

Regional Transformational Opportunities

COHI Paper

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Introduction

1.1 Since 2018, the Convention of the Highlands and Islands (COHI) has been working to identify potentially transformational projects across the Highlands and Islands. A list of large-scale projects of local and potentially national significance was collated, and Highlands and Islands Enterprise (HIE) and the COHI Senior Officers Group (SOG) was tasked with developing and refining the list. This led to the adoption of a thematic approach to identifying opportunities and the agreement of four priority areas, namely **Marine, Energy, Advanced Technology, and Natural Capital**.

1.2 Ekosgen were commissioned to undertake research to explore the nature and scale of potentially transformational opportunities under each of these themes. This paper outlines the regional transformational opportunities (RTOs) which emerged. Implicit in transformation is that the opportunities are complex and cross-cutting and so often align with more than one theme, for example marine renewable energy straddles marine, energy and natural capital.

Transformational opportunities

1.3 In economic development terms, transformation is the continuous process of moving labour and resources from lower to higher productivity activity to bring about structural transformation within and between sectors. Whilst this is one point for the study, it is also much wider. It is about community welfare through social and economic wellbeing, and it is about the climate emergency. Key will be that the transformation will bring about far-reaching reforms that will have long term impacts. Examples include: establishing and developing new high value-added industries in the region; securing a larger share of markets that Scotland currently has limited access to; addressing the persistence of low pay and under-employment; capturing the benefits of the region's natural assets; tackling energy poverty and enhancing the security and reliability of local energy networks; and transforming the pattern of energy generation and consumption across the region.

1.4 Critically, while embedded in a place-based systems approach, the RTOs presented here have the capacity to ensure that the benefits extend across the region and have an impact at Scottish and UK levels. They could revolutionise living, working, visiting, learning and doing business in the Highlands and Islands and significantly shift the profile and emphasis of the region on the world stage.

1.5 This ambition means that RTOs are not straightforward and will require complex interaction of a range of inputs and will deliver cross-cutting outcomes and impacts – economically, socially and environmentally. The themes of marine, energy, advanced technology and natural capital, and the emerging RTOs, are often cross-cutting. For example, opportunities in marine arise because of the natural capital in the waters and coastal areas of the Highlands and Islands. There are also areas where the ambitions of one may impact on another. For example, while there are direct economic opportunities associated with seaweed harvesting, seaweed is a contributor to blue carbon capture. Therefore, extraction may also have an environmental cost.

RTO themes

1.6 The **Marine** resource in the Highlands and Islands is a unique asset, not only for the region but for Scotland and the UK. The Highlands and Islands contain almost two thirds of the UK's coastline and coastal waters, providing a large, rich and pristine marine environment. There is a very healthy existing marine economy spanning interdependent industries and well-established sectors such as fisheries, aquaculture, marine tourism and renewables. The region is home to world class marine science, research and innovation and this, along with the supply chain, extends to other parts of Scotland.

1.7 These well-established sectors have substantial growth potential and are already the focus of research activity (e.g. the MAXiMAR Science and Innovation Audit¹ and Aquaculture Growth to 2030²). Alongside this there are opportunities for a step change in capturing the value of the marine assets in a sustainable way, creating high value-added activities and careers in the region.

1.8 **Energy** is a multi-stranded opportunity that has the potential to be transformative for the Highlands and Islands, Scotland and the UK. Realising the potential will be complex and require collaboration across public, private and academic partners. The opportunity lies not simply in the potential for renewable energy generation through the natural capital in the region – it encompasses every stage, including: science and innovation; testing and deployment; manufacture, installation and maintenance; energy generation; and decommissioning. Marine renewable energy is a central component of this but has been included in the Marine theme.

1.9 The Highlands and Islands has a growing capability in **Advanced Technology**. Spanning many sectors, it underpins economic growth in areas from life science and marine biotechnology to renewable energy, through to advanced engineering. Recent high-profile investments and developments include SSE's Beatrice Offshore Windfarm, and Liberty Group's plans to create an alloy wheel manufacturing facility in Lochaber – these two projects alone represent over £3 billion of investment. Businesses such as Carbon Dynamics, Organlike and Xanthella are driving R&D and innovation in the region, and this activity is supported by world-leading institutes such as Scottish Association of Marine Science (SAMS) in Oban and the European Marine Energy Centre (EMEC) in Orkney. Advanced Technology activity drives up productivity, and creates higher-skilled, better-paid job and career opportunities. It also increases exporting and inward investment opportunities, further strengthening the region's economy and improving resilience.

1.10 **Natural Capital** comprises assets such as trees, soils, plants, peatlands, minerals, mountains, rivers, lochs, seas, coasts, and grasslands. These assets provide ecosystems as well as goods and services such as food and drink, energy, materials, clean air and water, climate and flood regulation, and pest control and disease resistance. The natural capital assets have an intrinsic value and are very important for the physical and mental wellbeing of people who live, visit and engage with them. In fact, people derive a wide range of benefits from natural capital, often referred to as "ecosystem services". Ecosystem services are vital to society and the economy, providing benefits such as the food we eat, the water we drink, climate regulation, carbon storage, natural flood defences, and timber and crop pollination. Protecting the environment and safeguarding Scotland's natural capital is a crucial part of the transition to a low carbon society.

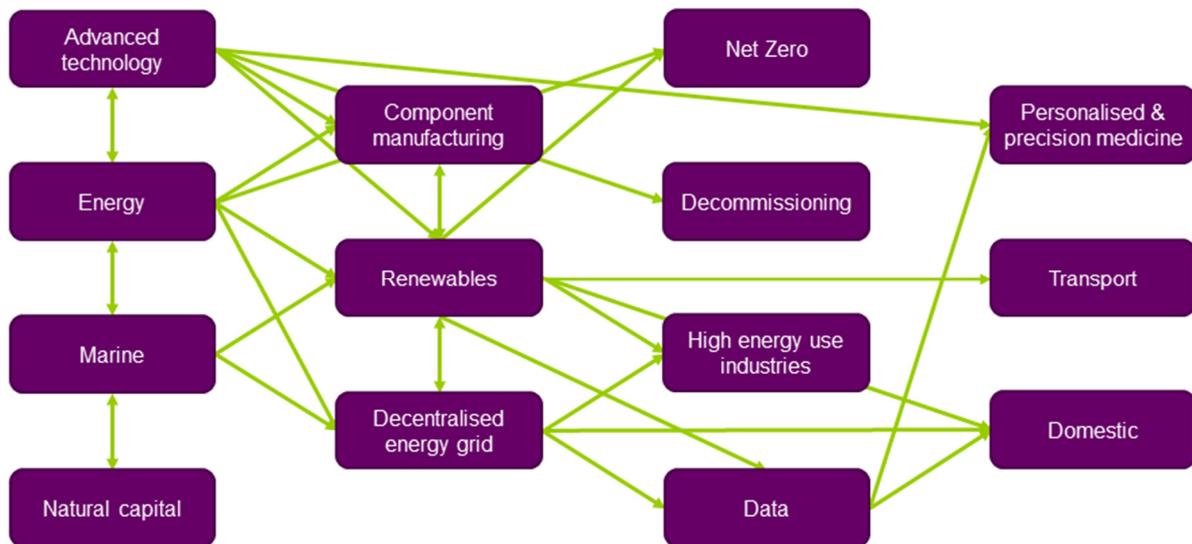
1.11 The Highlands and Islands has an incredible range and scale of natural capital assets. Renewable energy, marine-based industries, tourism, and food and drink (including whisky) are examples of sectors that have built on the natural capital in the region. But like any other capital asset, natural capital needs to be looked after. It must remain whole and be in good working order so that it can keep delivering. To do this, we must understand and invest in it. There is a growing recognition of the value of natural capital and the interplay between how we use it for economic gain, and the need to preserve it and ensure its ongoing health. Scotland is leading the way in demonstrating that it is possible to protect the environment and natural capital, and at the same time, grow the economy. Our natural capital is also an important part of the toolkit for addressing the climate emergency and there are potentially transformational opportunities relating to this in the Highlands and Islands.

¹ <http://www.hie.co.uk/regional-information/economic-reports-and-research/archive/maximar-science-and-innovation-audit.html>

² <http://scottishsalmon.co.uk/wp-content/uploads/2016/10/aquaculture-growth-to-2030.pdf>

1.12 Figure 2.1 demonstrates the thematic linkages, although it is illustrative rather than exhaustive. Appendix 2 also sets out the key regional, Scottish and UK policy linkages of each RTO.

Figure 2.1: Thematic linkages across RTOs



Assessing the transformational nature of RTOs

1.13 To be transformational, a RTO should comprise the following features:

- They are of national strategic value;
- They will deliver clear and substantial shifts as opposed to incremental change;
- Impacts will be major, visible, cross-cutting, and regional;
- A systems-based approach will be required through ‘team Scotland’;
- They will be complex and add to the diversity of the region;
- The activities will be of scale and be realised in the medium to long term;
- They may require new structures, processes, policies, and attitudes to risk and risk sharing; and
- They have the potential to make a significant contribution to key Scottish and UK policy objectives.

1.14 This type of transformation can be more unpredictable, iterative and experimental than traditional projects and consequently entails much higher risk. The key elements needed to build success are a clear vision of the final outcome, good stakeholder engagement and flexibility to adapt as the opportunity progresses. The ultimate vision may not change, but the route to realising the ambition will require continuous review and adaptation to overcome obstacles, exploit opportunities and respond to what is a changing context.

1.15 Appendix 1 sets out an indicative rating of each RTO against the transformational criteria set out above. This is a high-level assessment and will be refined in future iterations of the report.

Regional transformational opportunities

RTO 1: Seaweed and marine biotechnology

1.16 The Highlands and Islands has a vast and under-used natural resource in seaweed and microalgae. These are particularly abundant in three Marine Scotland Atlas regions: West of the Outer Hebrides, the Minch and Inner Hebrides, and the north coast of Orkney. Harvesting (currently restricted in Scotland) and cultivation of seaweed in the Highlands and Islands is a huge opportunity not just for the inherent value of the product, but for what it can unlock for Scotland in terms of its marine biotechnology applications in human health and pharmaceuticals, biomass (energy), cosmetics and food security. The key will be unlocking it in a sustainable way. Seaweed cultivation is undergoing rapid global expansion and is ideally suited to the sheltered, nutrient-rich waters of Scotland, particularly the west coast.

1.17 The transformative opportunity is to support and develop the burgeoning marine biotechnology sector and capture the value of current and potential international markets for Scotland. Estimates from the Industrial Biotechnology Innovation Centre (IBioIC) indicate that the value of marine biotechnology for the Highlands and Islands could amount to around £600m by 2030 of which: £350m would be from extractives from seaweed and £100m through microalgae opportunities. The remainder is from fish and shellfish waste (£50m) and fish protein (food) from whisky waste.

1.18 SAMS UHI in Oban is renowned for its work in marine biotechnology, spanning sustainable production of natural resources for human nutrition and life sciences, bioremediation, and bioenergy. SAMS UHI also has the largest culture and algae and protozoa (unicellular organisms) collection in Europe which is effectively a 'nursery' for the industry.

1.19 The Highlands and Islands also have a growing marine biotechnology sector with companies such as the global chemicals company BASF Pharma based in Callanish. Its lipid development plant is used by researchers and pharmaceuticals companies to develop active pharmaceutical ingredients. Its R&D is focused on using high purity lipids in cardiology, neurology and oncology, as well as novel applications in diabetic neurotherapy and inflammation. This is a very good example of the sort of activity that could be developed and attracted to the Highlands and Islands as a result of the seaweed and microalgae in our waters. Other examples include Cuantec and Xanthella which are private enterprises clustered around the public research at SAMS UHI. Hebridean Seaweeds is using seaweeds for products such as nutraceuticals and fertiliser. Research institutions and industry are well-connected internationally, through collaborations and joint ventures.

1.20 The aim of this RTO is to use the natural resources of seaweed and algae to lever the marine biotechnology sector and ensure that the high value-added activities remain in and benefit Scotland. The risk is that while the product may be produced here, if the majority is exported we will not maximise the value and lose ground in terms of research and innovation, product development, processing and manufacture. The opportunity offered by seaweed and marine biotechnology is there to be grasped, and it is important that it is grasped *by* Scotland, *for* Scotland. It is already attracting major international investment, for example Arcadian Seaplants, a Canadian multinational has invested in Uist by acquiring Uist Asco.

1.21 The scale of the opportunity, the reach of the impacts and the opportunity to be at the forefront of this global sector is potentially transformative. Achieving it will be complex, requiring the public, private and education sectors to work together to fast track the development of the sector, invest in research and remove inhibitors and constraints to sustainable growth.

RTO 2: Marine renewable energy

1.22 The Highlands and Islands is well-positioned to maximise the potential of marine renewable energy (offshore wind and wave & tidal energy). The emergence of such renewable energy sources has seen a degree of shift of energy generation – and therefore opportunity – to more peripheral parts of the country. With access to significant generation resource in and around the region, the Highlands and Islands is arguably on the cusp of being able to take advantage of a significant opportunity.

1.23 Scotland, and the Highlands and Islands in particular, is the global leader of wave and tidal energy innovation, with the world's first commercial scale projects in development in surrounding waters and excellence across the supply chain. This is driven by the natural resources available, making the region a very successful testing environment. Scotland has around 25% of Europe's tidal stream potential, equivalent to approximately 10GW, and 10% of wave resource with a potential of around 15GW. The waters around the Highlands and Islands have some of the highest tidal ranges, and some of the most powerful waves in the world. There have been more wave and tidal deployment in the region through EMEC than in any other single location in the world. The MeyGen project being delivered by SIMEC Atlantis Resources in the Inner Sound of the Pentland Firth is the world's largest tidal stream array project. By harnessing the marine power of the Highlands and Islands region, Scotland and the UK will be able to position itself at the forefront of one of the untapped global clean energy industries of the future.

1.24 Offshore wind can in many ways be considered an established sector. In recent years there has been the development of large windfarms off the North East Coast of Scotland, such as Beatrice and the Moray Offshore Windfarm. Following the recent round of Contracts for Difference (CfD), it is almost in a position where energy can be generated subsidy free due to falling costs. However, with 25% of Europe's offshore wind resource passing over Scottish seas, there is scope for further development. The next big area of development for this sub-sector is floating offshore wind. The world's first floating array is Hywind Scotland off the Aberdeenshire coast; the Kincardine Offshore Wind Farm, which at 50MW is the largest floating wind array in the world, is also under construction 12km off the coast from Stonehaven.³

1.25 The opportunity is to support and co-ordinate the development of the marine renewable energy industry, making the most of the region's abundant clean energy resources for the benefit of Scotland. This is across the entire value chain, including testing and development of new and novel devices, construction, generation, operation and maintenance, and supply chain activity. It would capitalise on the region's already well-established reputation for testing and developing renewable technologies, and its burgeoning activity in supporting renewable energy sectors.

1.26 This opportunity is transformational for several reasons. First, it would contribute to increasing Scotland's renewable energy generation capacity. This is directly in line with the Scottish Government's Energy ambition to generate the equivalent of 50% of all energy consumption from renewable sources. It also contributes to priorities around system security and flexibility, and innovative local energy systems. By supporting a number of technologies and generation sites across marine renewables, the opportunity would contribute to the development of a decentralised energy network. This would serve to help transform the energy supply system for Scotland.

1.27 The Scottish Energy Strategy also has clear priorities regarding supporting research and innovation. In doing so the region can continue to demonstrate the market viability and support commercialisation of emerging technology. Wave and tidal energy is moving into a new phase of

³ <https://www.offshorewindscotland.org.uk/>

innovation where it is seeking to commercialise and export knowledge, to 'capture the value' of new device innovation and systems learning to date. Current estimates indicate a potential value to the UK of £800m by 2035. Alongside this world-leading expertise, the DeepWind cluster⁴ aims to accelerate the development of the innovation and skills required to advance deep water fixed bottom and floating offshore wind.

1.28 A key aim of the DeepWind cluster is to help raise UK content in future windfarm projects to 60%, in line with the Offshore Wind Sector Deal. Many of the components used in marine renewable energy projects around Scotland are imported. Supporting the marine energy sector in the region will help to secure a greater proportion of sector's value chain for Scotland through on-shoring of component manufacture and supply chain development. There are clear links here with other regional transformational opportunities such as Nigg Energy Park, as well as wider development opportunities in the region such as Arnish, Kishorn, etc.

1.29 This opportunity will also directly contribute to the priorities addressing the climate emergency set out in the Scottish Government's Programme for Government 2019-20⁵, and specifically contributing towards priorities on ending Scotland's contribution to climate change, Scotland's 'Green New Deal', infrastructure and investment, and regional and rural economies.

1.30 To achieve the anticipated impacts in terms of energy generation, carbon reduction, etc., deployment needs to be at utility scale to achieve sufficient generation capacity. This will require a considerable amount of public support, with co-ordination across a number of public bodies.

1.31 Financial mechanisms will also be needed to support emerging technologies. As the last round of CfD demonstrated, costs of conventional offshore wind are falling, strengthening the case for a specific CfD mechanism for wave, tidal and floating offshore wind.

RTO 3: Hydrogen

1.32 Hydrogen technology presents a truly significant opportunity to transform energy generation, heating, transportation and storage in the Highlands and Islands. Natural gas is the principle fossil fuel used for domestic heating in the UK and reducing its use will undoubtedly make a significant contribution to reducing UK and Scottish Government targets of carbon reduction.

1.33 One way of achieving this will be to either widen the range of gasses that the gas mains network can accommodate without processing to include lower or zero carbon gasses such as bio-methane hydrogen, or to substitute natural gas entirely. Hydrogen may also provide a solution to heating supply in areas not currently served by the gas mains network.

1.34 Hydrogen powered vehicles are being introduced on an ever-increasing scale. Elsewhere in Scotland, Aberdeen is trialling buses as part of its fleet, and this may also be an opportunity for the Highlands and Islands. Orkney is looking at a hydrogen fuelled ferries through the HySeas3 project⁶ and there is potential for this to be applied to trains: advancements in this area through projects such as HydroFlex (due to undertake testing in Scotland as well as in the south of England) mean that hydrogen may be a viable replacement for the Highlands rail network's ageing and polluting diesel fleet.⁷ There is also potential for hydrogen to be used to replace diesel in the region's haulage and logistics fleet (e.g. timber transportation in forestry operations).

⁴ <http://www.hie.co.uk/growth-sectors/energy/deepwind---north-of-scotland-offshore-wind-cluster.html>

⁵ <https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/>

⁶ <https://www.hyseas3.eu/>

⁷ <https://www.railway-technology.com/projects/hydroflex-hydrogen-train/>

1.35 Key to the development of hydrogen technology in the region will be to ensure sufficient co-ordination so that partners are able to capitalise on a range of current and proposed demonstrator projects across the region and draw learning from elsewhere in Scotland. This will include influencing consumer behaviour and generating demand, which the development of commercial models can then seek to address.

1.36 Orkney is delivering a number of strong projects in using hydrogen for energy and energy storage as part of its decentralised energy network approach. For example, the Surf 'n' Turf project takes excess energy from marine and other renewable energy generation, turning it into hydrogen. The compressed hydrogen is transported by ship to a fuel cell in Kirkwall where it makes electricity on demand. The BIG HIT project⁸ builds on this to produce hydrogen on the islands of Eday and Shapinsay using wind and tidal energy, which is then stored as high-pressure gas and transported to mainland Orkney.

1.37 There are proposals to develop a hydrogen production plant in Stornoway. Scottish Gas Network's H100⁹ project is also exploring the use of hydrogen as alternative fuels in towns. Machrihanish could potentially be a demonstrator for this approach. Similarly, Fort William is not on the gas mains network, and hydrogen is a potential solution to providing gas for energy and heating.

1.38 Hydrogen may also be ideally suited to meeting the energy needs of high energy consumers such as distilleries, and the Liberty smelter in Lochaber. For example, Moray's non-domestic per capita use of gas is the third highest in Scotland as a result of its many distilleries and shifting to hydrogen as a fuel source could drive a significant reduction in carbon.

1.39 The transformational opportunity is to support various forms of hydrogen energy, and projects designed to test and demonstrate the viability of hydrogen as an energy source, in a co-ordinated manner to position hydrogen as a key part of a sustainable, low-carbon energy mix. This will require significant co-ordination and integration. There is already a wide range of projects underway or in development, and there is a danger of overlap and duplication in these. There is a need to share learning, understanding, etc. to maximise benefit, and to join projects up to achieve economies of scale.

1.40 Further, it may also require commitment from the public sector to pursue hydrogen as an energy source, to help de-risk investment in its development and support demonstration of viability and market readiness.

1.41 The potential impact cannot be understated – the development of a new, clean energy industry, and provision of clean carbon-free energy to homes and communities, and to high consumption industries. There are clear links with the Scottish Energy Strategy, in terms of decarbonisation, and in contributing to a decentralised energy and heating supply network, ultimately improving energy security. More broadly, there are also links to the UK Industrial Strategy and the Challenge Fund.

1.42 The RTO also has strong links to the marine energy, aviation and place-based solution RTOs for energy storage and provision of an energy source.

⁸ <https://www.bighit.eu/about>

⁹ <https://sgn.co.uk/about-us/future-of-gas/hydrogen/hydrogen-100>

RTO 4: Energy infrastructure to support market competitiveness

1.43 Across the Highlands and Islands region there are a number of energy infrastructure opportunities which serve the onshore and offshore energy market. There has been extensive investment in this infrastructure to date (approximately £250m in total over the last 10 years), for example at Kishorn and Arnish, and there will be an ongoing requirement for further investment across the region's port infrastructure if the opportunities and emerging markets associated with renewable energy in particular, are to be exploited.

1.44 **Nigg Energy Park (NEP)** and the ultra-deep-water harbour at **Dales Voe** in Shetland are both worthy of note in that they both present transformational opportunities for the region, Scotland and the UK as a result of their unique sites and their ability to service the offshore renewables and oil and gas markets and compete in global markets.

1.45 In 2016 a review by the Offshore Wind Council¹⁰ identified NEP as the priority site in the UK for the establishment of a high value manufacturing facility for the offshore wind sector – an integrated manufacturing and assembly hub for wind turbines. This builds on the development of the site to date and a planned extension to the existing quayside at NEP (an enabler for such a facility). It is already considered an excellent location for offshore renewables works because of its unrestricted access to open water, the ground loading capacity of the quays, the amount of laydown space, the deep-water depths and the suitability for jacking operations. It is the only port in Scotland to possess these characteristics and one of a few in the UK.

1.46 The serial manufacture of components for wind turbines and associated parts however, gives it the potential to be a strategic hub for the offshore renewables sub-sector to compete with similar facilities such as Esbjerg and Rotterdam. It will change the way offshore wind projects are delivered in the UK and represents a new offering on a global stage.

1.47 The transformational opportunity is associated with the component manufacturing facility and the creation of long term manufacturing employment, an opportunity not seen since the 1970s and 80s in the offshore oil and gas sector. Serial manufacturing will create a pipeline of work from different developers servicing the North East and North West coasts of Scotland in the first instance and England and Wales as new offshore fields open. It has the potential to quadruple offshore wind resources to help take Scotland and the UK to Net Zero by 2045.

1.48 The potential economic impacts include direct job creation (250 FTEs, rising to 450 over time) and as the manufacturing facility will be highly automated, high value technical jobs will be created. The more significant impacts, however, of the on-shoring of component manufacture will be the development of the supply chain and the economic benefits that will be realised for businesses and communities in the region and Scotland as a whole.

1.49 There is a vision to transform **Dales Voe** in the Shetlands into a state-of-the-art deep-water decommissioning site for single lift and reverse installation lifts to rival the facilities of world-leading decommissioning sites in Norway. The Scottish Government recently commissioned a feasibility study¹¹ into ultra-deep-water ports in the UK. The report estimated that *“Of the £1.2bn estimated expenditure for onshore recycling and disposal activities, an UDW port could target £583m of that expenditure”*. Dales Voe was identified as an optimal location in cost terms and showed that investment in the site could show a net benefit to the UK.

¹⁰ Strategic review of UK east coast staging and construction facilities, BVG Associates for Offshore Wind Industry Council (2016) - <https://ore.catapult.org.uk/app/uploads/2018/02/BVGA-17004-Report-r2-final.pdf>

¹¹ Ultra-deep water Port Feasibility Study for Scottish Government, November 2018, Ernst and Young

1.50 In addition to a planned 24-metre water depth at the quayside, the site has the capacity and capabilities established over the last 40 years in supporting the oil and gas sector to undertake major decommissioning projects. Investment in the port's infrastructure to date and an established supply chain for processing decommissioned modules make a strong case for developing the site.

1.51 The transformational opportunity it presents is not about job creation at the site alone but that it would be the only deep-water facility in the UK, making it a unique offering on a global stage. Providing the engineering and preparation space alongside a deep-water quay is a key requirement for companies in the industry and would allow the region to further exploit the upcoming decommissioning market which is forecast to see the highest number of oil platforms to be decommissioned between 2030 and 2033.¹²

1.52 As highlighted earlier, the next big area of development for the marine renewables energy sector in the region is the trialling, development and commercialisation of floating offshore wind technologies. Currently being trialled by Hywind of Norway off the coast of Peterhead, if the technology can be proven commercialisation could take place within the next 10 years. Dales Voe is ideally placed to exploit this longer-term potential for the onshore and more cost-effective assembly and launch of floating wind turbines. It would allow Scotland to compete on a world stage and access markets which are currently dominated by Norway and Denmark.

1.53 Allied to this and in the context of Scotland's transition to Net Zero the Oil and Gas industry's need to decarbonise and re-purpose oil terminals to 'green' them as well as 'platform electrification' will require renewable power that is closer to offshore platforms and is thus a potential driver of demand for energy generated by floating wind farms.

1.54 The potential of the emerging offshore wind industry is huge and has the potential to attract billions of pounds of investment and create highly skilled and sustainable jobs. Both NEP and Dales Voe as strategic sites stand to benefit from this and both have a key role to play. It will be important for partners and funders to consider how the potential economic benefits to be realised from investment in these sites can be distributed more widely across the region and replicated at other energy port locations in the Highlands and Islands.

RTO 5: A centre for Aviation and Advanced Technologies

1.55 The Highlands and Islands has a long history of involvement in civil and military aviation through the plethora of short flights that link islands and rural communities and current and past RAF airbases in Lossiemouth and Machrahanish. There is now a potentially transformational opportunity to establish the Highlands and Islands as a centre for training in aviation pathways within a global context. A £100m strategic centre is being built at RAF Lossiemouth in Moray by the Ministry of Defence in partnership with the USA business The Boeing Company. This is part of a £400 million investment by the UK government to ensure that RAF Lossiemouth is Scotland's main airforce base. The Boeing Company will provide round-the-clock maintenance for a new fleet of up to fifteen P-8A Poseidon military aircraft owned by the UK, Norway and United States. Through the Moray Growth Deal, UHI plan to establish a training and research centre for the maintenance, repair and overhaul of fixed-wing and rotary aircraft in partnership with an international manufacturer. Education and training in aviation skills pathways is highly sought after across the globe, especially when in partnership with industry. This initiative represents a significant development for Highlands and Islands as a UK centre for aviation and transformational impacts will extend across the region.

¹² Ibid.

1.56 These developments are already bringing new high-skilled jobs to the region, for example with 470 additional RAF personnel located in Moray. There is also a substantial supply chain with an increasing presence in the area. Experience shows that with the creation of high skilled employment, the talent that will be attracted is likely to mean that households, as well as single employees, will move in to the area which has implications for services and infrastructure. It also has implications for employment opportunities available to second adults in households who may want to work, boosting the local talent pool.

1.57 As well as the value of the jobs themselves, there is clear evidence that a highly-skilled, technical workforce with supporting training and a skills system nurtures a virtuous circle that fuels innovation, investment, economic diversification and competitiveness, as well as social and occupational mobility. This generates the ongoing creation of more, and more productive and rewarding, jobs.¹³

1.58 Whilst the investment at RAF Lossiemouth is largely within the military installation, there are numerous opportunities to capitalise on the skilled workforce and increased presence of substantial businesses serving contracts in the area. The international aspect will deliver strategic value and a new dimension to the region's profile.

1.59 Alongside its extensive education and training programmes for industry, the proposed Aviation and Advanced Technologies Centre for aviation will have a pivotal role in testing new types of low carbon planes. These collaborative projects comprise testing:

- Hydrogen planes;
- Electric hybrid planes; and
- Pure electric planes.

1.60 Partnerships across the projects include organisations such as European Marine Energy Centre (EMEC), Cranfield Aerospace, Ampaire, and Zero-Avia; the latter two are USA-based companies.

1.61 The supply chain that will develop around the plans in Moray, and the skills, will also support the space sector which is gaining considerable traction in the Highlands and Islands through the Sutherland SpacePort and the proposals for SpacePorts in Uist and Unst in Shetland. The former Machrihanish air base has recently been awarded £488,000 to develop its plans for a spaceport cluster centred on it, which has the benefit of being the longest runway in Scotland.

1.62 This RTO also aligns with the Scottish Government's aim of creating the world's first zero emission aviation region in partnership with Highlands and Islands Airports, as set out in the new Programme for Government.¹⁴ This would see the decarbonisation of all aspects of HIAL airport operations.

1.63 Whilst the expansion of RAF Lossiemouth is underway, and the Moray Growth Deal is confirmed, capturing the value of the transformational opportunity is not. It will require a high degree of strategic collaboration across the public, private, and education sectors, and encouragingly, there are already very good examples and models to build on. The opportunity here is to use the Aviation and Advanced Technologies Centre as the anchor around which to develop the region as an international location for high calibre industry training and research.

¹³ <https://www.oecd.org/g20/summits/toronto/G20-Skills-Strategy.pdf>

¹⁴ <https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/pages/5/>

RTO 6: Point of care health and social care

1.64 The Highlands and Islands is increasingly recognised for its growing life sciences sector. It is home to over 80 companies employing some 1,800 people in mostly SMEs located around the Inner Moray Firth, Argyll and the Islands and Moray. The technology profile of the region includes a significant concentration of know-how in medical technology, biotechnology, analysis of biological materials and related instruments, and the geography of the region presents opportunities in digital health and medical diagnostics to demonstrate how technology can successfully overcome barriers caused by distance. In the digital healthcare and devices cluster technological know-how is the main driver of competitive advantage for the region, evidenced by a range of public-private sector digital health initiatives that are already being developed and the location of a large international firm – Lifescan Scotland – and a range of smaller tech-based firms within the region.

1.65 It is recognised globally that current healthcare systems are not sustainable. Rising healthcare costs, an aging population and an increase in patients with long term conditions pose significant health and social care challenges that will impose an increasing strain on healthcare delivery. There is a growing gap between the level of need and the capacity of public health service organisations to satisfy it. In addition, the Highlands and Islands region faces the challenges of ensuring parity of access and delivering quality healthcare in remote and rural areas. Addressing these challenges present opportunities for new models of healthcare delivery to be developed; innovation in healthcare delivery to develop new, more efficient services is more important than ever and the use of technology has the potential to play a major part in healthcare delivery in the future. New technologies, process redesign and commercial partnering will develop new models in sustainable healthcare and contribute to the Life Sciences Strategy for Scotland 2025 Vision¹⁵ which aims:

“To make Scotland the location of choice for Life Sciences businesses, researchers, healthcare professionals and investors while increasing Life Sciences’ contribution to Scotland’s economic growth”.

1.66 The transformative opportunity is ‘Point of Care’ (POC) health service delivery – an alternative delivery model – the development of which requires the creation of cutting edge digital and other technologies in the medical device and diagnostics and healthcare informatics arenas, and their subsequent testing and trialling in a local community setting. The region presents the ideal ‘test bed’ for innovative product development given its plethora of remote and rural communities and locations which are distant from mainstream healthcare services. If successfully mainstreamed POC can potentially result in efficient healthcare delivery in any setting.

1.67 This opportunity will also directly contribute to the priorities of a successful, fair and green economy set out in the Scottish Government’s Programme for Government 2019-20¹⁶, and specifically contributes towards priorities to develop and drive close links between industry, academia and the health sector to support improved wellbeing and inclusive economic growth.

1.68 The potential ‘test bed’ could be the USP for the region in trying to engage the private sector and attract further inward investment for the digital health and medical diagnostics markets. There is a real opportunity to roll out such products and services across Scotland and to the rest of the UK and markets further afield. Attracting pharmaceutical and healthcare companies involved in research and product development and validation is key to realising this opportunity. Retaining the benefits of this

¹⁵ <https://www.lifesciencesscotland.com/wp-content/uploads/2017/08/Life-Sciences-Strategy-for-Scotland-2025-VisionFINALLow-res.pdf>

¹⁶ <https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/>

type of healthcare innovation in the region is the overall aim through anchoring research activity locally and being able to demonstrate the benefits realised through product development and commercialisation to the end user patient.

1.69 Current trials include a wireless POC colon capsule endoscopy product which is currently being piloted by CorporateHealth International, a Danish company with a base in Inverness, to understand its applicability for colorectal cancer screening in the home. Recent inward investment has seen ODX, a life sciences company, establishing a new medical technology research and development centre at Inverness Campus. It is developing a rapid, cost effective POC testing solution for use by GPs as well as hospital emergency departments and specialist clinics around the world; a test that helps detect the ability of urinary tract infections (UTIs) to resist antibiotics. Importantly, NHS Highland has long been involved in trialling new products and monitoring devices like the recently launched LymeAPP, a website and linked app being developed by a new company formed by Scotland's Rural College (SRUC), a representative company Highland Health Ventures Ltd (a collaborative partner for NHS Highland), ERGO (Environmental Research Group Limited) and Belgium-based Avia GIS NV. It aims to prevent the occurrence of Lyme disease in the Northern Hemisphere. It is an integrated project involving satellites, emerging technology and big data.

1.70 The region has an established and growing digital healthcare hub at Inverness Campus and its environs. Comprising the Centre for Health Science (HIE's first major collaborative development co-locating academia, business and research), Raigmore Hospital, Lifescan Scotland, and UHI's Health Faculty, the campus is now also home to UHI specialist teams, Inverness College UHI, HIE, the aforementioned SRUC, Scottish Vet Referrals and a number of life sciences companies including: Aqua Pharma, Aseptium and Dynamic Health. The Triple-Helix approach has been a big attractor at the campus to date. Further, £9 million has been invested through the Inverness and Highland City Region Deal to establish a centre of excellence in innovation and commercialisation in health and life sciences.

1.71 The latest phase of development at the campus is the Centre for Health Science 2 – part of the Inverness and Highland City Region Deal – a life sciences innovation centre promoting engagement between NHS Highland, UHI, HIE and commercial partners. The Centre will increase UHI's academic healthcare research and promote the creation of new commercial opportunities, products and services in digital health and life sciences. Easy access to a pool of patients is critical for the trialling of new diagnostic devices and the new Centre's 28 bed Elective Care Centre will support this. This builds further upon the region's reputation as a world leading innovator in health technology and provides the enabling infrastructure required by world class companies.

1.72 There are a number of enablers which are critical if the region is to harness the potential economic benefits of the POC market. Digital connectivity across the region is key, as are people with digital skills e.g. data analysts. Investment in relevant course development by UHI and engagement with schools to build STEM skills is required now. Investment in digital infrastructure such as a data centre on the Inverness campus would enhance the Campus' attraction for companies as it would lower costs of operation and allow for ease of access as well as helping to anchor digital expertise in the region for the digital health sector.

1.73 The potential social impacts are significant. The cost of healthcare delivery would be reduced by less hospital admissions, shorter lab and hospital waiting times (in urban areas in particular), and fewer antibiotic prescriptions. It positively impacts patients by reducing the cost of getting to hospital (for patients travelling from remote areas this can include patient escort and accommodation costs), faster diagnosis and treatment, and increasing life expectancy.

1.74 The economic impacts of the opportunity posed by POC healthcare delivery include catalytic opportunities for companies moving into this space, enhancing talent retention and attraction to the region and providing careers in life sciences which offer high value jobs, e.g. scientists, data analysts.

1.75 This aligns with one of the aspirations for the region stated in HIE's Strategic Plan¹⁷ "to seize the opportunity to be a global leader in the fast-growing digital healthcare market whilst supporting the growth of businesses, the sectoral supply chain and academic research". This will necessarily involve the promotion of the region as a location for inward investment, capitalising on Enterprise Area status in particular and the continued development of appropriate sectoral infrastructure.

RTO 7: Demonstrating place-based solutions

1.76 In recent years, a place-based approach to development has gained considerable traction in Scotland. In April 2019, the Place Principle was adopted by the Scottish Government and COSLA. It promotes a shared understanding of place, and the need to take a more collaborative approach to a place's services and assets to achieve better outcomes for people and communities. The principle encourages and enables local flexibility to enable public, private, third sector and community partners to develop clear visions for places and respond to issues and circumstances in different places.¹⁸

1.77 The disparate nature of the region's geographies and communities, particularly in fragile areas, not only require such an approach, but also provide ideal opportunities to demonstrate integrated and holistic approaches to place development.

1.78 This opportunity is to: take advantage of key locations, development needs and emerging development and regeneration plans across the Highlands and Islands; deliver long-term transformation of the region's towns, rural communities and islands; and demonstrate truly place-based approaches to development and regeneration, and how these can be applied elsewhere in Scotland.

1.79 There are already some key developments and approaches taking shape in the region. For example, the Fort William Masterplan (FW2040)¹⁹ aims to overcome a range of constraints to the development of the town and grow Fort William by around 30% in a decade. The proposed capital programme covers £500 million of investment across housing, transport, transport infrastructure, renewable energy and local energy systems, services and tourism.

1.80 Similarly, Orkney has developed a clear place-based approach to developing its renewable energy infrastructure, to take advantage of its vast renewable energy resource to position itself at the cutting edge of renewable energy development and implementation in Scotland, and indeed the UK. Across wave and tidal and wind generation, energy storage and hydrogen production from excess generation, as well as electric vehicles, Orkney is at the vanguard of decentralised energy systems. This is perfectly demonstrated in the recently launched ReFLEX Orkney²⁰ project, funded through the UK Industrial Strategy Challenge Fund.

1.81 The transformational opportunity here is to realise a step-change in place-based development, through partnership-led, integrated approaches. It will contribute to a range of Scottish and UK policies and strategies, not least the Place Principle. As well as contributing to HIE's Operational Plan and specific priorities around building strong capable and resourceful communities, it also provides an opportunity to fully align development plans with the current Programme for Government.

¹⁷ HIE Strategy 2019-2022

¹⁸ <https://www.gov.scot/publications/place-principle-introduction/>

¹⁹ https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/582/west_highland_and_islands_local_development_plan/5

²⁰ <https://www.orkney.gov.uk/OIC-News/285m-ReFLEX-Orkney-project-to-create-a-smart-energy-island.htm>

1.82 Pursuing this opportunity will also explicitly contribute to inclusive growth priorities at the regional and national level. This is critical for encouraging the region's young people to stay or return. It will also help to attract inward investment and strengthen the region's economy. Such an approach will enable the integration of demonstrator or 'test-bed' projects as key components of development plans, rather than as isolated projects.

RTO 8: Carbon Capture – and a low carbon destination

1.83 In response to the global climate emergency, the Scottish Government has committed to the country being a net-zero society by 2045, five years ahead of the rest of the UK. It has also committed to reducing emissions by 75% by 2030. Demonstrating the strength behind this commitment, Roseanna Cunningham, the Climate Change Secretary said:

“No one should be in any doubt of the Scottish Government’s commitment to use every policy lever at our disposal to rise to this challenge.”

1.84 These targets are ambitious and will require a complete rethink across the public services, the economy and how we live and work, for example it will mean changes in transport, energy, food and drink, tourism, housing, and marine and land use policy. Reaching net-zero can only be achieved by making radical changes to reduce carbon emissions, but a key part of the solution lies on the other side of the equation – carbon sequestration²¹ and usage. The Highlands and Islands is in a unique position within the UK to contribute to this, through two key natural assets and also through re-purposing of the region's oil and gas terminals e.g. Nigg, Flotta and Sullom Voe.

1.85 The huge reserves of peatlands in the North Highlands and Western and Northern Isles, in their natural state, are a carbon capture asset. For example, the Flow Country in Caithness and Sutherland is Europe's largest area of blanket bog peatland, extending to 494,210 acres (200,000 hectares). These reserves are Scotland's largest terrestrial carbon store, holding around 1.6 billion tonnes of carbon. Over time, land use practices have caused them to degrade and coupled with climate change, there is a risk that many areas in Scotland may not be able to support peatlands in the near future. The potential losses of carbon have been calculated and show that more than half of the carbon currently stored in Scottish blanket bogs will be at risk of loss through emission. It is therefore vital that the carbon they currently hold is secure and that steps are taken to boost sequestration. There is an opportunity to restore the peatlands to enhance their capacity to store more carbon and the Scottish Government's Climate Change Plan has set a target to restore 250,000 ha of degraded peatlands by 2030. Scottish Natural Heritage (SNH) has kick-started the restoration challenge with the 'Peatland ACTION' project.

1.86 Building on these assets and existing expertise at SNH and UHI, there is an important opportunity not just to restore the peatlands and manage them sensitively, but to position the Highlands and Islands as a leading destination for science, research and testing in peatland restoration and management, alongside wider land management support systems. Establishing the region at the forefront of this will enhance its ability to promote itself as a low-carbon, innovative destination with diverse and high-level research capabilities.

1.87 Forestry is also an important part of the natural capital in the Highlands and Islands – there are over 500,000 ha of woodlands in the region. The forestry sector is a key component of the economy with a wide range of companies operating in forestry-related activities in the region. These include some larger and technologically-advanced wood processing companies, and the supply chain.

²¹ A natural or artificial process to remove carbon dioxide from the atmosphere

1.88 As with peatlands, forests sequester carbon dioxide and store it within living biomass, soil and waste materials. In so-doing, it contributes to the forest carbon stock. This natural reserve is dynamic in that it captures and stores carbon, but it can also lose it through forest fires. The 500,000 ha in the Highlands and Islands sequester millions of tonnes of carbon every year and for each new hectare of forest and woodland created, it is estimated that an average of seven tonnes of carbon dioxide will be removed from the atmosphere each year.²² As a result, in its Climate Change Plan the Scottish Government commits to incrementally increasing the annual woodland creation target from 10,000 ha per annum to 15,000 ha by 2025. The Scottish Government's Forestry Strategy aims to increase forest and woodland cover in Scotland from 18% to 21% by 2032.²³ This increase in forests and woodlands will enhance carbon sequestration, help to preserve Scotland's carbon sink²⁴, increase timber supply and support the development of the low carbon economy.

1.89 Forestry as a response to climate change presents an opportunity for communities in the Highlands and Islands to benefit economically as well as in wellbeing terms. Communities could generate income from planting trees, particularly by operating within the Woodland Carbon Code²⁵ which is a voluntary code that standardises carbon trading through trees. It also provides an opportunity to restore habitats, e.g. through projects such as Cairngorm Connect.²⁶

1.90 As with peatlands, there is already forestry academic research and expertise in the Highlands and Islands, for example the Scottish School of Forestry at UHI but there is scope to enhance this by investing in new science and research capacity. Examples of areas for further research and development include:

- Using drones to collect data, inform planning and monitor and manage forests. This of course is equally applicable to peatlands; and
- The implications of climate change for forests and woodlands, building resilience and sustainable responses.

1.91 The regional transformational opportunity here, therefore, is to take advantage of the region's natural assets to mitigate the effects of the climate crisis. However, rather than taking action to address issues where there are negative effects on the environment, such as in urban areas, it involves positively enhancing areas, habitats and ecosystems that are already high-performing in terms of addressing climate change, in order to maximise the possible benefit of them, or restoring environments so that they can again help to mitigate climate change.

1.92 The opportunities across the natural capital assets of peatlands and forestry are clear and while perhaps will not deliver the greatest, direct economic benefits, are transformational in terms of what they can achieve for the region, for Scotland and for the UK in terms of the climate change agenda and as a location for research. It can also help to drive societal benefits in terms of wellbeing, and environmental benefits such as increased biodiversity.

1.93 However, there are barriers to unlocking this potential – it will require sustained multi-agency support and action. A very long-term commitment from all partners is also required: peatland restoration to achieve sequestration may take decades, and reforestation can be measured in centuries rather than years.

²² Scotland's Forestry Strategy 2019-2029 <https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/>

²³ Ibid.

²⁴ Natural carbon reservoir that accumulates and stores sequestered carbon

²⁵ <https://www.gov.uk/guidance/the-woodland-carbon-code-scheme-for-buyers-and-landowners>

²⁶ <https://cairngorms.co.uk/3-75m-investment-announced-cairngorms-connect/>

1.94 Enhancing the region's carbon capture capability and creating a low carbon destination can create wider opportunities. For example, in the region's forestry industry, there remains scope to establish higher value-added activities through cross-sectoral linkages, e.g. in sustainable construction (and specifically the development of modular timber construction). Reforestation may create greater opportunities in this regard. It may also help to regenerate Scotland's Atlantic woodland – a temperate rainforest – which in turn may create new tourism opportunities as well as enhancing biodiversity. Additionally, it may offer the opportunity for businesses to invest in peatland or woodland restoration to offset their carbon footprint, securing inward investment for critical natural assets.

Appendix 1: Indicative assessment of transformational nature of RTOs

RTO	National strategic value	Major, visible, cross-cutting, and regional or national impacts	Clear and substantial shift as opposed to incremental change	A systems-based approach required through 'team Scotland'	Complexity adds to the diversity and resilience of H&I	Large-scale direct and indirect activities involved in delivery	Medium-to-long term realisation of significant benefits	Potential need for new structures, processes, policies, and attitudes to risk and risk sharing
RTO 1: Seaweed and marine biotechnology	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓
RTO 2: Marine renewable energy	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓
RTO 3: Hydrogen	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
RTO 4: Energy Infrastructure to support market competitiveness	✓✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓
RTO 5: Centre for aviation and advanced technologies	✓✓	✓✓✓	✓✓	✓	✓	✓✓✓	✓✓	✓
RTO 6: Point of care – health and social care	✓✓	✓	✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓
RTO 7: Demonstrating place-based solutions	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓
RTO 8: Carbon capture – a low carbon destination	✓✓✓	✓	✓✓✓	✓	✓✓	✓	✓✓	✓

Appendix 2: Alignment with Strategic Priorities

The table demonstrates how each RTO aligns with key policies and strategies.

RTOs	Key policies and strategies
RTO1: Seaweed and marine biotechnology	HIE's 2019-2022 Strategy Scotland's National Marine Plan
RTO 2: Marine renewable energy	Scottish Economic Strategy (2015) HIE's 2019-2022 Strategy HIE's Operating Plan 2018-2019 Scotland's Climate Change Plan 2018-2032 Scottish Energy Strategy (2017) Scotland's Arctic Policy Framework Scotland's National Marine Plan
RTO 3: Hydrogen	HIE's 2019-2022 Strategy Scotland's Climate Change Plan 2018-2032 Government's Programme for Scotland 2019-20 Scottish Energy Strategy (2017) Scotland's Arctic Policy Framework UK Clean Growth Strategy (2017)
RTO 4: Energy infrastructure to support market competitiveness	HIE's 2019-2022 Strategy HIE's Operating Plan 2018-2019 Scottish Energy Strategy (2017)
RTO 5: Centre for aviation and advanced technologies	HIE's 2019-2022 Strategy HIE's Operating Plan 2018-2019 Government's Programme for Scotland 2019-20 UK Clean Growth Strategy (2017)
RTO 6: Point of care – health and social care	Scottish Economic Strategy (2015) HIE's 2019-2022 Strategy Life Sciences Scotland – Life Sciences Strategy for Scotland 2025 Vision Government's Programme for Scotland 2019-20 UK Industrial Strategy
RTO 7: Demonstrating place-based solutions	HIE's 2019-2022 Strategy Government's Programme for Scotland 2019-20 Scotland's Arctic Policy Framework Scotland's Economic Action Plan
RTO 8: Carbon capture - a low carbon destination	Scotland's National Peatland Plan Scotland's Forestry Strategy 2019-2029 Scottish Economic Strategy (2015) Scotland's Economic Action Plan HIE's 2019-2022 Strategy HIE's Operating Plan 2018-2019 Scotland's Climate Change Plan 2018-2032 Government's Programme for Scotland 2019-20 Scottish Energy Strategy (2017) Scotland's Arctic Policy Framework UK Industrial Strategy UK Clean Growth Strategy (2017) UK Green Future: 25 Year Plan (2018) Transport Scotland's Switched On Scotland