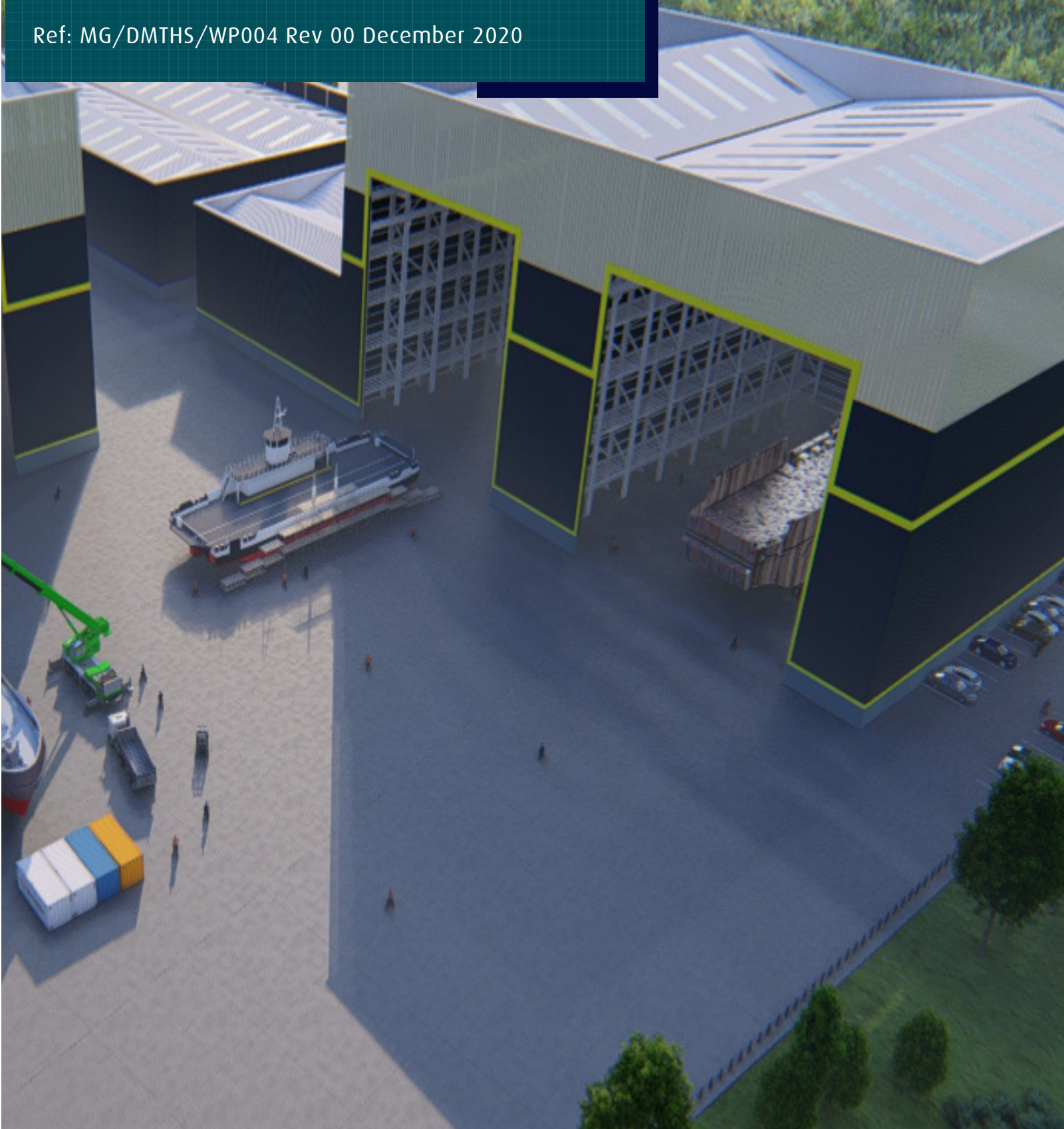


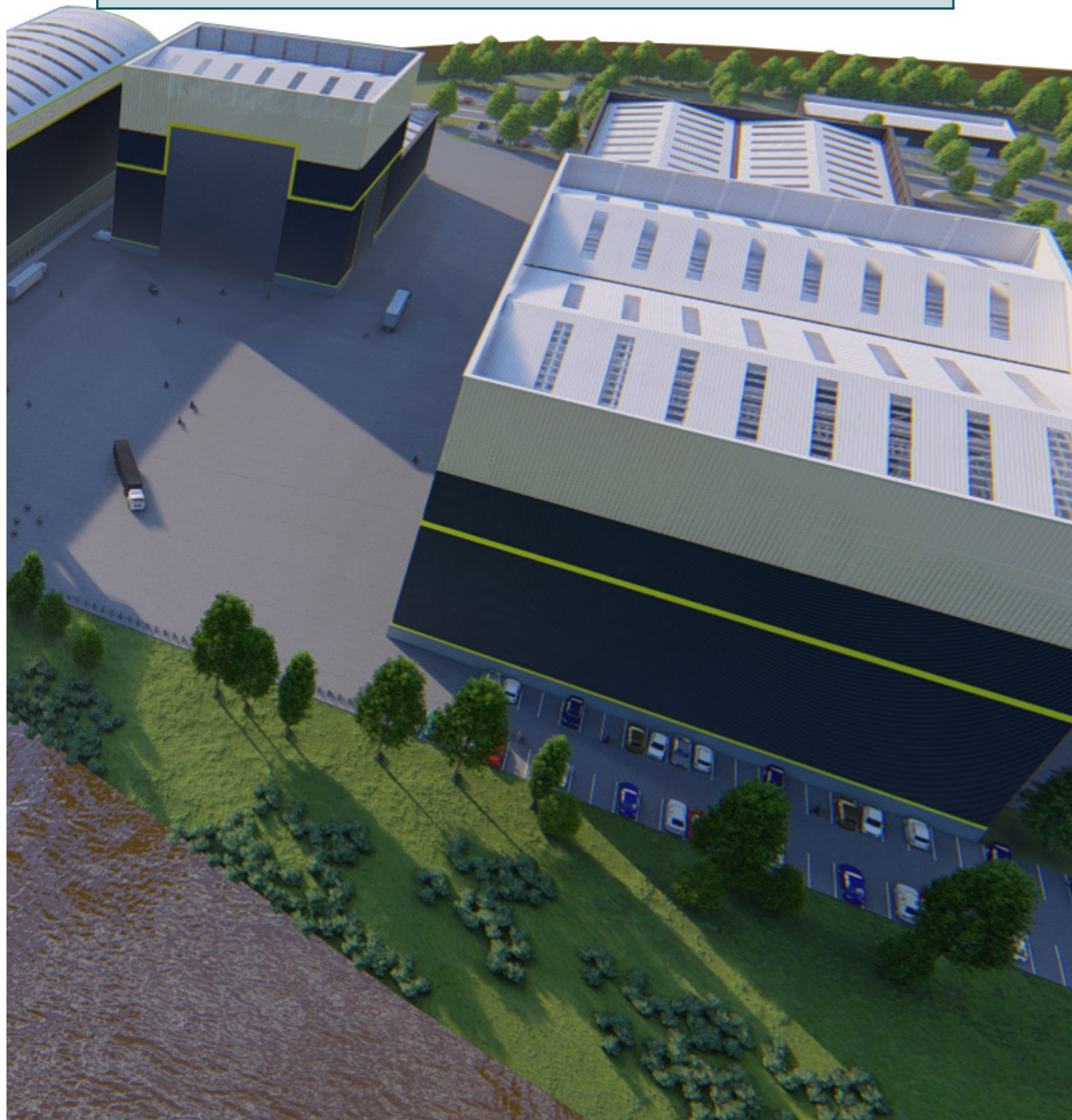
Delivering a Marine Technology Hub for Scotland White Paper

Ref: MG/DMTHS/WP004 Rev 00 December 2020



“To innovatively create new sustainable high quality, green jobs in the Scottish Maritime Manufacturing and Technology Sector and deliver wealth creation into the local communities of the Clyde.”

Scottish Marine Technology Park Mission



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Executive summary

The Scottish economy will, like many others, face immense challenges as we seek to repair the damage caused to businesses, industries and employment by the Coronavirus pandemic. As in all periods of crisis, however, changed circumstances also create new opportunities and demand reappraisal of past assumptions to deliver an exciting, prosperous future for Scotland.

As a maritime nation, Scotland has an exceptionally strong tradition of shipbuilding and marine engineering. The River Clyde was for long the leading shipbuilding centre of the world. Gradually, over the decades, that status declined for a wide range of reasons. It became the received orthodoxy that civil shipbuilding on the Clyde was uncompetitive, under-invested in and generally finished without the life support of occasional state aid. This general climate of pessimism persisted for too long and led to insufficient attention being paid to opportunities which still existed – and are now more relevant than ever.

The assumption that the banks of a river which once provided thousands of skilled jobs, building and maintaining ships, are now only useful for the construction of apartment blocks went unchallenged for too long. This White Paper explains why it should no longer be “business as usual” and that now is the time to set a new course for the Clyde and the Scottish supply chain more generally. It identifies the basis for a shipbuilding and marine industries revival with public sector procurement policies as the starting point.

From the Malin Group’s perspective, a key to this strategy could lie in the brownfield site at Old Kilpatrick which is being developed as the Scottish Marine Technology Park (SMTP). This park will provide an accessible option for any business looking to expand into the marine manufacturing sector on the West coast of Scotland, and it will allow them access to the deepwater channel on the Clyde via a shared marine facility from their own base of operations.

This new collaborative approach will lower the barriers to accessing the open sea from an open-access focal point for marine manufacture on the Clyde. It will kick start new growth industries which will both build and develop existing talent and skills in Scotland while simultaneously attracting new talent from overseas. It will attract Scotland’s next generation of engineers, scientists and technologists into the marine sector, leverage existing planned public expenditure in the marine sector and help Scotland build an export offering that can be promoted in global markets.

In summary, the Scottish Marine Technology Park will:

- Create new, exciting, sustainable, green jobs in the modern marine sector.
- Deliver prospects to local communities much in need of employment and fresh opportunities and support the Scottish Government’s drive towards 20 minute neighbourhoods.
- Attract inward investment and bring fresh talent to Scotland.
- Deliver greener infrastructure which in turns delivers green technology in support of a net zero vision for Scotland.
- Partner with world leading STEM institutions to bring manufacturing and research together in a self sustaining environment.
- Incubate start ups by having research and commercial talent working hand in hand to capitalise on the revolution in the marine sector that decarbonisation offers in the next 50 years.

Our vision is for the Scottish Marine Technology Park to become a multi-user hub across all aspects of marine industries, to complement existing operations on the Upper and Lower Clyde, to the advantage of all. This is an eminently deliverable concept if supported by the UK and Scottish governments, using public procurement as the essential foundation for an industrial sector that can once again support large numbers of jobs and the skills which go with them.

Malin Group are marine engineers – not property developers. By securing ownership of the Old Kilpatrick site we have created the opportunity to develop the Scottish Marine Technology Park. However beyond the area required for our own company’s use, we would be happy to look at how ownership of other parts of the site can be best used by public bodies on a not-for-profit basis on the sole condition that tenants secured will be in sectors which will contribute to the concept of a multi-user Scottish Marine Technology Park.

All this can be achieved by looking to the future rather than the past and through working with all governments, political parties, businesses and individuals who share our belief in what can be achieved for the River Clyde and the Scottish economy.

At a time when vision and courage are required, this is a challenge for all who are in a position to turn bold vision into reality and thereby deliver enormous benefits for our people and communities.



Figure 1: Scottish Marine Technology Park (SMTP) architect render

New, high value, green jobs in the marine sector

Scotland already punches well above it's weight in the maritime field. In 2017, turnover directly associated with the sector was £9.9 billion, representing 21% of the total maritime turnover in the whole of the UK. The question we must ask ourselves is how we can add even more? How can we attract in more work currently being delivered from outside the UK to Scotland?

Looking to the future of the maritime sector there are opportunities and challenges coming in equal measure. Oil and gas production is expected to reduce in the next 15 years and trends show an ever-ageing workforce. In addition to this women are both under-represented and poorly paid when compared to their male colleagues in this sector.

Exports of goods and services from the maritime sector have been falling with an 18% drop from 2010 to 2017.

Despite this, maritime driven GVA is expected to continue to show cumulative growth of 15% over the period of 2019 to 2023, with much of this driven by the continued growth in seaborne trade of containerised and dry bulk goods. However, this growth in seaborne trade must be delivered by ever greener ships as we look to reduce the environmental impact of our vessels.

Overlaid on this is Scotland's role as a world leader in generating clean energy from our oceans, spearheading the shift to cleaner fuels, and the leveraging of decades worth of indigenous work to support this.

Taking these challenges in context with a mission to deliver high quality, sustainable, green jobs in the maritime sector we must address the gender and age imbalances in our workforce. We must address the decline in exports which we can do by embracing the green opportunities that legislation on ever increasing seaborne trade and energy production will bring.

And we must address the fact that there are very few options for marine manufacturing at scale on the Clyde.

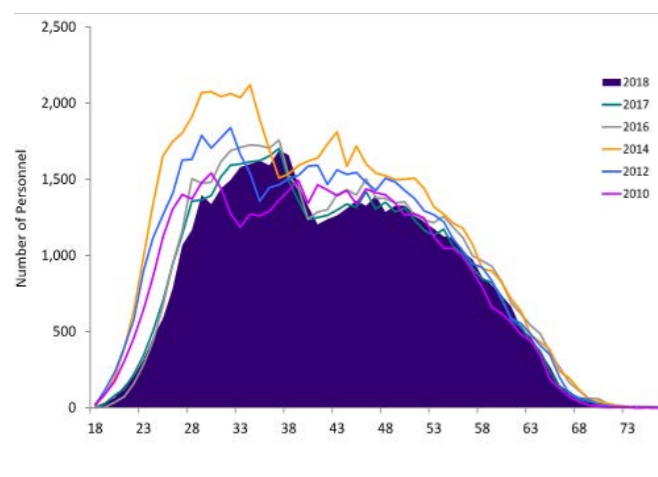


Figure 2: Age profile of the offshore workforce (OGUK Workforce report 2019)

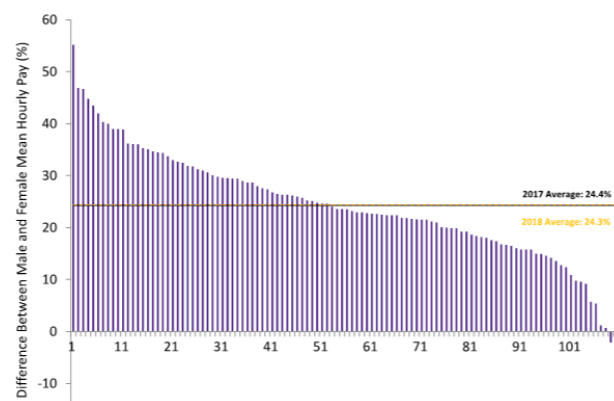


Figure 3: Average hourly gender pay gap of OGUK member companies (OGUK Workforce report 2019)

At the core of meeting this opportunity is the ability to generate excitement about our sector in the youth of today and accept the generational challenge facing us. We must show them that there are exciting opportunities on their door step in the maritime sector. They need to see it in action. They need to be able to walk from their community to an exciting place of work that is forward looking, well paid, equitable and both technologically and intellectually stimulating.

For millennial workers the boundaries between passion projects and their day job continues to blur. When surveyed in 2014 by the Case Foundation, 9 out of 10 wanted to work for a company that is making a positive impact in the world. The worker of the future needs to feel that they are working for something that is grander than the individual.

And the challenges facing the maritime industry will allow them to do just that if the right steps are taken to encourage the right businesses to take root and grow in Scotland.

As well as exciting back-end jobs, we need to inspire excitement by seeing real technology take shape on their doorstep.

An EIA (Stantec) conducted on the impact of the Scottish Marine Technology Park indicates that that a developed Scottish Marine Technology Park at Old Kilpatrick will deliver significant economic benefits across West Dunbartonshire, the City Region and Scotland as a whole.






- 
Ideas: the project will bring marine fabrication and leading innovators in the marine industry to West Dunbartonshire providing a hub for collaboration and innovation in marine manufacturing and related industries
- 
People: the SMTP will provide high quality employment opportunities driving wage growth and providing opportunities for upskilling. It will support a net addition of 1,130 jobs to the City Region.
- 
Infrastructure: the proposed development will be resource efficient, contributing to low carbon and net-zero targets. Specific elements of the development will contribute directly to the objective for a circular economy and improved infrastructure across the site will improve connectivity and accessibility.
- 
Business environment: the SMTP will deliver 40,000 sqm. of high-quality business space in a landscaped riverside setting across industrial, manufacturing, office, and ancillary uses.
- 
Places: the SMTP will provide a competitive advantage in manufacturing to the local economy. It will support the achievement of a 20-minute neighbourhood, by providing local employment opportunities for the local community, where these are currently limited.

Figure 4: EAI Indicator figures, Stantec EIA (2020)

The rest of this White Paper will outline a clear road map for bringing these new green jobs, incubators and investment to Scotland and the Clyde in particular.

The role of the public sector in a Scottish maritime renaissance

It is recognised that public sector buying represents an opportunity to support a green recovery. It also represents an opportunity to use upcoming spending in the marine sector to encourage local supply chains to establish and be ready to deliver on Scotland's future needs.

While the spending power of the public sector can often provide the necessary springboard for industry, its role in ethically encouraging local content for private procurement is also worth considering. This latter point is outwith the scope of this White Paper but nevertheless, both approaches are fundamentally built on the premise that to encourage local spending and growth in the sector, a country needs a healthy Tier One and associated supply chain ecosystem towards which they can direct paying customers.

Over the next 20 years, the public sector in Scotland will procure new vessels to the value of around £850 million and it will do so under procurement conditions which are currently being established. It is vital that these are framed in a way which supports the stated industrial policies of both UK and Scottish governments, so that indigenous industry can be allowed to compete effectively. We firmly believe that competitiveness is possible and indeed necessary since the ambition must extend to winning work, both nationally and internationally, in commercial markets. However, the short-term role of public procurement is crucial to establishing the necessary scale and competitiveness of operations.

The largest Scottish public agency involved in the procurement of new vessels and associated infrastructure will continue to be Caledonian Marine Assets Ltd but they are far from the only one. Local authorities which operate their own ferries, Marine Scotland with its fisheries research and protection services, the Northern Lighthouse Board and others are also relevant. In addition, there are vast areas of marine activity where government is capable of having influence over procurement policies such as renewable energy, oil and gas, and aquaculture. In each of these cases, a positive approach to domestic procurement could help to establish an industry which, at the same time, would be competing for work in other fields. The UK Government is committed to a programme of defence shipbuilding at the Upper Clyde yards which may secure work, both for the MoD and to meet export orders, for the next 20 years. This too allows a reinvigorated marine sector elsewhere on the Clyde to maximise supply chain opportunities.

This should be seen as a fresh start for a great Scottish industry and while it is necessary to learn from past experiences, there is no benefit in dwelling upon them. Specifically, the problems experienced with orders for two Caledonian MacBrayne ferries from the Ferguson yard should not be used to spread gloom or undermine the concept of building such vessels on the Clyde. On the contrary, the lesson to be learned is that increased capacity and flexibility can contribute to the prospects of future success. The alternative should not be to resume sending these orders overseas, but to do the job more effectively by taking advantage of all the facilities that exist in home waters and, where facilities are lacking, encourage the creation of more.

In line with the aspirations for a greener way of working as well as attracting new talent and ways of thinking to large scale marine manufacturing in Scotland, we need to look at how we can best use new infrastructure to our nation's best advantage.

We need to adopt new ways of working and look to what others are doing as well as developing our own indigenous advanced analysis and manufacturing techniques.

Taking cues from Australia and Finland, among others, a clear way forward to deliver all of this becomes apparent. Clustering of Tier One manufacturers, with their supply chain. Involving local research and development centres of excellence to develop new techniques for large scale manufacturing. Sharing expensive infrastructure to reduce both the cost of operation and carbon footprint of every business that operates from the Park. This all contributes to a modern way of working that drives innovation, value for money and change.

To support this aim, the Scottish Marine Technology Park, has allocated space in the masterplan for:

- Two large shipbuild halls each capable of building/outfitting or repairing 60m long vessels.
- One large 200m long recycling/outfit hall supported by a 136m long, Clyde based semi-submersible floating dock barge.
- Common marine facility with 1,100 Te shiplift allowing all users of the Park fair, economical and low carbon access to Scotland's natural marine environment.
- A research and development incubator.
- Up to 6,000 square meters of smaller workshops and sheds representing space for supply chain and start-ups on the park.
- Local amenities and green parkland space.



Figure 5: SMTP outline

Ferries

It is estimated that 18 vessels will reach their end of life over the next 10 years. However, within Scotland there is limited shipbuilding capacity. Ferguson Marine is the only established commercial shipbuilder with the ability to build these vessels, but as it stands, there would be limited capacity in the near future as they complete the current builds that are ongoing. They also have limited space to expand their operations without moving to a new site. This aside, if capacity permits, the facility could likely build one major vessel or two minor vessels at a time, which will probably not be sufficient to fulfill the significant requirement in the short-term for Scottish ferries - meaning these publicly-funded orders are highly likely to be constructed outwith Scotland.

There is an alternative. Delivering the capacity in an efficient, timely and scalable manner, will require the clustering of capability, facilities and outfit halls along with suppliers all incorporated on a common marine facility that would be shared by a number of users on an equitable and commercially viable model.

Building on existing expertise in Scotland, for the first time we can encourage and enable this public spend from within Scotland, while attracting new expertise and overseas investment, all for the purpose of creating new jobs on the Clyde. Developing partnerships to create modern, efficient, manufacturing methods and a common marine facility means that new ways of working can be used that both increase in-country content while de-risking the overall ship build programme. A theoretical production schedule that a combined Ferguson/Scottish Marine Technology Park could deliver is shown below.

		Newbuild Programme					Annual Spend (Avg £53m)
		Loch Class			Large Ferry		
		30m (£10m)	40m (£12m)	50m (£15m)	70m (£35m)	90m (£45m)	
2023	Q1	start			start		42
	Q2		start				
	Q3	deliver					
	Q4						
2024	Q1	start	deliver		deliver	start	56.5
	Q2			start			
	Q3	deliver					
	Q4						
2025	Q1	start		deliver			58.5
	Q2		start		start	deliver	
	Q3	deliver					
	Q4						
2026	Q1	start	deliver				54.5
	Q2			start			
	Q3	deliver			deliver	start	
	Q4						
2027	Q1	start		deliver			51.5
	Q2		start				
	Q3	deliver					
	Q4						
2028	Q1	start	deliver		start	deliver	56.5
	Q2			start			
	Q3	deliver					
	Q4						
2029	Q1	start		deliver			56.5
	Q2		start		deliver	start	
	Q3	deliver					
	Q4						
2030	Q1	start	deliver		start	deliver	58.5
	Q2			start			
	Q3	deliver					
	Q4						
2031	Q1	start		deliver			47.5
	Q2		start				
	Q3	deliver					
	Q4				deliver		

Figure 6: Intensive build schedule.

This intensive build schedule could be met if the capability of Ferguson Marine and a site like the Scottish Marine Technology Park could be combined for a common goal. With FMEL's capability to build one major vessel and with a cluster operation at the Scottish Marine Technology Park facilitating two minor vessels built in parallel by different and competing entities, potentially with both providing fabrication and outfitting assistance to FMEL, this Centre of Excellence could successfully deliver the renewal programme required. Couple this with a feedback loop of manufacturing excellence from partners on the site such as the University of Strathclyde, focused on developing world leading expertise in large scale marine manufacturing and you have a recipe for a truly enabling and sustainable economic ecosystem.

If the model is proven to be a success then Scotland has a number of other brownfield sites adjacent to the marine environment that could imitate variants of this same strategy, potentially expanding to further marine sectors, such as aquaculture, renewables and commercial marine.

Ultimately, if the goal is to keep as much of the construction or outfit work within Scotland, additional capacity is required and soon. The Scottish Marine Technology Park could provide a viable option in the near future with other developments providing further options

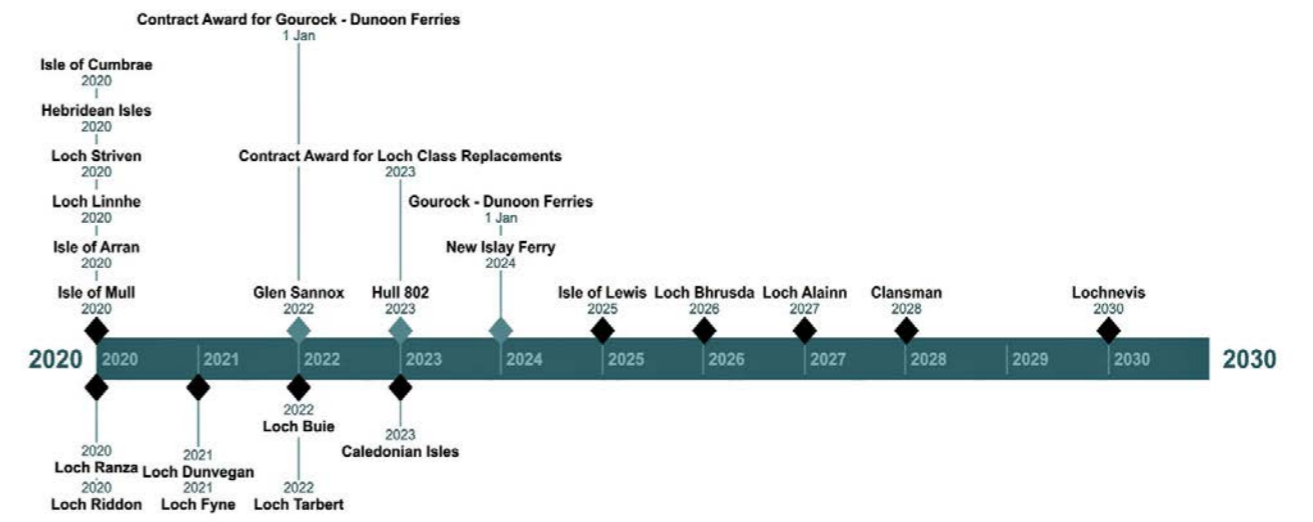


Figure 7: Milestones in CMAL's corporate plan.

Oil and gas, defence and commercial marine opportunities

Notwithstanding the new and developing markets that are available, there remains a buoyant and vibrant demand for solutions and new entrants into the existing marine markets such as oil and gas, defence and commercial marine operations.

For Scotland and the Clyde to attract new entrants to these markets, we must look to reduce the barriers to entry. We must increase the ease by which they can set up their businesses and enter the market.

While incubators in the back end, covering digital and service offerings can operate far from the shores of our marine environment there is an opportunity to increase the rate at which we can deliver new products economically to the market, by lowering the burden on any one entity to provide or access the infrastructure they need.

There remain huge opportunities in the general marine market to deliver Scottish products and services to clients around the world. From marine systems, linkspans, passenger access systems, access ramps, much of which are currently bought overseas and imported to Scotland for our domestic market.

However in order to deliver anything of scale, it must be shippable and the closer you are to the sea, the larger any one component can be.



Figure 8: Vessel modification work undertaken alongside a heavy lift quay

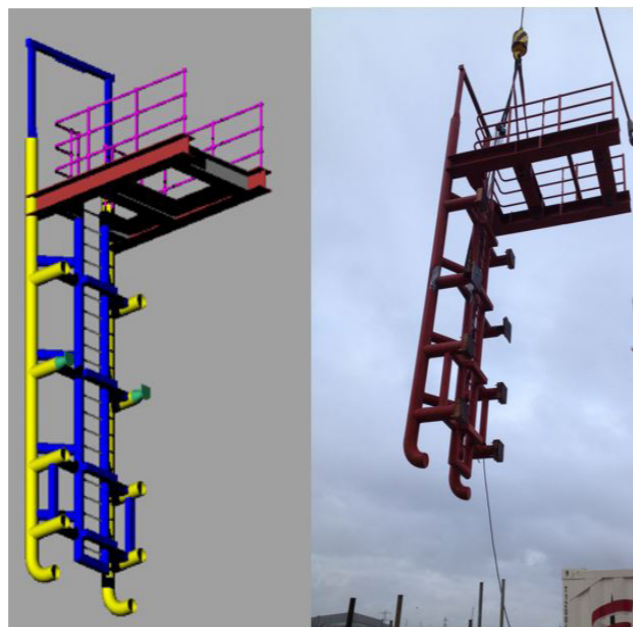


Figure 9: Design to fabrication

Renewables

As noted previously, the renewable sector is particularly buoyant with Scotland well represented in both established offshore installations as well as developing new speculative technologies to bring to the market.

There is an opportunity to build on the successful track record of Wave Energy Scotland who, through focusing on the key systems and sub systems of wave energy converters, are building a stream of robust technology that can be applied to the benefit of all.

By taking a similar approach to the build and operability of novel technology through access to modest space at the Scottish Marine Technology Park, taking prototypes to testing at scale and, thereafter, market becomes that much more economical.

Expertise is retained from project to project despite the core entity changing from prototype to prototype. With a suitably deep supply chain, commercial considerations can also be maintained ensuring best value for money is achieved at each iteration while also tapping into supply chain expertise gleaned through repeat projects.

The efforts at WES have made great inroads in delivering new and viable technology, and now if we can solve the bespoke approach to commissioning and testing prototypes at scale the last lap in the journey to market can be made that much more efficient.

This bringing together of science, research, and delivery in a cluster with ready access to the marine environment, an expert local supply chain, and ready access to units and facilities on a temporary basis can transform how Scotland delivers new technology to the offshore marine renewable markets.



Figure 10: Minesto buoy

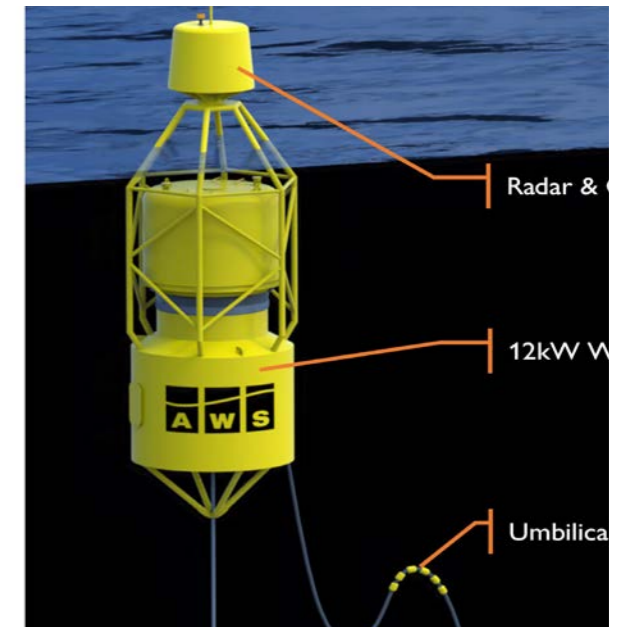


Figure 11: wave energy converter

Green shipping technology

As noted earlier, there is a growing challenge to square the circle of ever increasing seaborne trade with a desire to reduce the carbon and environmental impact of our ships at sea today and in the future.

The IMO agreed in April 2018 a draft greenhouse gas strategy requiring the shipping sector to reduce its emissions by at least 50% by 2050 however getting these measures fully adopted and effective has been a struggle.

Nevertheless, shipping will see increased pressure to reduce its environmental impact with new technologies in the fields of fuelling options and power assist playing a major role in this.

In February 2018 the Scottish Government published the Climate Change Plan - this was enshrined in the 2019 Act and set a legally binding target to reduce emissions of greenhouse gases to net-zero by 2045. This target accounts for all emissions including Scotland's share of emissions from domestic and international aviation and shipping. The adoption of such a stringent economy-wide target makes it imperative that the highest possible ambition is adopted in all sectors. Challenges that have not yet been confronted must now be addressed.

In 2019 the UK Maritime Minister announced that all new ships for UK waters ordered from 2025 should be designed with zero-emission capable technologies in a commitment set out in the Clean Maritime Plan. This is now only five years' away, and with battery electric being the only proven zero-emission propulsion solution on the market there is an urgent need to develop innovative new zero-emission technologies and put them into the marine environment.

These innovations are taking place all over the world with companies in many countries looking at ways to move everything from huge cargo ships to personal watercraft across the water without fossil fuels. Scotland is leading the charge with numerous innovation projects, including wind-assisted propulsion and hydrogen fuel cell power generation, already well advanced. However these innovations are taking place in silos and if we want to maintain this momentum and capitalise on the work done so far we need to create a focussed Maritime Technology centre of excellence that will bring together the best of our innovators to help develop, demonstrate and commercialise the zero-emission marine propulsion systems of the future.

It is only in recent years that the spotlight has turned on the maritime sector's contribution to the global problem of harmful emissions. In the intervening time, ships have continued to be commissioned with little or no consideration for what has now become a major environmental concern. The International Maritime Organization (IMO) estimates that carbon dioxide emissions from shipping were equal to 2.2% of the global human-made emissions in 2012 and expects them to rise by 50-250% by 2050 if no action is taken. The Department for Transport's 'Maritime 2050 Call for Evidence' report highlights that the UK Maritime sector contributes £14.5 billion to the UK economy and directly supports an estimated 186,000 jobs with approximately 95% of all British imports and exports transported by sea. However, shipping is currently responsible for 3.4% of the UK's overall greenhouse gas (GHG) emissions and it emits a range of pollutants that are harmful to human health (DfT, 2019). In line with DEFRA's 2018 Clean Air Strategy and with recent global trends to curb emissions from both ground vehicles and aviation, the maritime sector is embracing the need to legislate and to develop a strategy to reduce greenhouse gases for shipping, to ensure global legislation delivers transformational change by promoting the need for future zero emission vessels.

Shipping for the most part is hidden away and an opportunity to showcase one of its most important technology developments in the drive to decarbonise is really important, especially with the IMO initial decarbonisation strategy of at least 50% GHG reduction across the fleet by 2050 based on a 2008 baseline, the first global industry to set such a target.

On 24th August 2020 BEIS published a new report (BEIS electricity generation cost report [2020]) with their latest predictions for the future levelised cost of energy (LCoE) over the next 30 years. This report shows that renewable electricity from offshore wind, onshore wind and large-scale solar is already cheaper than electricity from combined cycle gas turbines burning natural gas, and by 2030 the price of renewable electricity is expected to be less than half that of conventional fossil-fuelled generation. If this is the case then even at today's efficiencies (~50% round trip through electrolyser and fuel cell) the cost of electricity from renewable hydrogen will be cheaper than the cost of electricity from natural gas turbines, with zero emissions to consider.

The question therefore remains, if we are looking to be at the forefront of these technologies, and minimise the risk of exporting expertise as soon as it is created then we must deliver a two pronged charge at the market by building both intellectual and manufacturing expertise in country to take the maximum benefit from these markets of the future.



Figure 12: Render of sail for vessel



Figure 13: Ballast Water Container (BWC) on the river Clyde



Figure 14: Hydrogen vessel, Malin Group



Figure 15: Marine hydrogen projects in Orkney, EMEC

Supporting an environmentally sustainable Scotland

We support the Scottish ambition for a net zero country by 2045. The park represents opportunities to do things differently and improve our environment in a number of ways. From supporting the circular economy, sharing infrastructure and efficient build methodologies to minimise impact of the businesses on the Park, improving flood mitigation on the Clyde and remediating polluted land, there exists an opportunity to tackle a number of fronts in one development.

The ability to locally recycle old vessels and assets will play an important role in the future of transforming the Scottish marine sector to one that is net zero. These ageing assets must be efficiently recycled and disposed of as close to their home port of operations as possible.

The Scottish Marine Technology Park has an application lodged with SEPA for a recycling license for a 200m long covered facility adjacent to the common marine facility. This in conjunction with the new floating dock capability that is to be brought to the Clyde at the end of 2021 will allow for the economical transfer of large floating assets from sea to land. Smaller assets up to 1100 Te in capacity can be rolled ashore and delivered to the recycling shed by the traditional shiplift.

The park also offers an opportunity to use infrastructure investment to leverage green job creation and long-term growth. Delivering on the challenge of a lower carbon footprint across our marine manufacturing and service sector via shared resources, concentrated supply chain and efficient ways of working is a core principle of the Scottish Marine Technology Park.

Scotland's world leading emissions goals of a 75% reduction from 1990 levels by 2030 and net zero by 2045 requires a rethinking of residential and commercial buildings as well as transport and land use.

The Scottish Marine Technology Park is committed to this primarily by facilitating a concentration of supply chain, end users and infrastructure. The effect of bringing as many disparate pieces of the supply chain to a single point is part of the hidden environmental cost of major marine manufacturing projects.



Figure 16: An overview of the impact of the SMTP

Delivering local community wealth

It is well understood how COVID-19 has affected perceptions of our local communities and the importance of creating employment which utilises every available asset. The marine sector on the Clyde offers a classic example of how that can be delivered in practice.

If we look at how major marine projects are presently delivered, we can see that there is very little local clustering anywhere other than the very largest of shipyards and sites. Taking these benefits to SMEs and start-ups is a significant challenge.

With the clustering of suppliers, Tier One users, research and development and amenities proposed at the Scottish Marine Technology Park, this environmental benefit is baked into the core of the Park's ethos.

Attracting Tier One anchors to the site will create a critical mass drawing in others. The services and shared resources that represent a USP for the Scottish Marine Technology Park on the Clyde will draw in companies and wealth to the local communities that otherwise would never land in West Dunbartonshire - for the simple reason that they cannot access the open sea from existing business park offerings.

These sustainable procurement strategies lock the value they create into local communities. If we take the local "20 minute community" boundary around the site, as shown in the figure below, and analyse its demographics we can see the profound impact such wealth and job creation can have in the area that it serves.

It is understood that not all the roles that the Park will eventually create will be served locally at the outset. However the highly skilled, technical, operational, and managerial roles that will be generated will create a local, visible, highly influential symbol of what a modern career in the marine and renewables field looks like.

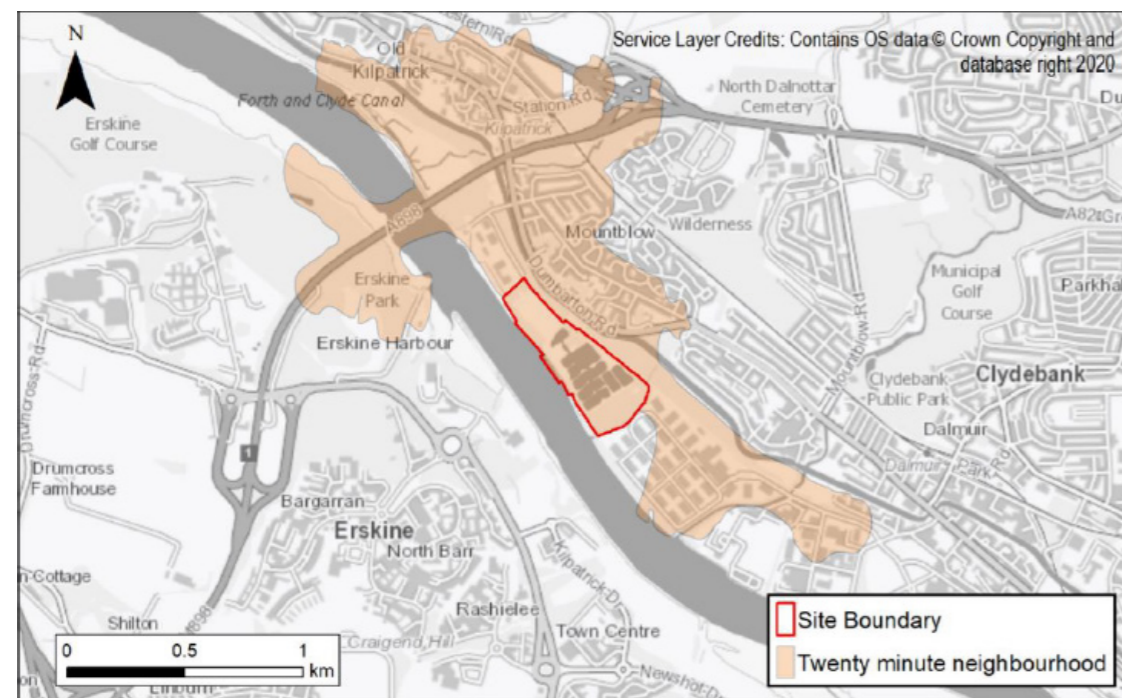


Figure 17: 20 minute neighbourhood boundary

Attracting new business to Scotland

Fundamental to the ethos and vision of the Scottish Marine Technology Park is the desire to attract new entrants to the Scottish market and supply chain while strengthening those that already exist.

This is a "non-displacement" model where by additional capacity will allow Scottish companies to bid for work that is presently going overseas, in many cases to countries on mainland Europe with a similar cost base to that found in Scotland. The challenge is not simply that we are "too expensive" or we "cannot compete". We need to compete in a different manner.

A barrier to entry into the Scottish market in and around the marine manufacturing sector is the need for significant marine infrastructure investment. Very often, due to the nature of this investment and geographic location, this can only then be used by a single tenant. Shipyards, for example, rarely share launch capability and so the return on this investment must then be spread over the revenue generating potential of just one yard. However, the model proposed here allows entrants to move infrastructure cost from capital expense up front to an operating expense which in itself is low due to higher utilisation across a number of users.

Under the model proposed by the SMTP, this investment is de-risked by having both multiple users within any one sector and multiple marine sectors serviced by tenants from the one Park. It is this depth and breadth that is critical to the industry's wider success and sustainability.

This model allows the Park to offer new entrants to the medium sized shipbuilding sector, many of which are SMEs, viable and economic, long-term lets on plots on normal industrial terms.

Couple this with the arrival of a new launch barge to the Clyde late in 2021, and you have all the physical ingredients for handling and launching oversized items into the marine environment on a very cost-effective basis.



Scotland leading a smarter approach to marine manufacturing

The advancements in marine manufacturing technology have levelled off with the next holy grail of robotic welding in confined spaces and for complex geometry yet to be full realised.

We have, in Scotland, numerous success stories such as in the Advanced Forming Research Centre and National Manufacturing Institute Scotland, delivering new work practices and methodologies into a wide range of sectors. But the idiosyncrasies of the type of structure found in the marine and shipbuilding sector demand research and development of its own.

There is a world leading opportunity to take the advanced manufacturing skills, partnerships with leading robotics companies and experience already gained across the aerospace and automotive sectors and apply this to the challenges of the marine sector where state of the art manufacturing remains largely limited to flat, repetitive panels and simple structures.

Some early successes have been made here with partnerships in the defence sector and have resulted in new work coming to Scotland from overseas. This learning must be applied to the wider commercial sector both at the tier one and SME level.

This extends beyond labour saving but to higher productivity while employing the same labour base in a more efficient and safer manner. Access in confined spaces and welding in double bottom structures as well as more efficient means of installing highly repetitive but complex tasks such as collaring of stiffener penetrations all could benefit from an advanced approach to manufacturing through automation.

At the Scottish Marine Technology Park, we are talking to leading institutions and the Tier One fabricators, each with enviable track records in their field, on how we can bring a centre of excellence to the site and the transformational effect it would have if the beneficiaries encompassed the full spectrum of the supply chain.

Space in the masterplan has been allocated for this use as it is critical to the long-term viability of both the park and the wider Scottish marine manufacturing enterprise. Enabling the major manufacturers to develop and gain access to advanced techniques will be game changing. However allowing their supply chain access as well exponentially magnifies the benefits.

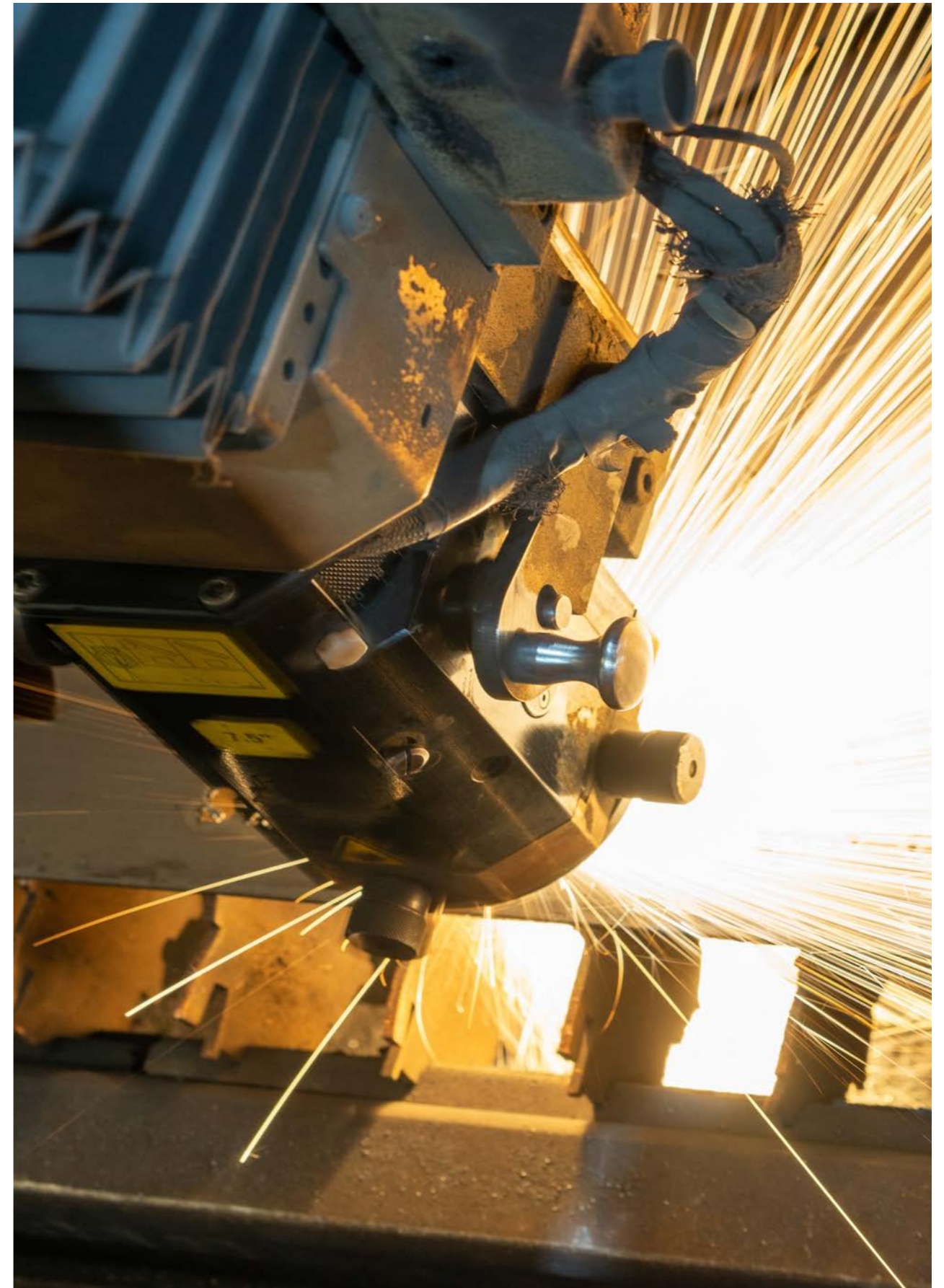


Figure 18: Image by Clayton Cardinali

Incubate our marine innovators to create viable businesses

A by-product of having a wide range of industrial partners delivering end products from the site, supported by an entrepreneurial supply chain as well as internationally renowned academic partners provides fertile ground for incubating start-ups in the marine sector.

Within the masterplan, space has been allocated for maritime incubators. The vision we have calls for soft landing desks around which collaboration and cross fertilisation of ideas can take place. Where successful ideas can mix with real life industrial challenges and applications. Where, thanks to a space rich environment, ideas that survive the nascent development stage can leave the desk and enter into a small workshop on the site among the tier 2 supply chain. Here start-ups can draw, first hand, on experience of those that require or will monetise the solutions. An atmosphere of changing fast and finding faults quickly to adjust or start again is essential and this can only be achieved if the cost of failure is low enough. Where sunk costs are minimised it becomes easier to begin the journey again with fresh ideas.

Those that are a success can grow into larger facilities either on site or off, leaving space behind them for other ideas to develop and grow.

However this can only be achieved by attracting fresh talent to the sector. By delivering a vision for an innovative, and collaborative sector that our future engineering talent will want to join.

The clustering effect at the Scottish Marine Technology Park will achieve this. It will let a local and national community see what can be achieved when the right critical mass of users come together and organically intermingles sharing ideas and concepts in the day to day execution of their business.



Conclusion

In the post-pandemic period, there will be an even greater need than before for deliverable outcomes that create jobs and support businesses in Scotland – particularly in parts of the country which already suffered the symptoms of post-industrial decline.

The Malin Group was working on this White Paper, and the ideas it embraces, before the pandemic struck. It would have been relevant and necessary under any circumstances. Now, however, it offers the kind of practical agenda which is urgently required to address the dire economic and social challenges that we face.

At the heart of the White Paper is a belief in the potential of the River Clyde as a key driver of future industry, employment and prosperity. All its maritime glory is not in the past, as has been widely portrayed. With the necessary interventionist measures, the natural assets which made the Clyde great can be deployed to create a successful, sustainable future built around the maritime industries.

As promoters of the Scottish Maritime Technology Park, the Malin Group sees the particular potential of the role it can play, on land that was once used for industry and with priceless deep water access to the river and the open sea. However, this White Paper is not about any one company or its interests. Above all, it is about the potential for collaborative working.

There are roles for both Scottish and UK Governments and their agencies. Our objectives are perfectly matched to the stated policies of both governments. The question is whether sufficient will, vision and co-ordination exist to bring them to fruition. Malin Group will work with anyone who is supportive of these objectives and willing to turn words into actions and achievements.



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