

# A plan for clean growth

The decarbonisation of South Wales industry  
is an investment into the future of  
Wales and the UK.

## Supported by...



## Cluster Plan Partners...



## Acknowledgements

**This phase 2 cluster planning project was part funded by UKRI's Industrial Decarbonisation Challenge and led by energy-engineering consultancy CR Plus Limited.**

The project's success has been thanks to all of the positive and collaborative contributions made by those additional partners who provided match funding from South Wales Industry, academia and other organisations, namely: Associated British Ports, Capital Law Limited, Carbon8 Systems Limited, Celsa Manufacturing (UK) Limited, Confederation of Paper Industries Limited, Connect & Convey Limited, Costain Oil Gas & Process Limited, Dragon LNG Limited, Energy Systems Catapult, Environmental Resources Management Limited, Front Door Communications Limited, Liberty Steel Newport Limited, Port of Milford Haven, National Grid Electricity Transmission plc, National Grid Electricity Distribution plc, Neath Port Talbot Council, Offshore Renewable Energy Catapult, Pembrokeshire County Council, Progressive Energy Limited, ROCKWOOL Limited, RWE Generation UK plc, Sector Development Wales Partnership Limited (Industry Wales), Siemens plc, Tarmac Trading Limited (Aberthaw Cement Works), University of South Wales, Vale Europe Limited (Clydach Nickel Refinery), Valero Energy Ltd, Wales & West Utilities Limited and Western Bio-Energy Ltd.

Particular appreciation is given to Dr Chris Williams who initiated this regional industrial collaboration during 2019, leading to the successful establishment of the embryonic cluster now recognised as the South Wales Industrial Cluster (SWIC), and now supported by the newly established Net Zero Industry Wales.

Thanks are also extended to all wider stakeholders who have contributed to this project and furthered the SWIC vision of **"Developing a world leading, truly sustainable industrial Cluster, befitting the societal needs of 2030, 2040, 2050 and beyond"**.

## Disclaimer

The content of this document does not represent the views of any one organisation, and no one organisation is responsible for the views in this document. This document represents the progress made by the South Wales Industrial Cluster during the Cluster Plan project. Although the South Wales Industrial Cluster has taken reasonable precautions to ensure that all views are accurate, the South Wales Industrial Cluster cannot accept responsibility for any of the views in this document. The South Wales Industrial Cluster does not accept any liability and/or responsibility for any decisions or investment which may be made by third parties on the basis of information provided in this report. There should be no implied commitment from the South Wales Industrial Cluster (or any of the partners and the participant involved in the project) to operate using the processes described. How businesses are developed and operated is a commercial matter for those individual companies.

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**David TC Davies**  
**Secretary of State for Wales**

*“Decarbonising industry is vital in achieving our net zero targets and supporting the businesses of the future.*

*The South Wales Industrial Cluster’s plan is a fantastic example of how UK government funding can be used to bring about real change.*

*There is a huge challenge ahead of us but this report is the springboard needed to reduce emissions across the region’s industries while growing the economy and creating a prosperous Wales for future generations.*

*South Wales has a rich industrial history and I am confident that its story will continue long into the future, partly through the work of projects like the South Wales Industrial Cluster which utilise the innovation and collective strength of business, industry and government.”*



**Bryony Livesey**  
**Director of the Industrial Decarbonisation Challenge**

*“The South Wales Industrial Cluster (SWIC) plan has brought together 31 different partners to deliver a vision of how industrial decarbonisation can be achieved within the region. The project has acted as a catalyst for building relationships across industry, academia and local authorities. This wide base of support has enabled identification of a credible route to decarbonisation and a clear understanding of the required actions and policy to get there.*

*The SWIC plan is one of 6 projects receiving funding from UKRI’s Industrial Decarbonisation Challenge to deliver a regional plan for decarbonisation. As the UK’s second largest carbon emitting industrial cluster, decarbonisation of the region is key to the UK reaching its net zero targets.*

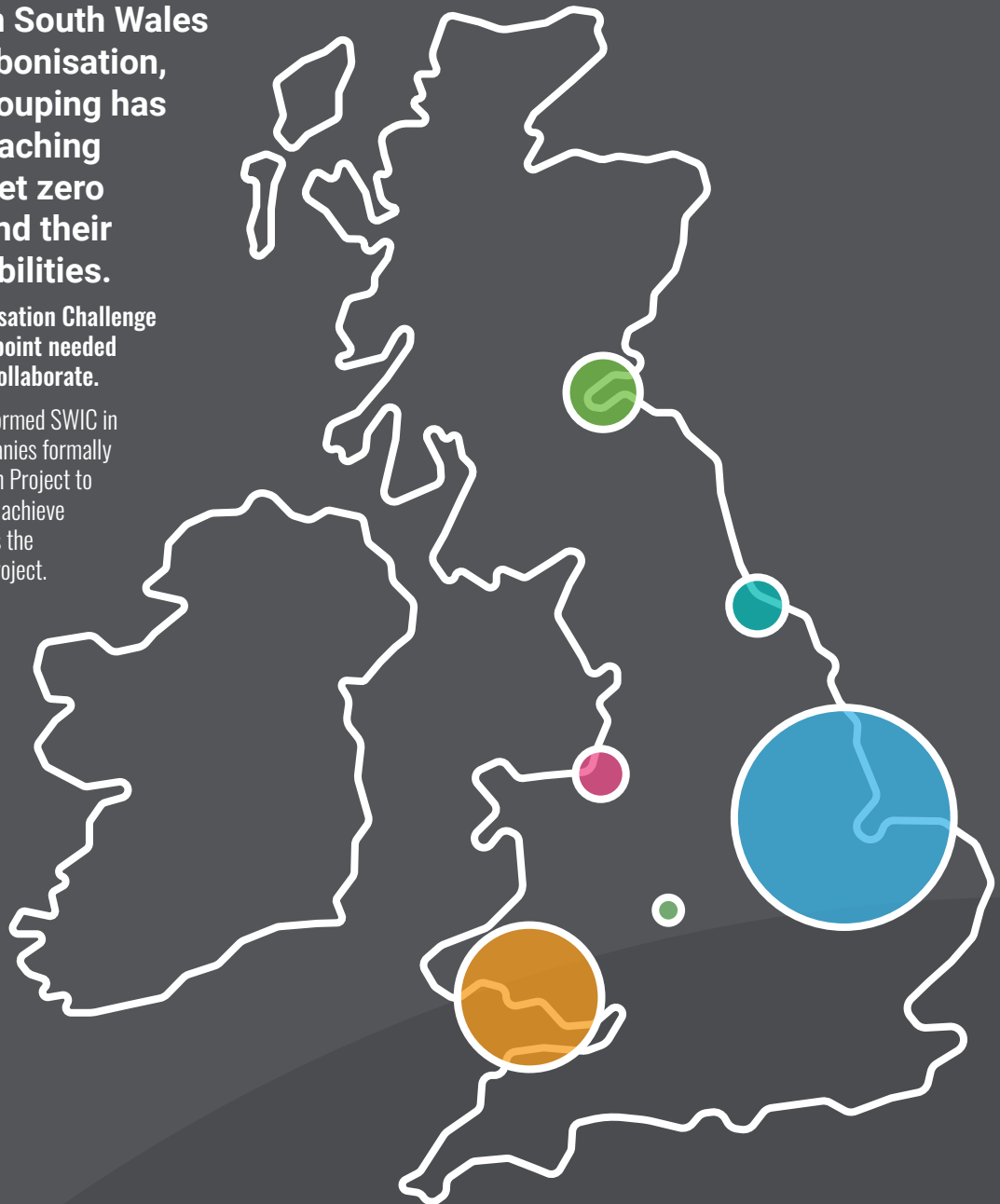
*The path to net zero outlined within this report will enable Wales to reduce its CO<sub>2</sub> emissions by ~40%, secure over 100,000 jobs and result in £30-40bn of investment within the region. The delivery of the cluster plan is a significant milestone in the journey towards net zero in Wales and the UK. The formation of Net Zero Industry Wales as a result of this project will provide a continued network of support and ensure that the cluster plan is implemented.”*

# Executive Summary

**As industries in South Wales consider decarbonisation, a significant grouping has realised that reaching the emerging net zero targets is beyond their individual capabilities.**

**The Industrial Decarbonisation Challenge Fund provided the focal point needed for 47 organisations to collaborate.**

Together they had already formed SWIC in 2019, from which 30 companies formally partnered in the Cluster Plan Project to identify the requirements to achieve net zero. This report outlines the findings and vision of that project.



# The SWIC Vision

**“Develop a world leading, truly sustainable industrial cluster, befitting the societal needs of 2030, 2040, 2050 and beyond”.**

The SWIC Vision showcases ambitious plans to achieve:

- Net zero industries in South Wales by 2040, equating to **40% reduction of current Welsh CO<sub>2</sub> emissions**
- **Retention of 113,000 jobs** and a net positive increase in jobs overall
- **Unlocking £30bn investment opportunities** in the region
- **Growing the £6bn Gross Value Added** from South Wales industry.

The Cluster Plan Project has resulted in a transformational change in terms of industrial collaboration and vision setting in the region. SWIC aims to extend the reach and responsibilities of its industrial partners in order to create a connecting industrial and energy network that extends “beyond the fence line” and results in a new future for South Wales infrastructure.

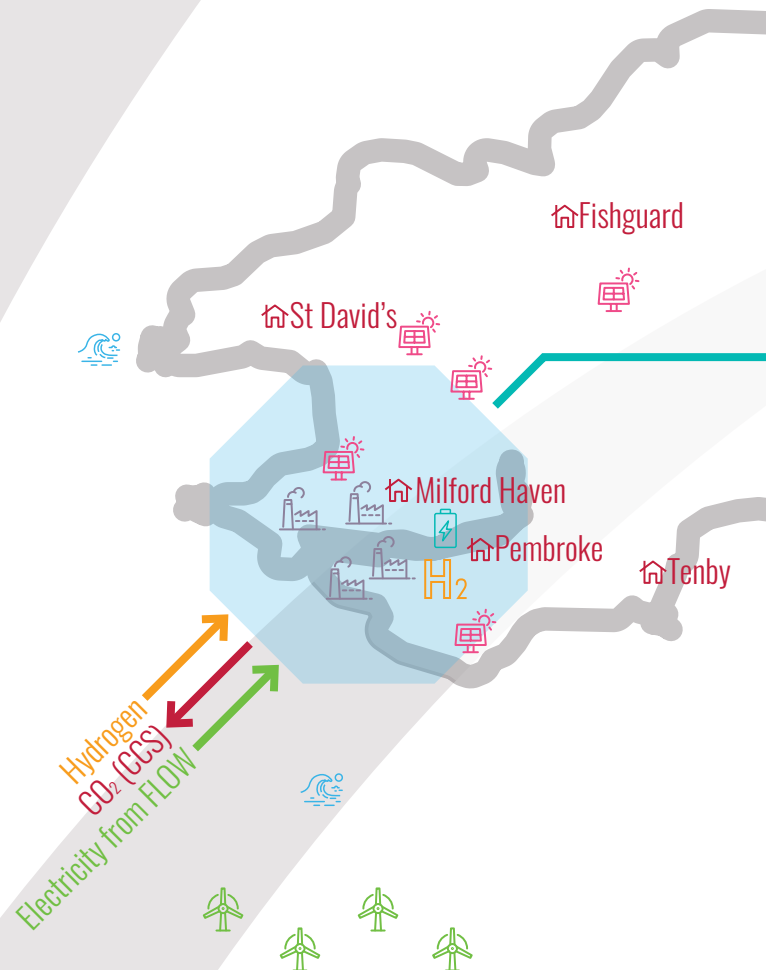
## The South Wales Industrial Cluster (SWIC) collaboration

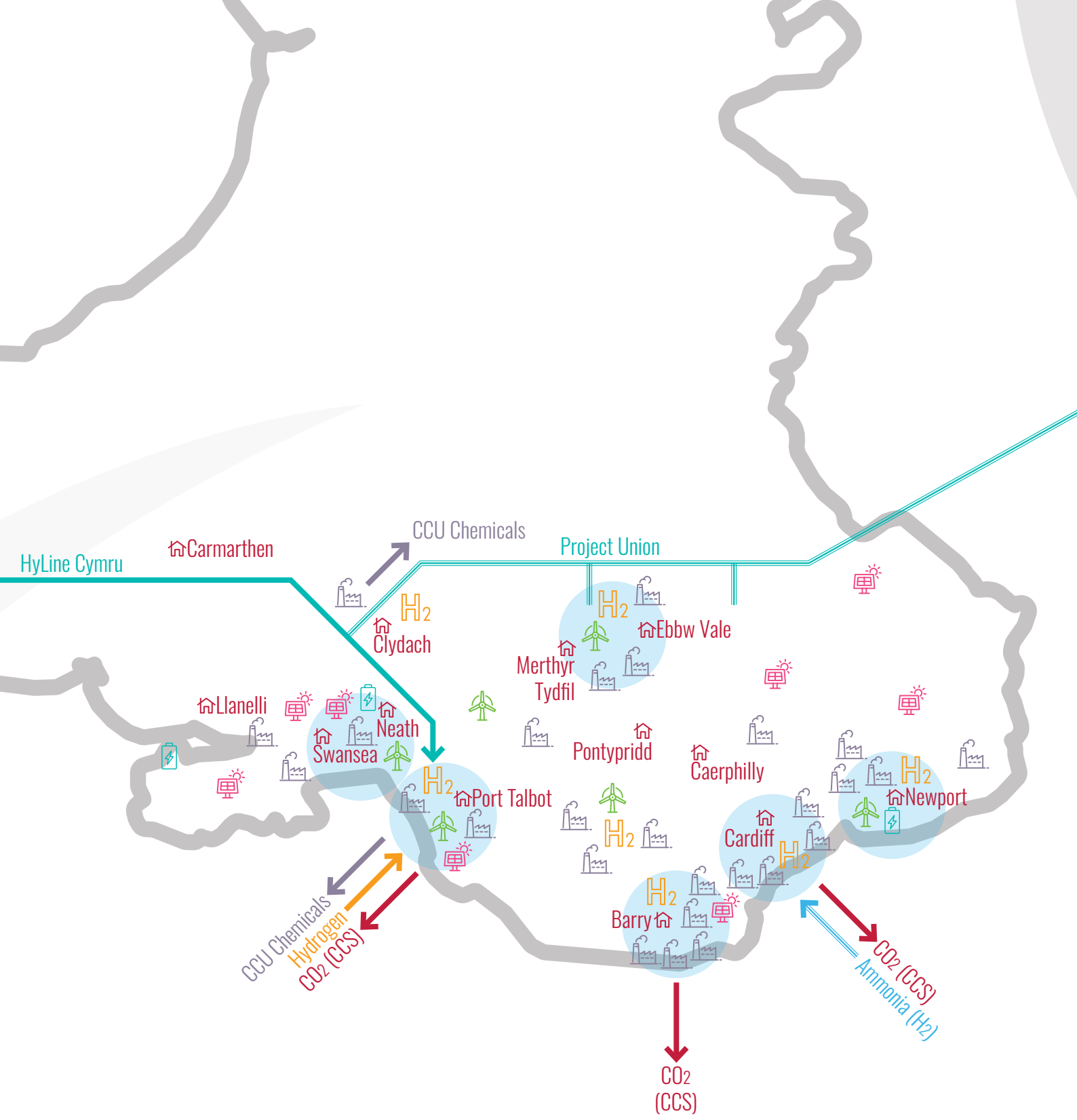
South Wales is home to a significant industrial base, including the UK's largest integrated steelworks, one of the UK's seven oil refineries and one of only four nickel refineries in Europe.

In addition, there are a number of other energy intensive manufacturing plants and industries within a diverse range of sectors including steel recycling, cement, paper, glass, mineral wool and chemicals, food and general manufacturing industries.

As well as its unique industries, South Wales has a large and diverse energy supply sector including large combined cycle gas turbine (CCGT) power stations, one of which is among the largest in Europe, plus numerous on-shore wind sites and two liquefied natural gas (LNG) terminals which supply over 20% of the UK's natural gas demand.

The SWIC collaboration can, alongside helping to deliver regional industrial decarbonisation, challenge and accelerate the timescales laid out by the UK's emissions policies and contribute to a more prosperous Wales.





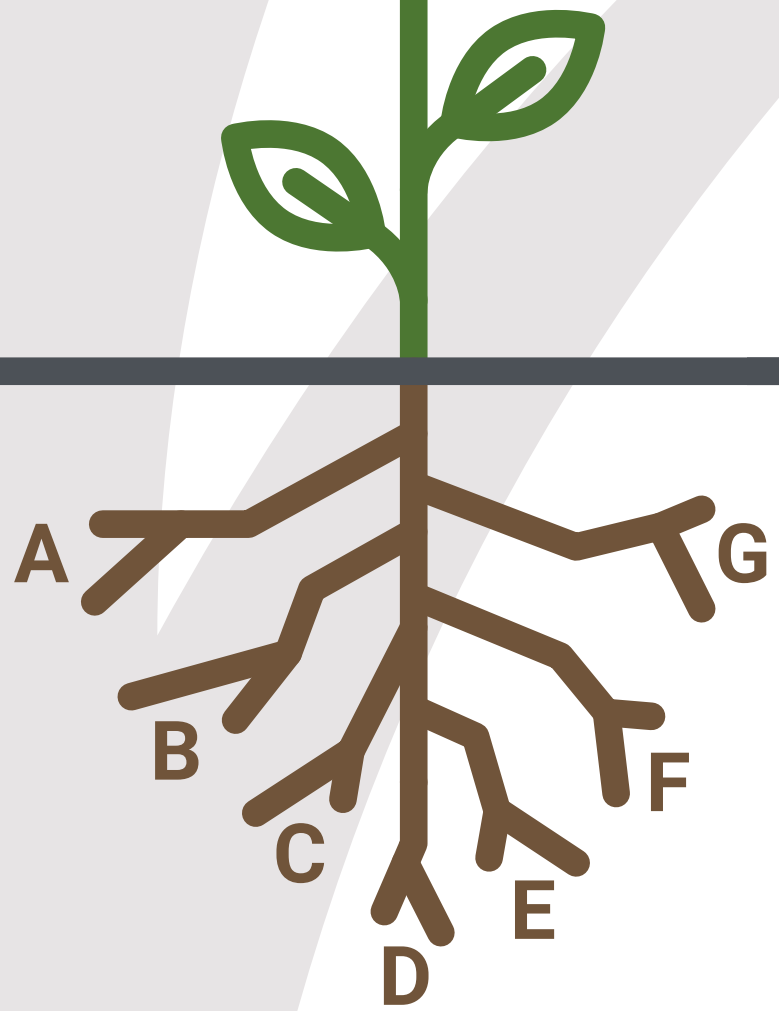
**KEY:**

- Milford Haven Waterway Future Energy Cluster
- Clean Growth Hubs

- Towns and Cities
- Industrial Sites
- Solar Power
- Wind Power
- Marine Energy
- Hydrogen Generation
- Battery Technology

- HyLine Cymru
- Project Union

- Electricity from FLOW
- Hydrogen
- CO2 (CCS)
- CCU Chemicals
- Ammonia (H2)










# Our Mission:

## SWIC's holistic approach to decarbonisation has three core objectives:

- 1) Industry:**  
Through a just transition, deliver internationally competitive and sustainable low carbon industries.
- 2) Infrastructure:**  
Exploit significant renewable power capabilities available in South Wales to develop world-leading infrastructure to decarbonise our industries, attract additional investment and create long term regional employment.
- 3) People:**  
Create a globally recognised agile region that is innovative, opportunity-driven, highly skilled and capable of exploiting the huge clean growth opportunities that net zero offers South Wales.

## These core objectives are delivered by:

-  **1. Energy and resource efficiency**
-  **2. Fuel Switching**
-  **3. Clean Growth Hubs**
-  **4. Carbon Capture and Utilisation**
-  **5. Carbon Capture and Storage**

## Supported by the enablers:

- A. Resourcing, Skills and Supply Chain Requirements**
- B. Circular Economy Principles and Carbon Accounting Requirements**
- C. Generation of Clean Energy and Infrastructure**
- D. Research and Innovation**
- E. Legal and Planning**
- F. Investment Requirements**
- G. Stakeholder Engagement**

## The graphs opposite demonstrate how these objectives and enablers could come together, with supportive policies, to achieve SWIC's ambitious pathway to net zero and beyond.

The emission numbers presented represent territorial emissions (mainly scope 1) and therefore are aligned with current government methodology.

### SWIC's Carbon Emission Projections

The **red line** represents the likely territorial emissions pathway should the existing known policy trajectory (as of Jan 2023) remain unaltered. Representing de-industrialisation, de-growth and irresponsible offshoring of emissions.

The **green line** represents the position SWIC strongly believes is achievable where emissions reach net zero by 2040 with net negative emissions achieved thereafter - representing a globally responsible and prosperous region for our future generations.

### Potential Impact on SWIC Jobs through Decarbonisation

SWIC believes that following the current trajectory to net zero via existing policy will have significant impact to the people and economy of South Wales as reflected in the jobs graph, i.e. site closures particularly in the 2030's. The **red line** shows the estimated impact to jobs from de-industrialisation.

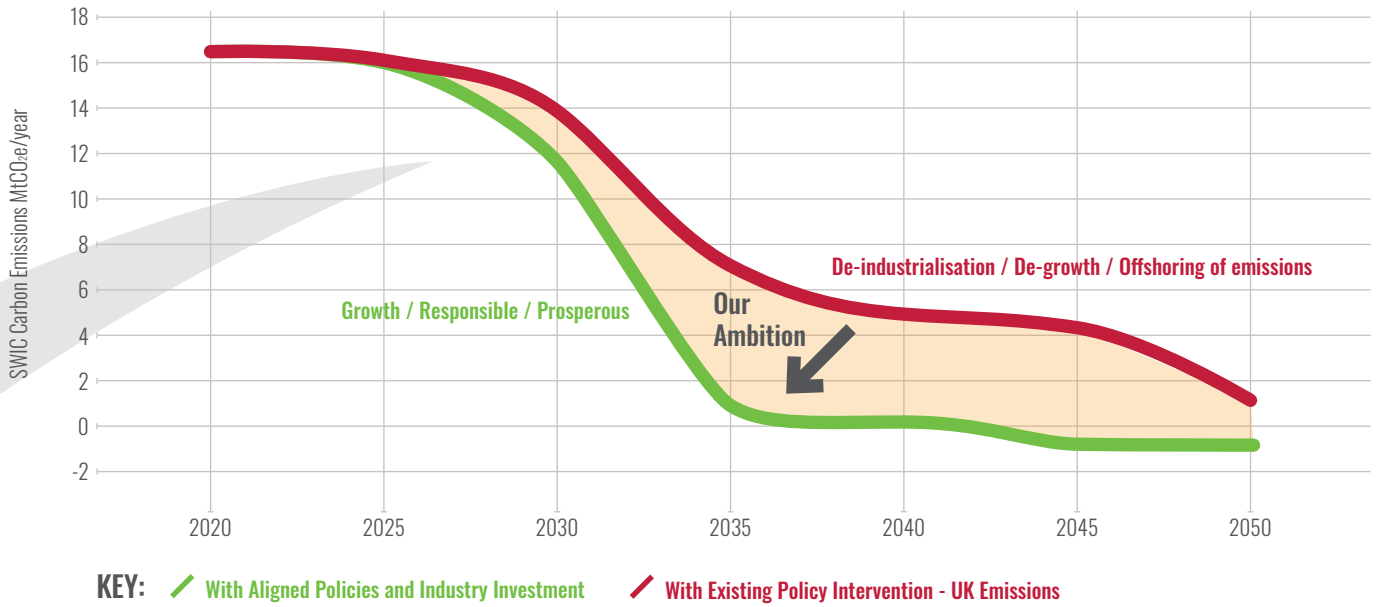
The **green line** attempts to show the retention and growth of jobs due to SWIC's ambitious plans and supportive policies. The pathway of the **green line** estimates job increases from the construction of infrastructure developments for hydrogen, CCUS and electricity and the installation of the technologies on each industrial site, but also takes into account the losses associated with productivity improvements. Therefore, a net positive position on jobs is produced, rather than the sharp drop associated with the **red line**. It should be noted that the **green line** does not represent a wholly regional vision for jobs as this project is focused on industry only.

SWIC's mission for South Wales industries therefore not only **achieves a transition to net zero 10 years ahead of 2050** but will also improve the socio-economic status of the region.

To achieve this ambition, SWIC has developed a strategy that draws upon the locational strengths and opportunities present within the South Wales region, as well as the skills and experience of our people to exploit such opportunities.

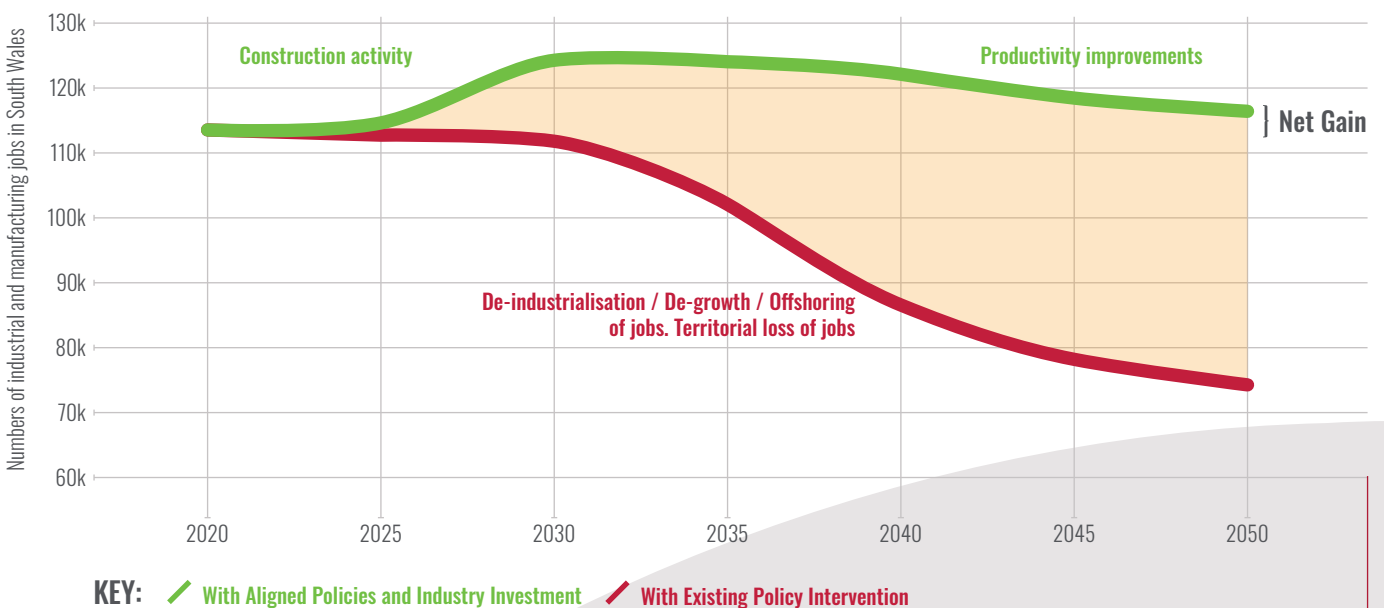
However, it is vital that industry, investors and the UK and Welsh Governments collaborate, guided by a suite of policy drivers to unlock financial investment and to generate momentum.

## SWIC's Carbon Emission Projections



This graph represents the total SWIC regional emissions. It does not represent emissions of individual companies. Some companies may not be able to achieve net zero alone but will rely on others within the region to offset, resulting in a net zero overall position.

## Potential Impact on SWIC Jobs through Decarbonisation



This graph estimates the total regional industrial jobs trajectory. It does not represent individual company trajectories which may increase or decrease in job numbers as their net zero journeys unfold.

# The Strategy

**Across South Wales are areas of industrial high density centred around shipping/port facilities, enabling early initiatives to utilise localised asset and skill resources to accelerate the net zero transition.**

**SWIC's five major ports include two deep water facilities, located at Port Talbot and the Haven Waterway, that already provide nationally significant assets serving the UK's requirements for steel and energy supplies respectively.**

South Wales has a mix of renewable assets already in place with significant capability to increase capacity, particularly the potential for marine energy, for example large scale Floating Offshore Wind (FLOW) deployment. Combined with SWIC's large scale expertise for dispatchable clean power and storage systems, the integrated systems for accelerated transition to net zero are rapidly emerging.

During the project SWIC has developed a Clean Growth Hub (CGH) methodology which will inform dispersed sites on pathway options to transition to net zero or a significantly lower carbon position whilst waiting to integrate into the developing regional infrastructure initiatives. This ensures all South Wales industry will benefit from the plan and structures developed by SWIC.

SWIC has identified a suite of key policy drivers needed to unlock the opportunities present within South Wales, to achieve the SWIC vision and position SWIC as a leading cluster in the UK. SWIC's industries will work with the UK and Welsh Governments to deliver these policy drivers, unlocking the required investment and ensuring that the three core objectives can be met.

**SWIC's policy driver suite is organised into 6 main themes:**

- A. Ensure energy and carbon policies plus support mechanisms are internationally competitive (supporting objective 1)
- B. Provision of business model support for electrification and Carbon Capture and Utilisation (CCU) equivalent to the support for Carbon Capture and Storage (CCS) and hydrogen (supporting objective 1)
- C. SWIC to be included in Track 2 of the CCUS cluster sequencing process. To accelerate CCUS infrastructure for the region and the south of the UK (supporting objective 2)
- D. South Wales electricity grid and hydrogen infrastructure must be developed with urgency (supporting objective 2)
- E. Celtic Freeport bid to be successful (supporting objectives 1, 2 and 3)
- F. Collaboration is crucial for clustering (supporting objective 3).

Net Zero Industry Wales (NZIW), a pan Wales organisation, has been set up to support Wales's existing and emerging industrial clusters, thereby maximising the lessons learned and opportunities available for the whole of Wales.

# Next Steps

## Our industries will:

- Continue to establish their optimum decarbonisation routes that enable future net zero options. (It should be noted that Industry has already committed to over £100m worth of investments associated with this plan)
- Continue to implement early measures with support from ongoing funding streams such as IETF, IHA, TFI as required
- Apply for Track 2 of the CCUS cluster sequencing programme to initiate CO<sub>2</sub> shipping from the region
- Engage with and capitalise on Freeport development in South Wales to accelerate net zero transitions
- Complete the IDC supported SWIC Deployment Project that is providing the basis for the infrastructure development and unlocks the £billions of investments needed
- Combine locally where appropriate into SWIC supported clean growth hubs that will also strengthen SWIC's aspirations to secure supply chains and create circular economy opportunities
- Develop and optimise the new entity NZIW in its support of SWIC to:
  - Provide the forum for continued trusted collaboration between industry, governments and academia
  - Follow through on the policy driver requirements
  - Set up working groups – provide the evidence going forwards and future project collaborations
  - Support industries with funding stream access and influencing business models
  - Work with infrastructure providers to develop the vision into a reality to create the required connections.

***“SWIC is committed to transition towards producing more sustainable goods and services in Wales, as set out in the SWIC Cluster Plan, 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 and 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 and resilient industry that the citizens of Wales can continue to be proud of.”***

**Ben Burggraaf, CEO of NZIW**

# The SWIC Plan for Clean Growth

## Our Ambition

The SWIC vision has been developed by industries from Milford Haven in the west to Newport in the east, encompassing one of the UK's recognised industrial heartlands.

The unique industrial heritage of the area is hugely advantageous to South Wales in accelerating the transition to net zero, benefitting regional communities and businesses.

Our vision of adapting our nationally significant industry, skilled people and energy infrastructure assets will also significantly contribute to the national net zero landscape.

## SWIC's Vision

*"Develop a world leading, truly sustainable industrial cluster, befitting the societal needs of 2030, 2040, 2050 and beyond".*

**South Wales industry and power plants typically emit ~16 MtCO<sub>2e</sub> per year of emissions directly (Scope 1).**

Our industrial heritage helps provide the resources to kick-start clean growth for the South Wales region, delivering aspects of UK Government policy and the Welsh Government's aspirations from the Well-being of Future Generations (Wales) Act 2015.

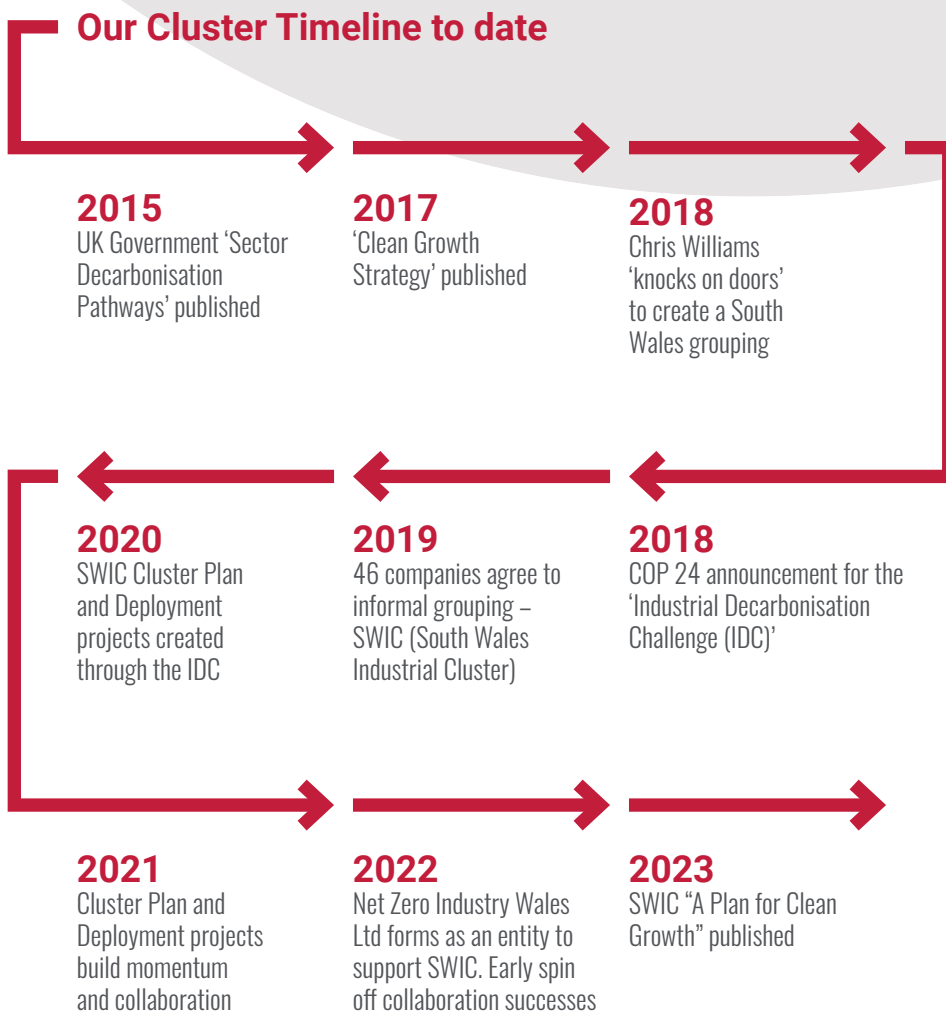
**Delivering this will act as a catalyst in accelerating our industries in their regional transition to achieve:**

- Net zero industries in South Wales by 2040, equating to **40% reduction of total current Welsh CO<sub>2</sub> emissions** (Wales currently emits ~38 MtCO<sub>2e</sub> per year)
- **Retention of 113,000 jobs and a net positive job increase overall** (relating specifically to the production industry sector in South Wales)
- **Unlocking £30bn investment opportunities** within industries in the region (not including the investment for FLOW or tidal)
- **Growing the current £6bn Gross Value Added** benefit from South Wales production industry to an as yet undefined potential.

# Formulation of the Plan

As individual sectors and industries began to explore their decarbonisation options it became clear it was beyond the capabilities of individual sites to deliver the required outcomes for net zero.

Significant problems were identified, such as the lack of any known viable geological storage for CO<sub>2</sub> in the area. It became apparent from the outset that South Wales industry would have to employ a range of innovative solutions that would involve a number of stakeholders in potentially quite complex “end-to-end” solutions.



## The SWIC IDC funded Projects

The potential of IDC funding in 2019 provided the incentive to bring industries together to form SWIC. A key feature of IDC support funding is that project partners fund part or all of their own efforts, demonstrating their commitment to SWIC's aspirations.

Partners in the two SWIC projects range from energy production, distribution companies (including ports), manufacturing sites, local authorities, academia and a range of service providers (financial, legal, planning, permitting, infrastructure, technical/systems, engineering, and communications). The strong collaborations between both projects provide robust development opportunities.

Following successful navigation of the IDC support process, SWIC commenced the Cluster Plan Project, led by CR Plus, in February 2021.

### SWIC CLUSTER PLAN PROJECT

## The Cluster Plan Project

**30 formal partners and 1 participant**

Aiming to create the plan for clean growth and to identify next steps on the pathway to decarbonising industry in the region.

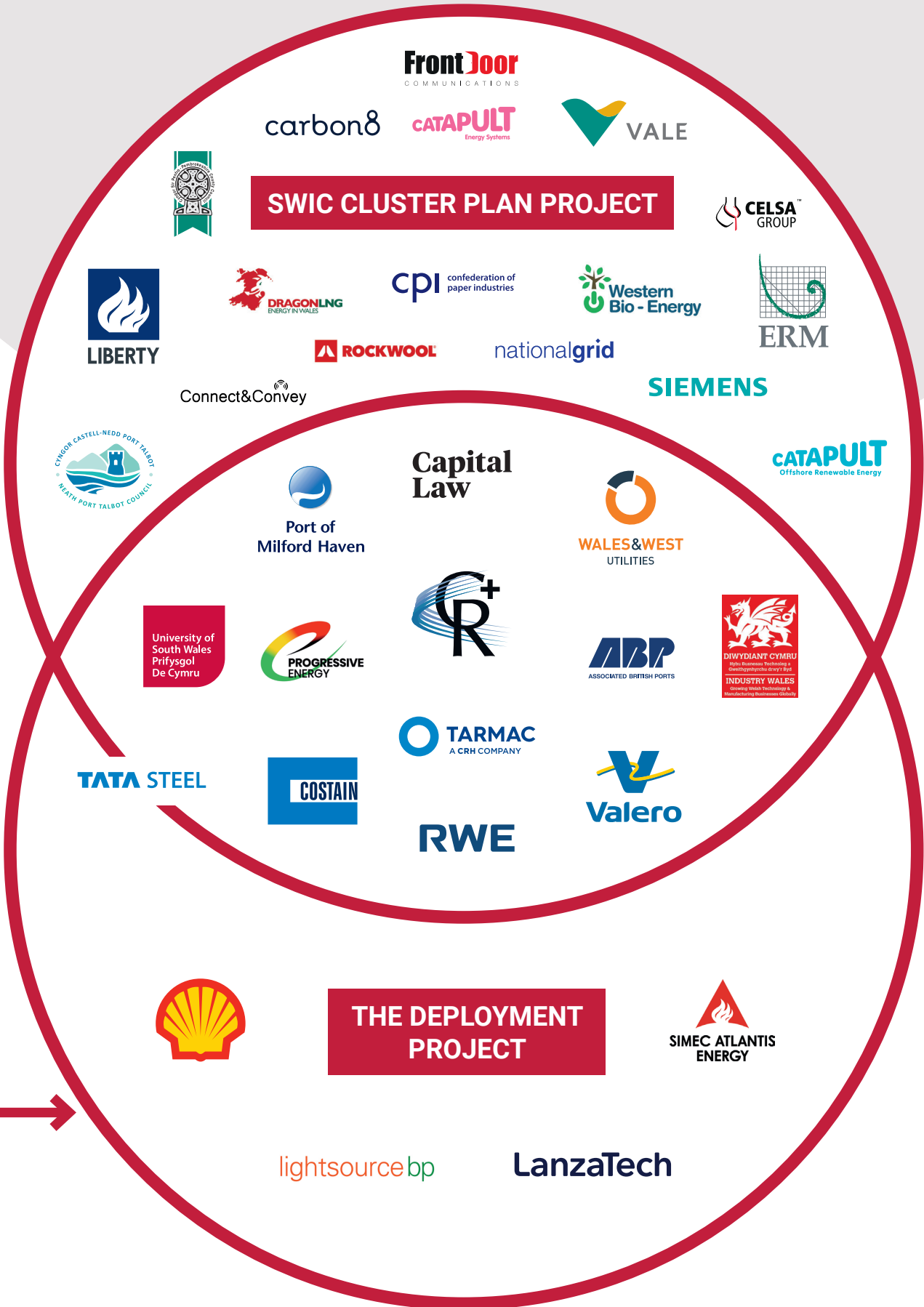
## The Deployment Project

**17 formal partners**

Engineering-based studies on the implementation of some of the largest potential decarbonisation opportunities and infrastructure development.

### THE DEPLOYMENT PROJECT





**SWIC CLUSTER PLAN PROJECT**

**THE DEPLOYMENT PROJECT**

FrontDoor  
COMMUNICATIONS

carbon8

cATAPULT  
Energy Systems

VALE



CELSA  
GROUP

LIBERTY

DRAGON LNG  
ENERGY IN WALES

cpi  
confederation of  
paper industries

Western  
Bio - Energy

ERM

ROCKWOOL

nationalgrid

SIEMENS

Connect&Convey



Port of  
Milford Haven

Capital  
Law



WALES & WEST  
UTILITIES

cATAPULT  
Offshore Renewable Energy

University of  
South Wales  
Prifysgol  
De Cymru

PROGRESSIVE  
ENERGY



ABP  
ASSOCIATED BRITISH PORTS

DIWYDIANT CYMRU  
Digital Business Transformation &  
Gwasgyllyddysu ddiwydiol  
INDUSTRY WALES  
Building Welsh Productivity &  
Manufacturing Business Capability

TATA STEEL

COSTAIN

TARMAC  
A CRH COMPANY

Valero

RWE



SIMEC ATLANTIS  
ENERGY

lightsourcebp

LanzaTech

# The SWIC cogs and roots of decarbonisation

To address the highly complex concepts underpinning industrial decarbonisation, the Cluster Plan has identified activity areas that are supported by cross-cutting themes.

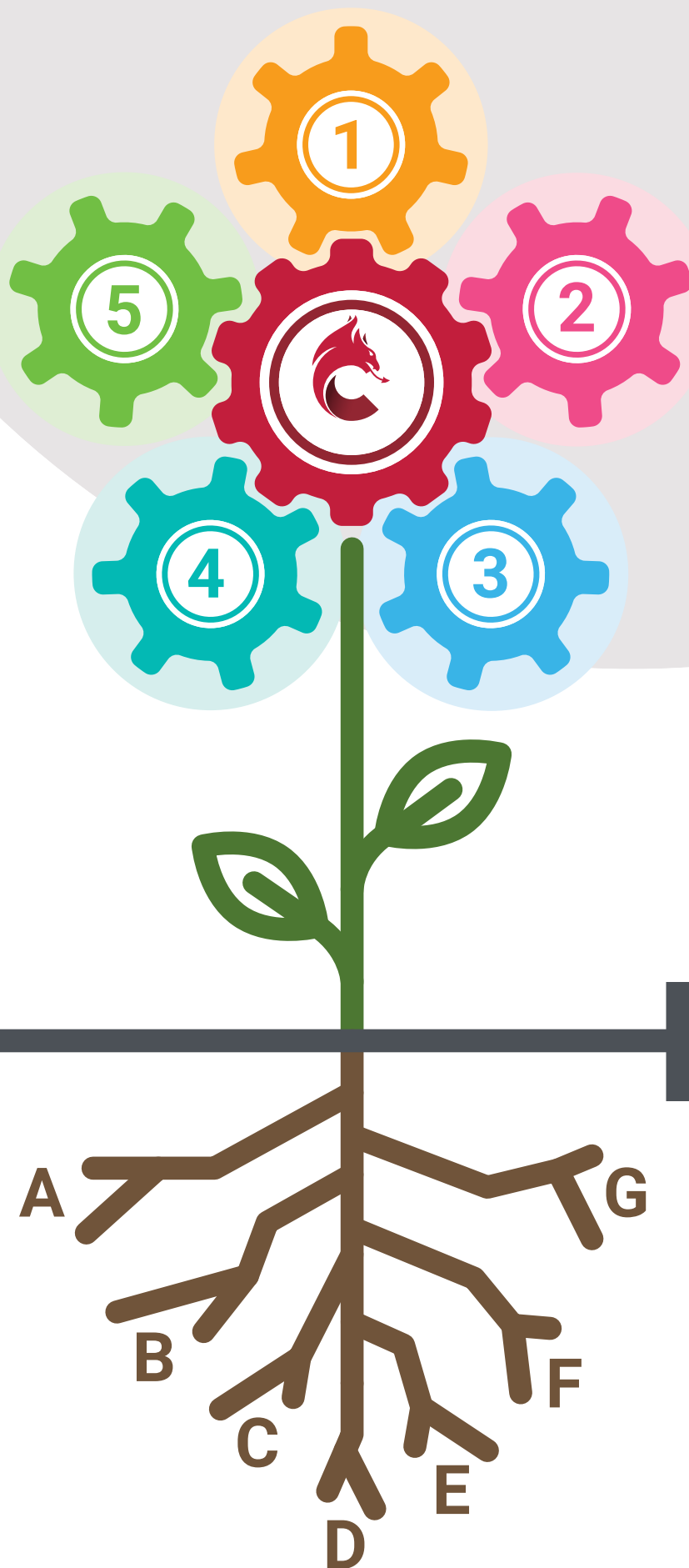
This thinking has evolved into the five cogs of decarbonisation supported by seven roots of support.

**The five cogs for industries to reach net zero can be summarised as:**

- 1. Energy and Resource Efficiency**
- 2. Fuel Switching**
- 3. Clean Growth Hubs**
- 4. Carbon Capture Utilisation (CCU)**
- 5. Carbon Capture and Storage (CCS)**

**The underpinning roots to support a successful transition to net zero for SWIC industries are:**

- A. Resourcing, Skills and Supply Chain Requirements**
- B. Circular Economy Principles and Carbon Accounting Requirements**
- C. Generation of Clean Energy and Infrastructure**
- D. Research and Innovation**
- E. Legal and Planning**
- F. Investment Requirements**
- G. Stakeholder Engagement**



**As our industries have been exploring their decarbonisation options, they have been able to shape their plans, with several case studies involving the cogs and roots, as signposted at the end of Appendix 2.**

**By using the above structures to help organise the areas that industries need to be progressed, we have been developing the methods required to progress each cog in a way that is adaptable over time, ensuring optimised long-term net zero outcomes**

The integration of these cogs and roots into net zero planning will be one of the main challenges to overcome on the pathway to decarbonisation, as no single item can be delivered on its own.

For example, one of the main objectives of the Cluster Plan Project was for industries to work together to help infrastructure providers understand what infrastructure will be needed for the region to support net zero manufacturing. This allows investment with confidence from both the infrastructure providers and the demand-side users. A huge regional project plan based on this work will need to be initiated to coordinate a just transition while policies and plans become fixed over the coming years. As individual industries establish access to infrastructure in terms of grid connection, hydrogen and CCS, SWIC will be best placed to help facilitate this ambitious regional transformation.

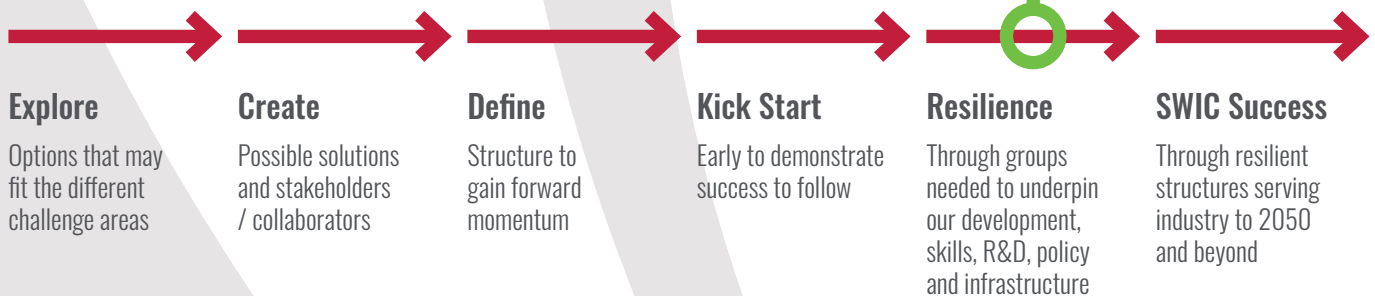
As part of this, the SWIC Cluster Plan has been developing and trialling Working Groups to provide a mechanism to keep momentum and facilitate action. These groupings provide a bottom-up approach. SWIC's Cluster Plan has an integration team that merges the resulting outcomes to share lessons, exploit opportunities, anticipate unintended risks, and provide a voice for creation of appropriate policy, enabling the working groups to deliver the net zero ambition. This integration team can be considered as the top-down team. Only by working together from top-down and bottom-up, to meet in the middle, will we be able to deliver net zero as quickly as possible.

# What has SWIC Cluster Plan done so far?

## Establishing our Vision

SWIC's geographical area has a diverse industrial landscape that encompasses industries emitting quite intensive carbon as well as those emitting relatively modest levels. These industries employ significant levels of people in their local areas.

## The Cluster Plan strategy has been to:



Over the two years of the Cluster Plan Project, SWIC's industries have individually assessed their decarbonisation options, leading to the formation of local infrastructure requirements which are being developed using the concept of 'SuperPlaces', such as Milford Haven, and Clean Growth Hubs (CGHs). CGHs are emerging in Port Talbot, Barry, Cardiff and Newport to accelerate local infrastructure needs.

As our industries look to electrification and hydrogen, they are shifting their direct (Scope 1) and indirect (Scope 2) carbon emission balance. Larger amounts of low carbon power generation and an electricity grid that is fit for purpose will be needed to help achieve net zero. The Milford Haven SuperPlace, where it is envisaged that most of the low carbon power and hydrogen will be created, plays a key role in the decarbonisation of our electricity system by 2035.

The HyLine Cymru project announced by Wales and West Utilities would provide the ability to transport that hydrogen away from Milford Haven into the middle of SWIC and link to the developing National Gas Transmission's Project Union.

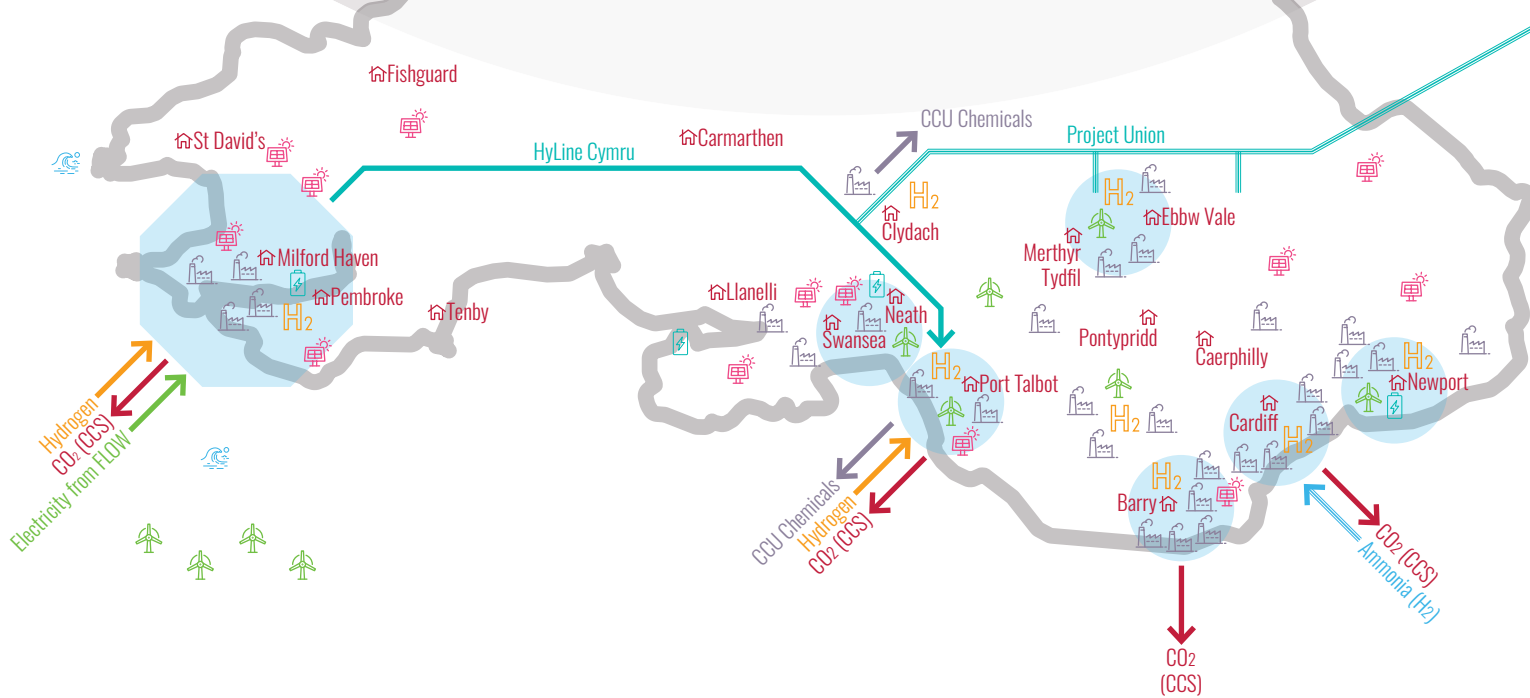
The Celtic Sea FLOW projects, plus Pembroke Net Zero Centre, combine to create the gigawatts of stable low carbon power that underpin our net zero ambitions for South Wales and this will extend to have national benefits.

The UK Government's CCUS cluster sequencing process is due to allocate its Track 2 funding. It's imperative that SWIC has access to CO<sub>2</sub> storage facilities in the Track 2 process via CO<sub>2</sub> shipping to ensure Welsh industry has access to the abated power that industry needs even when the wind is not blowing.

The map opposite represents our current thinking on the key features of the wide-ranging activities involved in our vision.

# The SWIC vision of 2040

The vision shown in the map, with the work done by the individual industries and assuming our policy drivers are delivered, would produce the projections shown in the carbon emissions and jobs graphs overleaf.



**KEY:**

- Milford Haven Waterway Future Energy Cluster
- Clean Growth Hubs
- Towns and Cities
- Industrial Sites
- Solar Power
- Wind Power
- Marine Energy
- Hydrogen Generation
- Battery Technology
- HyLine Cymru
- Project Union
- Electricity from FLOW
- Hydrogen
- CO2 (CCS)
- CCU Chemicals
- Ammonia (H2)

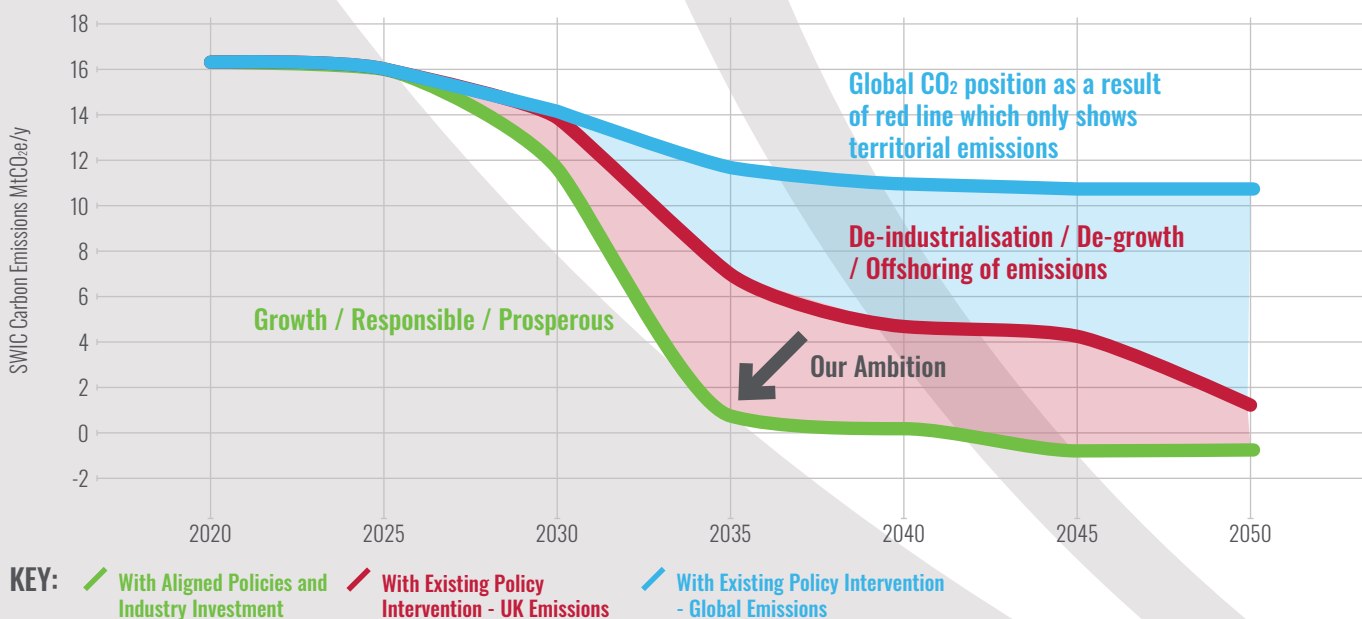
**The South Wales region will need to deploy a whole range of technologies to achieve net zero in a timely manner to not only accelerate but also achieve a transition that serves South Wales societal needs and builds on the regional industrial heritage.**

**In the southwest we are building the nationally significant energy infrastructure facilities at Milford/Pembroke, as part of the Milford Haven Waterway Future Energy Cluster, which will initially help to decarbonise significant carbon emitters in southwest Wales. Project HyLine Cymru (proposed by WWU) will then distribute hydrogen to the Swansea, Neath, Port Talbot area directly or by feeding through the National Transmission System (NTS) off-take point at Clydach.**

At Port Talbot plans to develop a world-class manufacturing and assembly facility for the offshore wind industry, combined with the production of low carbon fuels and CO<sub>2</sub> shipping, has the potential to create infrastructure that will support thousands of new jobs. In addition, there are plans for the production of low carbon hydrogen and low carbon sustainable aviation fuel to support decarbonisation of the aviation sector.

Southeast Wales industrial decarbonisation, although with fewer carbon emissions, significantly contributes to the socio-economic activity of South Wales. Therefore, its decarbonisation pathway is likely to start at or close to the port facilities, developing projects that can build into CGHs, that in turn will provide localised community heat, clean power and hydrogen infrastructure. Localised CGH infrastructure will link to the national gas and electrical transmission initiatives being developed, e.g. Project Union. In this way southeast Wales decarbonisation can advance and complement wider regional and national initiatives to achieve decarbonisation both efficiently and in a cost-effective manner.

## Creating the trajectory graphs



This graph represents the total SWIC regional emissions. It does not represent emissions of individual companies. Some companies may not be able to achieve net zero alone but will rely on others within the region to offset, resulting in a net zero overall position.

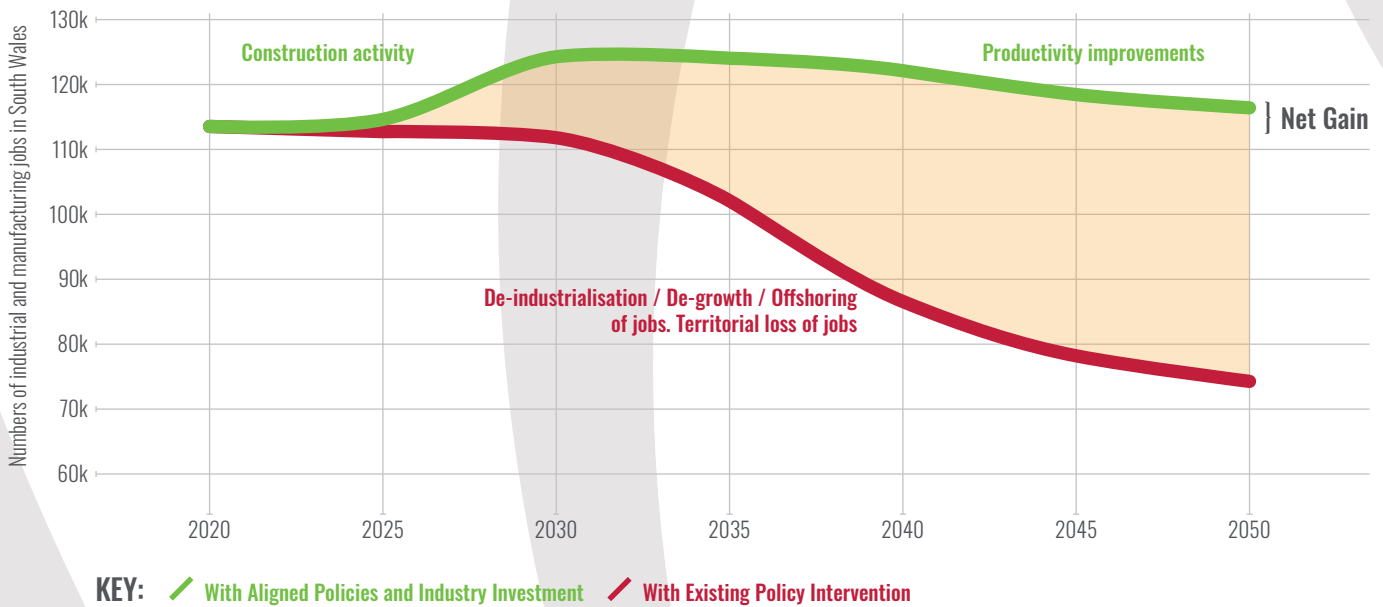
From the outset there has been some uncertainty from an investment landscape perspective. Thus we have investigated the potential options that the 'Art of the Possible' could look like, compared to what will happen to territorial and global emissions if existing policies (end of Jan 23) remain in place. Wales, through its Well-being of Future Generations (Wales) Act 2015, has a responsibility to consider the global impact of its actions as well as the direct impact on Wales. The graph opposite maps out the boundary limiting potential pathways for SWIC's 16 Million tonnes of CO<sub>2</sub>, which are the calculated emissions from South Wales industry and power between 2020 and 2050. The emissions numbers presented represent territorial emissions (mainly scope 1) and therefore are aligned with current government methodology.

The **red line** represents the likely territorial emissions pathway, should the existing known policy trajectory (as of Jan 2023) remain unaltered. A significant quantity of the **red line** pathway occurs as a result of reduced industrial activity in South Wales (closure of certain industries), as industrial production is relocated offshore. It is anticipated that industrial activity will transfer to both low carbon and high carbon economies depending on corporate requirements, resulting in a likely global emissions pathway (**blue line**) that is higher than the reduced territorial emissions. Current carbon accounting systems are being developed to understand the complexity of territorial vs global emissions to help understand the **blue line** boundary pathway.

The **green line** represents the position SWIC strongly believes is achievable, where emissions reach net zero by 2040, with net negative emissions contributing thereafter. With this example both territorial and global emissions follow the same pathway. To achieve the **green line** industry, investors and governments would need to collaborate using the policy drivers indicated in this report to create both the financial investment landscape and momentum. Thus, the area between the red and green lines represents the net zero potential both in achieving net zero emissions and creating additional economic activity, which is key to delivering a prosperous Wales and UK in the future.

The graph overleaf represents what could happen to jobs based on the **red** and **green** boundary trajectories defined previously. Please note that the wider aspects portrayed are only best estimates at this stage, with the Cluster Plan Project helping to shape areas of future work where industry, academia and government will have to collaborate to obtain more detailed insights that can help form and refine emerging policy drivers.

## Potential Impact on SWIC Jobs through Decarbonisation



This graph estimates the total regional industrial jobs trajectory. It does not represent individual company trajectories which may increase or decrease in job numbers as their net zero journeys unfold.

The **red line** shows the estimated impact on jobs from de-industrialisation.

The **green line** attempts to show the retention and growth of jobs due to SWIC's ambitious plans and supportive policies.

The curved pathway of the **green line** estimates the job increases from construction activities and infrastructure developments for hydrogen, CCUS and electricity and the installation of the technologies on each industrial site, but it also takes into account the losses associated with productivity improvements such as increased digitisation and automation of existing manufacturing industries and the adoption of smarter net zero technologies. Therefore, this produces a net positive position on jobs rather than the sharp drop associated with the **red line**. It should be noted that the **green line** does not represent a wholly regional vision for jobs as this project is focused on industry only.

By using boundary conditions the capture of almost all pathway options is achieved. In practice, the order in which policy drivers are enacted and investments made are too many in number to present a few plausible pathways. Therefore, SWIC has initiated structures that will enable the collaborations to respond to circumstances as they arise to maximise the decarbonisation potential.

Overall, the graph highlights the key role policies can play in determining how quickly SWIC industries can decarbonise in collaboration with governments and stakeholders, and the extent that UK policy can impact global carbon emissions. This reinforces the importance of industries and governments working closely together to deliver net zero for the world.



# SWIC Cluster Plan Legacy

**Following on from what has already been achieved within SWIC, the intention of the Cluster Plan was not only to set out the proposed pathway for industrial decarbonisation but also to set up the structures required to be able to take the plan forward past the end of the project.**

**The setup of a formal entity to support SWIC in the future has been a key aim of the project.**

The grouping of the activities required to get to net zero via the five cogs and seven roots, and starting working groups to move the topic areas forward, provides the mechanism for industries to collaborate and identify barriers and challenges that need to be overcome. Finally, the creation of policy drivers which are currently required to support SWIC's ambitions, identifying what industries need from the UK and Welsh Governments.

## Activities in SWIC so far

**As part of the Cluster Plan Project a wealth of work has gone into exploring the SWIC pathways, listed in Appendix 2.**

As is the nature of the work carried out, some of the detailed work is publicly available whilst other pieces are confidential to project partners or smaller sub-groups. Further insights may be available upon request at the discretion of the partner(s) responsible for that area of work.

Furthermore, outside of the Cluster Plan Project industries and other organisations have been working on other activities that also contribute towards the SWIC vision. Many of these have had case studies developed that are available on the SWIC portal signposted at the end of this report.

# Policy Drivers

**The five cogs and seven roots to achieving decarbonisation provide a clear pathway forward for South Wales industry, but they can't be achieved without the appropriate support. A key output of the project has been to identify the vital policy drivers needed by industry and the further work required.**

**We have developed a list of 30 policy drivers for the UK and Welsh Governments.**

## Those policy drivers have 3 main objectives:

### 1. Industry:

Through a just transition, to deliver internationally competitive and sustainable low carbon industries

### 2. Infrastructure:

Exploit the significant renewable power capabilities available in South Wales to develop world-leading infrastructure to decarbonise our industries, attract additional investment and ensure long term employment in the area

### 3. People:

Create a globally recognised agile region that is innovative, opportunity-driven, highly skilled and capable of exploiting the huge clean growth opportunities that net zero offers South Wales.

## Based around 6 priorities: (in no particular order)

### A. Ensure energy and carbon policies, plus support mechanisms, are internationally competitive.

Thus, helping to prevent offshoring of emissions (carbon leakage), improving supply chain resilience, supporting industrial energy and resource efficiency and the development of the circular economy (supporting objective 1)

### B. Provision of business model support for electrification and Carbon Capture and Utilisation (CCU) equivalent to the support for Carbon Capture and Storage (CCS) and Hydrogen.

This will deliver efficient industries in the long run and support the development of the circular economy (supporting objective 1)

### C. SWIC to be included in Track 2 of the CCUS cluster sequencing process. To accelerate CCUS infrastructure for the region and the south of the UK.

Through the engineering work done in the Deployment Project, SWIC has the opportunity to lead the development of CO<sub>2</sub> shipping capability for the UK (supporting objective 2)

### D. South Wales electricity grid and hydrogen infrastructure must be developed with urgency.

Without grid connectivity and a hydrogen network then our industries will not have the infrastructure needed to implement their optimal decarbonisation pathway and to maximise the potential of Celtic Sea floating wind (supporting objective 2)

### E. Celtic Freeport bid to be successful.

This will accelerate the preparation within the region for building and maintaining floating offshore wind, renewable generation, CO<sub>2</sub> shipping, low carbon fuels, skills and the supply chains (supporting objectives 1, 2 and 3)

### F. Collaboration is crucial for clustering.

Support is needed to ensure ongoing collaboration maximises on the development of skills plans, supply chain opportunities, research and innovation benefits, and the development of Clean Growth Hubs (supporting objectives 1, 2 and 3).

## The table below shows the 30 policy drivers identified during the project.

### The table identifies:

- Which objective the policy driver supports
- Which priority the policy driver supports.

Number	Policy Drivers	Gov	Objective	Priority
1	Competitive industrial energy pricing	UK	1	A
2	CO <sub>2</sub> Non-Pipeline Transport (NPT) Business Model support	UK	1	C
3	A carbon charging policy that is fair and ensures an internationally competitive industry	UK	1	A
4	Continued energy and resource efficiency support funding (e.g. IETF)	UK	1	A
5	Electrification Business Model support	UK	1	B
6	Carbon Capture and Utilisation (CCU) Business Model support	UK	1	B
7	Incentivise the production and use of low carbon fuels	UK & WG	1	D
8	Develop globally agreed carbon accounting policies	UK & WG	1	A
9	Ensure electricity grid capability for a net zero region	UK & WG	2	D
10	Regulatory, planning and connections reform which allows electricity networks to move at pace and develop networks to meet future needs	UK	2	D
11	CO <sub>2</sub> shipping to be included in the Track 2 process of the Industrial Cluster sequencing	UK	2	C
12	Accelerated renewable power availability and options for storage to be progressed	UK & WG	2	D
13	Accelerated hydrogen availability to be progressed	UK & WG	2	D
14	Increased support and advocacy for hydrogen infrastructure development plans	WG	2	D
15	Water supply for hydrogen strategic plan needed	WG	2	D
16	Clean Growth Hub developments to be incorporated into council strategic visions	UK & WG	2	D
17	Develop policy to de-risk port infrastructure investment	UK & WG	2	D
18	Continued collaboration support	UK & WG	3	D
19	Ensure capable resource at WG and NRW for policy, planning consent and permitting development	WG	3	D
20	Circular economy to be recognised as an essential component of net zero	UK & WG	3	F
21	Skills plans to be developed	UK & WG	3	F
22	Research and innovation strategic plans to be initiated	UK & WG	3	F
23	Local supply chain opportunities to be maximised by UK companies	UK & WG	3	F
24	Support for the development of Negative Emission Technologies to be initiated	UK & WG	3	F
25	Policies and support mechanisms are developed to ensure they enable long term investments	UK & WG	3	F
26	Develop the 'Team Wales' concept by creating a net zero delivery team	WG	3	F
27	The Future Leaders Group concept is to be developed with the Future Generations Commissioner	WG	3	F
28	Ensure alignment of policy and funding mechanisms for both site decarbonisation and infrastructure	UK	3	F
29	Societal and public acceptance of net zero infrastructure mechanisms to be planned	UK & WG	3	D
30	Support the Celtic Freeport development	UK & WG	3	E

**Through NZIW, SWIC industries need to work with the UK and Welsh Governments on the delivery of these 30 policy drivers.**

This will then unlock the required investment to meet the 3 main objectives, ensuring our industries can not only be maintained, but grow through their just transition to a sustainable net zero future.



**Industry, academia and local, Welsh, and UK Governments must work together as a united 'Team Wales' to deliver the 30 policy drivers and maximise the environmental and economic benefits presented by this opportunity for future generations. It is envisaged that each policy driver will necessitate an action plan to be taken forward over a period of planned time.**

While many of the 30 policy drivers are not newly raised asks, collating them into one regional list will help both policy makers and industry to appreciate the scale of the task going forward. This will help with resource allocation on all sides and demonstrates the importance of NZIW and SWIC. Many of the drivers that are included in the Chris Skidmore net zero review are aligned to ours and we see this as strengthening our policy asks.

The policy drivers table can be used in many ways. For example, it can define the total overall cost benefit analysis and identify the economic risks going forward. Many of the policy drivers affect the whole of the UK and need to be tackled for all industrial clusters, highlighting the necessity for continued collaborative interaction between all UK clusters.

Industries' role behind this programme will be to work through the options for decarbonisation alongside infrastructure providers as per the five cogs, seven roots and the NZIW/SWIC collaborative working groups. This ensures that policy developments will, as accurately as possible, reflect industry requirements and encourage the investment needed to develop the pathways to net zero.

Appendix 1 (Policy Drivers) includes a more detailed breakdown to help explain some of the background to the policy drivers table.

# The Breakdown

## Background

In 2017 the UK Government published the **Clean Growth Strategy**, developed from working with UK industries to create decarbonisation pathway documents.

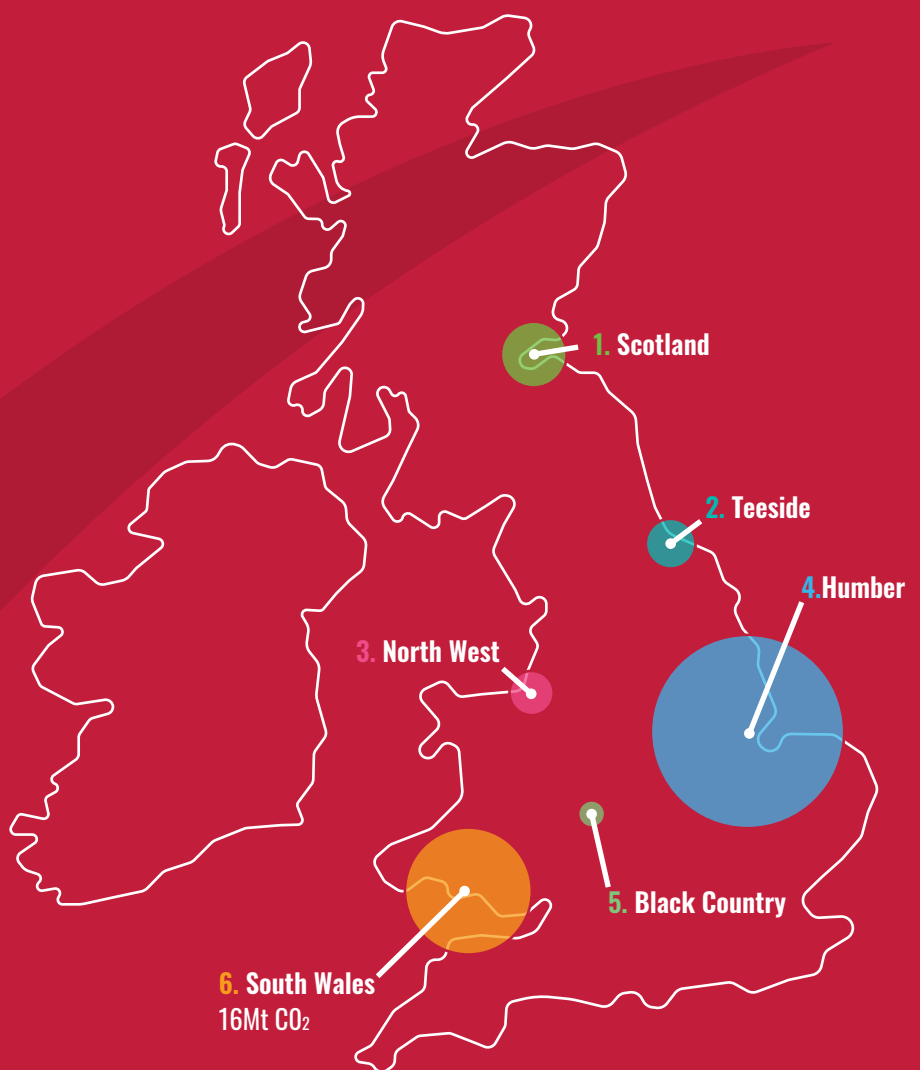
It became clear that regional infrastructure and new technologies would be needed as support for individual industries to decarbonise.

The Industrial Strategy Challenge Fund announced the Industrial Decarbonisation Challenge (IDC) at COP24, funding six clusters to research and develop a net zero plan. SWIC is the second largest UK industrial cluster in terms of its CO<sub>2</sub> emissions.

Many industrial clusters have been led by Local Enterprise Partnerships (LEPs) in the UK, providing the cluster plans with the regional economic intelligence. In SWIC, it has been the reverse, with industrial partners leading the cluster, and identifying the challenges from the bottom-up.

IDC Cluster Plan Projects have been funded for 6 clusters:

1. Scottish Cluster
2. Teesside Cluster
3. North West Cluster
4. Humber Cluster
5. Black Country Cluster
6. South Wales Cluster



## Five cogs proposed for achieving net zero in South Wales:



**1. Energy and Resource Efficiency**



**2. Fuel Switching**



**3. Clean Growth Hubs**



**4. Carbon Capture and Utilisation**



**5. Carbon Capture and Storage**

## What is an industrial cluster?

### World Economic Forum (WEF) states:

*“Industrial clusters are geographic areas where co-located companies, representing either a single or multiple industries, provide opportunities for scale, sharing of risk/resources, aggregation and optimization of demand.”*

### WEF states:

*“A holistic and collective approach is required to optimize emissions solutions and create an integrated energy system that maximizes system value outcomes across economic, social and environmental aspects.”*

**Strategic developments and strategies for “System Efficiency & Circularity, Hydrogen, Direct Electrification & Renewable Heat, Carbon Capture, Utilisation & Storage” will be required.**

## South Wales - a heritage of industry and development

**The area covered by the South Wales Industrial Cluster is vast, spanning the M4 Corridor from Milford Haven in the west to Newport in the east – 110 miles wide and up to 40 miles deep. South Wales has a rich industrial history which has shaped the development and growth of this area for hundreds of years.**

*“At the end of 18th Century, the Industrial Revolution sought out the iron, limestone, timber, and coal that was plentiful in the region. Since then, South Wales’ industry was, at its peak, the biggest producer of iron and a supplier of one third of the world’s coal. South Wales was the first industrial society where more people were employed by industry than agriculture.”<sup>1</sup>*

Today, South Wales is home to a significant industrial base. This includes one of the UK’s seven oil refineries, the UK’s largest integrated steelworks and the only nickel refinery in the UK. This nickel refinery, dating to the turn of the 20th Century, and one of only four nickel refineries in Europe, is one of many large industries in South Wales. These include several large steel manufacturing plants and industries within a diverse range of sectors including cement, paper, glass, mineral wool and chemicals, food and general manufacturing industries.

As well as its unique industries, South Wales has a large and diverse energy supply sector including large combined cycle gas turbine (CCGT) power stations, one of which is among the largest in Europe, plus numerous on-shore wind sites and two liquefied natural gas (LNG) terminals which supply over 20% of the UK’s natural gas demand.

As part of the IDC, over the past two years the SWIC industries have been individually identifying their pathway to decarbonisation. Then, working together in mini clusters, they have explored the local infrastructure needed in Milford, Port Talbot, Barry, Cardiff and Newport. In parallel, the larger infrastructure and energy supply challenges for the wider SWIC region as a whole have been considered.

In essence, as the industries of South Wales move to electrification and hydrogen they are shifting their emissions from Scope 1 to Scope 2 as part of their reduction strategy. This shift will require larger amounts of low carbon power generation and electricity and gas grids that are fit for purpose.

<sup>1</sup> Visit Wales. Retrieved from <https://www.visitwales.com/destinations/south-wales/uncover-south-wales-history>



# Industry in South Wales and SWIC

## Successes so far

**SWIC formed in January 2019 as an unofficial group with a steering team made up of members from Tata Steel UK, Celsa Steel UK, ROCKWOOL Limited, Valero Energy, Vale and the University of South Wales. Now formalised, the steering team acts as the governance and drive for the cluster as it has matured on its journey.**

So far, SWIC has over £100 million of committed investment associated with this plan, which does not include the additional investment of the many uncounted hours of time and expertise that individuals have added to projects in developing feasibility, deployment and engineering studies.

### Achievements so far include:

- Cluster Plan and Deployment Industrial Decarbonisation Challenge (IDC)-funded projects
- The support of SWIC via a legal entity - Net Zero Industry Wales (NZIW)
- The launch of the Milford Haven Waterway Future Energy Cluster, a national energy asset which aims to achieve 20% of UK Government low carbon hydrogen production target by 2030 and at least 10% of UK Government Floating Offshore Wind (FLOW) target by 2035. This incorporates:
  - Gigawatts (“GWs”) of FLOW in the Celtic Sea
  - The RWE Pembroke Net Zero Centre, which is looking at decarbonisation of the RWE Pembroke power station with hydrogen and CCS, development of a hydrogen electrolyser, and FLOW in the Celtic Sea
- CO<sub>2</sub> shipping terminal and vessel concepts developed in Milford Haven and other ports across South Wales
- The visioning of Future Port Talbot, linked to FLOW, port-centric manufacturing, production of low carbon fuels and CO<sub>2</sub> shipping in South Wales
- LanzaTech, a global commercial CCU company, is building its base in the region facilitated by a £25m DfT grant
- Wales & West Utilities (“WWU”) is progressing with hydrogen pipeline (HyLine Cymru) developments, aligning with National Gas Transmission’s Project Union
- Development of industrial Clean Growth Hubs in Barry, Port Talbot, Margam, Cardiff and Newport
- Many partner industries are progressing with energy and resource efficiency, electrification and hydrogen developments.

**Combined, these achievements enable and initiate a new economy for South Wales and for the UK, rich in commercial and further investment opportunities, given the right policy interventions.**

The SWIC project represents over 113,000 Wales based industry and manufacturing jobs that would be preserved and secured. In addition, there would be a net gain of 5,000 jobs in supporting industries and clean energy infrastructure, opening up all sorts of local supply chain opportunities, especially in renewable energy and CCU.

Collaboration has been the key driver in enabling these achievements. There are 30 partners and 1 participant on the Cluster Plan, 17 partners on the Deployment Project (with many partners involved in both projects) and over 100 further organisations that have been directly engaged with SWIC activities in the past three years from across industry, Governments, academia and the private sector. SWIC will continue to develop, to facilitate integration, and build on the progress made within SWIC projects so far.

An exciting vision for the region has developed as a result of the collaboration so far. By developing the infrastructure to enable manufacturers to ‘produce products in a net zero way’, Wales will be recognised on a global stage, helping to attract inward investment and to ensure prosperity for future generations in a net zero world.

## Aligning to local and global goals

Wales led the world with its Well-being of Future Generations (Wales) Act 2015 the (“Future Generations Act”) which builds upon the UN’s Sustainable Development Goals.

The Future Generations Act has “the sustainable development principle” at its heart, which ensures that public bodies subject to the legislation must have the well-being of future generations at the heart of their policy decisions. The Future Generations Act makes it clear that the listed public bodies must work to achieve all, and not less than all, of the seven goals.



1. A prosperous Wales

2. A resilient Wales

3. A more equal Wales

4. A healthier Wales

5. A Wales of cohesive communities

6. A Wales of vibrant culture  
and thriving Welsh language

7. A globally responsible Wales

**As part of the SWIC Deployment project, a Future Leaders Group (FLG) has been formed with members from the different partner organisations.**

There have been two different cohorts of the FLG to date. The FLG cohort of 2021/22 mapped the activities of SWIC against each of the seven “well-being goals” of the Future Generations Act, which was an excellent way to show how SWIC’s activities align with the Act and its aims.

### **1. A prosperous Wales**

SWIC strives to achieve net zero by decarbonising heavy industry in South Wales. SWIC endorses investment to secure a long-term, lower carbon, industrial presence in Wales and to promote the economic prosperity of future generations. The success of SWIC and its legacy is dependent on appropriate financial support mechanisms for green technologies and consistency from Government in its approach to business modelling.

### **2. A resilient Wales**

All industrial planning and activity will strive for biodiversity enhancement and mitigation of environmental degradation and habitat loss, safeguarding ecological resilience while promoting a responsible and sustainable use of resources. SWIC promotes and is investigating how waste materials can be used as fuel for other processes, encouraging a circular economy. SWIC will develop the technologies, skills and knowledge to preserve and improve our ecosystems.

### **3. A more equal Wales**

SWIC will be the industrial hub that supports the “just transition” framework. It will enable greater diversity in the green industry sector, promoting active collaboration between industries, schools and universities. SWIC encourages the involvement of women, disabled people, neurodiverse people, people from Black, Asian and other ethnicities and people from LGBTQIA+ community to take an active role in the green economy, regardless of their socioeconomic background, via education and training in green skills and STEM subjects at an earlier age.

### **4. A healthier Wales**

SWIC project aligns with reducing pollution, improving air quality and enhancing nature. This green industrial revolution will accompany the delivery of training in green skills for new jobs. These factors contribute to maximised physical and mental well-being of employees, and prolonged life expectancy and greater quality of life for communities in industrial areas.

### **5. A Wales of cohesive communities**

The SWIC project encourages colocation of community growth with industry growth to conserve and develop attractive, viable, well developed and safe industrial communities which will continue to support the economic futures of coming generations. SWIC aims to retain and attract talented young individuals to develop and stay in Wales.

### **6. A Wales of vibrant culture and thriving Welsh language**

Welsh heritage is closely linked with the prosperity of industry and the legacy which remains. SWIC protects this Welsh industrial heritage by encouraging industries and the communities in which they are built to thrive, by modernising themselves and becoming part of the green industrial revolution.

### **7. A globally responsible Wales**

SWIC collaborates across borders to achieve its decarbonisation aims whilst also remaining independent in its goals, such as the establishment of carbon dioxide shipping capabilities in South Wales. This promotes international responsibility and accountability, contributing to global well-being.

# The Five Cogs of Decarbonisation

SWIC's five cogs of decarbonisation provide a framework for ways industrial sites and power generators can move towards being net zero.

Accomplishing net zero cannot be done by solely implementing one cog in isolation, but rather requires a combination of all five.



## 1. Energy and Resource Efficiency

Reducing energy and resource use which in turn reduces demand, and therefore the magnitude of supply infrastructure, contributing to a "least cost" transition.



## 2. Fuel Switching

Switching from carbon intensive energy vectors to renewable options. Moving away from the current high use of natural gas in most cases will reduce emission points and make carbon emissions more manageable.



## 3. Clean Growth Hubs

Establishing interactions outside of a site boundary using energy or material vectors to maximise the opportunities for decarbonisation and clean growth for all.



## 4. Carbon Capture Utilisation (CCU)

Converting captured carbon into useful products such as fuels, chemicals, aggregates and foodstuffs.



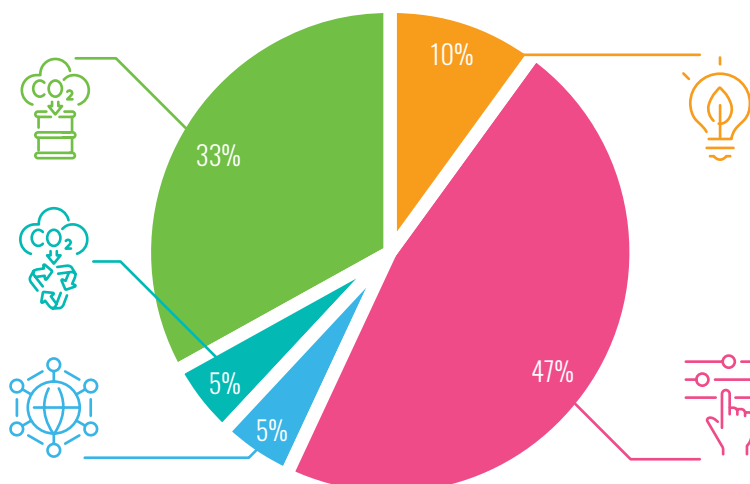
## 5. Carbon Capture Storage (CCS)

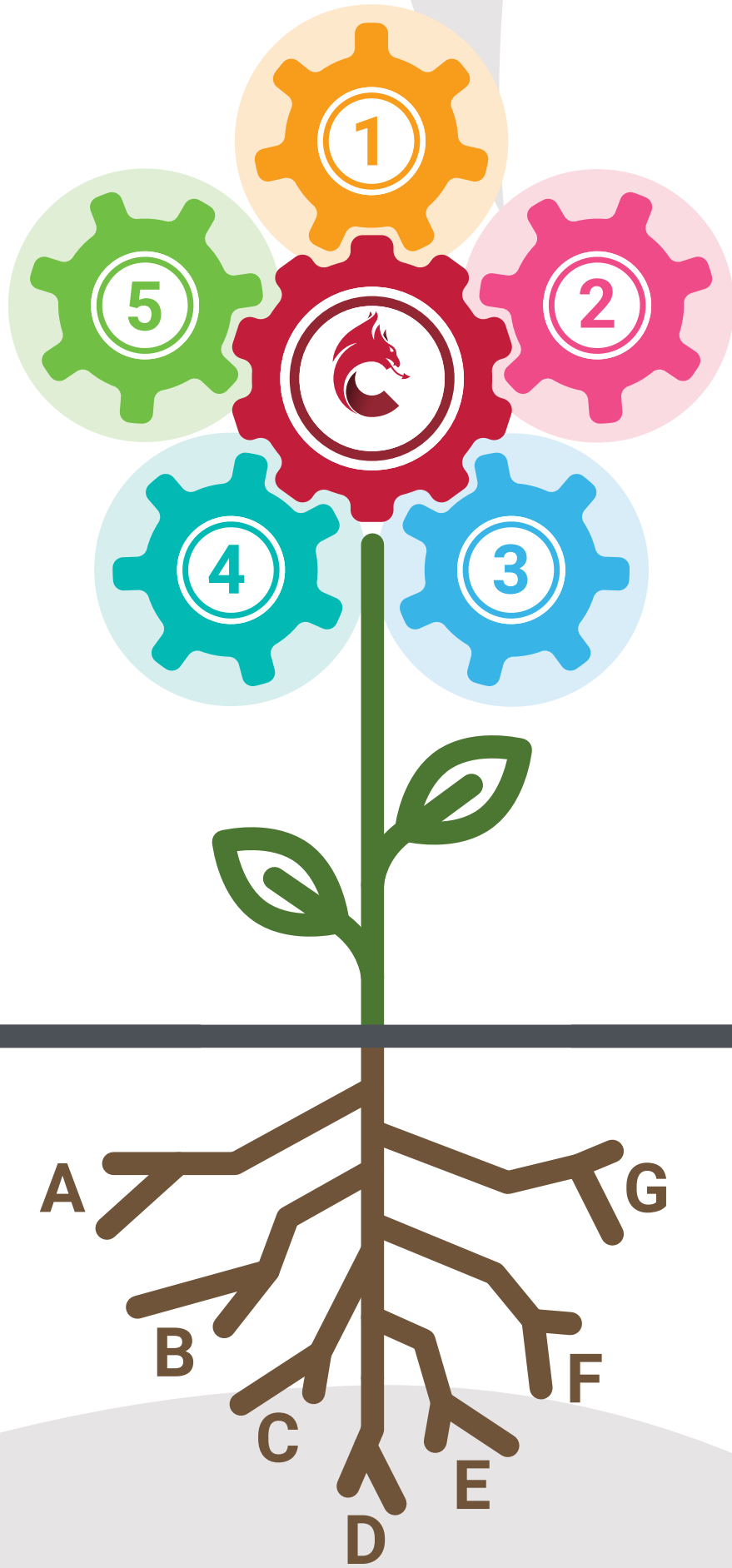
Capturing carbon and shipping it to offshore carbon storage sites, focusing on the extra-largest emitters. This is a necessary step to decarbonise the largest sites and upscale hydrogen production at the rate required.

### The following segments outline what each of these activities mean in a little more detail.

The pie chart outlines the proposed split of the five cogs to achieve the SWIC net zero ambition with support from the policy drivers. It must be recognised that the pie chart will evolve as the region goes through its net zero trajectory.

As the amount of renewables increase, and battery storage and green hydrogen develop, the divisions within the pie chart will vary significantly. The chart reflects a suggested split for 2040 when SWIC's ambition of net zero is achieved and does not show the long-term evolution of infrastructure.







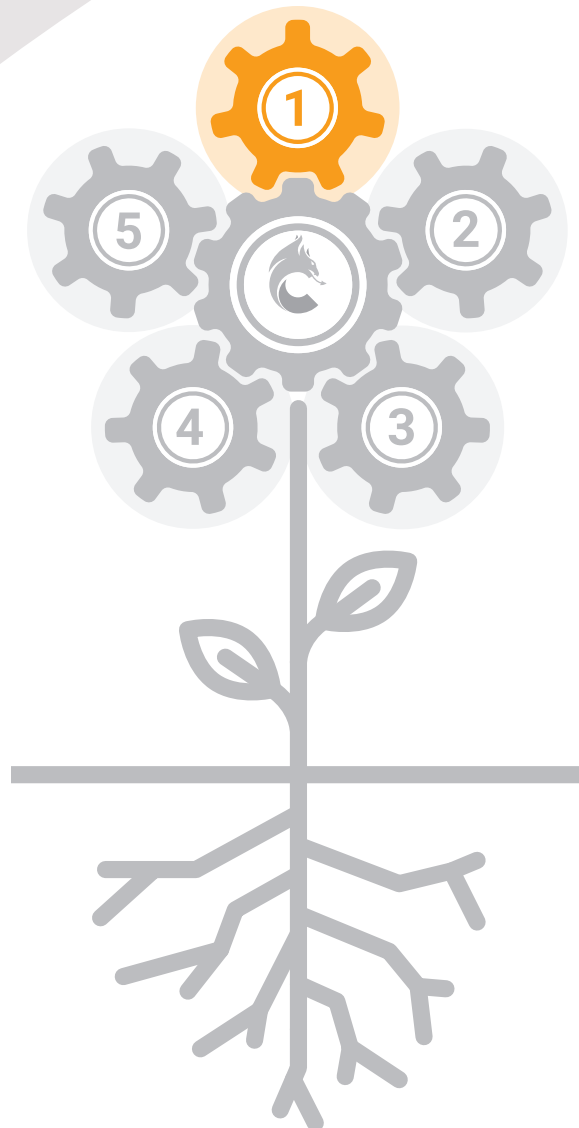
# 1. Energy and Resource Efficiency

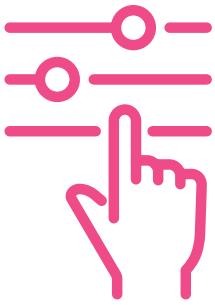
**Energy and resource efficiency is the use of Earth's limited resources in the most sustainable manner whilst minimising impacts on the environment. In industry, this has to be done in a way that is cost-competitive within their relevant markets.**

Focusing on energy and resource efficiency is important. It ensures that our industries are as lean as they can be and are well positioned in the short, medium and long term.

Schemes like the Industrial Energy Transformation Fund (IETF) and Transforming Foundation Industries (TFI) funds have been a huge success. Support mechanisms are of increasing importance in helping industry develop their opportunities for decarbonisation and must continue to be run for our industries to decarbonise in the most cost-effective way – a way that can be seen at consumer level.

It is anticipated that energy and resource efficiency will eliminate around 10% of SWIC's emissions.





## 2. Fuel Switching

**Fuel switching involves moving away from traditional fossil-derived fuels such as oil and gas towards cleaner energy such as:**

- **Electrification** - suitable for many industries, especially low temperature manufacturing industries
- **Hydrogen** - especially useful for high temperature heat users and where there is a reductive chemical process
- **Alternative low carbon fuels** - such as the use of HVO in mobile plant or in rural industrial applications or biomethane where it is easily available.

Although all fuel switching options will be necessary if industry is to decarbonise quickly and with the least disruption to processing plants and operators, electrification is often the most efficient option. However, there are some obstacles to overcome, namely grid capability, equipment availability, the lack of an electrification business model and uncompetitive pricing.

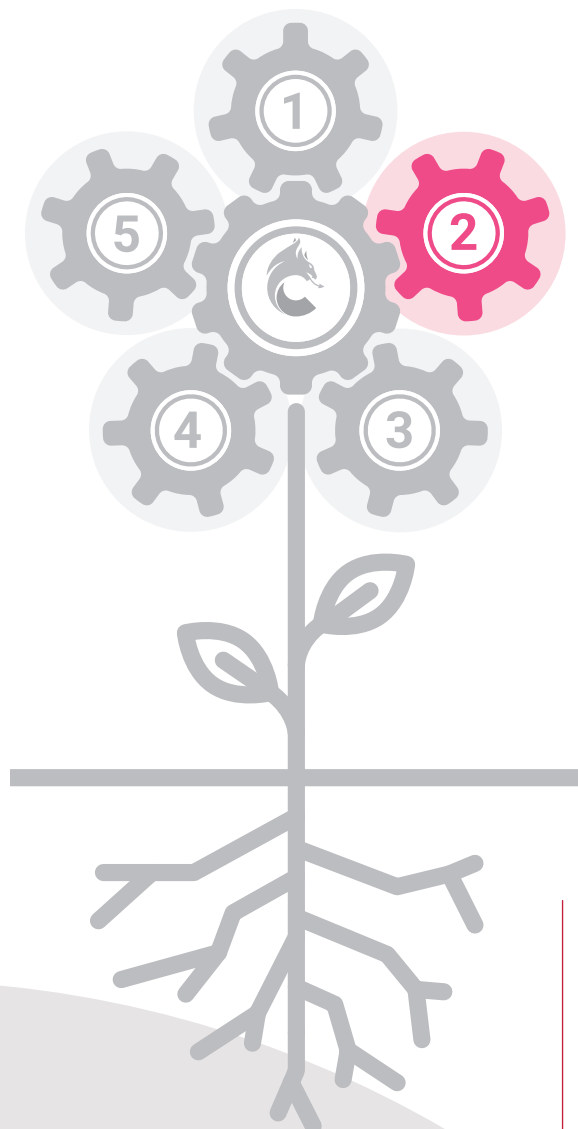
While the UK Government has policies developing to support CCS and hydrogen, it does not have policies to support electrification yet. Without policy support, industry may well be driven down a less efficient fuel switching pathway. Policy should be available to support industry in making a holistic decision regarding fuel switching which takes long term operational costs and efficiency into account.

Fuel switching to hydrogen is currently being explored by many industries via the supportive IETF, IHA and IFS funded projects. These projects can help to quickly reduce carbon emissions with the least operational impact on business as usual.

The current grid infrastructure is not capable of supporting all industries to fuel switch. Large-scale infrastructure upgrades are required for both electricity and gas grids to support the energy demands of the future, as well as support the acceleration of renewable power and hydrogen generation. Current grid infrastructure will need to go through a national programme of transformation to satisfy growing hydrogen and electricity demands as early as 2030. If done correctly, this transformation has the ability to accelerate the renewable power and hydrogen generation targets set out by the UK Government.

The developing hydrogen business model support mechanisms, IETF and IHA are all important in helping industry explore and implement fuel switching technologies. Electrification needs to be supported in the same way.

It is anticipated that 47% of SWIC's CO<sub>2</sub> emissions will be eliminated through fuel switching.





### 3. Clean Growth Hubs

**Clean Growth Hubs (CGHs) are the mechanism by which organisations can create a smart network, working together to share resources, clean energy and infrastructure, whilst maximising the benefits of decarbonisation for all.**

SWIC has proven that collaboration between organisations can achieve more than any single organisation could alone, and the continuation of this collaboration will be essential to move to net zero as quickly as possible.

Industries can create CGHs by investigating collaborative and geographically local projects, potentially making them more resilient and fit for the future. Supporting clean growth by attracting investment, new businesses to the area, and creating new high quality, sustainable jobs in the region is essential. As CGHs grow, this can fan outwards to develop national benefits.

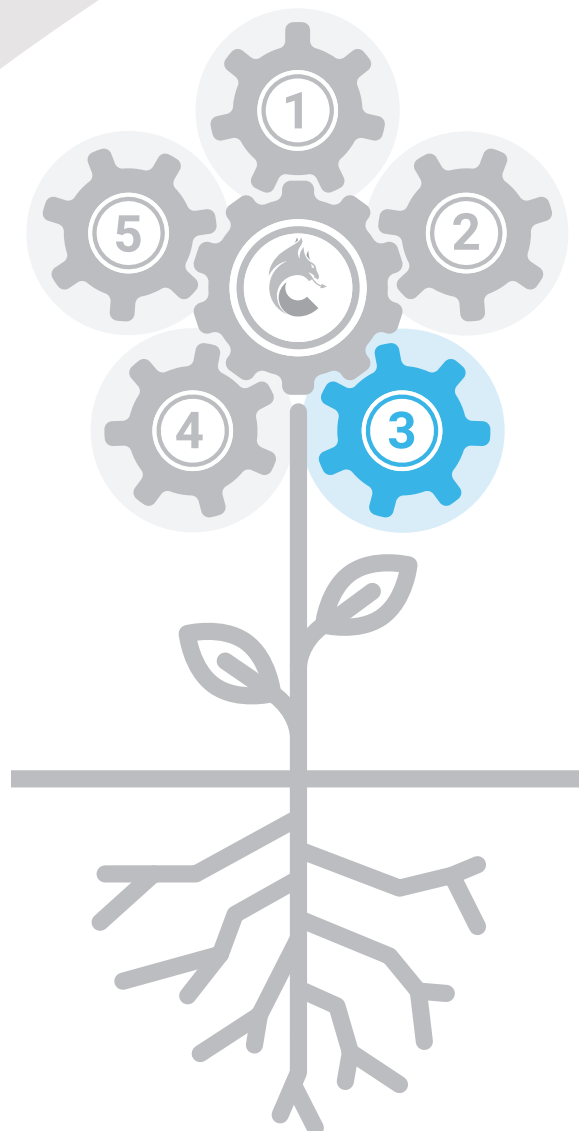
**These hubs aim to achieve the following goals:**

- 1. Local growth** – Through improving existing and attracting new industry, CGHs provide jobs, products and more investment into key regions of South Wales
- 2. Greater resilience** – By utilising local resources, skilled people, and considering the historic context, these hubs maximise the benefits to local people and communities. They also improve the quality of life and sense of place for the surrounding areas
- 3. Circularity** – CGHs aim to discover connections between processes where output of one can input to another, to minimise both energy and material waste
- 4. Infrastructure development** – To achieve net zero, huge efforts are required in upgrading, optimising and installing new infrastructure to support both electrification and transition into a hydrogen economy
- 5. Clean energy** – This includes the generation of electricity from renewable sources and alternate fuels (e.g. hydrogen) and its effective use by shared heat and private wire networks.

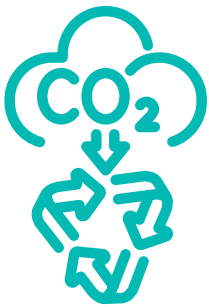
Symbiotic CGHs at Barry, Neath Port Talbot and Cardiff, for example, can combine to support the wider SWIC Zero Carbon Plans by accelerating local activity.

For CGHs to move forwards in a timely manner, they need legal, technical, economic and general facilitation support. The initiation and continued drive for the development of CGHs will require modest support to keep that momentum through funding routes such as the Shared Prosperity Fund. Examples of a potential small CGH in Margam and a larger CGH in Barry can be found on the case studies section in the SWIC virtual room.

It is anticipated that 5% of SWIC emissions will be eliminated by CGHs.







## 4. Carbon Capture and Utilisation (CCU)

**CCU is the process of capturing carbon dioxide from flue gases or from the air to be recycled for further use. By capturing and utilising the CO<sub>2</sub> a new value stream is created, avoiding the use of primary fossil fuels and turning costs into potential profit instead.**

CCU is also particularly beneficial for 'dispersed' businesses that cannot fuel switch and which are not located close enough to benefit from potential CO<sub>2</sub> shipping infrastructure. These industries typically emit less than 350,000 tCO<sub>2</sub>t/yr.

CCU sites also provide additional jobs and revenue for the region, therefore inputting further value into the South Wales economy.

### Uses of CCU technologies are:

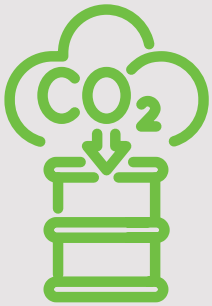
- Direct usage in the food and drink industries
- Green Fuels – captured CO<sub>2</sub> can be reacted with hydrogen to create hydrocarbon-based fuels such as methanol
- Green Chemicals – captured CO<sub>2</sub> can be used to produce hydrocarbons for use as chemical feedstock, e-methanol which can be used as a fuel and materials such as plastic
- Accelerated Carbonation Technology (ACT) – a combination of flue gas with ashes / dust from a range of industries creates building aggregates
- Algae – untreated flue gas reacts with algae to create a range of products such as animal protein feed.

**While there are currently policies being developed to support CCS and the creation of hydrogen, there are currently no policies in development that are related directly to CCU. To facilitate the implementation of CCU, policy is required that includes:**

- Streamlined carbon accounting that benefits industries by showing the carbon abated by the technology. For example, a CCU technology that does not permanently abate CO<sub>2</sub> still reduces CO<sub>2</sub> as a replacement for virgin inputs elsewhere
- Promotion of the circular economy through the reuse of CO<sub>2</sub> and material vectors
- Facilitation of Clean Growth Hubs including the collaboration of multiple organisations that can gain from a CCU technology
- The view of CO<sub>2</sub> as a resource and economic opportunity.

It is anticipated that 5% of SWIC emissions will be eliminated by CCU.





## 5. Carbon Capture and Storage (CCS)

**CCS in South Wales is critical to decarbonise industries where unavoidable emissions arise from process activities. South Wales, like the whole of the south of the UK, does not have access to CO<sub>2</sub> storage and it will be a necessity to ship captured CO<sub>2</sub> to available stores in the north of the UK.**

Similar projects are already underway in Norway, Netherlands, Japan, and many other countries. As part of the SWIC deployment project CO<sub>2</sub> shipping from South Wales is being engineered. As stated in our policy drivers, it is therefore important that SWIC and CO<sub>2</sub> shipping is part of the UK Government's Track 2 Cluster Sequencing programme.

There will always be some residual emissions that are not or cannot be captured and there is requirement for 'negative emissions' technologies such as Bio Energy Carbon Capture and Storage (BECCS), Direct Air Capture (DAC) and agriculture.

It is likely that CO<sub>2</sub> shipping capabilities will need to be developed in Milford Haven, Port Talbot, Barry, Cardiff and Newport. This shipping capability will form part of a UK shipping capability linking in with Avonmouth, the Solent, London and the stores in the north of the UK. There is also a European CO<sub>2</sub> shipping capability being generated that will link Ireland, UK and mainland Europe.

It is likely that 33% of SWIC emissions will be abated by CO<sub>2</sub> shipping.

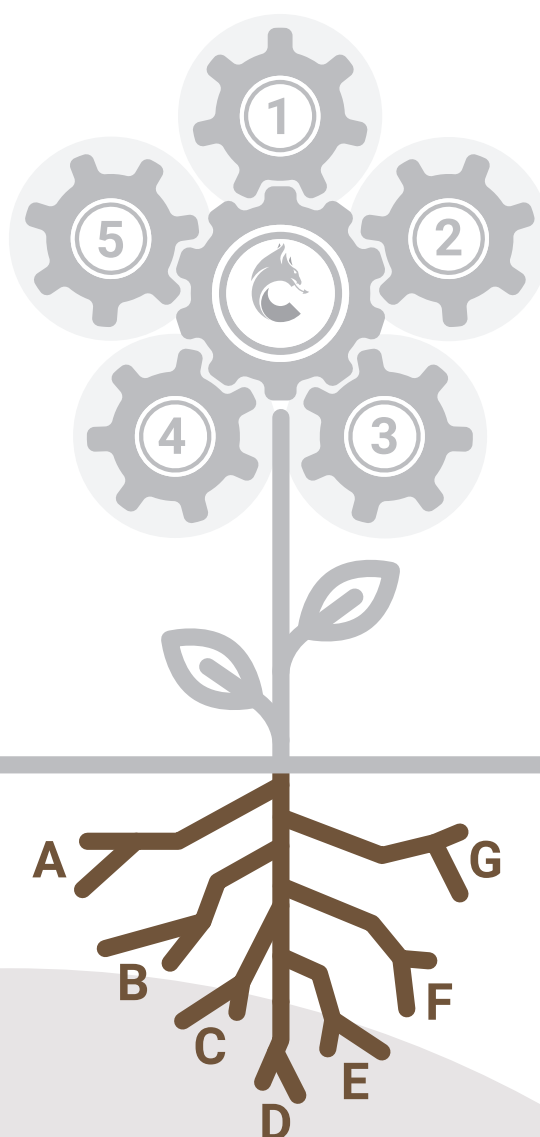


# The Seven Roots Supporting Decarbonisation

By implementing the five cogs of decarbonisation, net zero can be achieved. But the seven essential roots of support for these elements are also required in the long run. The five elements will only be viable for businesses when these roots are unlocked through policy interventions by both the UK and Welsh Governments.

As a reminder, the seven roots are as follows:

- A.** Resourcing, Skills and Supply Chain Requirements
- B.** Circular Economy Principles and Carbon Accounting Requirements
- C.** Clean Energy and Infrastructure Development
- D.** Research and Innovation
- E.** Legal, Planning and Permitting
- F.** Investment Requirements
- G.** Stakeholder Engagement.



## A. Resourcing, Skills and Supply Chain Requirements

**“Skills and resources are the closest silver bullet to get to net zero”**

**Prof Mercedes Marotor-Valer, Heriot-Watt University, Director of IDRIC.**

The current South Wales workforce of over 113,000 people is highly productive and skilled. Many of the roles required to support a hydrogen economy and CO<sub>2</sub> shipping are already in situ (such as trained process operators, engineers with technical, operational, maintenance and storage expertise). However, many of these roles will need to be upskilled.

Industries already face general resourcing issues such as an ageing workforce and low interest in working in industry from younger people. Now, industries must also manage a lack of resourcing whilst driving towards net zero. There is a need to improve resource numbers to write bids for funding, to improve knowledge of new technologies, such as for electrification or use of hydrogen, and more generally for an increase in planning, environmental, financial and messaging workloads.

In addition, the future skills requirements for industries in a net zero world have not been fully mapped yet, and the development of future supply chains are still to be understood in an evolving landscape.

SWIC hosted a workshop focussing on future skills needs and commissioned a skills gap study specifically focussed on the Milford Haven Waterway energy sector. These activities have begun to identify the growing need within industry and the energy sector to develop careers, skills and the resources the education system must provide.

SWIC has also been working with academic institutions to develop a future skills blueprint.

The proposed Net Zero Wales South Wales Industrial Transition from Carbon Hub (NØW SWITCH) will support the exploration of new technologies and incubator schemes for sustainable energy and fuels. Moreover, NØW SWITCH will also support a skills escalator programme, embracing skills development from school leavers into apprenticeships, degree apprenticeships, undergraduate and postgraduate courses and workforce upskilling programmes, that bring local education providers and employers together to capitalise on these future career opportunities.

Alongside the need for people to up-skill or re-skill, the net zero transition will create new supply chains, especially in the renewable sector, which will also require resourcing.

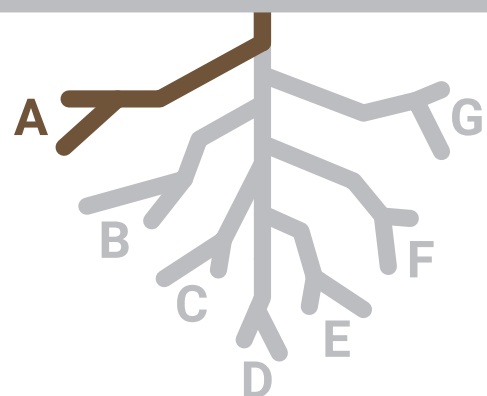
Some of these new industries will build upon Clean Energy, CGHs, CCU and the circular economy elements explored by SWIC. However, the largest potential supply chain opportunity for SWIC is likely to be for the development of FLOW.

Foundations, anchors, mooring chains/lines and turbines (amongst other components) for FLOW will need to be manufactured. Currently, Wales has limited capability to support this. The scale that is needed is vast – to deliver 4GW of FLOW by 2035, 267 turbines would be required (48 turbines per year between 2030-35). Crown Estates have stated that there is a likely economic case for an additional 20GW FLOW by 2045.

For this to happen, FLOW foundations will need to be assembled locally, offering a huge opportunity to South Wales. SWIC is developing the knowledge base in this area to understand the impact around security of supply, growing skills area, and well-being of future generations to help determine where globalisation or localisation is best served. Further supply chain opportunities around the FLOW components will need to be exploited or the economic and environmental benefits of manufacturing in Wales will be lost.

Strategic benefits to the UK in having local supply chains, such as steel for offshore wind, can be supplied from UK producers including Liberty Steel, Celsa Steel and Tata Steel. A market study would be helpful to identify the demand for these products. However, for other components, Welsh fabrication companies are generally quite small, and the sector will need to be scaled up to meet the likely demand for FLOW. To do this, primary materials and quantities must be understood, and the steps identified from raw material to final product, including cost and risk assessments.

There is a clear coordination gap that needs to be filled in order to mobilise the required manufacturing and supply chain resources as quickly as possible.



## B. Circular Economy Principles and Carbon Accounting Requirements

The Ellen MacArthur Foundation, 2020, defines the circular economy as:

A circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system.

**Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles:**

1. Design out waste and pollution;
2. Keep products and materials in use; and
3. Regenerate natural system.

There is a huge opportunity for businesses, and the world, to move towards a more sustainable, low carbon economy through implementing CE principles. For example, according to the Energy Steel Report, the circularisation of steel can save 37% of virgin steel.

New economic models need to be constructed and implemented to sustainably secure the resources required for a net zero world. The Cardiff Circular Economy Network (CCEN), led by Cardiff Metropolitan University, has been running alongside the SWIC Cluster Plan Project, developing circular economy ideas that are relevant to the whole industrial economy.

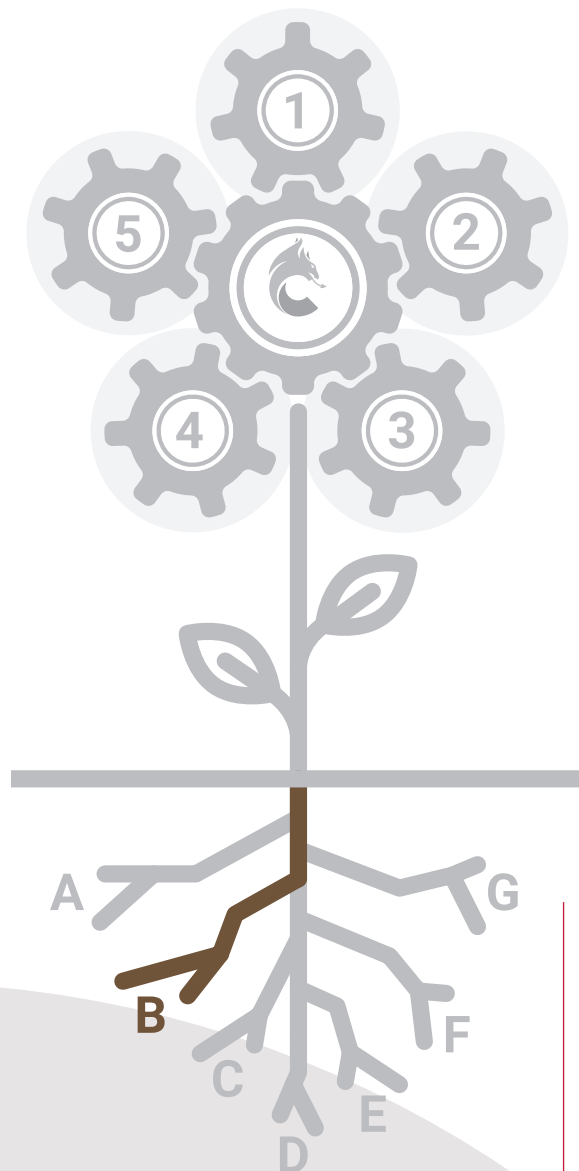
**Some of SWIC's key lessons from this programme include:**

1. Start within your organisations; what can be implemented
2. Just outside your organisations; how companies can work together
3. Look at whole supply chains and how things can be improved together.

In order to begin this process, every part and level of a business will need to be educated, for example: procurement, designers, innovators, finance, leaders of all levels. Collaboration within teams, organisations, between organisations and between different regions and companies will be key to implementing a successful circular economy.

Delivering the circular economy requires accounting systems that truly gauge the impact from a global perspective and does not narrow into territorial perspectives that may provide local wins at the expense of the planet. Carbon accounting is critical and must come with a change in the way targets are set to include consumption (full footprint) emissions. Otherwise, we are at serious risk of carbon leakage.

To create this more coherent approach the Energy Systems Catapult published a report in October 2022 looking at improvements to be made to carbon accounting methodologies. ERM also undertook a piece of work to understand how our industrial corporates currently reported on carbon, adding evidence to the call for a universal system that provides outcomes to help our industries make sustainable business decisions. SWIC collaborated with Repowering the Black Country and the Teesside Cluster. As a result, a project to investigate how a universal system may arise was proposed to IDRIC. This project led by Prof Marcelle McManus (Bath) will report on the subject in March 2024 .



## C. Clean Energy and Infrastructure Development

The energy sector in South Wales plays a vital role in the decarbonisation jigsaw. Milford Haven is the UK's largest energy port. RWE's Pembroke Power Station, on-shore wind, and small biomass plants in Margam and Barry, provide a varied mix of power generation options currently in South Wales.

Power stations will transition to provide carbon-free, clean electricity through hydrogen and/or carbon capture, with biomass plants potentially providing a source of negative CO<sub>2</sub> emissions through CCS or CCU technologies.

Decarbonising our electricity grid by 2035 then becomes a reality.

As we transition to a greener future there is a huge opportunity for the development of renewable power, both onshore and offshore, which will position Wales to be a significant net exporter of power. These opportunities include wind and solar PV from our land and buildings, and FLOW, tidal and marine power from the Celtic Sea. Good access to clean electricity and modernised port facilities also provides a good basis to create clean hydrogen which will also be essential for the decarbonisation of many industrial sites.

FLOW is the single largest renewable energy opportunity to serve the SWIC region with zero carbon power. The Crown Estate target of 4GW FLOW by 2035 is likely to increase to 20GW by 2045. Increase in FLOW will suit green hydrogen production, creating a cost parity with blue hydrogen and overseas competitors. This opportunity therefore looks increasingly credible and the export market will also potentially grow as hydrogen becomes a critical fuel in Europe and beyond.

As the GW's of power from the Celtic Sea FLOW projects develop, Pembroke Power Station will have to cover the intermittency of wind generation and generate electricity for the UK's security of supply when it is not windy. Pembroke Power Station's ability to generate electricity in a low carbon way, i.e. with CCUS or burning blue or green hydrogen as it becomes more available, will therefore be imperative, further demonstrating the importance of the Pembroke Net Zero Centre project.

The demand for hydrogen is much wider than for power stations. In a likely 'high hydrogen' case, industries could be burning over 4.9 TWh/year of hydrogen by 2050,<sup>2</sup> and these figures may be conservative if primary steelmaking is decarbonised through use of hydrogen for direct reduction of iron ore. This will also require suitable investment in transmission, distribution and storage infrastructure as well as the development of social readiness.

Meeting this demand will require a significant investment in new hydrogen production in South Wales. The scale of this hydrogen production will require a combination of approaches including electrolytic and thermochemical production with carbon capture as the key hydrogen provider, with biological production also contributing to the clean energy mix and potential further production of hydrogen carriers such as ammonia or methanol.

In order to transport hydrogen from producers to industrial users, WWU's HyLine Cymru will construct a new hydrogen pipeline connecting South Wales gas users with hydrogen produced in and around the Milford Haven Waterway.

Starting at Pembroke, hydrogen pipeline routes are being explored, heading eastward towards Swansea and Port Talbot where several options are available, including connections to industrial sites and the existing WWU gas networks. It is also likely that Project Union (National Gas Transmission) will link into HyLine to bring large scale hydrogen supplies to southeast Wales, linking in with early mover projects in Barry, Cardiff and Newport to complete the low carbon hydrogen coverage of the SWIC area.

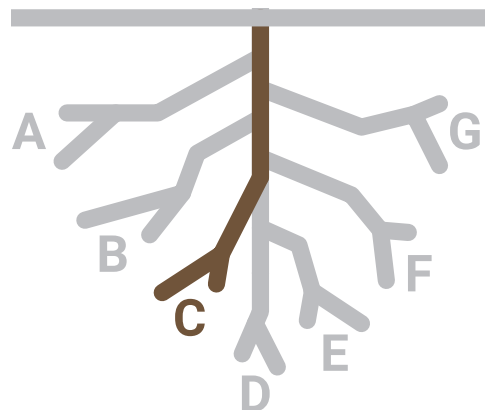
<sup>2</sup> From Hydrogen Networks South Wales Industrial Cluster (Progressive Energy for WWU, August 2022)

This can then extend to provide benefits to the southwest of England.

As industries transition from natural gas to electricity and hydrogen, competition for grid capacity will escalate, making the current lack of capacity an increasingly important issue.

The role of ports will also be key for the deployment delivery of marine renewables, in particular FLOW, as well as shipping CO<sub>2</sub> to storage sites, hydrogen production and potentially green ammonia, methanol or other hydrogen carriers for import/production. Port modernisation plans must be de-risked to unlock the ability to implement the infrastructure requirements.

South Wales is well positioned to develop CO<sub>2</sub> shipping capabilities from both Milford Haven and Port Talbot, with smaller potential at Barry and Cardiff. It is therefore essential that SWIC is part of the UK Government's Track 2 Cluster Sequencing programme or risk a significant delay to SWIC's net zero ambitions.



## D. Research and Innovation

A strong academic research base has developed in South Wales over the last several decades, including leaders covering a wide range of research areas.

**This is generally well aligned with the industry in the region and there are numerous examples of impactful research and innovation collaboration between university research groups and industry partners, as well as national and international research collaborators.**

It must be acknowledged that this collaboration between academia and industry is not universal, and there remain a few industrial organisations in South Wales with less background in research and innovation activity with the regional academic base. SWIC has been effective in improving research and innovation engagement in the region.

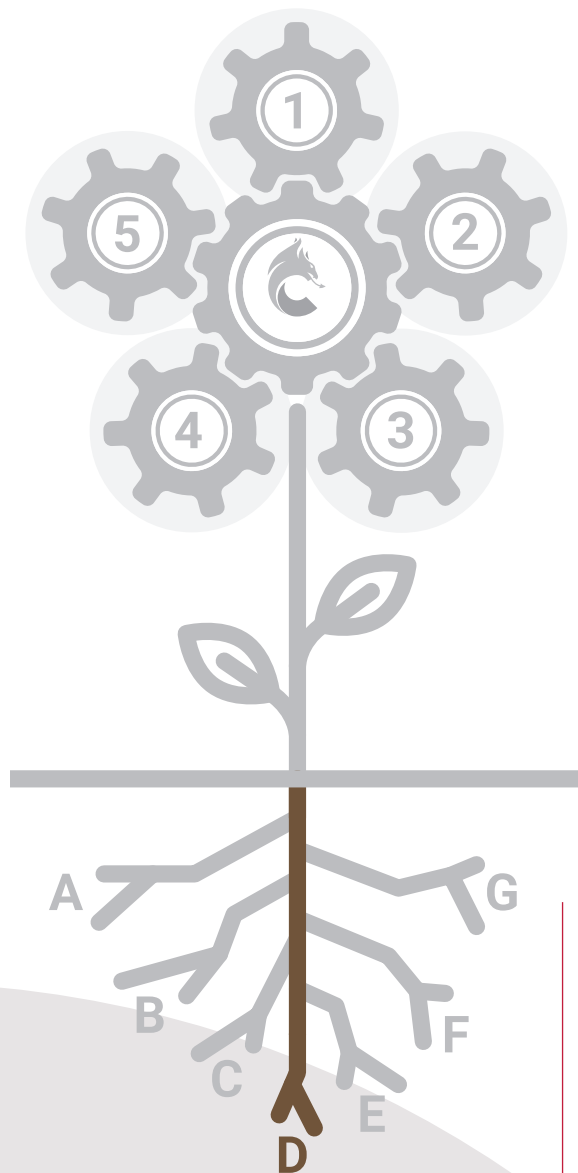
Whilst there is increasing clarity on the options for industrial decarbonisation in South Wales, there are several aspects that still require detailed investigation for us to achieve efficient and effective transition.

### This includes:

- Addressing new or improved technical solutions
- System optimisation
- Economics
- Environmental impact
- Social and policy impact.

To reinforce the strong regionally coordinated research and innovation in support of industrial decarbonisation, the universities of Cardiff, Swansea and South Wales are creating Net Zero Wales Supporting Welsh Industrial Transition from Carbon Hub (NØW SWITCH), bringing together exceptional regional academic expertise with a large range of research and cross-cutting themes.

In addition to this regional collaborative approach to Research and Innovation, NØW SWITCH will nurture broader industry-academic research partnerships, including with other UK research organisations. The continuation and further development of the IDRIC programme is a key example of this, ensuring alignment between clusters and industry driven research on a wider UK scale.



## E. Legal, Planning and Permitting

**For a net zero transition to occur smoothly and in a timely manner, the structures, processes and personnel have to be in place.**

SWIC Partners ERM and Capital Law have led efforts to understand the full range of challenges and opportunities in these areas, providing insights as to where our resources need to be efficiently applied.

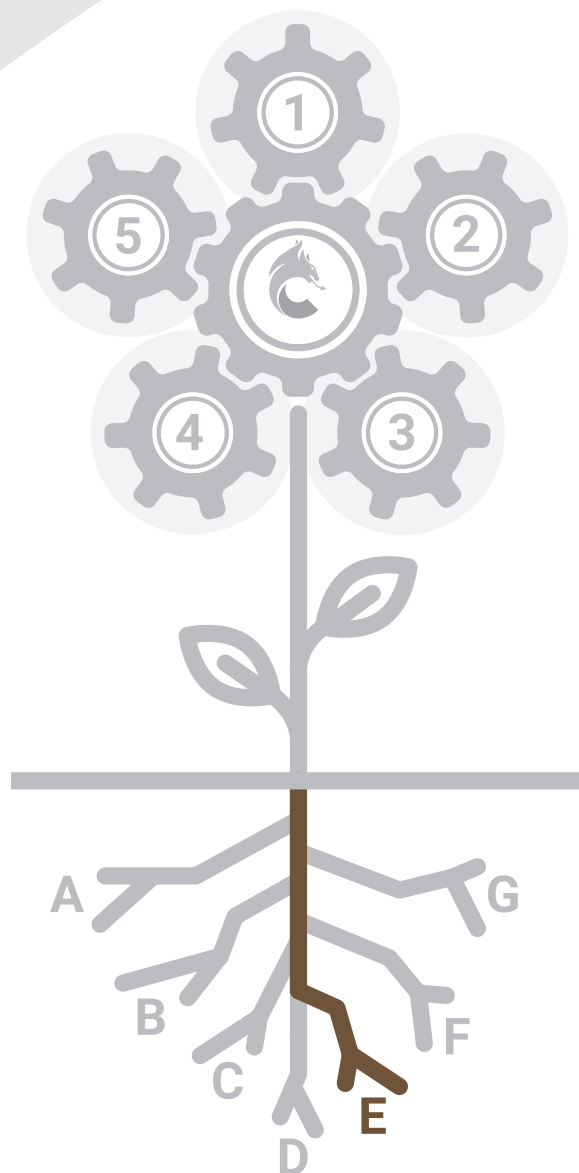
With devolved responsibilities in some of these areas, Wales can benefit from more localised understanding which, combined with its focus on the “Well Being of Future Generations”, can provide a basis for planning and permitting in the emerging net zero landscape to be refined to efficiently speed up processes. This process will require collaboration between: SWIC and various bodies in the different levels of government; NRW and the relevant planning authority for the locality. These communication avenues were initiated and explored during the Cluster Plan and will continue to be strengthened, particularly with local authorities and NRW.

As SWIC is transitioning, understanding the detail of the legislative landscape and what may or may not need to be done and by whom is essential to ensure mitigation of unexpected delays and blockages.

SWIC’s legal partner (Capital Law) have created the safe legal foundation that underpins the ability to collaborate on both the 30 partner and 1 participant Cluster Plan Project and the 17 partner Deployment Project. The legal arrangements have allowed initial sharing of ideas, plans and information to kick-start momentum in a multitude of project areas. Additional company specific NDAs are typically then put into place once a project concept moves towards feasibility assessments. Through this legal framework SWIC partners are continually building trust and confidence in businesses that they would never have previously engaged with. The value of this piece of work cannot be overstated.

In addition, Capital Law have led initiatives in a number of areas such as EDI and the SWIC “Risk and Opportunity” register based around a PESTLE analysis of potential risks to the future success of SWIC decarbonisation and developed a mitigation strategy around this. The results of this are helping inform how SWIC’s range of complex projects, kickstarted by the Cluster Plan, are structured to achieve the desired outcomes.

The results of this are helping inform how SWIC’s range of complex projects, kickstarted by the Cluster Plan, are structured to achieve the desired outcomes.





## F. Investment Requirements

To enable industries to invest in their decarbonisation journey they will need to see long term fixed policies that de-risk net zero investments.

Where the return on investment (ROI) is too slow, when compared to a lengthy list of projects from global facilities, a grant system is the simplest method to bring the ROI to a level that allows South Wales' facilities and projects to be investable. The IETF financial support scheme is such an example and SWIC businesses have benefitted from such support to advance sites in their net zero journeys. However, where there is no ROI, the emerging business model support schemes are sensible, with the hydrogen and CCS business model examples leading the way.

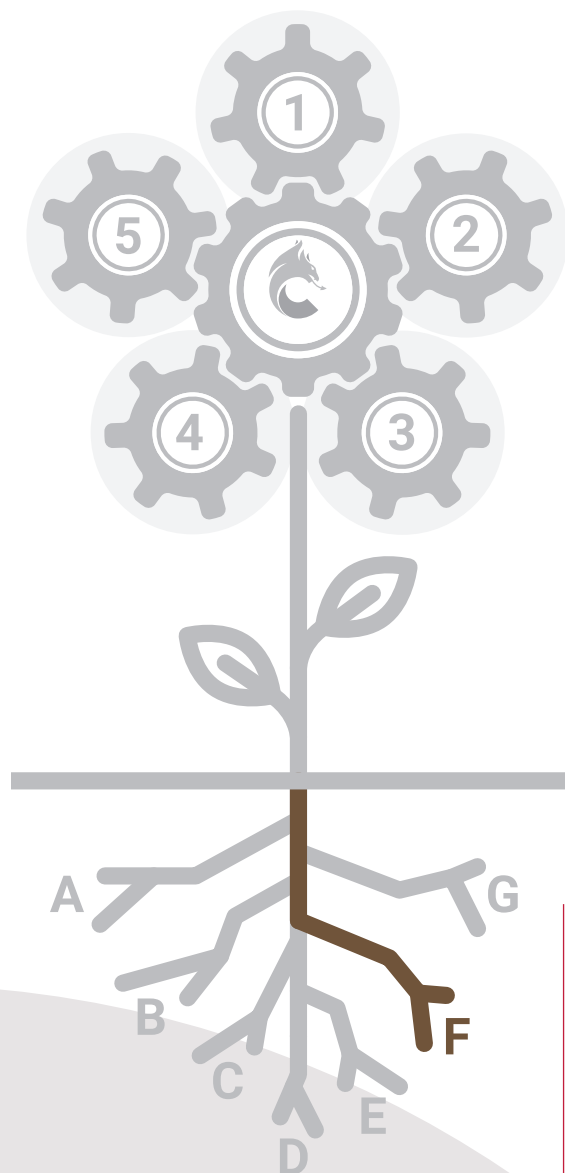
Similar business models are needed for electrification and CCU, which play a significant role in the South Wales decarbonisation landscape. Delayed policy development invariably delays investment and risks relocation of industrial output to other global facilities that do support electrification and CCU, or have greater carbon intensity production at lower costs.

A lack of investment would result in closures of South Wales facilities. Whilst this may reduce CO<sub>2</sub> emissions in Wales, it would increase global CO<sub>2</sub> and risk to the global supply chain, and reduce the number of high-quality jobs in Wales that pay 28% higher than the local average wage.

Business model support for non-pipeline transport (NPT) of CO<sub>2</sub> is less well developed at a UK Government level, as the focus has been on developing the CO<sub>2</sub> stores themselves. As the net zero agenda has accelerated, NPT is now becoming crucial beyond South Wales and south of the Mersey-Humber axis. How CO<sub>2</sub> shipping is supported through the CCS business models is not yet clear, but it is critical to ensure early investment in SWIC infrastructure.

SWIC hopes to be included in Track 2 as the first cluster in the UK to incorporate CO<sub>2</sub> shipping.

With many advanced countries around the world developing ambitious net zero financial support mechanisms for their own industries, the UK and Wales may potentially lose their current world leading position in decarbonisation. This would build a less favourable investment image for Wales, despite the attractive features in South Wales.



## G. Stakeholder Engagement

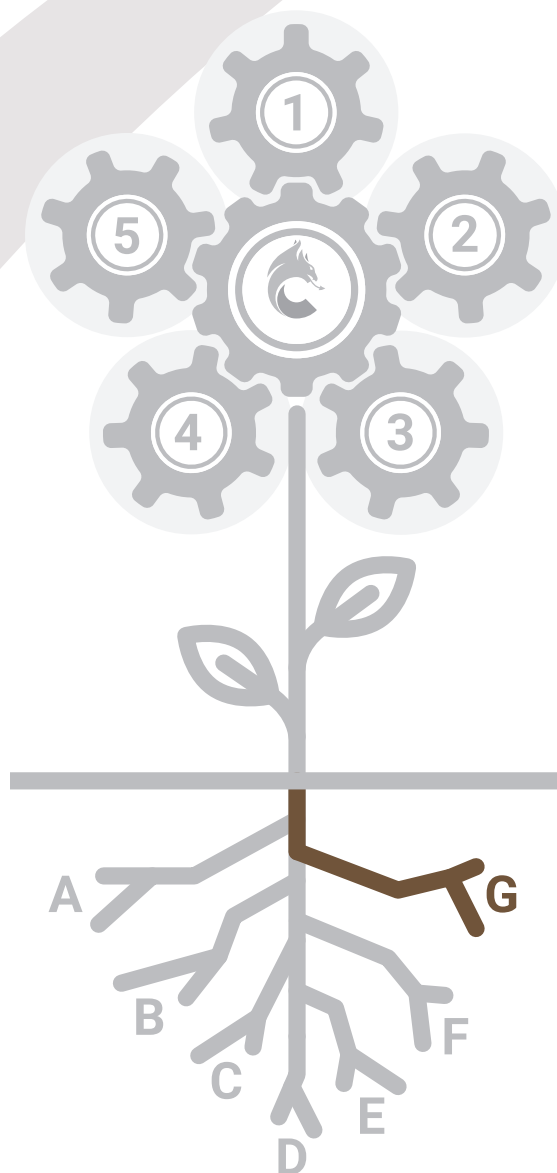
With no equivalent to the English Local Enterprise Partnerships (LEPs) to provide very good connection structures from which the local net zero landscape can be developed, SWIC has had to develop a stakeholder network from scratch. Navigating SWIC engagement through; 14 county councils, 2 Regional City Deals, Welsh Government departments, UK Government departments, 30 partners in the Cluster Plan Project, 17 partners in the Deployment Project, around 80 additional companies (not in either project), Trade Associations and Universities, has been a significant achievement of both the SWIC Cluster Plan and SWIC Deployment Projects.

The impact of Covid-19 proved a challenge in the early days of building these in-depth relationships and the associated trust that allows momentum to build in highly collaborative projects. The SWIC teams have demonstrated that wide ranging connections and collaborations can happen and, furthermore, can lead to spin-off projects that would not have started or be implemented without these collaborative networks.

This stakeholder map forms the basis of how SWIC utilises the network to achieve its net zero ambitions for all in SWIC. As the Cluster Plan is taken forward by SWIC, with support from the recently created pan Wales NZIW, then stakeholder engagement will be a key activity, achieved by redefining the SWIC Working Groups trialled in the Cluster Plan into effective groups to build the Cluster Plan legacy.

Additionally, as projects turn from concept to feasibility through to design and implementation, co-ordination of stakeholders with the cluster and its spin off projects will be even more vital to accelerate net zero attainment using those valuable lessons learned from the 1st and 2nd adopters.

Engagement is seen as key and the policy driver around developing the "Team Wales" concept. SWIC, initially represented by the CEO of NZIW, would be part of that Team Wales delivery team along with other leaders that are delivering net zero housing, transport, councils, universities, public buildings, airports, Welsh Government, UK Government and so on, to accelerate the lowest cost, most efficient net zero outcome for Wales.



# Conclusions

Since January 2019, when industry and power generation in South Wales came together more cohesively to form SWIC, an understanding has developed of how we can begin to decarbonise a large, complex industrial geographical region.

Along with 30 partners and 1 participant, the SWIC Cluster Plan Project has demonstrated over 3 years that the required level of collaboration on this scale can be delivered. Cluster Plan partners have and continue to build trust, enabling smaller collaborative groups (still linked to SWIC) to move forward and take advantage of potential opportunities such as CGH's and SuperPlaces.

Without the initial focus provided by the aim of being included in the IDC programme and the subsequent support and governance structure, SWIC would not have reached this stage of its development. As no existing structures were in place to build from, the SWIC Cluster Plan Project has learnt from other clusters and been able to bring exciting and ambitious concepts forward to the net zero agenda.

Due to the lack of available natural geological CO<sub>2</sub> storage, SWIC has had to be creative in its thinking and solutions, developing a holistic, integrated approach suitable for the wide variety of industrial settings found in South Wales.

Building new relationships between governments, academia, industry, service providers, equipment suppliers and project developers has enabled SWIC to have a solid foundation from which it's ambitions can be developed.

SWIC's ambition is clear. During this project, the collaborative structures are being put in place for SWIC's industries to continue working with governments and stakeholders, to accelerate South Wales' pathway to a prosperous net zero future. Importantly, the plans for SWIC also align with the goals of the Well-being of Future Generations Act, supporting overall Welsh societal aims.

The 30 policy drivers will help SWIC to unlock this ambition with the three main objectives of:

1. **Industry:** Through a just transition, to deliver internationally competitive and sustainable low carbon industries
2. **Infrastructure:** Exploit the significant renewable power capabilities available in South Wales to develop world-leading infrastructure to decarbonise our industries, attract additional investment and ensure long term employment in the area
3. **People:** Create a globally recognised agile region that is innovative, opportunity-driven, highly skilled and capable of exploiting the huge clean growth opportunities that net zero offers South Wales.

With these collaborations, the policy drivers and support in place, we will then deliver for the cluster as a whole:

- Net zero industries in South Wales by 2040, equating to 40% reduction of total current Welsh CO<sub>2</sub> emissions
- Retention of 113,000 jobs and a net positive increase in jobs overall
- Unlocking £30bn investment opportunities in the region
- Growing the £6bn Gross Value Added benefit from South Wales industry.

We have attempted to quantify the value to society of achieving SWIC's ambition by looking at the UK Government's valuation of greenhouse gas emissions for policy appraisal and evaluation. The value of carbon emissions each year is provided as a cost per tonne figure, and we have considered the central value.

**Based on this, we have estimated our ambition will prevent in the order of £18 billion of the cumulative cost to society between 2020 and 2050.**

These costs are related to the impact of climate change and how it will affect economic outcomes, including changes in agricultural productivity, damage caused by rising sea levels, and the anticipated decline in human health and labour productivity.

# Next Steps

**The intention of the Cluster Plan was not only to set out a proposed pathway for industrial decarbonisation, but to also set up the structures required to be able to take the plan forward past the end of the project.**

**It follows that one of the outputs of this project was the creation of the new Net Zero Industry Wales (NZIW) entity, which will support SWIC and any other Welsh industrial clusters going forward.**

## **Industries have set their own targets of when they will achieve net zero, and many have interim targets as part of their defined journey.**

**To be able to deliver net zero for the SWIC Cluster as a whole, and develop the regional infrastructure needed, SWIC industries will work together on the following activities:**

- Complete the IDC supported SWIC Deployment Project that is providing the engineering design basis for the necessary infrastructure development that will help unlock the £billions worth of investments needed
- Each industry will continue to develop its own optimum decarbonisation route (it should be noted that industry has already committed to over £100m worth of investments associated with this)
- Continue to implement early measures with support from ongoing funding streams such as IETF, IHA, TFI as required
- Apply for Track 2 of the UK Government's CCUS Cluster Sequencing Programme to initiate CO<sub>2</sub> shipping from the region
- Engage with and capitalise on Freeport development in South Wales to accelerate the transition to net zero
- Industries to collaborate locally, where appropriate, into SWIC supported CGHs. This will also strengthen SWIC's aspirations to secure future supply chains and create circular economy opportunities.

**Industries will also develop and optimise the new entity NZIW in its support of SWIC to:**

- Provide the forum for continued trusted collaboration between industry, governments and academia
- Set up working groups to provide the evidence going forward and develop future project collaborations
- Support industries with funding stream access and influencing the development of business models
- Work with infrastructure providers to develop the vision into a reality for the region
- Progress the list of 30 policy driver requirements working with the support of NZIW and coordinated by the SWIC steering team.

**This project has acted as the team builder for industry in the region that has developed into a regional vision and the list of policy asks. Industry now needs to work with Welsh Government, Local Authorities and academia on a socio-economic benefits case for the vision, the 30 policy drivers and the retention and growth of industry in the area. This should incorporate a 'value to society' analysis based on the societal cost.**

The above next steps are to be managed by the SWIC steering team, with support from NZIW and collaborating with the Welsh and UK Governments, and academia.

# Glossary and Appendix



# Glossary

- **CCGT**  
Combined Cycle Gas Turbine
- **CCS**  
Carbon Capture and Storage
- **CCU**  
Carbon Capture and Utilisation
- **CGH**  
Clean Growth Hub
- **CPP**  
Cluster Plan Project
- **DfT**  
Department for Transport
- **DNS**  
Development of National Significance
- **EDI**  
Equality Diversity and Inclusion
- **EU ETS**  
European Union Emissions Trading Scheme
- **FLG**  
Future Leaders Group
- **FLOW**  
Floating Offshore Wind
- **HND**  
Holistic Network Design
- **HVO**  
Hydrotreated Vegetable Oil
- **IDC**  
Industrial Decarbonisation Challenge
- **IDRIC**  
the Industrial Decarbonisation Research and Innovation Centre
- **IETF**  
Industrial Energy Transformation Fund
- **IHA**  
Industrial Hydrogen Accelerator
- **IFS**  
Infrastructure Funding Scheme
- **LNG**  
Liquefied Natural Gas
- **NØW SWITCH**  
Net Zero Wales South Wales Industrial Transition from Carbon Hub
- **NPT**  
Non-Pipeline Transport
- **NRW**  
Natural Resources Wales
- **NZIW**  
Net Zero Industry Wales
- **SWIC**  
South Wales Industrial Cluster
- **TFI**  
Transforming Foundation Industries
- **UK ETS**  
United Kingdom Emissions Trading Scheme
- **WEF**  
World Economic Forum
- **WWU**  
Wales and West Utilities
- **SuperPlaces**  
Locations where net zero infrastructure is likely to happen first
- **South Wales Industrial Cluster (SWIC)**  
Is defined as the collective of manufacturing industries in the south Wales area that had been recognised in UK Governments Clean Growth Strategy. This key industrial area that needs to 'cluster' to support the development of the infrastructure in the region and thus enable its individual industries to get to net zero, up until project end, SWIC has been represented by an informal steering team of industries, academics and others focused on achieving decarbonisation. Going forward this SWIC steering team will be supported by NZIW
- **The Cluster Plan Project**  
Funded by Innovate UK and involved stakeholders to identify the requirements to achieve decarbonisation as concluded in this report
- **The Deployment Project**  
Funded by Innovate UK and involved stakeholders. Separate to but running alongside the Cluster Plan Project, conducting engineering studies for partnered industries that are aligned to this report
- **Net Zero Industry Wales**  
An arms' length (from Welsh Government) independent entity established as an output of the Cluster Plan Project to continue to support SWIC via the SWIC steering team and the work identified in this report
- **Working Groups**  
Trialled during the Cluster Plan Project and recommended to continue at the end of the project to push the outcomes.

# Appendix 1 Policy Drivers

	Policy Drivers	Why?
1	Competitive industrial energy pricing	UK Existing UK industrial energy policy results in considerably higher energy costs in the UK compared to Europe. For example, £130/MWh in Germany vs £211/MWh in the UK (as per UK Steel). This makes UK industry uncompetitive. As industries decarbonise and rely more on electricity, the subsequent increasing demand for energy will further increase disparity in operating costs. This detracts from the UK as a destination for new industry, risks the potential of further investment, and pushes existing industry away from the UK. As it stands, energy costing more than EU countries will deter industry from investing in the UK. If the UK is to have a competitive net zero industry, then policy costs need to change for the better.
2	CO <sub>2</sub> Non-Pipeline Transport (NPT) Business Model support	UK CO <sub>2</sub> emitters situated away from the coast or in the whole of the south of the UK (ie away from the CO <sub>2</sub> stores in the north of the UK) will need to transport CO <sub>2</sub> via Non-Pipeline Transport (NPT) routes, e.g. ship, rail or road. Policy support for pipeline connections is nearing completion but NPT policy support development is nascent. Delayed establishment of policies for NPT will deter industrial investment in the region.
3	A carbon charging policy that is fair and ensures an internationally competitive industry.	UK The UK ETS cost for industry is higher than EU ETS, which is putting UK companies at a disadvantage and limiting the availability of cash to invest in decarbonisation.  The only result of these competitive disadvantages will be closures of UK industrial production and territorial decarbonisation through deindustrialisation. This will prevent UK industry from making a positive contribution to Net Zero, undermine the high-skilled jobs needed for a 'just transition', and weaken growth in regions in need of 'Levelling Up'.  A new mechanism is needed to fairly incentivise industry to decarbonise but at the same time ensure competitiveness. The monies paid into this new system must be retained for industrial decarbonisation and not lost into general taxation. One of the options is a Carbon Border Adjustment Mechanism (CBAM), which should be put in place for UK industry before phasing out or removing free allowances. The development of a CBAM is an option for the long-term viability of industry in Wales. We must define a carbon border for products that ensures imports and exports can compete on the same level playing field of environmental standards. There are options for the way forward, but whichever mechanism is used the outcome needs to be protection of the UK market from carbon leakage. This is linked, of course, to the carbon accounting driver.
4	Continued energy and resource efficiency support funding (eg IETF)	UK Schemes like the Industrial Energy Transformation Fund (IETF) and the Transforming Foundation Industries (TFI) fund have been a huge success and are of increasing importance in helping industry develop their opportunities. These support mechanisms must continue to be run to ensure our industries can develop their optimum pathway to net zero.
5	Electrification Business Model support	UK The UK Government is developing policies to support CCS and hydrogen. However, it does not have policies to support electrification as a decarbonisation pathway of industry. For an individual industry the most efficient option for decarbonisation may well be electrification, over hydrogen or CCUS. Without policy support industry may well be driven down a less efficient fuel switching pathway.
6	Carbon Capture and Utilisation (CCU) Business Model support	UK The UK Government is developing policies to support CCS and hydrogen. It does not have policies developing to support CCU. The development of the Circular Economy and de-fossilisation of the chemical industry supply chain will develop opportunities for CCU and therefore support decarbonisation opportunities for dispersed industrial sites. Carbon recycling offers huge net zero and circular economy growth opportunities.
7	Incentivise the production and use of low carbon fuels	UK & WG Clean-burning, renewable fuels can support widespread emissions reductions, particularly for hard-to-abate sectors such as transport. We need policies and incentives for the production of fuels from sustainable feedstocks (such as sustainable aviation fuel (SAF) and renewable diesel) that can cut GHG emissions. As an example, recycled carbon fuels need to be added to the SAF and RTFO mandates.
8	Develop globally agreed Carbon Accounting policies	UK & WG With all net zero policies and deliverables, a globally agreed Carbon Accounting Methodology is needed. Irregularities and differences between these risk closure of UK industries and offshoring of emissions. Carbon Border Adjustment Mechanisms, CCU, CGHs, Direct Air Capture Systems, Product Standards and district heating all result in CO <sub>2</sub> emission reductions and all need to be measured and counted in the same way globally.
9	Ensure electricity grid capability for a Net Zero region	UK & WG Gigawatts of additional renewable energy generation will need to be connected to the electricity grid as industry fuel switches away from natural gas to electricity for electrification and/or hydrogen. A grid fit for the future, that can cope with the additional supply and the additional demand, must be developed. Long timeframe and expensive grid connection costs will deter industry from investing in the region. In one example, SWIC has found that grid connection cost is higher than the furnace conversion cost.  To help this, industry can support National Grid Energy System Operator's upcoming Holistic Network Design and, combined with a strong push from Welsh Government, deliver the electricity generated by offshore wind turbines in the Celtic Sea to the SWIC region where advantage can be taken of the green hydrogen potential.  The grid needs for future industrial decarbonisation will therefore be included in strategic planning for the grid in South Wales (alongside the grid needs for net zero more generally, such as increased renewables, EV charging, heat pumps, etc.) and 'anticipatory investment' must be enabled to deliver the upgrades necessary at the times they are needed.



	Policy Drivers		Why?
10	Regulatory, planning and connections reform which allows electricity networks to move at pace and develop networks to meet future needs	UK	<p>HND and Accelerated Strategic Transmission Investment (ASTI) represent a welcome early shift towards more strategic network planning and development. However in order to meet the scale and pace required, reform is required in three specific areas – regulation, planning and connections. Therefore, reform should focus on:</p> <ul style="list-style-type: none"> <li>Refresh regulation to an approach that drives long-term work programmes and anticipatory investment, reflecting the scale and risk profile of new infrastructure needed to rewire the country</li> <li>Speed up the planning and consenting process for projects which are critical for enabling Britain's pathway to net zero.</li> </ul> <p>Reform the current connections process to introduce transparent criteria for alternative customer treatment, aligned with broader government policy, to transform the connections approach in order to ensure that projects can connect when they want to connect.</p>
11	CO <sub>2</sub> shipping to be included in the Track 2 process of the Industrial Cluster sequencing	UK	<p>The South of the UK has no known CO<sub>2</sub> storage capability. Shipping from the south to the north of the UK therefore needs to be developed. The SWIC Deployment Project includes engineering studies for CO<sub>2</sub> shipping, so SWIC will be ready to participate in Track 2 of the Cluster Sequencing programme and therefore instigate UK wide CO<sub>2</sub> shipping capabilities. A diversified transport network adds resilience to the carbon and hydrogen economies of the UK. For SWIC, as our industries look to a considerable increase in their electricity demand and offshore wind capability grows in the Celtic Sea, the intermittency associated with renewable power can be overcome with generation from the Pembroke net zero Centre and its CO<sub>2</sub> shipping. With UK Government policy defining that there will be no un-abated gas power generation by 2035, SWIC participation in Track 2 therefore becomes vital for the region.</p> <p>UK government should ultimately support a sufficient number of regional projects to underpin investment in a nascent CO<sub>2</sub> shipping fleet, critical to regional decarbonisation. This fleet should have some spare capacity to encourage further potential capturers to invest in CCS, confident that the shipping offtake capability exists. At this early stage, before shipping is established at scale and given the cost of liquefaction, regional CCS projects are likely to be marginally more expensive than at the existing clusters. From a policy perspective, this implies those regions are more reliant on and deserve more government support as a catalyst to regional decarbonisation, without which those regions will fall behind. It is important that policy recognises this and supports industries accordingly.</p> <p>The SWIC Cluster is an ideal example to test and progress the use of shipping, which should be seen as a vital addition to overall UK capability and strategy. It should be noted that flexibility of the CO<sub>2</sub> shipping regulatory/commercial framework is needed to best take advantage of the emerging markets for CO<sub>2</sub> disposal. An inflexible single capture plant to single storage facility is less resilient and misses the competitive advantages of an open market.</p>
12	Accelerated renewable power availability and options for storage to be progressed	UK & WG	<p>Aligned with Welsh Governments 'Renewables Deep Dive' and its subsequent actions, all efforts are needed to generate the huge amount of resilient renewable electricity supply, from all sources, that industry will require to achieve net zero. This must include the ability to implement a fast-tracked consenting regime and also introduce mechanisms to de-risk the Celtic Sea FLOW opportunity. Particular emphasis should be put on developing and maximising opportunities for local energy storage and grid balancing.</p>
13	Accelerated hydrogen availability to be progressed	UK & WG	<p>Industry will need considerable amounts of hydrogen to decarbonise. Hydrogen supply capabilities and distribution will be essential for the region to maintain industry in a net zero world. To supply and deliver on this need, and the national hydrogen targets supported by capital co-investment and revenue business models, we need to unlock the strategic opportunities for large electrolyser installations and storage. Blue hydrogen gives access to industrial scale hydrogen a decade or more before green is available and has the additional benefit of helping to support the creation of a CO<sub>2</sub> shipping capability from South Wales.</p> <p>SWIC needs political support and early stage development funding for hydrogen supply capabilities to be delivered in the late 2020s. Involvement in Track 2 for the cluster sequencing will support this.</p> <p>SWIC supports 100% hydrogen for heating trials (WWU proposing Milford Haven as a Hydrogen Town Pilot). Also, South Wales needs to be given a reasonable hydrogen production target by UK and Welsh Governments.</p> <p>There is also an issue with combining renewables &gt;10MW and electrolysers, which means they fall under the DNS regime. It would be beneficial to have an exemption to this rule for hybrid renewables/electrolyser projects on industrial land that are producing hydrogen for industrial decarbonisation.</p> <p>The development of the Clean Growth Hubs will support smaller regional hydrogen networks and capability of supply.</p>
14	Increased support and advocacy for hydrogen infrastructure development plans	WG	<p>Huge investment in new hydrogen infrastructure will be required for the SWIC region and support will be needed to communicate, plan and drive public engagement for the installation programme. For example, the WWU hydrogen conversion programmes, and particularly their HyLine Cymru project and the interconnected National Gas Transmission scheme, 'Project Union', will need cross party-political support to ensure they can be installed as quickly as possible.</p> <p>South Wales should be prioritised in Project Union project that is developing a new hydrogen pipeline system for the UK. We need to ensure that the HyLine Cymru pipeline route is well supported to unlock this opportunity or risk significant delays to the development of the hydrogen economy for the whole of the UK's southwest region.</p> <p>Also, support for a Track 2 Cluster Sequencing Bid will be essential from Welsh government.</p>

	<b>Policy Drivers</b>		<b>Why?</b>
15	Water supply for hydrogen strategic plan needed	WG	Large amounts of water will be needed to service hydrogen demand in the region. A strategy and working group should be established to map supply and demand and plan the required infrastructure.
16	Clean Growth Hub developments to be incorporated into council strategic visions	UK & WG	The Cluster Plan Project has resulted in 'SuperPlaces' or 'Clean Growth Hubs' in Milford Haven, Port Talbot, Cardiff, Barry and Newport. This concept involves mini clusters working with the local councils to build a local team around each smaller region within SWIC. The Welsh Government sponsored Local Area Energy Plans (LAEP) plus the southeast and southwest 'Regional Plans' will help focus efforts. The CGHs would thus be supported as part of each council's net zero and economic development plans and should be helped via funding routes, such as any UK Government funds made available as a replacement to previously available EU Funding.
17	Develop policy to de-risk port infrastructure investment	UK & WG	Milford Haven and Port Talbot have been identified as critical "anchor ports" for FLOW development. However, these ports are actively serving other markets, and do not currently have the capacity or infrastructure in place to support commercial-scale FLOW deployment by the 2030s. Moreover, there is no firm business case for investment. Urgent policy incentives and capital are needed to de-risk this opportunity and to create a workable business case. This is essential for large scale infrastructure development to be undertaken well in advance of the commercial contracts that will be required for FLOW deployment.  The same applies for other SWIC ports (i.e. Swansea, Port Talbot, Barry, Cardiff and Newport) for provision of the infrastructure required for the decarbonising of our industries and to make sure we maximise the opportunity net zero offers.
18	Continued collaboration support	UK & WG	The Industrial Decarbonisation Challenge (IDC) fund has been a huge success in developing net zero regional strategies to ensure that our industrial regions have the infrastructure that industry will need to manufacture goods in a net zero way. The collaborations take considerable resource to facilitate. It is important that similar funding streams are maintained to ensure the regional collaborations can continue. SWIC and NZIW should therefore be supported to resource the collaborations needed for the region and ensure we have the most efficient pathway to a just transition to net zero.
19	Ensure capable resource at WG and NRW for policy, planning consent and permitting development	WG	As industries are following and supporting policy developments by the UK Government, then Welsh Government policies, planning and permitting capability needs to keep pace. Delays in policy build, planning or permitting will deter industrial investment in the region. Welsh Government need to be working closely with Natural Resources Wales to ensure their understanding is aligned in terms of awareness around technology development and efficient resourcing of the support required to match industries pace. An overall plan and resourcing capability analysis should be developed with SWIC / NZIW to ensure that there is a streamlined planning and permitting process for net zero enabling infrastructure.
20	Circular Economy to be recognised as an essential component of net zero	UK & WG	The circular economy is an overarching socio-economic philosophy that challenges the current status-quo and needs to be recognised as an integral part of all government policy.  Achieving and maintaining net zero via the existing Linear Extractive Economy is a highly improbable outcome.  Policy support for resource and energy efficiency, biodiversity, equality and well-being, sustainability and carbon reduction, CCU, supply chain resilience, finance and economics, education at all levels, product and service design need to be developed. An ambitious net zero or 'Net Positive' policy of a Circular Restorative Economy will ensure we have a society and planet fit for Future Generations.  Clean Growth Hubs are a short/medium term example of how these aspects of circular economy policy and strategy can be developed, delivered, scaled and showcased across the UK, EU and globally.
21	Skills plans to be developed	UK & WG	To support the exploration of new technologies and incubator schemes for sustainable energy and fuels, we need to harness and grow the existing skills base. Within the current, highly productive, workforce of over 100,000 people, many roles needed to support a hydrogen economy and CO <sub>2</sub> shipping are already in situ. However, a skills accelerator programme is needed that will bring local education providers and employers together to ensure a new generation can capitalise on these career opportunities. The Cluster Plan Project is helping develop an exciting industrial vision for the region to attract future generations. The Welsh Government's "Net Zero Skills Plan" needs to continue to engage with SWIC and NZIW to ensure an aligned strategy and to fully develop the 'skills escalator' concept as part of SWITCH, enabling a seamless educational programme to be introduced that supports life-long learning in the new industrial landscape.
22	Research and Innovation strategic plans to be initiated	UK & WG	In the same way as IDRIC has been initiated to support the industrial clusters during the IDC, then a continued fit-for-purpose IDRIC to 2050 should be instigated to ensure alignment between UK clusters and an industrially driven research agenda for our universities. In the SWIC region the SWITCH concept should be developed and supported going forward. SWITCH activity brings together substantial energy and decarbonisation resources from the Research and Innovation sector in Wales to interlink with a new innovation centre which starts construction in 2023. Existing teams of research experts from across the region are in place now as a result of the last decade of EU funding. The key is maintaining this momentum and expanding local capability interlinked with the skills escalator programme. The need for a Fuel Switching centre of excellence has been identified to support our industries through the technical aspects of fuel switching away from natural gas.

	<b>Policy Drivers</b>		<b>Why?</b>
23	Local supply chain opportunities to be maximised by UK companies	UK & WG	As our industries continue to innovate and evolve, we need an accelerator programme to ensure the facilities, spaces and services within the locality evolve in time to support this large-scale industrial opportunity.  FLOW, renewables, hydrogen and CCUS will necessitate new supply chain opportunities. Policies should drive and encourage local supply chain development where possible.
24	Support for the development of Negative Emission Technologies to be initiated	UK & WG	Policy developments are needed to promote the use of Negative Emission Technologies e.g. BECCS, Energy from Waste and Direct Air Capture. These need to be included within the proper globally recognised Carbon Accounting mechanisms.  Early clarity on the Welsh and UK Government's policy of what constitutes a robust negative emission will stimulate the voluntary markets. Inclusion of these negative emissions as a partial offset to ETS obligations will unleash substantial funding from the private sector without the need for government support. Specifically for SWIC, the endorsement of the negative emissions from early energy from waste or DACS plants will help build demand for negative emissions and substantially reduce the cost of any government support.
25	Policies and support mechanisms are to ensure they enable long term investments	UK & WG	The Welsh and UK Governments need to develop policies to be long term in duration to ensure investments are financeable. In order for industry to invest in the net zero opportunity then UK and Welsh Governments need to make sure that policies are financeable. There needs to be alignment between UK and Welsh policies to ensure investments are not deterred from investing in Wales.
26	Develop the 'Team Wales' concept by creating a Net Zero delivery team	WG	We need to develop the "Team Wales" approach to make sure this huge task to net zero can be properly managed through to success. Every effective team has a leader and a strategy. Consideration should be given to developing "Team Wales" a step further by adding a leader (a project manager). This team, incorporating members from NZIW, Transport, Housing, Public Sector, Aviation, Farming, would project manage "Team Wales" through its programme over the decades to deliver net zero. It would be the holder of the overall plan for Wales and its just transition. The team would ensure that the different sectors are co-ordinated and driving together along the same overall plan. This would also align to the Chris Skidmore review recommendation that the UK Government creates an Office for net zero Delivery by March to help coordinate policy across departments and with devolved administrations.
27	The Future Leaders Group concept is to be developed with the Future Generations Commissioner	WG	The SWIC Deployment project Future Leaders group has developed out of the Deployment Project and into an important networking and engagement mechanism for young professionals in our region. The group has close relations with the Future Generations Commissioner. This should be developed and supported going forward to develop the next generation of "Team Wales" through NZIW.
28	Ensure alignment of policy and funding mechanisms for both site decarbonisation and infrastructure	UK	There is a risk that funding support for fuel switching of sites does not align with the Business Model and funding support mechanisms for infrastructure or hydrogen supply. For example, IETF funding could run out before infrastructure is in place through the business model support. This should be carefully managed by the UK Government, especially for geographically dispersed sites.
29	Societal and public acceptance of net zero infrastructure mechanisms to be planned	UK & WG	Policies need to be developed that help the public understand and accept the technologies and infrastructure that will be needed to decarbonise industry and society in general. For example, as the grid expands then so potentially will the number of pylons, as hydrogen networks are developed then underground pipework will be installed, as CCS is needed then CO <sub>2</sub> shipping will be required. On distribution and transmission infrastructure in particular, establishing a new framework that delivers consistent community benefit to communities hosting transmission network and distribution infrastructure is needed. Those that host infrastructure should see a fair level of enduring benefit. We welcome the UK Government's commitment to consult on options and believe there is a need to establish a community benefit framework, which is built into policy and regulation. This presents a critical opportunity for industry, government and the regulator to work together to deliver more ambitious and coordinated community benefit plans, whilst bringing greater clarity and consistency to host communities.
30	Support the Celtic Freeport development	UK & WG	The Celtic Freeport will accelerate the development of the region. A Celtic Freeport will drive significant inward investment in new manufacturing facilities to support the roll-out of FLOW within the Celtic Sea, while providing the backbone for a cleaner future based on the hydrogen economy, sustainable fuels, carbon capture, cleaner steel and low-carbon logistics.

## Appendix 2

# Cluster Plan documents

	<b>Title</b>	<b>Owner</b>	<b>Status</b> (Public/ Private/ Request)
<b>Deliverable 1</b>	WP 2 SWIC Governance structure and objectives	Industry Wales/NZIW	Public
<b>Deliverable 2</b>	WP 3 Case study of hydrogen production opportunities in Neath Port Talbot	USW and NPT CBC	Private
<b>Deliverable 3</b>	WP 3 SWIC Cluster Plan: Clean Energy Supply to the Cluster Report	USW	Public
<b>Deliverable 4</b>	WP 3 Offshore emerging renewables in Wales: The opportunity for the South Wales Industrial Cluster	PoMH	Public
<b>Deliverable 5</b>	WP 3 SWIC supply chain opportunities – summary of presentation	PoMH	Public
<b>Deliverable 6</b>	WP 3 Celtic Sea Developers Alliance Questionnaire on Port Requirements	PoMH	Public
<b>Deliverable 7</b>	WP3 BEIS FLOW MIS response from Port of Milford Haven (Redacted) and Potential to Support FLOW in the Celtic Sea (Redacted)	PoMH	Private
<b>Deliverable 8</b>	WP4 - CCS and infrastructure	Progressive Energy	Public
<b>Deliverable 9</b>	WP 5 WWU Regional Decarbonisation Pathways	WWU	Public
<b>Deliverable 10</b>	WP 6 Risks and Opportunities Register for the Demand Side	CR Plus	Private
<b>Deliverable 11</b>	WP 6 Funding opportunities for the demand side	CR Plus	Public
<b>Deliverable 12</b>	WP 6 Decarbonisation pathways for SWIC sites	CR Plus	Private
<b>Deliverable 13</b>	WP 7 CGH Case Studies	CR Plus	Public
<b>Deliverable 14</b>	WP 7 Neath Port Talbot CGH opportunities study	NPT CBC	Private
<b>Deliverable 15</b>	WP 7 CCU opportunities for South Wales	CR Plus	Private
<b>Deliverable 16</b>	WP 7 Circular Economy opportunities for South Wales	Celsa	Private
<b>Deliverable 17</b>	WP 7 Carbon Accounting Summary report on current methodologies	ERM	Private

	<b>Title</b>	<b>Owner</b>	<b>Status</b> (Public/ Private/ Request)
<b>Deliverable 18</b>	WP 7 Carbon accounting in industry: Learning from the South Wales Industrial Cluster to develop a consistent and coherent national framework	ESC	Public
<b>Deliverable 19</b>	WP 8 Haven skills Gap Study Report	PoMH	Public
<b>Deliverable 20</b>	WP 10 EDI webinar with case studies	Celsa	Public
<b>Deliverable 21</b>	WP 11 Skills needs analysis	CR Plus	Public
<b>Deliverable 22</b>	WP 11 Cluster plan WP Overviews	CR Plus	Available on Request
<b>Deliverable 23</b>	WP 11 Port Commercial case for FLOW and costs for Port Development	PoMH	Private
<b>Deliverable 24</b>	WP 12 The business models of decarbonisation Quarter 2 report	Connect and Convey	Public
<b>Deliverable 25</b>	WP12 The business models of decarbonisation Quarter 8 report	Connect and Convey	Public
<b>Deliverable 26</b>	WP 13 Risk register for industrial decarbonisation and summary report	Capital Law	Private
<b>Deliverable 27</b>	WP 13 SWIC Decarbonisation Plan – Regulatory Review (Environmental Planning and Permitting)	ERM	Public
<b>Deliverable 28</b>	WP 13 COMAH Tier Guidance	ERM	Private
<b>Deliverable 29</b>	SWIC Cluster Plan: R&D Support for Industrial Decarbonisation Report	USW	Public
<b>Deliverable 30</b>	Videos of SWIC Weeks 1 and 2	All	Public
<b>Deliverable 31</b>	SWIC Working Group reports and presentations inc. Skills, Hydrogen within the site	CR Plus	Available on Request
<b>Deliverable 32</b>	Net Zero by 2040: A Year in the Life of the South Wales Industrial Cluster (SWIC) Deployment Project (June 22)	Costain	Public

Links to all of these publicly available materials/documents, as well as case studies on the activities that have been going on in SWIC can be found on the SWIC virtual room here:

[https://content.zone-secure.net/swic\\_planforcleangrowth/](https://content.zone-secure.net/swic_planforcleangrowth/)



**SOUTH WALES INDUSTRIAL CLUSTER**



