



# **Capturing the Economic Potential: Maximising the Positive Impact of the Scottish Cluster**

How the Scottish Cluster will support Scotland and the UK to reach net zero by 2050 while retaining and evolving the industrial base.

**SCOTTISH  
CLUSTER**



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Note that this report is an indicative analysis based on the potential of the 'Reference Case' which was submitted to the UK Government in July 2023. As a snapshot in time, the data is subject to revision and will change as the Acorn Transport and Storage project progresses through the UK Government's Track 2 CCUS Cluster sequencing process. As such, both the initial phase (the 'Anchor Plan') and the subsequent phases (the 'Build Out') stipulated by UK Government Cluster Sequencing guidance may differ from the 'Reference Case' in scope and impact.



**This era is marked by the imperative to balance industrial progress with environmental responsibility. It is accepted that industrial emissions must be reduced whilst enabling a sustainable future for industry and workers, protecting jobs, supporting communities and creating new value-adding activity for Scotland and the UK.**

Through the lens of economic impact, industrial carbon capture and storage (CCS) emerges not only as an environmental necessity, but as a cost-effective and flexible solution that allows UK industry to remain competitive. In its 2023 report to Parliament on progress in reducing emissions, The Climate Change Committee (CCC) states that *“to avoid being left behind in a race to the top, the UK should ensure that timely policy development and investor clarity in sectors such as CCS, hydrogen and engineered removals is prioritised.”*<sup>1</sup>.

The UK Government’s ambition is to have two CCUS industrial clusters by the mid-2020s (Track 1) and a further two clusters by 2030 (Track 2) capable of capturing and storing a combined total of 20-30 million tonnes of CO<sub>2</sub> per year by 2030<sup>2</sup>.

In July 2023, Acorn – as part of the Scottish Cluster - was selected as one of the CO<sub>2</sub> transportation and storage (T&S) networks best placed to deliver these ambitions.

Acorn uses legacy oil and gas infrastructure to send captured industrial CO<sub>2</sub> emissions to permanent geological storage, 2.5 kilometres under the North Sea. Acorn is Scotland’s only advanced T&S network and makes use of one of the UK’s most mature and best understood CO<sub>2</sub> storage sites.

The Scottish Cluster brings together Acorn, National Gas Transmission’s SCO<sub>2</sub>T Connect Project (a pipeline repurposing project which links the Central Belt with North-East Scotland) and a variety of industrial, power, hydrogen, bioenergy and waste-to-energy businesses with their shared aim of capturing up to 10 million tonnes of CO<sub>2</sub> annually by 2030 – and in doing so realising massive economic benefits for Scotland and the UK.

And the reach of Acorn goes beyond Scotland too – there is potential to use non-pipeline transportation, like shipping, to move captured CO<sub>2</sub> to the Acorn storage sites. This would enable Acorn to support the decarbonisation of industry across the UK and even internationally.

The following report highlights how together these transformative projects could be a national economic success story by creating up to 4,700 long-term, highly skilled jobs, diversifying supply chain opportunities, and supporting Scotland’s energy transition – all whilst securing the future of our energy intensive industries, and so safeguarding further tens of thousands of jobs across the UK.

**Nic Braley**  
General Manager, Acorn

<sup>1</sup> This statutory report provides a comprehensive overview of the UK Government’s progress to date in reducing emissions - <https://www.theccc.org.uk/publication/2023-progress-report-to-parliament/>

<sup>2</sup> CCUS: Market engagement on cluster sequencing – government response; May 2021

## About the Scottish Cluster

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The Scottish Cluster is made up of Acorn, National Gas Transmission's CO<sub>2</sub>T Connect Project (a pipeline reuse project which links the Central Belt with North-East Scotland) and a group of industrial, power, hydrogen, bioenergy and waste-to-energy businesses across Scotland who are committed to cutting the country's carbon emissions and making a vital contribution to achieving net zero.

Together the projects in the Scottish Cluster have the potential to abate 5-10 million tonnes of CO<sub>2</sub> per year by 2030 – that is up to one third of the UK Governments total CO<sub>2</sub> emissions reduction target for that year<sup>3</sup>.

<sup>3</sup>Carbon Capture, Usage and Storage: a vision to establish a competitive market - GOV.UK ([www.gov.uk](http://www.gov.uk)) 20th December 2023

## Strategic case for the Scottish Cluster

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Only the Scottish Cluster can provide the infrastructure and scale of ambition to transport carbon to offshore stores, making it possible to decarbonise all of Scotland's industry. At the same time, it will open doors to build new industries, develop new technologies, create manufacturing opportunities, accelerate the hydrogen economy and export skills internationally, all attracting inward investment and providing sustainable jobs.

The Scottish Cluster is expected to make a £17.7 billion contribution to UK economic output up to 2050 (when measured as Gross Value Added or GVA). £9.0 billion of that figure would contribute directly to Scottish economic output.

The Scottish Cluster will also deliver substantial employment benefits:

- An average of 10,800 jobs in the UK economy during the development and construction period (of which 4,700 will be in Scotland).
- An additional 4,700 operational jobs (with 2,300 expected in Scotland).
- This investment could safeguard 18,800 jobs that would otherwise be lost across the UK, including 12,100 across Scotland.

### What is GVA?

Gross value added (GVA) is one way of measuring economic output and is used to measure the contribution made to an economy by one individual producer, industry, sector or region. The figure is a measure of the value of goods and services produced minus the cost of inputs and materials used in the production process. The figure is used in the calculation of gross domestic product (GDP).

## The Cluster in numbers

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**£17.7B**

contribution to UK  
economic output  
(GVA) to 2050

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**10,800**

development and  
construction jobs  
across the UK

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**4,700**

operational jobs  
across the UK

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**18,800**

jobs safeguarded  
across the UK

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Scotland has set its  
net zero target for

**2045**

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Industrial emissions  
contribute

**10.1Mtpa CO<sub>2</sub>**

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By 2030, the Scottish  
Cluster aims to capture

**5-10Mtpa CO<sub>2</sub>**

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## The challenge

The UK Government has legislated a net zero emissions target for 2050 and Scotland has set its net zero target for 2045.

These targets must be met whilst enabling a sustainable future for industry and workers, protecting jobs, supporting communities, and creating new value-adding activity for Scotland and the UK.



Emissions from industry need to decrease by

# 43%

on 2018 levels by 2032.





## The solution

The Scottish Cluster will help the UK meet its targets via a three-step process that involves:

1. capturing CO<sub>2</sub> emissions from high energy-intensity sources
2. transporting CO<sub>2</sub> through Acorn and National Gas Transmission's transportation pipelines
3. permanently storing CO<sub>2</sub> in Acorn's storage under the North Sea


This expansion approach aligns with the UK Government's vision and regulatory support plans for CCS, in enabling efficient and value for money development that is aligned with users' needs.


### Emitter Types:

 Acorn Transport & Storage System


 Hydrogen

 Power CCS

 Industrial Carbon Capture  
(post combustion)

 Industrial Carbon Capture  
(pre-combustion)

 Energy From Waste

 Bioenergy w/Carbon  
Capture & Storage

### Reliable and repurposed infrastructure:

The Acorn stores are connected to the Scottish mainland by existing legacy pipelines. Repurposing these assets reduces project delivery risk, cost and environmental impact. These existing pipelines could transport up to 20 Mtpa of CO<sub>2</sub> to the Acorn stores.

Industry in the Central Belt of Scotland will be able to send their captured CO<sub>2</sub> to the Acorn storage sites thanks to National Gas Transmission repurposing an existing onshore natural gas pipeline.

### One of the UK's most mature and best understood stores:

CO<sub>2</sub> will be stored approx.100km offshore from St. Fergus, in sandstone rock 2.5km under the seabed, sealed by a caprock approximately 400m thick. Over time, the trapped CO<sub>2</sub> will bind with elements of the surrounding rock to create solid, chalky minerals, permanently locking the CO<sub>2</sub> into place.

Storage will extend as demand requires, into nearby geological structures which also already have pipeline access and CO<sub>2</sub> storage licenses. All Acorn storage sites have been independently verified as suitable for CO<sub>2</sub> storage.

### Shipping:

The proximity of Peterhead Port to Acorn's geological storage sites, existing pipeline connection and existing jetty makes it an ideal location for a CO<sub>2</sub> import facility.

Investment in redeveloping Peterhead Port will allow CO<sub>2</sub> captured from sources in other parts of the UK or internationally to be shipped to Acorn via Peterhead – providing an option for emitters across the UK without immediate access to CO<sub>2</sub> storage and the potential to create substantial international trade opportunities.

# Maximising the potential

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Scotland is blessed with huge CO<sub>2</sub> storage potential and existing energy infrastructure which can be readily repurposed to decarbonise Scotland and the UK, create sustainable jobs and develop new industries. Of the UK's potential 78GT of cost-effective storage, 75% is in Scottish Waters in the Central and Northern North Sea<sup>6</sup>. The Scottish Cluster aims to make the most of this potential by opening access to infrastructure for CO<sub>2</sub> reduction projects aligned to the country's net zero goals.



## Customers (carbon emitters)

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Multiple emitters across Scotland and beyond, provide opportunities to both create and preserve jobs, support local supply chains, and create fully integrated CCS developments.



## Onshore infrastructure

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By working with National Gas Transmission to repurpose existing onshore infrastructure, the Scottish Cluster will limit the costs of CO<sub>2</sub> transportation.



## Offshore infrastructure

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The North Sea is home to aquifers and depleted oil and gas fields suitable for use as major underground CO<sub>2</sub> storage sites. The Acorn Project intends to store CO<sub>2</sub> in the Acorn and East Mey stores in the North Sea, with a potential combined capacity of 240MtCO<sub>2</sub>. Two offshore oil and gas pipelines will also be repurposed (Goldeneye and Miller Gas System Pipelines) which will connect St Fergus with the storage facilities in the North Sea.



## A just transition and opportunity to reskill

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In 2019, hydrocarbon extraction was worth an estimated 5% of total Scottish GDP<sup>7</sup> while the industry supports more than 122,000 jobs across the UK. Direct employment is largely based in the North East of Scotland. In 2021, upstream oil and gas activities employed 19,000 people across Aberdeen City and Aberdeenshire. With the transition to net zero, demand for oil and gas production will reduce leading to a relative decline in the workforce. The Scottish Cluster will support a just transition to new, permanent and skilled low carbon jobs in the CCS and hydrogen sectors using the skills and experience of the existing oil and gas workforce.

<sup>6</sup> CO<sub>2</sub> Stored (The Crown Estate, British Geological Survey, UKRI Natural Environment Research Council, Energy Technologies Institute), ETI's Strategic UK CCS Storage Appraisal 2016.

<sup>7</sup> <https://www.parlaimaid-alba.scot/chamber-and-committees/questions-and-answers/question?ref=S5W-30431>



The UK has the potential to provide the necessary components to support the delivery of the Scottish Cluster. However, supply chain capacity and capability may pose a challenge in the near-term unless mitigating action is taken.

Acorn and Scottish Cluster partners are working with the local supply chain and government bodies to maximise the local and national benefits. That includes working with everyone from UK-wide suppliers to local businesses such as hotels and other suppliers close to the projects.



**“The economic impact could be higher, if efforts to develop the Scottish and UK supply chains are successful.”**

Biggar Report 2023



#### Acorn Supply Chain Case Study, November 2023:

Supply chain companies based across Scotland, the UK and Europe learned about the procurement timeline for the Acorn project at an event in Aberdeen. More than 100 companies from regional small to medium sized enterprises to multinationals expressed an interest in the event, and some 114 people from 66 companies turned out to hear about pre-qualification for upcoming front end engineering and design studies from representatives of the Acorn Project.

Representatives of major contracting organisations, technical and engineering consultancies, equipment manufacturers and industry bodies were invited to engage with the project and posed questions to its leadership. Areas of interest included:

- The type of facilities needed at St Fergus to capture CO<sub>2</sub> emissions and transport that CO<sub>2</sub> to the Acorn stores offshore
- The skills and size of workforce needed to create the Acorn system
- The measures expected to be in place to decarbonise project operations

## Preparing for success

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In the reference case used for this economic impact study the Scottish Cluster's plans include the transport and storage infrastructure projects and 14 capture projects up to 2030. A further eight capture projects have been identified beyond 2030. The economic benefits of these projects will be realised in three phases:

### Development phase:

Development covers the period up to the final investment decision stage (FID) and mostly involves contracts in professional services, engineering design and planning support. 85% of this spend would be expected to occur within the UK, and of this UK spend, 59% would be in Scotland. The estimated total investment up to FID is more than £0.5 billion which during the development phase could result in:

- £0.8 billion GVA and 1000 jobs across the UK (of which £0.4 billion GVA and 400 jobs specifically in Scotland)

### Construction phase:

Projects in the construction phase are expected to last for three years on average.

The total construction investment is forecast at £11.9 billion. On this basis, it is estimated that during the construction phase this could result in:

- £7.1 billion GVA and 15,100 jobs across the UK (of which £3.2 billion GVA and 6,600 jobs specifically in Scotland)

### Operations phase:

Projects in the operational phase could require a total annual spend of more than £0.4 billion. It is estimated that each year, the Scottish Cluster will contribute:

- £0.5 billion GVA and 4,700 jobs across the UK (of which £0.3 billion GVA and 2,300 jobs specifically in Scotland)

### Safeguarding employment:

By 2034, it is estimated that each year the Scottish Cluster could safeguard £1.1 billion GVA across the UK (91% of which would be in Scotland), and 18,800 industrial jobs (62% of them in Scotland) that would otherwise be lost.

- £1.1 billion GVA and 18,800 jobs across the UK (of which £1.0 billion GVA and 12,100 jobs specifically in Scotland)



Safeguarding

**18,800**

jobs across the UK +

**12,100**

jobs across Scotland

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**57%**

of **construction spending** could benefit UK-based businesses

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**85%**

of **development spending** could benefit UK-based businesses

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## Summary of impact

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Overall, during the period to 2050, the Scottish Cluster plans to invest £12.5 billion in development and capital and £8.7 billion in operations, which will result in:

### For the UK:

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 **£17.7B**  
UK GVA

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 **10,800**  
development and construction jobs

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+

**4,700**  
operational jobs in UK economy

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+

**18,800**  
jobs safeguarded in the UK

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### For Scotland:

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 **£9.0B**  
Scottish GVA

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 **4,700**  
development and construction jobs

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+

**2,300**  
operational jobs in Scottish economy

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+

**12,100**  
jobs safeguarded in Scotland

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## Capturing the potential

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The Scottish Cluster provides critical infrastructure for the UK and Scotland to meet net zero targets, but it will also provide considerable economic benefits including:

-  **Inward investment**
-  **Building new industries**
-  **Developing new technologies**
-  **Creating manufacturing opportunities**
-  **Repurposing legacy infrastructure**
-  **Transitioning existing industries to a sustainable future and safeguarding jobs**
-  **Exporting skills internationally**
-  **Establishing the UK as an international CO<sub>2</sub> transport and storage hub**

This Economic Impact summary report covers the whole of the Scottish Cluster, including the proposed emitters (or industrial customers) from the 'Reference Case' which the Scottish Cluster submitted to the UK Government in July 2023. The report uses bottom-up data directly provided by those emitters. In this summary form, the report focuses on the headline impact on jobs and the economy and emission reductions.

This work is complemented by an in-depth report produced by Strathclyde University's Centre for Energy Policy (CEP), which focuses exclusively on the Scottish CO<sub>2</sub> Transport and Storage industry and how it can be deployed and invested in ways that are both economically and politically feasible and that deliver value.

Turner, K., Race, J., Katris, A., Calvillo, C., Zanhou, A., Karkoutli, A., Corbett, H. and Swales, K. (2024) A new Scottish CO<sub>2</sub> Transport and Storage sector: supporting decarbonisation, jobs and value across the UK economy. University of Strathclyde. Available at <https://doi.org/10.17868/strath.00088173>

#### SOURCES:

- Biggar Economics: Economic Impact of the Scottish Cluster (Reference Case) Summary Report October 2023.
- UK Supply Chain Assessment, April 2023 Shell UK Limited.
- Emissions data: Climate Change Committee Scottish Emission Targets – first five-yearly review & Progress in reducing emissions in Scotland – 2022 Report to Parliament.

#### GLOSSARY:

- *Net present value (NPV)* is used to calculate the current value of a future stream of payments from a company, project, or investment.
- *Gross value added (GVA)* measures the contribution made to an economy by one individual producer, industry, sector or region. The figure is used in the calculation of gross domestic product (GDP). GVA is one way of measuring economic output which is used by researchers to measure the contribution made to the economy by individual producers, industries, sectors or regions. The figure is a quantitative assessment of the value of goods and services produced minus the cost of inputs and materials used in the production process.
- Mtpa – Million tonnes (of CO<sub>2</sub>) per annum



SCOTTISH  
CLUSTER

