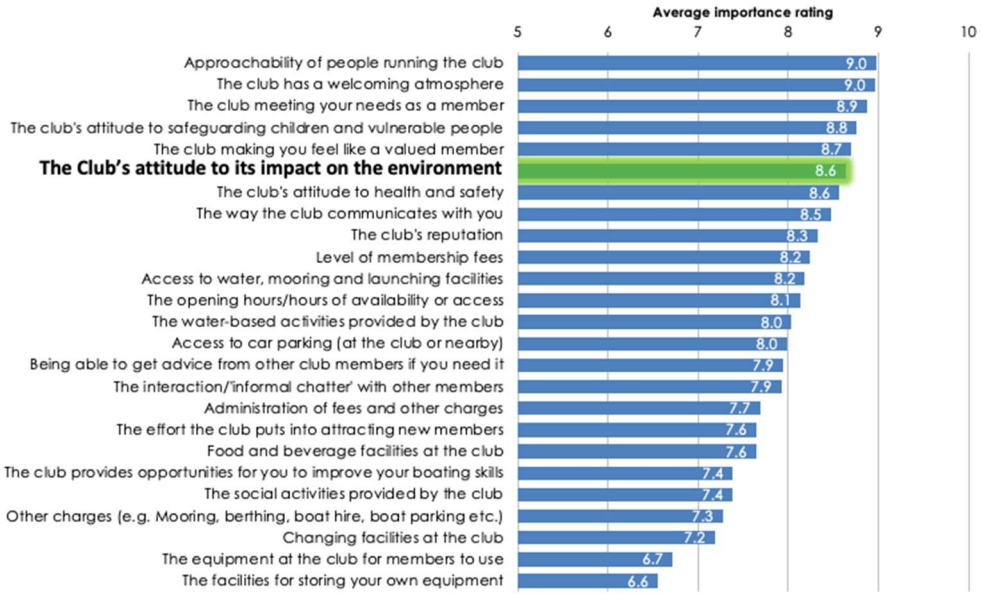
These clearly stated preferences and concerns require the RYA to be seen to be taking action if we are to continue to attract members and keep ahead of the curve as public opinion, policy, technology and science develop in parallel towards net zero.

[2] https://www.bbc.co.uk/news/election-2019-50552535. Note: more recent polls are skewed by health concerns around the Covid crisis.

Views of RYA Members

The latest (2019) club member survey ranked environmental concerns as important as health and safety and safeguarding. Analysis by our consultants concluded that this is now considered a "hygiene factor", i.e. Members expect their clubs, and by extension the RYA, to be taking action on environmental concerns.

Figure 5: Club Members' Satisfaction Survey 2019



Support for our Members and Affiliates

The RYA's members and affiliates work and play predominantly in outdoor environments, and would be negatively impacted by sea level rise, increased precipitation in the winter, hotter summers and, potentially, increases in storm intensity. These will impact on facilities and water availability (either too much or too little depending on context) and directly on available sailing areas and suitable times to take part in our sport.

Sudden, unanticipated changes in legislation could easily become the norm as climate change impacts start to bite. The RYA has a duty to keep ahead of the curve, and to educate and inform its members and affiliates to help them to plan for and adapt to a low carbon future.

Affiliates and training centres are likely to see the early impacts of climate change, with sea level rise, drought, and changes in storm intensity.

The RYA therefore needs to ensure that its lobbying, education, operations, and representation activities all work towards supporting the net zero targets as determined through international, national, local, and sectoral agreements.

Declaring a Climate Emergency

The UK Parliament, many local authorities (300/404 (74%) of District, County, Unitary & Metropolitan Councils at the time of writing[3]), and an increasing number of businesses, have "Declared a Climate Emergency". These declarations are in response to the latest science presented by the Intergovernmental Panel on Climate Change (IPCC), and the brief time available during which we can act to correct our emissions and climate change trajectories.

[3]Details from website (Climate Emergency UK, 2021)

As noted above, recognising the climate situation as an emergency puts it into its proper context, as an existential threat. The challenge is to translate this into real action that delivers the necessary changes to the way we generate and efficiently use energy.

This pathway plan makes a clear declaration of intent regarding the climate emergency, and details actions to deliver on that declaration, to regularly measure progress, review the plan and to change direction as required. We don't have all the answers yet, and this will be a working document that we review regularly in the hope of accelerating progress as technologies and economies adapt to the challenge.

In recognition of the existential threat of climate change, our understanding of what that means for our sport, and our determination to act:

The RYA Declares a Climate Emergency

Context: Opportunities and Benefits

A Carbon Net Zero pathway should be seen as a positive development, driving innovation, and providing member, affiliate, and business benefits alongside reducing the risks associated with climate change. The technological and behavioural changes that are required offer huge opportunities for businesses and for our sport. The RYA, and the wider recreational boating sector, can influence planning for a low carbon future that meets all our needs.

From engineering, business, and sporting perspectives there are exciting innovations in the pipeline that will improve our experience on the water while improving our environmental, social, and economic performance.

The clear opportunities and benefits of a sustainable future include:

For boaters with propulsion systems:

- Reduced noise and vibration above and below the water.
- Reduced maintenance costs.
- Increased reliability.
- Increased responsiveness of the vessel, particularly at low speed.

For the RYA and the boating industry:

- The appeal to members, particularly younger members, of making a positive contribution to the climate emergency.
- Demonstrating that our sport can be carbon neutral and continue to provide sustainable recreational activities beyond 2050.
- Investment opportunities.
- Innovation and new technology development – propulsion for new boats and retrofitting to old, vessel to grid, marine charging systems, modular batteries, and hydrogen energy systems.
- “Just transition” jobs and new businesses to support green technologies. This is a key element in a successful transition, with re-training critical to maintaining job opportunities within the sector.

For boaters, the wider public and the environment:

- Improved health.
- Improved air quality.
- Improved water quality, due to reduced fuel and oil contamination and, ultimately, reduced impacts of excess dissolved CO_2.
- Increased biodiversity due to reduced pollution and noise.
- Overall, a more pleasant, healthy, and relaxing experience on the water.

Principles

Balancing Environmental, Social and Economic Factors

A common description of sustainability is as a three-legged stool where environmental, social, and economic considerations are kept in balance to keep the stool stable.

An equally common response to environmental and societal concerns is to say that action is only possible if costs (usually, immediate costs rather than lifetime costs) remain the same. This does not represent a balanced view, rather it focuses on the economic at the expense of the other "legs", which has led us to the climate and biodiversity emergencies that we now find ourselves in. The stool would fall over…

Principle 1

The RYA's approach is to set science-based targets[4] for reducing greenhouse gas emissions, and then to find the most economic approach to delivering on those targets. This will provide a true sustainable balance and will enable us to deliver our fair share of greenhouse gas mitigation.

Acting Early

Baselining takes time, and our approach to measurement will continue to evolve. It is important that such analysis does not stop us from taking action that we know will have a positive effect.

Action will be taken on any significant aspects that become apparent during the baselining process as the main objective is to reduce emissions.

Principle 2

We will not delay action due to incomplete analysis or data, in line with the internationally recognised Precautionary Principle[5].

Carbon Offset

As noted in the section on Net Zero below, carbon offsetting is a controversial subject, and there are concerns that the approach could be used to put off actions that should otherwise be taken. It is therefore critical that we focus on emission reductions, and that carbon offsets only addresses residual emissions once those reductions are made. Further any offset scheme must demonstrate true "additionality", i.e. that funds are used to undertake carbon removal actions that would not happen otherwise. Offset schemes must also evidence that the carbon removed from the atmosphere is locked up permanently. Such schemes are covered by the UN / WWF Gold Standard, and any scheme used by the RYA will meet that minimum standard.

Principle 3

The RYA will first seek to minimise its own emissions, and those of its supply chain. Any residual emissions will be offset using a certified Gold Standard scheme

[4] Science-based targets initiative: See Glossary.
[5] See Glossary for a definition of the Precautionary Principle.

Approach and Scope

Baselining and Continual Improvement

At the outset of this plan there are significant uncertainties in our baseline and the actions that will be required to move to net zero. This is a common issue for all organisations seeking to address the climate emergency. The RYA will therefore follow the well-known plan-do-check-act cycle to implement this pathway plan. The annual cycle will allow for a staged approach, setting targets on a regular basis, implementing actions, measuring the results, and then correcting our trajectory.

The pathway will not be a smooth transition. Knowledge and technology will improve over time. Our overall targets will remain, but priorities and delivery mechanisms will change.

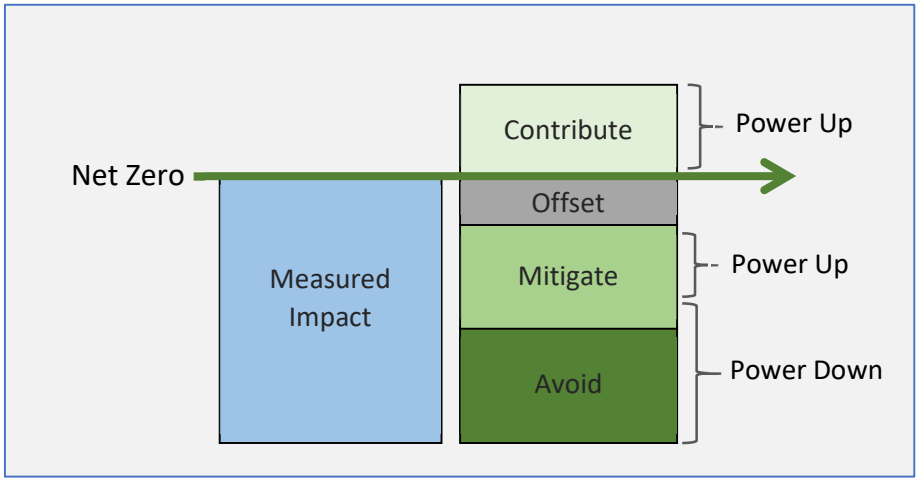
Planning, Prioritising, Acting and Measuring

The pathway to net zero involves understanding our impacts, prioritising action, reducing our energy use, switching to renewables, and mitigating residual impacts. We will:

- **Measure** predicted **Impacts**, set science-based **Targets** and **Prioritise** activities with the greatest impact.
- **Avoid** harmful activities wherever possible through changing behaviour and improving efficiency ("Power Down").
- **Mitigate** essential activities that are harmful, and look for opportunities to **Contribute** beyond our impacts ("Power Up").
- **Offset** the remaining impacts through globally recognised organisations.

In terms of tangible action, **Avoid**, **Mitigate** and **Contribute** are framed here as **Power Down** and **Power Up** This separation of actions into reducing real energy use and then switching to renewables and mitigation ensures that we do not continue with existing damaging and inefficient practices and simply offset our emissions.

Figure 6: Measure, Avoid, Mitigate, Offset, Contribute



Setting Science-based Targets

A science-based target is one that delivers an organisation's fair contribution to the Paris agreement targets. To contribute to achieving those objectives, the RYA has set a 2030 carbon net zero operational target. Some aspects of the RYA's operations, in particular international events and the British Sailing Team, will be a greater challenge to decarbonise so day-to-day operational emissions need to be reduced more rapidly, and

carbon offsets used to address residual emissions. This also sends a clear message to our members, affiliates, and other stakeholders that we will take the lead in achieving the 2050 net zero target for the whole sector.

To achieve net zero by 2030 will require a 10% reduction per year in net emissions from the baseline year 2019/20. Given uncertainties around baseline measurement and the reality of implementing the required change, these objectives and actions will be kept under continual review and modified as needed to meet the overall target. The objectives of our actions are for:

- Scope[6] 1&2 emissions to be zero carbon by 2030
- Supply chain (Scope 3) emissions to be net zero by 2030
- Carbon offsets to be purchased for air travel and the balance of supply chain emissions
- Renewable energy systems to be installed to make an overall positive carbon impact

Zero or Net Zero?[7]

According to the Intergovernmental Panel on Climate Change

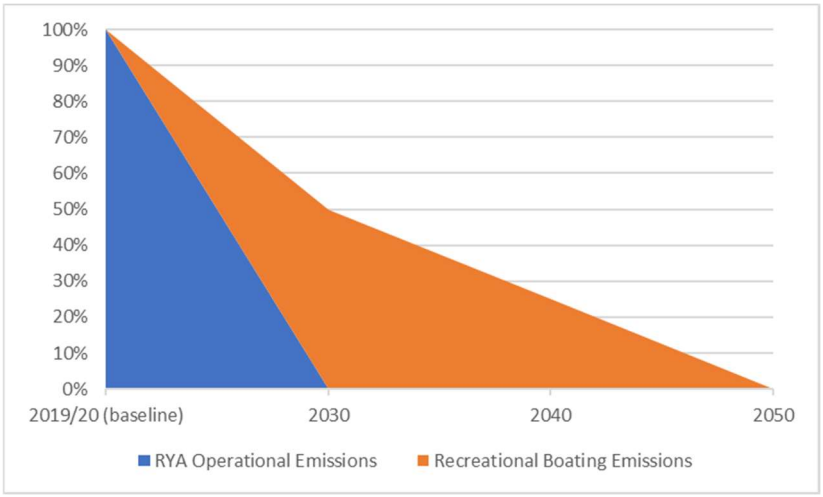
Net zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period (IPCC, 2018)

However, the key to achieving the Paris targets is a real and significant reduction in emissions. Recent commentary from the scientific community has questioned the concept of net zero, see e.g. (Dyke, 2021), and the new focus on net negative emissions technologies. There is a significant risk of "locking in" old and damaging technologies by planning to use unproven mitigation techniques.

The RYA will therefore be looking to significantly reduce its real emissions and to minimise the use of carbon offsets.

While the RYA does not have control over the wider recreational boating sector, our objective is to work with our partners at British Marine and elsewhere to achieve net zero across the whole sector by 2050.

Figure 7: Indicative Recreational Boating Carbon Emissions Pathway to Zero



[6] See section below for Scope definitions.
[7] See also Glossary.

Valuing Carbon

Carbon liabilities will be modelled in line with UN Global Compact protocols (UN Global Compact, 2016):

- Carbon cost of $100 per tonne of CO_2 equivalent

We will model and report on the carbon cost of our activities and will then look at ways to progressively incorporate actual costs through to 2025. This approach will enable the RYA to plan for necessary investment, and to ensure that we focus our attention on reducing emissions before offsetting. It is recommended that any real-world costs are applied as follows, to maximise the focus on emission reductions:

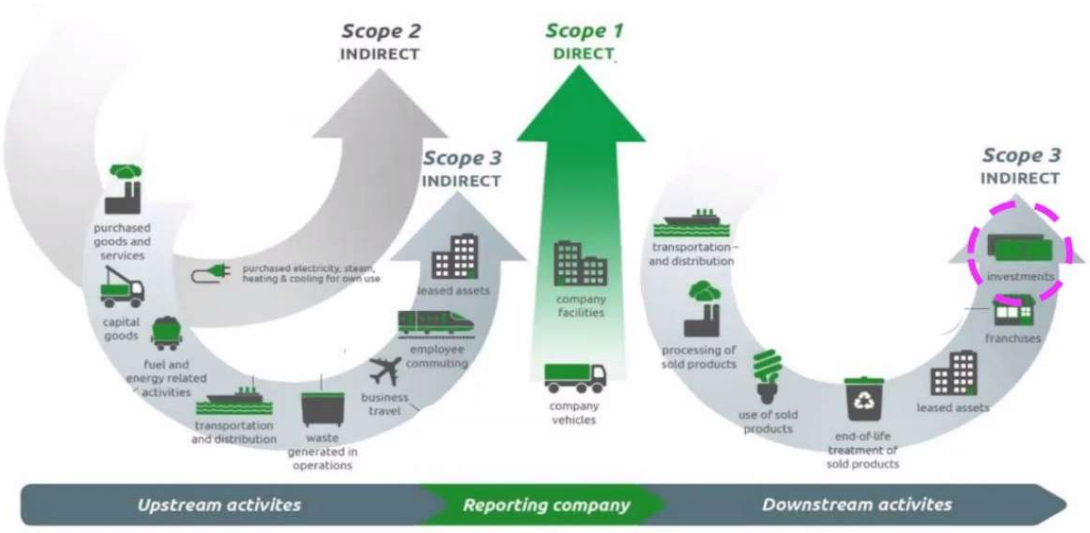
- 75% for internal investment on emissions reduction
- 25% for carbon offset

The RYA's approach will continue to develop as we increase our understanding and begin to report on progress.

Scope: The RYA

As members of the UNFCCC Sports for Climate Action framework, the RYA will be reporting on Scopes 1,2 and 3 emissions in line with the Greenhouse Gas Protocol[8] Corporate and Scope 3 Standards. These Scopes cover direct emissions (Scope 1), indirect emissions from bought in energy (Scope 2) and both upstream (supply chain) and downstream (delivery of products and services) (Scope 3). For more details see (World Resources Institute, 2004) and the Glossary.

Figure 8: Emissions Reporting: Scopes 1,2 and 3



Within this pathway we consider:

- Facilities – energy efficiency, energy supply and other services
- Staff travel
- Procurement, including our relationships with our funders and other partners
- Investment
- Events – sailing events, conferences, the Dinghy Show

[8] The Greenhouse Gas (GHG) Protocol is an international standard for measuring greenhouse gas emissions (GHG Protocol, 2021)

- Operation of the British Sailing Team
- Support to members and affiliates

In terms of geographical scope, this Pathway includes RYA Hamble, Portland, RYA Scotland, RYA Cymru and RYA Northern Ireland.

Scope: The Recreational Boating Sector

The RYA is not able to directly control the approach of the wider recreational boating industry to net zero pathways. However, the RYA does have considerable influence through its membership base, its deep knowledge and long-standing experience of the sector, and recognition of its importance in setting training standards, particularly in the UK.

RYA members and affiliates own and operate a wide variety of vessels, with differing requirements for both power and range. This leads to the need to cater for low speed displacement craft through to high speed, long range planing craft, with energy storage anywhere from the current equivalent of a 4.5 litre can of petrol with a small outboard up to a 20,000 litre diesel tank on a globetrotting power boat. In between we find PWCs, auxiliary engines for sailing yachts, safety boats, coach boats, and more. On board, power is also needed for navigation, lighting, heating, cooling, and entertainment.

The scope of this document therefore focuses on one area of particular interest to the boat user: the future of propulsion, with some additional commentary on domestic energy loads. Aspects of the circular economy, materials use and life cycle analysis will be covered in the RYA's forthcoming publication, *A Pathway to Zero Waste and Pollution*.

The Pathway – Baseline and Data Collection

The RYA's baseline will be for financial year 2019/20, based on utility bills, vehicle records, financial records and using DEFRA conversion factors (kg Co2e per £) (UK Government, 2017), supplemented with more recent data on 2019 greenhouse gas reporting (UK Government, 2020) and other academic-published life cycle carbon data such as that found in *"How Bad Are Bananas?"* (Berners-Lee, 2020) to determine overall RYA impacts.

To improve our understanding of our impacts, changes will be made to data recording for future target setting and progress monitoring.

Actions

- Complete work on 2019/20 baselining by end August 2021
- Update expenses policies to ensure sufficient travel and accommodation data is recorded
- Update driving policies to ensure sufficient duty cycle[9] and fuel data is recorded
- Update boat use protocols to ensure sufficient duty cycle and fuel data is recorded
- Undertake a review of how transactions are allocated within our financial systems to make future carbon impact calculations easier

[9] The emphasis on duty cycles, i.e. the usage pattern of a resource, is to enable early switching to alternative energy sources through better understanding of performance requirements.

The Pathway – RYA Facilities

Objective

The RYA will emit zero greenhouse gas emissions from its own facilities and operations by 2030, and net zero from its supply chain.

RYA Owned Facilities

The RYA owns buildings in Hamble and Portland, and operates out of leased buildings in Eastleigh, Portland, and the Home Countries. To reduce the climate impact of these facilities, the following energy reduction and energy provision actions will be taken – Powering Down the energy demand and Powering Up with sustainable energy sources.

Power Down

- Hold energy reduction workshops with each team to gain insight and input on options.
- Increase efficiency of heating, cooling and lighting systems in all of our buildings.
- Review heat losses through infrared photography and pressure tests, then increase insulation and draught proofing, and improve air-tightness, of our own buildings.
- Reduce solar gain in RYA HQ, and increase biodiversity and reduce run-off, through design and installation of a “green wall” and / or other passive measures (e.g. brise soleil) alongside management of land within our boundary for wildlife.
- Plan for future upgrades / replacement of heating and cooling systems in Hamble and Portland using the best available technologies.
- Iteratively improve building management system settings to minimise energy use whilst maintaining comfort.
- Specify lower GWP[10] refrigerants in air conditioning and refrigeration contracts as they become available.

[10] Global Warming Potential – see Glossary. The latest report from the Committee on Climate Change indicates that HFC-32 will likely be the refrigerant of choice by 2040.

Power Down

- Complete the programme of lighting replacement at RYA HQ with LED panels and additional controls[11]
- Repeat the process for lighting systems at Portland House.

Power Up

- Continue to purchase our energy from renewable sources, selecting suppliers that have wide sustainability credentials rather than simply trading in carbon and renewable generation credits.
- Eliminate gas consumption by switching to induction hobs and electric (heat pump / air conditioning) heating.

Facilities management is an area where there are real opportunities to generate our own energy. Alongside this sits the offsetting of residual emissions, which has the potential to contribute positively to the marine environment.

Contribute

- Develop a business case to install PV / battery systems at RYA HQ and Portland House. Generation from these systems will contribute to mitigating emissions from other RYA activities.
- Offset residual emissions through Gold Standard carbon offset schemes.
- Work with partners to develop a carbon offset scheme that works within the marine environment in line with the interests of our members.

A note on F Gases

F Gases are essential components of air conditioning and refrigeration systems. However, even though they are used in low volumes they have significant global warming potential if accidentally released through leaks or poor disposal practices.

[11] Note that this results in around a 75% reduction in lighting energy use as the requirement is for half the number of panels at half the energy consumption per unit.

The air conditioning systems at RYA House were replaced in early 2021. The previous system had around 130kg of R407c, with a GWP of 1774, i.e. equivalent to 230 tonnes CO_2 if released. The volume of F-gas in the new system was reduced to 96kg and the refrigerant used is R410a, with a GWP of 2088, i.e. equivalent to 200 tonnes of CO2 if released, a reduction of 13%[12].

HFC-32, a newer refrigerant, has a GWP of less than 700. It will therefore contribute far less to global warming through leaks and final disposal than the F-gases in the RYA's existing systems. According to the UK Climate Change Committee's Sixth Carbon Budget report, HFC-32 is expected to be the dominant refrigerant by 2040.

Power Down

- The RYA will move to an F-gas with a GWP of less than 750 when its air conditioning systems next come round for renewal.

RYA Occupied Facilities

Facilities occupied but not owned by the RYA, for example in the Home Countries, require a different approach.

The RYA, including the Home Countries, will work with site owners to:

Power Down

- Actively promote building energy efficiency measures, including improved building management systems and proper management of controls.

Power Up

- Actively promote switching to green energy suppliers.
- Actively promote provision of EV charge points.

[12] See (Environment Agency and Defra, 2019) for global warming potentials of f-gases.

The Pathway – RYA Operations

To embed sustainability principles within the organisation, and to benefit from the collective knowledge of teams, we will undertake a series of workshops to review activities and improve our energy performance.

Power Down

- Review all activities in light of both the climate emergency and the change in working patterns resulting from the Covid-19 pandemic.
- Adjust working patterns and logistics decisions to maximise efficiency.

Staff Travel and Commuting

(Note: some aspects of travel will remain subject to Covid-19 concerns for the foreseeable future. The actions and objectives here assume such restrictions have been lifted that that people are content to use public transport)

Initial assessment of 2019/20 data from the RYA's finance system indicates that 25% of emissions were from travel. Of that number, around 50% was related to air travel. Changing policies and managing our logistics are key to reducing this impact.

For staff travel that does not involve towing or transport of equipment, public transport will be encouraged as the carbon emissions per passenger mile are significantly lower than for cars, especially over longer distances. Time spent on trains and buses is also time that can be used for work, and this needs to be recognised as a benefit to the business.

The "last mile", or 20 miles, to a remote club or training centre, needs to be addressed. Options exist to hire vehicles on hourly rates from transport hubs, and these should be investigated.

Taking baseline work travel data from 2019/20, it is apparent that around two thirds of car trips were under 150 miles. This is within the range of existing electric vehicles, although it is unclear from the data how many trips involve towing.

A key element of business travel emissions is the "grey fleet", i.e. staff using their own vehicles. The average age of privately owned cars is 7 years, so emission levels will be higher than those from newer, company-owned vehicles. Recent experiments suggest that for return journeys of 100 to 200 miles it is cheaper to hire an electric car rather than claiming mileage on own car use.[13]

Commuting, which is reported under Scope 3 of the Greenhouse Gas Protocol, is likely to be significant in terms of impact, though not yet measured. Changed work patterns following the Covid-19 pandemic are an opportunity to reduce emissions in this area. More regular working from home, encouraging the use of cycles and public transport, and shared car travel, can all be enhanced by working with other businesses on Ensign Way and in Portland.

To encourage fewer cars on the daily commute, there must be adequate provision of safe cycling routes and public transport options. This can only be delivered by local authorities, so the RYA will work with other local businesses to lobby for this provision.

[13] See technical appendix for details.

Power Down

- Update the expenses policy to emphasise use of public transport, recognising increased financial cost balanced against lower emissions, reduced loss of staff working time and reduced stress.
- Ban mainland GB internal flights.
- Encourage the on-going use of remote meeting technology, while recognising that some in person meetings are essential for networking and relationship development.
- Review company vehicle use through monitoring duty cycles and towing requirements to reduce the size of the fleet and make better use of the vehicles.
- On recovery from the pandemic, continue to support home working for staff to reduce commuting miles.
- Work with Southampton City Council Sustrans project and local businesses to lobby for improved cycle provision on Hamble Lane and links to the railway station.

Power Up

- Put in place a contract with a national car hire company to ensure easy onward travel from rail stations and bus terminals to clubs & other remote sites.
- If viable, install an HVO fuel supply tank at the Boat Store or RYA House for interim powering of diesel vehicles.
- Increase provision of electric vehicle charge points at RYA HQ, Portland House and Portland units, also at the Boat Store.
- Encourage the hire of electric vehicles to address the “grey fleet” challenge. This will reduce emissions and likely costs as well.
- Replace of all company vehicles with zero emission options by 2025.
- Promote the existing cycle to work scheme.
- Investigate option for the purchase of EVs by staff through salary sacrifice

Committees and Team Meetings

Power Down

- Encourage the on-going use of online meetings, while recognising that in-person meetings are essential to team building and networking.
- Reduce the travel emissions from committee and team meetings by 50% compared to 2019 baseline.
- Change meeting locations to maximise the use of public transport by participants, while ensuring access requirements are met for all participants.

Operations and Procurement

Power Down

- ❖ Develop a procurement policy that aligns purchasing decisions with the sustainability strategy and carbon pathway to zero
- ❖ Set priorities and targets for supply chain energy and carbon reduction. Based on early analysis, our initial focus will be on printing & publications, postage & courier services, and accommodation & catering
- ❖ Actively support alternative approaches to coaching, including the use of drones to work with high-speed foiling boats rather than requiring RIBs that are capable of operating at continuous high speeds.

Power Up

- ❖ Plan the replacement programme for RIBs and outboard engines to ensure that we use the best available technology at reasonable cost, recognising that this cost will likely be higher than conventional approaches at least for the next 5 years.
- ❖ Aim to have zero fossil coach boat solutions in place by 2030.
- ❖ Choose suppliers on the basis of carbon impacts as well as cost, targeting a 25% reduction in carbon footprint by 2025 on the way to net zero 2030. This will involve consideration of transport, embodied carbon and wider product sustainability.

Member Benefit Partners and Sponsors

Updating our relationships with member benefit partners and sponsors is an opportunity to consider whether their products and services reflect the RYA's ambitions on carbon reduction. We will:

Power Down

- ❖ Develop a policy on partner selection criteria.
- ❖ Review contracts with member benefit partners and sponsors as they fall due, with a view to influencing their approach to carbon reduction and ceasing work with non-compliant partners.

Power Up

- ❖ Actively seek new partners who match our ambition and have procedures in place to help us to meet our targets.

Banking and Investments

The RYA holds significant assets on behalf of current and former staff in the form of pension funds. The organisation also operates bank accounts and holds operating funds on deposit. These assets in turn are

invested in businesses globally to generate a return. The RYA can therefore act to influence where those investments are made. While we cannot offer advice on pensions to our staff, or choose individual investments directly, we can choose our partner banks and pension providers, and educate staff about the options available to them for their individual pension pots.

Actions

- Review banking relationships and ensure that we are working with ethically focused providers
- Review pensions providers for their ethical investment criteria
- Inform staff that options are available to them to direct their pension funds to ethical investments

The Pathway – RYA Events and the British Sailing Team

Objective

The British Sailing Team and RYA Sailing Events will achieve a 50% reduction in emissions and net zero by 2030

(Note: some aspects of event management will remain subject to Covid-19 restrictions and concerns for the foreseeable future. The actions and objectives here assume such restrictions have been lifted that that people are content to use public transport)

Events, including the impacts of participants and spectators, are a significant component of RYA activities. The British Sailing Team travels globally for training and competition, and is recognised for its successful Olympic and World Championship campaigns. Setting baselines for the race team is challenging – for example, the 2020/21 Olympics being in Tokyo will have a far higher impact than 2024 in Paris from our perspective. Focus on real emissions reduction actions through changing behaviours and approach, rather than absolute numbers, is the only approach to take here.

Sailing Events

Power Down

- Choose event locations to maximise the use of public transport by participants.
- Alter the format of event series to focus further on regional activities feeding occasional national events.
- Work with our partners at WPNSA and other UK venues to ensure adequate infrastructure is put in place for new technologies to be deployed for training and events.

Conferences and The Dinghy Show

As the premier public event owned by the RYA, it is critical that the management of the Dinghy Show is in line with the objectives of this Pathway to Zero. The same principles will be applied to RYA conferences.

Power Down

- Select venues to maximise the use of public transport to attend events.
- Communicate public transport options and encourage visitors to use them, including through offering discounts on production of a travel ticket, and combined travel and entry
- Develop, with a partner, an RYA-branded app to encourage car sharing.
- Where venues are not adjacent to public transport options, provide bus services from nearby transport hubs to the venue.
- Work with venues to minimise the carbon impact of catering services by focusing on low meat, local, seasonal offerings.

Power Up

- Encourage venues to shift to renewable energy suppliers.
- Ensure venues have provision for EV charging.
- Prefer venues that have installed their own renewable energy systems

The British Sailing Team

Our vision is in line with the IPCC 1.5C pathway, and will take in two Olympic cycles as we work towards this objective. The twin approaches of emissions reduction and net zero are a recognition that real reductions are possible but that carbon offsetting will be needed to address international travel by the sailing teams.

Logistics will be a key part of reducing emissions through eliminating unnecessary travel, shipping and purchases.

Technology developments will also play a significant role. In addition to the increased availability of alternative propulsion, opportunities will arise for funding of research into drone and other new technologies.

Power Down

- Plan training events and influence the programming of open meetings to minimise return to base travel.
- Review methods of travel to European training destinations to reduce air travel by 25% by 2030.
- Work with coaches and other subcontractors to improve logistics and reduce the number of journeys taken.
- Relocate some RIBs and other support materials to appropriate training centres to reduce vehicle journeys between offices and training bases.
- Continue to improve boat maintenance to reduce the need for new boats.

Power Up

- Review coach boat duty cycles to ensure the correct mix of capabilities within the fleet.
- Support the transition to zero carbon propulsion within the sector through demonstrating technologies in our own operations
- Move to electric propulsion for coach and safety boats by 2030.
- Increase the use of drone technologies as chase devices to reduce the time spent at high speed in coach boats.
- Add sustainability criteria to partner contracts
- Demonstrate towing capacity of EVs with car manufacturers
- Include sustainability charter in athlete contracts to encourage behaviour change and to improve data recording

The Pathway – RYA Members and Affiliates

Objective

Support members, affiliates, and registered training centres to achieve net zero carbon by 2050

While the RYA does not manage or control the operations of our affiliates and registered training centres, we are able to offer them clear advice and guidance. Technical solutions to most of their needs already exist, though at present they represent a small proportion of the market and may not yet be economically viable.

One element of energy efficiency and emission reduction is that of training and proper passage planning. For those travelling longer distances this means emphasising the following.

- For sailing vessels, techniques for predicting and managing the effects of changing winds over the passage to minimise engine use.
- For both sailing and motor vessels, using tides to assist passage rather than "powering on through" against adverse currents.
- Allowing sufficient time on passage for unforeseen weather conditions, rather than having a tight deadline for arrival at your destination.

In other words, using RYA training to emphasise traditional methods of passage planning and reducing reliance on high power engines to compensate for lack of such planning.

The RYA interacts directly or indirectly with an estimated 250,000 boaters per year. Small changes in behaviour achieved through our information and education programmes can have a large positive impact on emissions.

Actions

- Continue to support and further develop the activities of The Green Blue
- Continue to encourage, through the RYA's training programmes, an approach to sailing and motorboating that is in tune with the conditions found on the water to minimise energy use.
- Work with affiliated clubs and registered training centres to plan for a net zero future including providing technical advice, running discussion forums, and developing links with suppliers of appropriate products and services.
- Support affiliates and members to make decisions to maximise the energy efficiency of their operations.
- Support affiliates to invest in their own renewable electricity generation through providing guidance on funding mechanisms and technologies suited to their needs.
- Develop, through a partnership with the British Association for Sustainable Sport (BASIS), an accreditation scheme that recognises affiliates' progress in delivering sustainability
- Lobby through British Marine for improved sustainability of services offered to boaters

It is important that boaters understand the likely pathway to net zero, and the rate of technological change, when they consider both purchasing and maintaining / upgrading their vessels. The transition will likely be rapid in relation to the lifetime of a typical boat. With that in mind, when buying new or used, boaters need to start asking questions of their supplier or broker. We also need to be asking our marinas and boatyards how they are planning to provide the charge points for electric cars and boats, whether they are considering supplying biofuels, and how they see their services developing in the near future to support the transition.

Action

❖ Support members to ask challenging questions of brokers, manufacturers and service providers to bring pressure to bear for environmental improvement:

- How will this boat transition to zero carbon emissions?
- Will I need to retrofit the propulsion system of my power or sailing boat in the near future? Will this be a significant additional cost?
- Is it better value for a new sailing yacht with an auxiliary engine to be carbon-free now?
- What impact will the propulsion and domestic systems have on future value?
- How am I going to charge my batteries, or source alternative fuels?

The Pathway – The Recreational Boating Industry

Objective

Support a 50% reduction in the carbon impact of propulsion in the UK Recreational Boating Sector by 2030 and zero carbon by 2050

Introduction

This objective is in line with the IPCC's latest reports on achieving the 1.5C target.

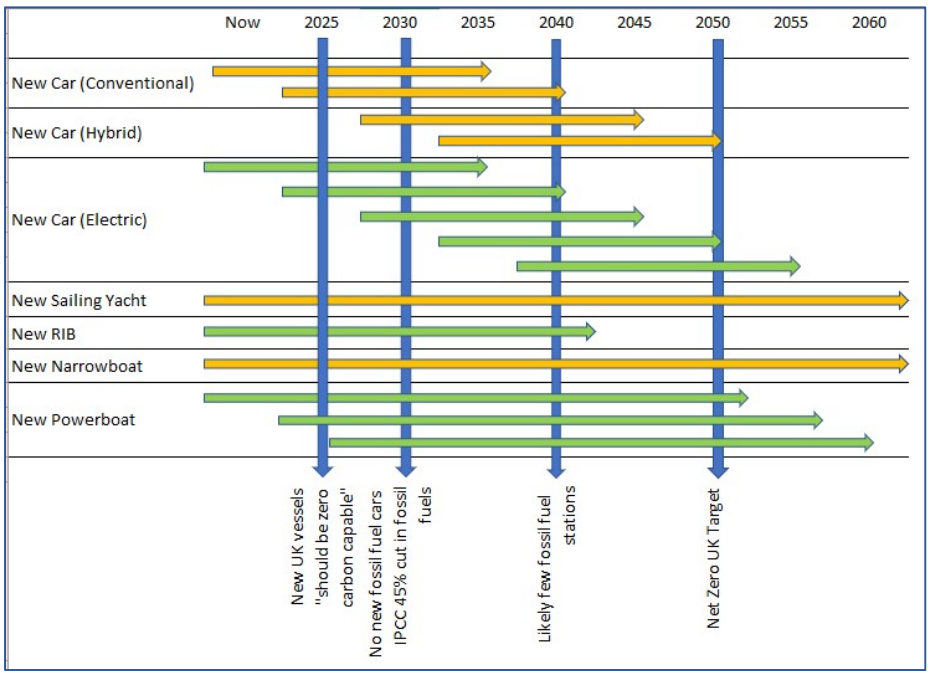
Much of the focus in terms of meeting the needs of decarbonisation of propulsion is on new build. This is where exciting and innovative technologies can be introduced and designs optimised for their use. However, we start here with the legacy fleet, as this will be the biggest challenge, and potentially the biggest opportunity for businesses over the next 30 years through to 2050.

It is anticipated that the recreational boating sector will move largely to electric drive with a mix of energy stores, mostly battery and hydrogen. This will mirror the changes already seen and forecast for road and rail transport.

The Legacy Fleet

There is little verified data available regarding the age of vessels in use. However, anecdotal information suggests that larger vessels have a life between 30 and 50 years. The 2018 Arkenford survey of recreational boating in the UK suggests there are around 320,000 boats in the UK that fall within the categories considered here.

Figure 9: Vessel Lifetimes



By 2030 all cars sold in the UK will need to be pure electric, or plug-in hybrids. By 2035 no more fossil-fuel powered cars will be available. Given the average life of a car is between 10 and 15 years, most will be off the road by the target date of 2050.

For boats, it is a quite different story. Boats being bought new in 2021 will likely still be in use well beyond 2050. Larger vessels have lifetimes of 40-50 years, and even RIBs and smaller sailing vessels will last 30 years or more. The challenge is therefore both for new build boats to become zero carbon in short order, and for existing boats, including those being sold today, to be retrofitted to be zero carbon. We need a "pathway" to zero that shows the stages that we will go through as we transition to a zero carbon world.

Another factor is that sailing areas and usage patterns differ widely, from day trips out of a well-serviced marina on the South coast of England to multi-day cruises around remote Scottish islands; from boats that are used on fine weekends in the summer to liveaboards with large domestic demands.

This extensive scope and variety mean that there is no single solution that meets all user needs. Further, the recreational boating sector is relatively small in comparison to commercial marine and, of course, land-based transport. The RYA therefore needs to assist the industry in determining core principles so that all requirements are catered for in terms of the installed technology, future energy supply and maintenance support, at minimal complexity and cost.

New Build

The UK's Clean Maritime Plan sets a 2025 deadline for new boats to be "zero carbon capable".

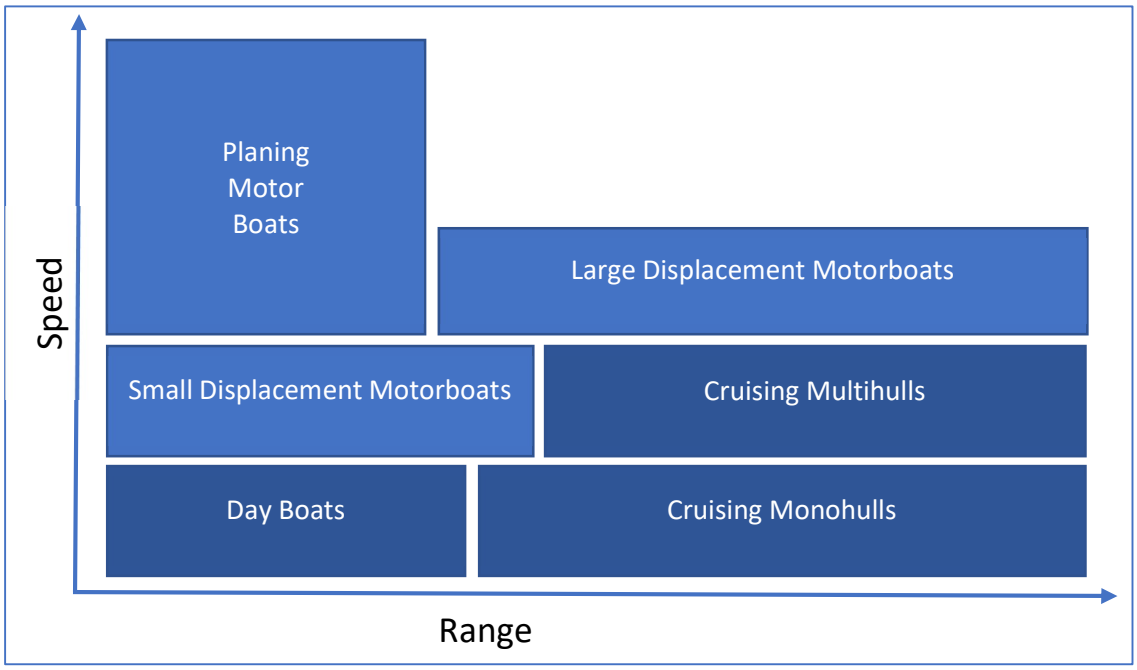
However, given the longevity of vessels, manufacturers need to take account of net zero objectives immediately. There is little evidence of this happening to date, with a few notable exceptions where electric auxiliary drives are being offered for sailing boats and a small number of experimental vessels using battery electric or hydrogen fuel cell devices.

Manufacturers need to inform customers how new boats are going to be converted to zero carbon propulsion within their lifetime, what the costs are likely to be and what support will be offered to new owners to manage the transition.

Duty Cycles

We have a wide variety of vessels, with many differing requirements for both power and range. This leads to a need to cater for energy storage anywhere from the current equivalent of a 4.5l can of petrol with a small outboard up to a 20,000l tank on a globetrotting power boat. In between we have PWCs, auxiliary engines for sailing yachts, safety and coach boats, and more.

Figure 10: Recreational Vessel Duty Cycles



To achieve an efficient transition for all boat types, understanding duty cycles (i.e. how the boats are actually used) is key. The marketing of boats, particularly larger sailing and motor cruisers, often emphasises the power and size of engines, generators and fuel tanks and quotes the range of the boat at cruising speed. The focus for specifying new and upgraded propulsion systems needs to switch to actual use patterns and the resulting power and energy requirements, to best inform the uptake of new, clean technologies.

Solutions

This summary of potential solutions is based on the discussions in the Technical Annex below.

Solutions - Inland Waterways

Interim: HVO fuel to 2030.
Moving to electric drive.
New build ramping up to 2030: battery electric.
Conversion of existing engines to battery electric drive through to 2035.

Solutions - Sailing Yachts and small non-planing craft

Interim: HVO fuel to 2030.
Moving to electric drive.
New build ramping up to 2030: battery electric.
Hydrogen fuel cell for extended range applications in 2030s and beyond.

Solutions - Small high speed craft

New build now: battery electric for shorter range, e.g. for PWCs.

Transition path for existing PWCs likely too expensive.

Transition for boats with outboards is straightforward to battery electric.

2030s onwards, potentially hydrogen direct burn in modified internal combustion engines for longer range / high power requirements.

Solutions - Large and long range powered craft

Interim: HVO / other biofuels.

Longer term: hydrogen fuel cell with electric drive, or hybrid parallel hydrogen internal combustion engine with battery storage.

Solutions – Domestic Loads

Cooking – induction hobs, electric ovens, microwaves and low kW kettles are all available solutions to cooking on board without gas. Currently prices are high, but wider roll out will reduce costs.

Heating and cooling – open circuit water source heat pumps are a viable future alternative to diesel heaters. Further technology developments will be needed to reduce costs and increase reliability.

Lighting and navigation loads are small relative to propulsion demand, so simply select high efficiency products that already exist

Solar panels and wind turbines are suitable on-board energy sources for maintaining batteries and powering domestic loads.

Research Requirements and Opportunities

As noted above, given the complexity and the range of use cases for boats in the UK, from small sailing dinghies, through RIBs and sports boats, to larger yachts (with and without auxiliary engines) and long range capable power boats, research into the different use cases will be critical to a successful transition. The example of “range anxiety” with electric vehicles is also a concern for boaters. However, many vessels currently in use are likely over-specified in terms of both power and range. Research is therefore required to better understand the duty cycles of both propulsion systems and generators, so that the most efficient solutions can be proposed.

Given infrastructure requirements and the move to an increasingly renewables powered grid, research opportunities exist for integrating boat batteries with grid support. This approach would be similar to that taken with EVs, where vehicle batteries are used to support the grid during periods of high demand, and charging takes place during periods of low demand. The use case for many boats is that they spend most of their time berthed, with intermittent recreational use. Understanding that use pattern may reduce the demand for infrastructure as most boat batteries could be charged slowly over a week or more. Making such

a system work for boaters will require research and development of suitable switch gear and apps to manage charging.

Business Opportunities

Opportunities and benefits include:

- Investment opportunities.
- Innovative technology development – propulsion for new boats and retrofitting to old, vessel to grid, marine charging systems, modular battery and hydrogen energy systems.
- "Just transition" jobs and new businesses to support green technologies.

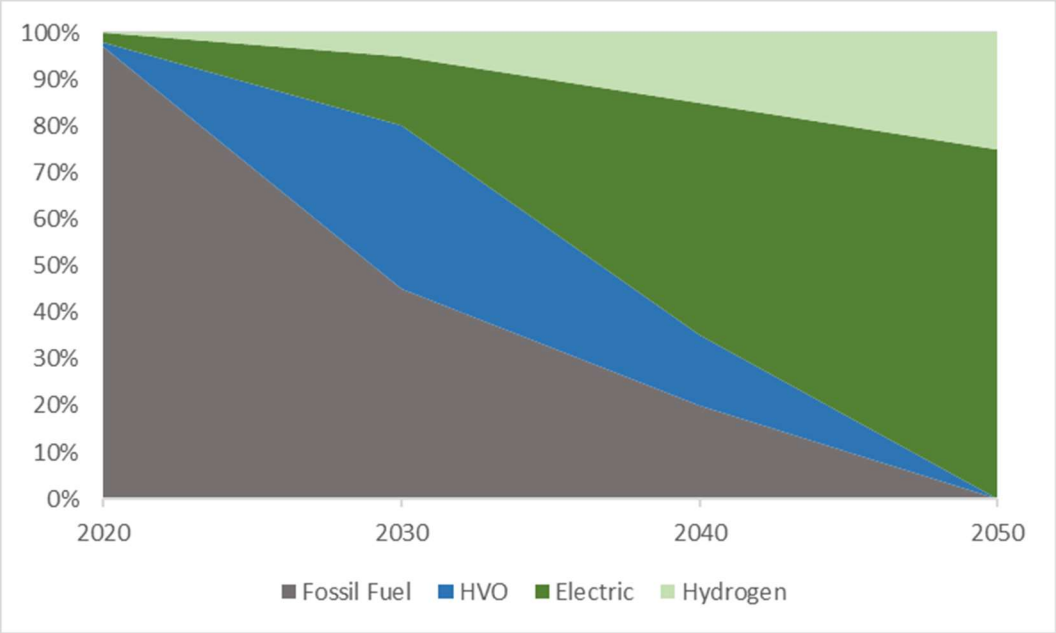
What does the Pathway look like?

Based on conversations with academics, government advisers and manufacturers, the discussions above and the analysis of Technologies below, the likely scenario is that we will see HVO used as an interim energy store, and an eventual move to a mix of battery and hydrogen energy stores with electric drive units, with battery taking most of the load and hydrogen reserved for long range vessels. There will be a need for some direct hydrogen drives using internal combustion engines, with related climate impacts, but the majority will be electric drive.

Both HVO and hybrid drives, except where the latter are powered by green hydrogen, will be interim solutions.

To meet the Paris targets, we need a 45% reduction in emissions by 2030. For this to be possible, there will be an initial increase in the use of biofuels as technology and markets develop. Post 2030 we will see a rapid move to electric drive and batteries or hydrogen for the energy store on board.

Figure 11: Likely Propulsion Energy Pathways



Case Studies in Propulsion

The following examples are a snapshot of current projects, both new build and retrofit. The latter are often undertaken as DIY projects at present, though there is increasing demand for professional conversions. Standardisation and packaged products will be key to cost and quality control.

Commercial

The Plymouth boat trips e-Voyager uses 22kWh of marinised Nissan Leaf batteries, enough for a full day's trips plus significant margin. They are moving on to a 100+ person ferry with 200kWh of batteries (custom built) and twin 140hp motors in series.

Operating on a 10km ferry route, the Bastø Electric is a 140m ferry with capacity for 600 passengers and 200 cars. It uses batteries with a capacity of 4.3 MWh. The fast-charging system has a capacity of 9 MW, according to the shipping company.

Victoria of Wight. The hybrid elements of the ship's powertrain are a pair of 408 kWh batteries which provide support to four 1,475bhp diesel generators.

We already have the outboard technology for many safety boat applications, and new products, both outboard and inboard, are appearing to fill the gaps, particularly for higher speed craft.

Recreational

The narrowboat Shine uses around 1kW once at cruising speed, so has minimal battery draw. She has 30kWh of lead acid batteries and the solar system will, in the summer months, provide most of a day's cruising energy. Narrowboats, and other inland vessels, have the distinct advantage of limited speed range, little concern over battery weight, and clear locations for infrastructure.

The Orca electric Personal Watercraft has a 180hp electric motor and a 30 mile range. PWCs are a great example where high power requirements are paired with relatively low energy storage needs as they are generally used for shorter day trips.

Greenline power boats have options for diesel, hybrid, or pure electric drive.

All Elan yachts are now offered with electric drive as an option. They are keen to state that “range anxiety” is a concern of the past. Currently, these larger sailing and power yachts are all top-of-the range models. However, as has happened with electric cars, the technologies will rapidly find their way into more affordable packages, and retrofit options will become available. Battery costs continue to drop, and recharge times are improving. Combining with affordable renewable systems will make zero carbon boating a reality within the next 5 years.

Communications and Representation

Objective

Clearly communicate with all stakeholders in support of the transition to zero carbon and use the RYA's influence to lobby on behalf of our members as they work towards that goal

Public Commitment and Transparency

The S4CA framework, to which the RYA has committed, is seeking accreditation to the Race to Zero campaign. The Campaign has minimum criteria, which the RYA will seek to work within[14]:

The High-level Climate Champions (appointed during COP21 that culminated in the Paris agreement) require that the commitments brought forward by networks and initiatives recognized in the Race to Zero campaign meet a minimum set of procedural criteria:

1. **Pledge**: Pledge at the head-of-organization level to reach (net) zero GHGs as soon as possible, and by mid-century at the latest, in line with global efforts to limit warming to 1.5C. Set an interim target to achieve in the next decade, which reflects maximum effort toward or beyond a fair share of the 50% global reduction in CO_2 by 2030 identified in the IPCC Special Report on Global Warming of 1.5C.
2. **Plan:** Within 12 months of joining, explain what actions will be taken toward achieving both interim and longer-term pledges, especially in the short- to medium-term.
3. **Proceed:** Take immediate action toward achieving (net) zero, consistent with delivering interim targets specified.
4. **Publish:** Commit to report publicly both progress against interim and long-term targets, as well as the actions being taken, at least annually.

To deliver on the pledge and publish elements, a clear communications plan will be developed.

Communications

It is critical to the success of this pathway plan that plans and progress are communicated to all stakeholders, that we actively represent the interests of boaters to Government during the transition, and that we encourage uptake of new technologies alongside supporting members to make the transition.

[14] The following section is an edited version of the guidance on the Race to Zero Campaign website (UNFCCC, 2021)

Actions

- ❖ Declare a Climate Emergency and act to address the threat of climate change.
- ❖ Report publicly under the GHG and SECR protocols annually.
- ❖ Sign up to the Race to Zero Campaign via the UNFCCC Sport for Climate Action programme.
- ❖ Engage with other sporting bodies to promote our action plan and encourage them to take on the challenge of net zero carbon
- ❖ Write and distribute a biennial Sustainability Report, highlighting progress towards our goals and noting successes and challenges.
- ❖ The RYA will use all its existing channels to promote our carbon reduction ambitions:

- Social media, email newsletters and the RYA magazine
- Annual club, training and instructor conferences
- Sailing events
- The Dinghy Show
- British Marine events attended by The Green Blue

Government Incentives

We will encourage all levels of Government to engage with our approach and to clearly set out regulatory and support frameworks to enable the transition.

Action

- ❖ We will lobby government through our usual channels to encourage:

- Clear communication about the requirements to meet net zero that go beyond high-level policy statements into a strategy for delivery
- Introduction of a scrappage scheme for the upgrading of existing propulsion systems
- Clarity of approach to fuel supply, including a likely timeline for the availability of green hydrogen
- A recognition of the specific needs of recreational boaters, which are different from those of the wider marine industry given the wide range of activities, both of use case and geography
- Support for the re-training of workers in the sector to meet the needs of new technologies

Collaboration / Funding Opportunities

To encourage all parts of the recreational boating sector to deliver on the commitments laid out here, the RYA will collaborate with its partners to amplify our actions.

Actions

- Develop, through a partnership between The Green Blue, the British Association for Sustainable Sport (BASIS) and The Yacht Harbour Association, an accreditation scheme that includes a Boater Pledge, RYA Club and Centre accreditation through BASIS and Marina environmental accreditation using the Clean Marinas programme
- Work with partner businesses, clubs and local authorities to develop a demonstration scheme in a major sailing hub that will seek funding from InnovateUK, Local Enterprise Partnerships and others to install and test the latest zero carbon technologies.

Technology Annex

Facilities

Energy Efficiency in Buildings

In many, though not all, cases it is cheaper to reduce energy use than to buy the required energy. This is certainly true over the long term. Reducing demand rather than buying energy is sometimes referred to as "negawatts".

Other advantages of creating an energy efficient environment are that it can often be more comfortable and better for occupant health, with better ventilation and steady temperatures.

Retrofitting of energy efficiency measures needs to be undertaken with care, to ensure that buildings are not subject to condensation that can ensue if rooms are sealed to prevent air movement. Good ventilation is key, and the RYA owned buildings generally have air conditioning systems which minimise this risk.

We will need to balance costs and benefits with retrofitting. Starting with a new build, design specifications would likely be near PassivHaus[15] standard, requiring little heating and relying on mechanical ventilation and heat recovery systems. Air conditioning would not be used, and the resulting risk of F-Gas losses would be fully mitigated. However, we have existing building stock, and it is generally recognised that re-use of buildings is better from an embodied energy perspective than knocking down and rebuilding. A pragmatic approach to cost benefit analysis will therefore be required.

Renewable Energy Supply

It is straightforward for the RYA, its affiliates and the wider sector to switch to a green energy supplier. Selecting a truly green supply can be a challenge, given the marketing "hype" around green products. It is notable that only two suppliers in the UK, Ecotricity and Good Energy, fall outside of Ofgem's price controls in recognition that their production costs are higher given their deep green approach to supply[16]. Of these two, Good Energy only offers domestic services and Ecotricity has both domestic and business customers.

The RYA has already switched its energy supply to Ecotricity, and a partnership agreement is in place to promote switching to members and affiliates.

All options for decarbonising the sector will rely on a ready supply of renewable electricity. The trajectory for the UK grid is positive, with PV and offshore wind installations growing rapidly, and a new impetus for cheaper onshore wind. By 2030 we will also see some generation from wave and tidal devices. The boating sector will potentially contribute to security of supply through the connection of multiple batteries to the system, with smart controls to balance the needs of the boater and the network. This approach will mirror that taken for electric vehicles in demonstration schemes such as those run by Cenex[17].

Staff Travel

At the time of writing, one team is experimenting with hiring electric cars for their travel needs. They need to carry equipment to sites but not to tow. Initial examples suggest this approach is:

- cheaper than hiring a fossil fuelled vehicle (hire cost is the same, but there is almost zero fuel cost)

[15] See www.passivhaustrust.org.uk.
[16] See www.ofgem.gov.ukfor details of the enduring derogations issued.
[17] See www.cenex.co.uk/projects-case-studies/efes/.

- significantly cheaper than using staff members' own cars and claiming mileage, if the journey is a day trip over 150 miles (£50 per day hire)
- much lower in emissions. The average age of a privately owned car in the UK is 7 years, so emissions are high from the use of the "grey fleet" (the use of staff owned vehicles).

To better evaluate the benefits of switching to electric cars for staff travel, usage patterns need to be properly analysed and the range of vehicle types reviewed.

Public transport for many journeys would be the most environmentally friendly way for staff to travel. This will need a contract to be in place for vehicle hire for the "last miles" to remote locations. Such schemes are available and will be put in place and promoted to staff.

Messaging is key, and the expenses and travel policies will be updated to reflect best practice.

Propulsion

Conventional

Internal combustion engines burning either petrol or diesel are still the standard in the boating sector. See below for the challenges of continuing to run these engines by switching to biofuels, though such a move will form part of the transition to zero carbon.

Some petrol engines could be modified to run on green hydrogen, though a ready supply is unlikely to be available until the 2030s. It should be noted that burning hydrogen directly in internal combustion engines does not emit carbon dioxide, but it does produce nitrogen oxides (NOx), which also have a warming impact on the climate.

Electric Drive

It is likely that most sailing and power boats will ultimately have an electric drive train. How the energy is provided to that electric drive is key. For existing installations, it is important to remember that the prop may well need to be changed to best use the different power characteristics of electric motors.

Pros

The key advantages of electric drive over conventional systems are:

- Simple system with a small number of moving parts (sometimes only one)
- Lower maintenance costs
- Removes the need to handle fuels and oils, except for small amounts of lubricating oil in bearings
- Low noise
- High torque from the off

Cons

- Standardisation is needed to ensure common charging infrastructure
- Such standardisation needs to be at an international level for vessels likely to travel overseas

Recommendations

> ➢ Encourage the switch to electric propulsion across the whole range of recreational boating applications.

Hybrid Drives

Description

Hybrid drives offer a mix between electric and conventional energy sources. There are two approaches – series and parallel.

Hybrids that use a **series drivetrain** only receive mechanical power from the electric motor, which is run by either a battery or a conventionally-powered generator. In hybrids with a **parallel drivetrain,** the electric motor and internal combustion engine can provide mechanical power simultaneously. Series/parallel drivetrains enable the engine and electric motor to provide power independently or in conjunction with one another. (Union of Concerned Scientists, 2018)

Hybrid drives are significantly more efficient due to running the petrol or diesel engine at optimum power output. As with hybrid cars, these should be seen as an interim solution as they could potentially lock boat owners into ongoing use of internal combustion engines.

Hydrogen powered internal combustion engines in a hybrid system are another possibility, with the caveat around NOx production described above, and conversions of existing petrol and diesel engines to run on hydrogen are already feasible. This is a likely solution for some applications such as larger high-speed craft.

Pros

- Hybrid drives enable significantly more efficient use of fossil fuels, and offer greatly extended range.
- The use of HVO fuel would substantially reduce emissions compared to using fossil sources.
- Conversion of the internal combustion element to renewably-produced hydrogen would be a significant benefit compared to fossil fuels, though NOx production does not make this a fully carbon zero solution.

Cons

Current hybrid drives are, for the most part, using conventional fossil fuel engines and generators. They will therefore need to be refitted in the future with a true net zero solution, either by adding more battery storage or a hydrogen-based system.

- Systems can be complex.
- Risk of locking in the use of internal combustion engines.
- See Energy Stores below for the pros and cons of the use of HVO at scale.

Recommendations

- Hybrid drive trains are a useful intermediate state on the pathway to full decarbonisation, encouraging the uptake of electric drives across fleets.
- Design of hybrid systems should ensure the ease of future retrofit with alternative energy sources. For long range vessels this should be the ability to retrofit with hydrogen. For short range vessels this should be the ability to retrofit with additional batteries.

Energy Stores and Energy Delivery

Biofuels and HVO

Description

Hydrotreated Vegetable Oil, or HVO, is promoted as a sustainable alternative to diesel. It is typically made from waste products and the process involves the addition of hydrogen.

HVO is a drop-in replacement compatible with the majority of existing diesel engines. It achieves around 90% reduction in carbon emissions, with the remaining issue being around the production of hydrogen as noted below. By the time that we have adequate renewable energy supplies for green hydrogen production, it is likely that the market for HVO will have reduced, assuming the UK as a whole remains on a viable net zero pathway.

HVO is therefore likely to be a transition fuel, to help bridge the gap as electric and hydrogen infrastructure and technology is developed further. Extensive use of HVO leads to the danger that the sector could become "locked in" to biofuel, without taking further action to move away from internal combustion engines.

Biofuel replacements for petrol are based around methanol. Existing standards require the roll out of E10 petrol, which has 10% biofuel content. The challenge here, as with all biofuels, is the land area required to grow suitable crops, and the displacement of food crops in the UK and Europe, or deforestation in South America and Asia for imports.

It is important to note that HVO and other similar fuels are quite different from "first generation" FAME biofuels. These earlier products suffered from water absorption and microbial growth ("diesel bug"). HVO suffers from none of these shortcomings, while increasing available power and reduction polluting emissions.

Pros

- Drop-in replacement for the majority of diesel engines
- Up to 90% reduction in life cycle carbon emissions compared to fossil fuels
- Potential to become fully carbon neutral through the use of green hydrogen

Cons

- Some particulate emissions remain, though at significantly lower levels than for conventional diesel.
- Biofuels made from specially grown crops raise the question of sustainable land use and are a challenge to justify in the UK context, unless tied in with significant land use changes away from pasture and the associated reduction in red meat consumption.

Recommendation

> ➢ HVO fuel is part of the transition, and is an interim solution to buy time in order to develop fully carbon zero energy stores. Given the likely restricted availability of this fuel, the land use required to expand production, and the demand on clean hydrogen then use of this fuel will likely peak in the early 2030s and decline thereafter.

Batteries

It is perfectly possible to use lead acid batteries in a propulsion system, but they have a relatively low depth of discharge capability, low lifetime recharge cycles and low energy density. However, they do have a low up-front cost and may be attractive on that basis.

$LiFePO_4$ is the common Lithium chemistry, available in marinised form. They require a reliable management system to safely manage charge / discharge cycles. Lithium batteries are much lighter than lead acid, and have a longer life, so their lifetime costs are becoming comparable.

Lifetime – battery cycles. The latest lithium chemistries will last up to 4,000 charge-discharge cycles with low energy demand. If you accelerate hard, you will reduce this. Using a battery 200 days per year leads to a theoretical 20 year battery life.

With regeneration from your prop (for sailing vessels) and a suitable on-board renewables system (typically solar, though sometimes supplemented with a small wind turbine) this is a true zero carbon solution.

Battery Charging

Charging infrastructure will be needed to make the transition work. An advantage of recreational boats is that they are used intermittently, so in most cases high speed charging is not required. A mix of capabilities at marinas and boatyards will be needed, alongside solutions for moorings and anchorages, which may involve swappable units or renewables on board.

Pros

- Readily available technology, already well proven in electric vehicles
- Long life and minimal maintenance requirements
- No need to refuel, so no risk of spillage and resulting pollution
- Ready end-of-life market for lower power applications
- In conjunction with wind and solar charging, they allow for full autonomy and true zero carbon boating

Cons

- Lack of charging infrastructure in the short term
- Concerns over sourcing of materials, which can be mitigated by using well-known brands who actively manage their supply chains
- Recycling needs to be stepped up to deliver on lab scale experiments to ensure full material recovery as part of a circular economy

Recommendations

- The use of advanced battery technologies should be encouraged in recreational boats. They will be the main source of energy for small to medium craft in the medium term.
- Encourage the development of suitable charging infrastructure, including for more challenging applications such as boats on swinging moorings
- Engage, alongside British Marine, in the discussion over end-of-life batteries and recycling.
- Standards are key to safe installations.

Hydrogen

Hydrogen can be stored compressed, or in a metal hydride. It's safe! Don't think airships, where it is contained as a gas. A small hole at the highest point and any gas will escape before achieving an explosive mixture.

In use, there are two options. The hydrogen can be burned in a modified engine, or converted to electricity through a fuel cell. Efficiency is lower than for batteries, but the energy density makes hydrogen an ideal solution for long range or high power applications.

Currently 80% of UK hydrogen is "grey" hydrogen, made by steam methane reformation and producing CO2 as part of the process. We are unlikely to have sufficient excess generation on our electricity grid until the 2040s to make green hydrogen. Until then, we will have at best "blue" hydrogen, made from methane with the CO2 captured and stored in the old North Sea oil and gas wells. Given the early development of this technology, it is likely that these problems will be solved before we see significant demand from our sector.

At present, the only way to make truly "green" hydrogen is through electrolysis using renewable electricity. It is anticipated that green hydrogen will be available in quantity from the 2030s, as peaks of renewable generation are diverted to its production (International Energy Agency, 2019).

Pros

- High energy density
- Can be used in internal combustion engines or through a fuel cell

Cons

- Round-trip efficiencies can be low, increasing costs
- Lack of sources of green hydrogen until the 2030s

Recommendation

> ➢ Hydrogen has a clear role to play in achieving net zero, particularly for larger and longer range power craft. The sustainability of hydrogen production will improve over time and its technological development and use should be encouraged.

Ammonia

Ammonia is being promoted to the marine sector as a replacement for heavy fuel oils typically used in commercial shipping.

Due to the handling issues associated with ammonia, this is likely to be a solution for larger ships that does not find its way into the recreational sector, with the exception of some larger superyachts.

Recommendation

> ➢ Ammonia is not a suitable energy source for recreational boats.

Infrastructure

Proximity to services

Charging infrastructure will be required to support the increasing use of battery electric technology. Understanding how many boats have access to shore-based electrical supplies is crucial, and research is required to determine the balance between marina based and mid-river moorings.

Standardisation

For those boats not able to connect to shore power, research is required into modular swap-out battery options alongside fast charging options from a service vessel.

Grid Interaction

Having large numbers and capacity of batteries connected to the grid gives opportunities to defray some costs through providing grid support at times of high demand, likely out of sync with recreational use. Work should be encouraged in this area, in collaboration with companies such as Cenex, who have undertaken similar work for EVs.

Safety and Quality Standards

Standards for performance and safety will be critical to uptake of innovative technologies. The RYA should work with British Marine to encourage the development of such standards.

Actions

- Lobby the boating industry to ensure safety and quality standards are developed in advance of need.
- Lobby Government to include small marine in funding programmes aimed at EV infrastructure.

Consultation Annex

This document was prepared by the RYA's Environment and Sustainability Manager. Internal and external review has been sought, and comments reviewed and incorporated where agreed.

Consultee(s)	Responses received	Notes
RYA Planning and Sustainability Committee (external)	Discussion of approach, concepts and objectives during regular committee meeting. Teams discussion with whole committee.	Report split into summary and background documents. Greater clarity on overall objectives.
RYA Planning and Sustainability Committee (external)	Emails and marked up comments.	Clarification of objectives. Added reference to some additional benefits. Useful discussion on the focus and clarified elements that will be in separate pathway to zero waste & pollution. This discussion did highlight the general interconnectedness of the pathways.
RYA External Affairs and Cruising Committee (external)	Email, marked up comments and Teams discussion.	Structure changed and more emphasis placed on the staged approach, with the need to be flexible as our understanding improves.
RYA Planning and Sustainability Team (internal)	Email, marked up comments and Teams discussions.	Some structure changes along with proofing corrections.
RYA CEO (internal)	Notes added during Teams discussion.	Structural and approach changes made to both papers.
World Sailing (external)	Email response	Supporting the approach
Electric boat conversion specialist (external)	Email response	Supporting the approach

Version Control

Version	Drafted by	Reviewed by	Approved by	Date of Approval
V0a-d	Phil Horton	PSC, EACC, Planning & Sustainability Team, external advisers.	N/A	N/A
V1	Phil Horton	As above	CEO	29th July 2021

Glossary

Net zero

According to the intergovernmental Panel on Climate Change

> *Net zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period (IPCC, 2018)*

The concept of net zero is a recognition that it is not possible to fully decarbonise all aspects of human activity. One aspect is that various industrial processes produce carbon and other greenhouse gas emissions by the nature of the chemical reactions involved. A second aspect of relevance to the RYA is that some activities such as flying are unlikely to be decarbonised in the foreseeable future. Net zero is achieved by taking measures to remove from the atmosphere an equivalent quantity of carbon dioxide.

However, key to achieving the Paris targets is real reductions in emissions. Recent commentary from the scientific community has questioned the concept of net zero, see e.g. (Dyke, 2021), and the new focus on net negative emissions technologies. There is a significant risk of "locking in" old and damaging technologies by planning to use unproven mitigation techniques[18] such as carbon capture & storage and hydrogen manufactured from methane.

For more details of this and related terms (e.g. absolute zero) see the UNFCCC Race to Zero Lexicon (UNFCCC, 2021)

CO_2e and Global Warming Potential (GWP)

Carbon dioxide equivalent and Global Warming Potential are equivalent names for the degree to which different gases impact the climate.

Carbon dioxide is the principal, but not the only, greenhouse gas. Others include methane and f-gases, the latter used in refrigeration and heat pumps. Factors need to be applied that convert the impact of other gases into an equivalent amount of CO_2. The factors take account of both the warming potential of the chemical and its lifetime in the atmosphere. At the time of writing, the UK Conversion Factors spreadsheet for carbon reporting has a multiplier of 25 for methane and 2,088 for R410a, the refrigerant that is specified for the RYA House air conditioning upgrade. Assumptions have to be made as gases linger for differing times in the atmosphere, and scientific understanding changes over time so the factors can change as well. For example, the Climate Change Committee's 6th Carbon Budget (Climate Change Committee, 2020) cites a methane multiplier of 28. This has negligible impact on the RYA, but an accidental release of R410a refrigerant would clearly impact on our net zero ambitions.

[18] How much CDR? In no modelled pathway can the Paris goals be achieved without rapid emissions reductions. It should thus be stressed that CDR is not an alternative to emissions reduction, and in fact can only play a minority role in mitigation. Most scientists and practitioners agree that CDR should be used to offset only the emissions that are hardest and most expensive to abate. […] The remainder of emissions reductions (the vast majority) must be achieved by energy efficiency, by changing fuels, by end-of-pipe capture or by reducing activity levels. […] CDR should be used at most for a minority of net zero targets, and not to offset any activities that can be reasonably avoided by other means within the stated timescale. (Greenpeace, 2021)

Radiative Forcing - Aircraft

Additional warming factors can be estimated for aircraft emissions at altitude. This recognises the impact of "contrails" and emissions other than CO_2 that increase the global warming effect of aircraft due to the zone in which they operate.

The impacts of non-CO2 aircraft emissions at high altitudes came to prominence back in 1999 following publication of a special report by the IPCC on aviation (IPCC, 1999). This estimated the total historic impact of aviation on the climate to have been two to four times higher than for CO2 emissions alone.

While there is much scientific debate about the mechanisms of radiative forcing, and the widely-used ICAO emissions calculator (ICAO, n.d.) set up by the aviation industry therefore does not include it, the UK's Defra / BEIS methodology for company reporting sets the factor at 1.9 (BEIS, 2018).

1.5C target

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016.

Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects.

Greenhouse Gas Protocol Scopes 1,2 and 3[19]

The Greenhouse Gas Protocol is an international standard for measuring and reporting on greenhouse gas emissions. The aim is to standardise measurements to allow fair comparisons between participants, and to ensure that all the impacts of an organisation are measured, not just their direct emissions.

Three scopes are defined, and two options are given for reporting. Most organisations will start by measuring and reporting on Scopes 1&2, then define methods for determining their Scope 3, then measure and report. Scope 3 has larger uncertainties, and defining the boundary can be challenging. The key is to identify the main sources of emissions and seek to address those, rather than arriving at a definitive total emissions value.

Scope 1: Direct Emissions

Scope 1 emissions are direct emissions from company-owned and controlled resources, i.e. emissions released to the atmosphere as a direct result of an organisation's activities. It is divided into four categories:

- Stationary combustion: e.g. fuels and heating sources
- Mobile combustion: all fuel-burning vehicles owned or controlled by a firm
- Fugitive emissions: leaks of greenhouse gases from refrigeration and air conditioning units
- Process emissions from industrial processes, and on-site manufacturing

[19] More detailed information is available from the Plan A Academy website (Plan A, n.d.)

Scope 2: Indirect Emissions – Owned

Scope 2 emissions are indirect emissions from the purchase of energy from a utility. For most organisations, electricity will be the only source of scope 2 emissions.

Scope 3 Indirect Emissions – Not Owned

Scope 3 emissions are all indirect emissions not included in scope 2 that occur in the value chain of the reporting company, including both upstream and downstream emissions. In other words, emissions that are linked to the company's operations.

Upstream activities

- For many companies, business travel is one of the most significant to report. Also, employee commuting must be reported, as it results from the emissions emitted through travel to and from work.
- Waste generated in operations relates to waste sent to landfill and wastewater treatment. Waste disposal emits methane (CH4) and nitrous oxide (N2O), which cause greater damage than CO2 emissions.
- Purchased goods and services, including upstream ('cradle to gate') emissions from the production of goods and services purchased by the company in the same year. This includes purchases of production-related products (e.g. materials, components, and parts) and non-production-related products (e.g. office furniture, office supplies and IT support).
- Storage, transport, and distribution in upstream (suppliers) and downstream (customers) elements of the value chain.
- Fuel and energy-related activities include emissions relating to the production of fuels and energy purchased and consumed by the reporting company that are not included in Scopes 1 and 2.
- Capital goods. For the purposes of accounting for scope 3 emissions, companies should not depreciate, discount, or amortize the emissions from the production of capital goods over time. Instead, companies should account for the total cradle-to-gate emissions of purchased capital goods in the year of acquisition (GHG protocol).

Downstream activities

- Investments are included largely for financial institutions, but other organisations can still integrate it into their reporting. According to GHG accounting, investments include equity investments, debt investments, project finance, managed investments, and client services.
- Franchises operate under a licence to sell or distribute another company's goods or services within a certain location. Franchisees include emissions from operations under their control. Franchisees may optionally report upstream scope 3 emissions associated with the franchisor's operations.
- Leased assets: if not reported under Scope 1 or 2.
- Use of sold products is included for products that have "in-use" emissions, such as electrical and electronic equipment.
- Companies must assess how their products are disposed of, and include any resulting emissions.

Figure 12: GHG Protocol Reporting Requirements

Reporting Option	Scope 1	Scope 2	Scope 3
Report in conformance with the *GHG Protocol Corporate Standard*	**Required**	**Required**	**Optional**: Companies may report any scope 3 emissions the company chooses
Report in conformance with the *GHG Protocol Corporate Standard* and the *GHG Protocol Scope 3 Standard*	**Required**	**Required**	**Required**: Companies shall report scope 3 emissions following the requirements of the *Scope 3 Standard*

The Precautionary Principle

The Precautionary Principle states that where significant risk of harm exists, protective actions should not be delayed, or new activities allowed, even where there is scientific doubt about impacts. There are several formulations of the principle, summarised as (Stewart, 2002):

- Scientific uncertainty should not automatically preclude regulation of activities that pose a potential risk of significant harm (*non-preclusion*).
- Regulatory controls should incorporate a margin of safety; activities should be limited below the level at which no adverse effect has been observed or predicted (*margin of safety*).
- Activities that present an uncertain potential for significant harm should be subject to best technology available requirements to minimize the risk of harm unless the proponent of the activity shows that they present no appreciable risk of harm (*BAT*).
- Activities that present an uncertain potential for significant harm should be prohibited unless the proponent of the activity shows that it presents no appreciable risk of harm (*prohibitory*).

Principle 15 of the 1992 Rio Declaration is widely recognized by states and provides practical guidance in the development and application of the principle in international law:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

For a wider discussion of the use of the Precautionary Principle in international law, including why it is seen as controversial in some contexts, see the paper produced by the International Institute for Sustainable Development in the Bibliography (IISD, 2020).

Science-based Targets Initiative

The science-based targets initiative is an initiative of CDP (formerly the Carbon Disclosure Project), the United Nations Global Compact, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). Its aim is to encourage governments and businesses to adopt targets that meet the objectives of the Paris agreement through applying scientific assessment to emissions and their impacts. In essence, a target is science-based if it would meet the twin objectives of a 45% reduction in carbon emissions by 2030 and net zero by 2050.

The initiative encourages interim target setting to ensure early action is taken.

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