

Empowering businesses to build green futures

Author: Ben Burggraaf, Chief Executive Officer, Net Zero Industry Wales

1. Introduction to Net Zero Industry Wales

Net Zero Industry Wales (NZIW) is a not-for-profit body which provides independent guidance and support to Welsh industries in their transition to delivering net zero.

Established in 2022, with support from Welsh Government & Welsh Industry, it aims to provide a neutral & trusted voice, whilst empowering industry to play an active role in the delivery of net zero through the uptake of low carbon technologies.

Net Zero Industry Wales seeks to foster collaboration (private & public sector) and helps to unlock investment, with the ultimate aim of making Wales the country of choice for sustainable goods and services.

2. Background

Welsh manufacturing & power sectors contribute up to 50% of the nation's carbon footprint¹. Since the closure of the coal mines, these sectors have struggled to gain access to competitively priced energy in the region and wider UK.

Welsh Coal drove the original industrial revolution and played a substantial role in shaping Wales's proud industrial & cultural heritage. Wales could be at the heart of the next Industrial Revolution.

But the path toward this, is not an easy one. The recent announcement by Tata Steel regarding the Port Talbot Steelworks will have a significant impact on not just their workforce, but their families and the surrounding communities.

But contrary to these recent events, the historical trend of industrial decline and the wider belief that decarbonisation of industry leads to job losses, there is actually a bright future for industry in Wales, if only the opportunity is unlocked now.

During the UK Parliament Welsh Affairs Committee meeting on Wednesday the 31st January 2024, Tata Steel's Global CEO & Managing Director (TV Narendran) clearly stated that if the right infrastructure (gas and/or hydrogen) were available at the Port Talbot site, there would be an opportunity to continue primary steelmaking in South Wales. The absence of an appropriately sized gas and/or hydrogen supply locally, which is available at their Dutch plant in IJmuiden, prevented Tata Steel from incorporating a DRI (Direct Reduced Iron) plant in their decarbonisation plan for the Port Talbot site.

The latter statement shows the incomplete understanding amongst stakeholders, of the current and planned infrastructure around the Tata Steel site. For example, the

¹ Source: Climate Change Committee – Progress report Reducing emissions in Wales – 2020 emission level (industry & power sectors combined value) – published June 2023

decommissioned Baglan Bay power station, which has a direct connection to the natural gas transmission network, which was able to support the generation of 500 MW of electricity, which is equivalent to ~1 GW thermal.

This currently unused connection, roughly 5 miles away from the Tata Steel site, should be large enough to support a 3 million ton per annum DRI plant (assuming ~10 GJ per ton).

The same connection is planned to link up in the long term with the UK hydrogen transmission network (Project Union) and Project HyLine Cymru, which is the proposed hydrogen pipeline between Milford Haven and Port Talbot, two Clean Growth Hubs at the heart of industry in Wales.

This pipeline, alongside the proposed CO₂ Infrastructure and the Celtic Freeport, form the backbone to the successful delivery of the South Wales Industrial Cluster Plan.

3. The South Wales Industrial Cluster (SWIC) Plan

Over the last 5 years, the manufacturing & power sectors in the South Wales region, which contributes to the overall majority of Wales's industrial emission and is one of the largest industrial clusters in the UK, has worked together to create the South Wales Industrial Cluster plan. This plan was published in March 2023².

Tata Steel's site in Port Talbot is an integral part of SWIC and they are an active partner in the Cluster Plan project and subsequent Deployment Project. Both these projects were supported by Innovate UK, as part of its Industrial Decarbonisation Challenge program.

This plan outlines an ambitious pathway, to reduce 16 million tons of CO₂ by 2040, requiring £30 billion of mainly private investment, to make this a reality. This pathway not only ensures that industry in Wales continues to produce high value goods & services, but also provides a quicker route to decarbonise, compared to the counterfactual, i.e. the continued de-industrialisation of the energy intensive industry in Wales.

A significant proportion of the emissions reduction achieved since 1990 (54% since 1990) was achieved by de-industrialisation, as manufacturing & associated emissions were offshored over this period. This isn't only globally irresponsible, but also makes the nation's supply chain less resilient and removes well paid jobs from our economy, demonstrated by the 47% reduction in manufacturing jobs over the same period³.

Wales has significant renewable energy generation potential, which is an important source of new energy and it's expected to become globally cost competitive in the long term. This will drive a new “green” industrial revolution and enable Welsh industries to prosper, be more resilient & sustainable and contribute to a more equal & globally responsible Wales.

² SWIC: A plan for green growth – March 2023

³ Aldersgate Group Report: Economic benefits of industrial decarbonisation – September 2023

4. Industrial decarbonisation pathway for South Wales

The South Wales Industrial Cluster plan outlines a decarbonisation framework that provides a pathway for the manufacturing & power sector to decarbonise.

This pathway revolves around “Five Cogs” of decarbonisation that drive the Green Industrial Revolution (see figure 1).

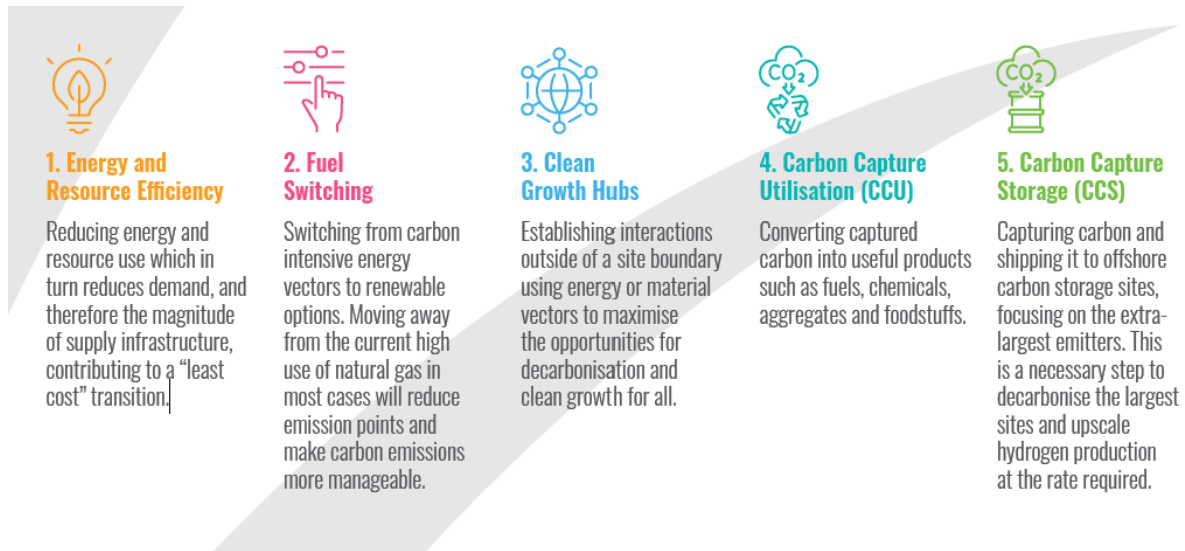


Figure 1 The five cogs of decarbonisation (source SWIC: A plan for green growth)

The detailed analysis undertaken within the SWIC cluster plan project, to develop this framework also provides a breakdown on how each of the “Five Cogs” contributes towards reducing the 16 million tonnes of CO₂ emissions (see figure 2).

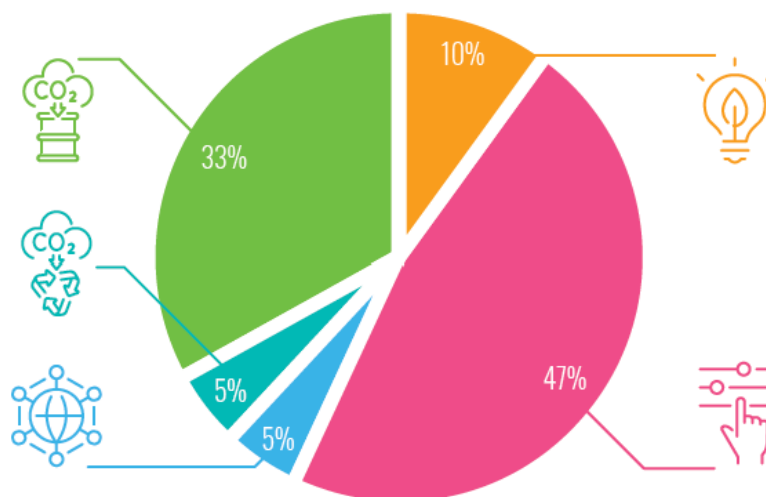


Figure 2 the contribution of each of the Five Cogs towards reducing the 16 million tonnes of CO₂ (source SWIC: A plan for green growth)

Figure 2 shows that there is a key role for the deployment of Carbon Capture & Storage (CCS) technology and Fuel Switching (enabled by hydrogen and/or electrification), which combined contribute toward meeting 80% of the targeted emission reduction.

In the case of the Port Talbot steelworks, this includes incorporating an Electric Arc Furnace and continuing the production of iron through a Direct Reduction Iron or similar technology route, as an alternative to the “traditional” Blast Furnace – Basic Oxygen Steelmaking route, currently deployed at Port Talbot.

The remaining 20% will be delivered through the other three “Cogs”, i.e. Energy & Resource Efficiency, Clean Growth Hubs and Carbon Capture & Utilisation (CCU). In the case of the Port Talbot steelworks, this includes the increase of steel scrap enabled by the Electric Arc Furnace, as well as the use of CO₂ to produce Sustainable Aviation Fuel, like implemented at a commercial scale in Ghent, Belgium and China.

The sequencing & pace of the deployment of the required port, CO₂, hydrogen and electricity infrastructure which support the realisation of the emission reduction for each of the cogs, determines the way the manufacturing & power sector in South Wales, is likely to decarbonise.

The high level sequencing between now and 2040, i.e. “the transition period”, is as follows:

Step 1. Carbon Capture & Storage combined with CO₂ shipping

Deployment of carbon capture & storage technology, which captures the CO₂ from large emitters. In the absence of an adjacent CO₂ store, these emissions need to be liquified and shipped to a store in the East coast of England (Viking cluster) or Scotland (Acorn cluster). The current projects developed in the Milford Haven Clean Growth Hub, show a potential to deploy this technology at scale, from 2030 onwards (subject to CO₂ business model support).

Step 2. Hydrogen distribution pipeline

Construction of a hydrogen pipeline (Project HyLine Cymru) between Milford Haven and Port Talbot Clean Growth Hubs, of which the Steelworks is an integral part. This pipeline is enabled by step 1, i.e. the CO₂ shipping infrastructure and allows the development of a “blue” hydrogen production facility, which needs carbon capture & storage infrastructure (step 3). The work that has been undertaken within the SWIC Deployment project shows that a pipeline could be in place from 2032 onwards (subject to regulatory approvals). The ultimate aim of this dedicated pipeline, is to link with the proposed hydrogen “back bone” for the UK, also known as Project Union (developed by National Gas Transmission).

Step 3. Blue hydrogen production

Construction of blue hydrogen plants enabled by the proposed hydrogen pipeline and UK Government's hydrogen business model support. These blue hydrogen plants produce low carbon hydrogen at a scale & consistency, needed to allow industry to “fuel switch” in the Milford Haven and Port Talbot Clean Growth Hubs (if appropriate), which sit within the Celtic Freeport area. The pre-feasibility studies of the blue hydrogen project have been completed as part of the SWIC deployment project and further work on this is on hold, until the CO₂ and hydrogen infrastructure projects have acquired more certainty (step 1&2).

Step 4. Industrial emitters switch to hydrogen, where electrification isn't an option

Fuel switch industrial emitters to hydrogen, to minimise the use of unabated fossil fuels and associated CO₂ emissions. The large-scale low carbon hydrogen generation in the Milford Haven Clean Growth Hub, will allow industry in this hub to further decarbonise using hydrogen, as well as hydrogen to be blended into the natural gas transmission system (up to 20%). The proposed pipeline between Milford Haven and Port Talbot, will also enable the further decarbonisation of the Port Talbot steelworks, port and the production of sustainable aviation fuel from captured CO₂. The hydrogen business model support, ensures that the cost of hydrogen for the end user, will be the same as the cost of natural gas.

Step 5. Industrial emitters switch to electricity

Electrify industrial processes where hydrogen isn't the best solution for businesses in the medium & long term or is not appropriate. The electrification and the associated emission reduction is enabled by the required electricity grid re-enforcement work, the proposed electrification business models, and full decarbonisation of the electricity grid by 2035. It is anticipated that any significant electrification of industrial processes will not take place before 2035, based on the current timescales for grid investments (10 years+). The proposed construction of an Electric Arc Furnace at Port Talbot steelworks would be an exception to this. The aforementioned business model support is needed, to ensure that businesses that don't get financially penalised, as the cost of electricity per unit of energy is still significantly larger than the equivalent fossil fuel energy source.

In parallel to the 5 steps outlined above, the deployment of the Floating Offshore Wind projects will commence, of which the first seabed lease round has been launched by the Crown Estate (in total 4.5GW), with at least, a further 12GW in the pipeline beyond that. The 16.5 GW of wind energy is enough to displace at least 50% of the fossil fuels used in industry (2020 levels) and reduce Wales's dependence on fossil fuels, in line with the Climate Change Committee's balanced pathway.

“Rhoi'r pŵer i fusnesau greu dyfodol gwyrdd”
“Empowering businesses to build greener futures”

It's important to note that fossil fuels still play an important role during the transition period and beyond 2040, given the fact that the UK is dependent on fossil fuels for 78% of its energy needs⁴ and in the ambitious, Balanced Pathway to net zero, oil and fossil gas are forecasted to still play a significant role in the UK's energy mix in 2050, to ensure it's affordable, resilient as well as sustainable (also known as the Energy trilemma).

The floating offshore wind developers and their partners are not only planning to supply the wind energy into the electricity grid, but also looking to produce green hydrogen. The production of green hydrogen at GW scale is unlocked by the proposed hydrogen pipeline between Milford Haven & Port Talbot, the connection into the national hydrogen backbone (project Union) and is complementary to the blue hydrogen production.

This two “energy vector” (electricity & hydrogen) approach, will ensure that curtailing of wind energy is minimised (i.e. stopping wind farms from generating when there isn't enough electricity demand to match the generation), as well as the deployment rate of Floating Offshore Wind technology isn't determined and/or limited by the development of the electricity grid.

It's well documented that there is also a significant potential for Welsh industry to play a key role in the supply chain of the construction of the Floating Offshore Wind (FLOW) farms, deployed in the Celtic Sea.

This could not only ensure that a lot of the social value associated with the development of these wind farms, is retained in Wales, but if Welsh industry is decarbonising in parallel with the deployment of FLOW in the Celtic Sea and increasingly is using this energy source to power Welsh Industry, it would also decrease the “embedded carbon” associated with the construction of these wind farms. This will accelerate the impact these wind farms will have on Welsh, UK and global emissions.

⁴ House of commons Environmental Audit committee, Accelerating the transition from fossil fuels and securing energy supplies, December 2022

5. Making the South Wales Industrial Cluster plan a reality

The SWIC plan outlined in the previous paragraphs, requires £30 billion of private investment⁵, over a period between 2025 – 2040. This equating to an average investment rate of £2 billion per annum.

Alongside this, there is the deployment of the Floating Offshore Wind (FLOW) technology in the Celtic Sea, with each GW requiring ca. £3 billion of investment. With 16.5GW in the pipeline, this would need at least a further £50 billion of investment to deliver.

This level of investment in industrial decarbonisation, alongside the deployment of FLOW is unprecedented and requires a high level of coordination & planning, delivered through private-public sector partnerships, to ensure that:

- The private investment can be attracted with the appropriate level of UK Government revenue support (CO₂, hydrogen, electricity business models, Contracts for Difference, etc.);
- Planning and environmental consents can be secured in a timely fashion, to reach financial investment decisions;
- Wales has the capability to manufacture materials & sub-components and people to construct, build & maintain the assets, which ensures that the social value is retained in Wales.

In recognition of this need to coordinate and plan, Net Zero Industry Wales (NZIW) has been tasked, to lead & support the delivery of the decarbonisation plans of the Welsh Industrial Clusters (SWIC & NEWID) and its partners.

Each of its NZIW's members have signed up to the following pledge:

“The Net Zero Industry Wales members are committed to transition towards producing more sustainable goods & services in Wales, as set out in the cluster plan(s), at a pace needed to meet the legally binding targets.

However, in a globally competitive environment, Welsh Industry needs the active support of UK, as well as Welsh Government, to create the Supportive Culture, Policy & Regulatory frameworks and Attractive Infrastructure that creates a level playing field, encourages the significant investment needed to make the transition to Net Zero and prevents carbon leakage.

This investment will build on Wales's Industrial Heritage and power the Green Industrial Revolution needed, to create a trusted, sustainable, prosperous & resilient industry that the citizens of Wales can continue to be proud off.”

⁵ SWIC: A plan for green growth – March 2023

5.1 UK Government support

From its inception, NZIW has been working in collaboration with UK & Welsh Government and its members, supported by Innovate UK grant support, to develop a credible solution to liquify & ship CO₂ from South Wales to one of the industrial clusters that are either part of Track 1 or 2 of the cluster sequencing program led by the Department of Energy Security & Net Zero (DESNZ).

This is a priority because without local geological carbon storage opportunities, the shipping of CO₂ is the only way that emitters in SWIC can access storage for captured CO₂.

To date Innovate UK has committed roughly £20 million of investment to develop these solutions. This grant funding has been matched by private sector investment as part of the Industrial Decarbonisation Cluster program.

As outlined in the South Wales Industrial Cluster plan, deployment of Carbon Capture & Storage technology is the first main step in the delivery of this plan. Therefore, developing a credible solution & demonstrating that UK Government revenue support through the CO₂ business models, represents “Value for Money” for the UK tax payer, will enable one of the largest industrial clusters in the UK, to access the £20 billion of financial support to deploy Carbon Capture & Storage technology and hence enable a just transition.

In the summer of 2023, NZIW commissioned an economic study to investigate whether liquifying & shipping CO₂ represents value for money for the UK tax payer and therefore justifies UK treasury support.

The report published in December 2023 concluded that there is a strong economic case for CO₂ shipping, as the deployment of a shipping solution, is forecasted to deliver £18.9 billion of GVA contribution over 20 years compared to the counter narrative, i.e. continued de-industrialisation of South Wales.

To unlock this social value and £8.6 billion of private investment, £2.4 billion of revenue support is forecasted to be needed over 20 years. This equates to 12% of the £20 billion of support that the UK treasury has already committed to support the deployment of carbon capture & storage technology in the UK and equivalent to Wales's proportional contribution to the total UK emissions covered by the UK Emissions Trading Scheme.

To date, non-pipeline-transport (NPT) solutions, i.e. the shipping of CO₂ hasn't secured, firm support of the UK Government. However DESNZ has announced in its CCUS vision that subject to certain conditions, it's planning to support NPT solutions from 2025 onwards following a consultation in 2024, with the aim to deploy the at scale beyond 2030.

Given the significance of the South Wales Industrial Cluster and that it has no geological storage for CO₂ within pipeline range, the cluster needs access to storage via ship, in order to support the delivery of Welsh and UK Governments legally binding decarbonisation targets for 2030 and beyond.

To unlock the opportunity of shipping CO₂, the UK Government needs to allow emitters that can only access geological storage by ship, like those in South Wales, to access business model support. More specifically the ask is to allow existing Track 2 clusters like the Scottish (Acorn) and/or Humber (Viking) clusters, to include NPT solutions in their Anchor Plans, which DESNZ requests the Track 2 clusters to produce, in December 2023, alongside the CCUS vision announcement.

Furthermore, UK Government should support the development of a CO₂ liquefaction port infrastructure in South Wales and select SWIC as the pioneer pilot project in the UK, both as part of the Celtic Freeport development and demonstrate CO₂ shipping at scale, ahead of full deployment from 2030 onwards.

Delivering this will help unlock the shipping of CO₂ as a national opportunity and support the hydrogen economy in Wales (Step 2). Both of which are key enablers of a future decarbonised electricity system.

To enable the development of a hydrogen pipeline between Milford Haven and Port Talbot, (connecting the two Celtic Freeport ports) and attract the necessary investment, Wales & West Utilities need approval from the energy market regulator Ofgem. This to allow them to recover the significant investment in this pipeline, through their customer's bills, over its asset life (45 years).

The study “Future Energy Grids for Wales”⁶ commissioned and published by the Welsh Government, clearly outlines a need for a hydrogen transmission & distribution network to transport the hydrogen generated in Wales. To that end, NZIW would like to see Ofgem making the necessary changes in gas licencing regulations, in order to allow companies like Wales & West Utilities to recover the investment, in the same way as investments into natural gas infrastructure for the next Price Control period (2026-2031).

Further delays in providing clarity on whether the South Wales Industrial Cluster can access the CO₂ business model support and whether investment's in hydrogen infrastructure can be recovered through customer's bills, will risk the economic impact to be delayed at best, at worst to be unrealised, as allocated investment is committed to other parts of the UK, Europe and or the world.

⁶ Future Energy Grids for Wales – Q2 2023

5.2 Planning and environmental consents

Once private investment is committed and, enabled by estimated £2.4 billion of UK Government revenue support over 20 years, it's important that the planning and environmental consenting process is delivered in a timely fashion to meet the DESNZ milestones to govern the cluster sequencing program and reach financial investment decision by the private sector.

The investment programme could reach a size of approximately £6 billion per annum and includes the deployment of Floating Offshore Wind at a rate of 1GW per annum. This requires an appropriate level of resource to be available for public bodies to undertake their statutory duties. Currently, it is likely that the planning & environmental consenting process is on the critical path for delivering decarbonisation & renewable projects.

Net Zero Industry Wales welcomes open, transparent and collaborative engagement with public bodies (e.g. Natural Resources Wales, Planning & Environment Decisions Wales and local authorities), to support delivery of the planning & consenting process in a timely way. The latter would in many cases require additional resources to be brought in, which could potentially be privately funded, if the respective governments can provide policy certainty for such a transformative and unprecedented investment program.

5.3 Skills and capability to deliver the large investment program

Wales may struggle to deliver the scale of investment, outlined in the previous paragraphs, once the financial commitment are made by the companies, without further forward planning and anticipatory investment, to maximise the potential social value it can create within Wales's communities.

On the backdrop of decades of industrial decline, the unprecedented scale of investment needed to turn this around, Wales's capability to construct, operate & maintain the assets and associated infrastructure, is likely to be severely challenged, without intervention.

It's not easy and straight forward, to deliver investment programs of £300-£400million per year. This is of comparable size to Tata Steel's investment plan, which aims to deliver a £1.2 billion investment in 36 months. If the scale is increased to multiple billions of pounds per year, as outlined in the previous paragraphs, the challenge is greater still.

To deliver this unprecedented level of transformation, Wales will need skilled workers. So, there are huge opportunities for up-skilling people ahead of these investments over the next couple of years in anticipation of this demand, while creating well-paid, quality jobs for our future generations.

Net Zero Industry Wales would advocate to train and support the individuals, families and wider communities affected by Tata Steel's announcement and get them ready & trained to

construct, operate and maintain the new low carbon facilities and infrastructure that are planned to be built over the next five years.

A starting point for this would be to create an individual skills “passport”, which is externally accredited & verified and recognises the knowledge & skills acquired by learning on the job or internal courses, which aren't necessarily covered by accredited qualifications. This would allow these skills to be more easily transferred between employers across Wales & beyond.

6. Final comments

As Net Zero Industry Wales's Chief Executive Officer, one of my main priorities is ensuring that this unprecedented level of investment becomes a reality, whilst ensuring that Wales has the right investment environment and skilled people to deliver these projects.

It's my firm belief that maintaining the current momentum or even accelerating the implementation of the South Wales Industrial Cluster plan, will enable the economic impact of Tata Steel's announcement to be mitigated in the medium to long term, as well as, shorten the period that the impact has in the short term.

Wales has the potential to become the country of choice for sustainable goods and services.

We can do this, if the resources available & urgency, matches the scale of the ambition!