SOLENT LIDP

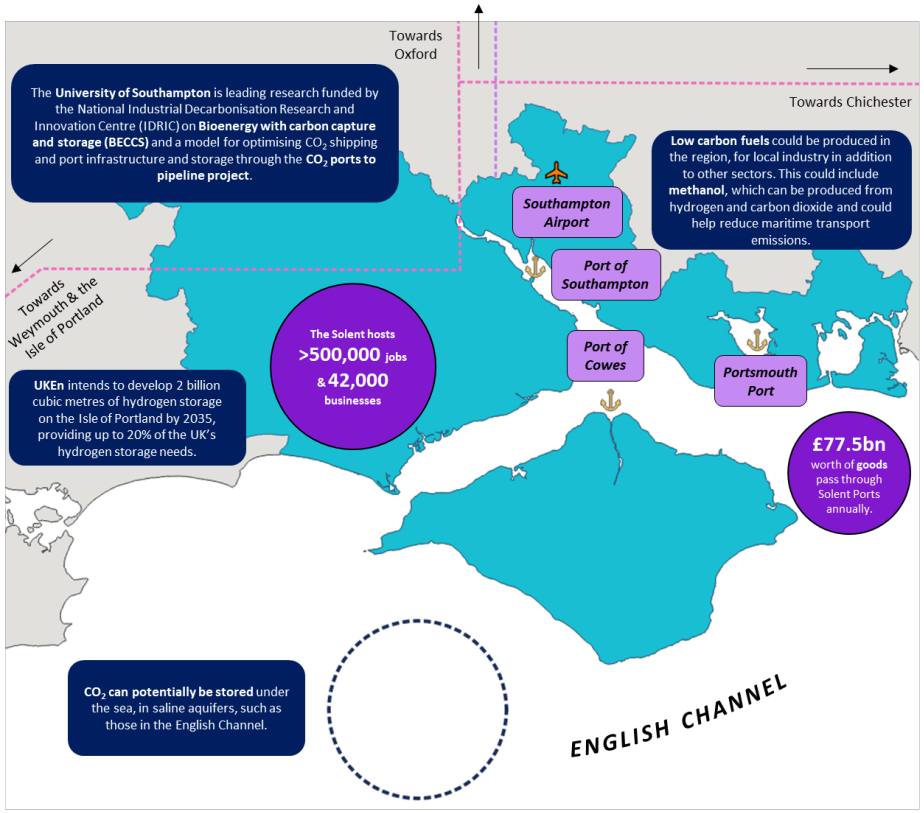
Macroeconomic Assessment Update

Sustainability is our business

Introduction

With a population of over 1.3 million people and 50,000 businesses, the Solent region is a critical economic hub in the UK.

- It is home to a wide range of industries, including maritime, health, education, retail and advanced manufacturing.
- Its proximity to major shipping routes and the region's natural harbours also make it well-suited for further growth of the maritime industry (the area's core sector) and its sustained relevance to the overall UK economy.
- The region emits roughly 5.3 million tonnes of CO_2 annually, and its economic activities are currently coupled with its greenhouse gas emissions.
- Plans to decarbonise the industries in the Solent will not only lead to emissions reductions but will have a significant impact on the local economy through the displacement, safeguarding, and creation of economic value for the region.
- ERM had previously worked with the Solent Cluster to estimate the potential jobs and Gross Value Added to the Solent economy, resulting in a socioeconomic report published in March 2024.
- The potential economic benefits of the Solent's decarbonisation investments hinge on which projects are implemented. This macroeconomic assessment evaluates various scenarios, illustrating how the overall outcomes will vary based on the extent to which all announced projects in the region are carried out.



Overview of Solent decarbonisation potential

This report summarises the updated socioeconomic benefits expected within the Solent cluster from major energy infrastructure projects

- Since publication of the socioeconomic report, the Solent Partners now understand that efforts on large-scale projects (Solent Blue hydrogen, CO_2 pipeline and ECOStore) are now not being progressed due to changing market conditions.
- Additionally, previously planned upgrades to the Fawley refinery in the Solent would likely not proceed because the refinery's decarbonisation is dependent on a reliable supply of low-carbon hydrogen.
- To reflect the shift in industrial landscape, ERM have produced updated jobs and Gross Value Added (GVA) estimates for an optimistic and pessimistic scenario:

Project	Original scenario	Optimistic scenario	Pessimistic scenario	Justification
Solent Blue hydrogen plant (Estimated capacity – 1.4 GW, to be extended to 2.8 GW)	✓	×	×	Changing market conditions have resulted in paused development.
Fawley refinery upgrades	✓	×	×	Changing market conditions have resulted in paused development.
Potential Sustainable Aviation Fuel (SAF) plant from a private developer (Estimated capacity – 200 kt/year)	✓	✓	×*	Project may be dependent on the availability of captured CO_2. Its viability could therefore be improved by the local adoption of CO_2 capture.
CO_2 capture at the Marchwood Energy from Waste (EfW) plant.	✓	✓	✓	Project's viability is improved by the availability of local storage. However, several storage/offtake options could be considered.
Offshore CO_2 storage in the English Channel Offshore Storage	✓	✓	×	The licence for CO_2 storage is available, but no clear project owner has been announced.
A potential CO_2 pipeline connecting the Solent region	✓	✓	×	This may be dependent on the realisation of a large-scale CO_2 storage and market.
Two green hydrogen plants (quoted separately*)	✓*	✓*	×	These projects appear to be in the conceptual phase, with little announced progress.

Within the assessment and outputs, the below definitions of the terminologies will be used

Gross Value Added (GVA)	• The value of goods/services minus any costs (e.g. equipment/materials from elsewhere, taxes, rent but not wages). • A measure of the contribution of that product to the company's profit before they have paid employees. • The amount of GVA will depend on the type of work being done (i.e. the SIC code).
Number of jobs	• Number of jobs created is a function of the gross value added. It is calculated using the employee turnover (number of employees per million £ turnover) from the ONS Annual Business Survey
Direct Jobs	• Jobs that will be created by project sponsors or named project collaborators (e.g. EPC contractors) for the delivery or operation of the project
Indirect Jobs	• Jobs that will be created by other businesses not directly engaged in the project as a result of project expenditure
Jobs Displaced	• Jobs that will be sustained due to the project, but would not be at risk in its absence
Jobs Created	• New jobs that will be created as a result of the project

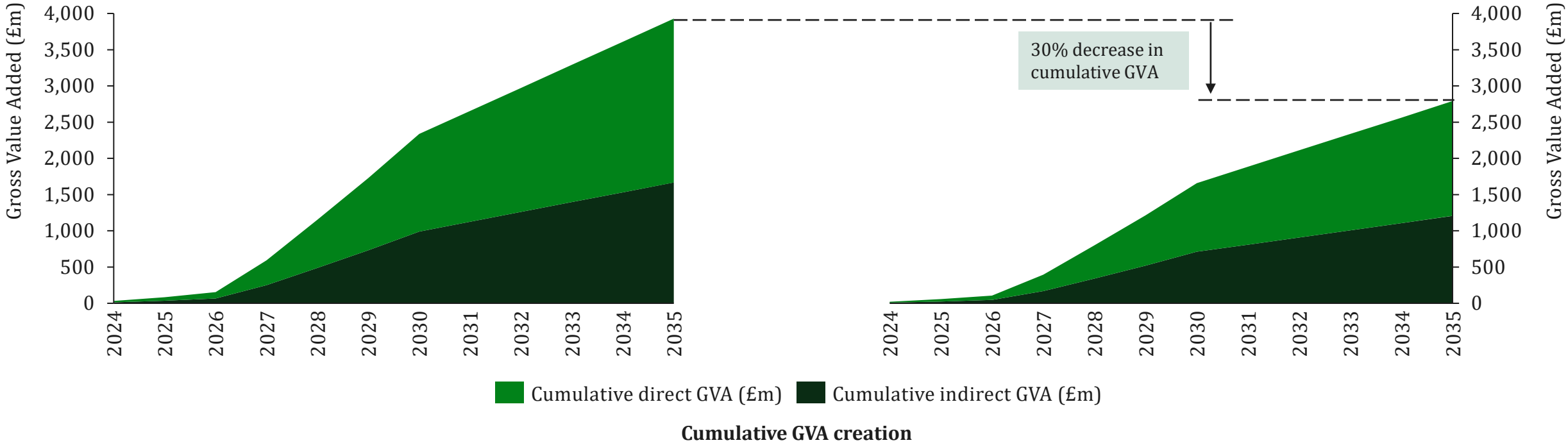
Up to £2.7 billion in direct and indirect GVA could be generated within the updated scope of assessment

Original scenario

- From 2024 to 2035, £4 billion in direct and indirect Gross Value Added (GVA) would have been generated.
- Over £600 million in direct and indirect GVA would have been
- The removal of the blue hydrogen and the Fawley refinery upgrades could result in a 30% reduction in the total cumulative GVA generated by decarbonisation projects in the Solent.

Optimistic scenario

- From 2024 to 2035, £2.8 billion in direct and indirect GVA is generated. 57% of this is direct and 43% is indirectly produced.
- Over 80% of the total GVA generated could be from a potential Sustainable Aviation Fuel plant.
- At the peak of spend in 2030, over £400 million is generated across projects.



Cumulative GVA creation

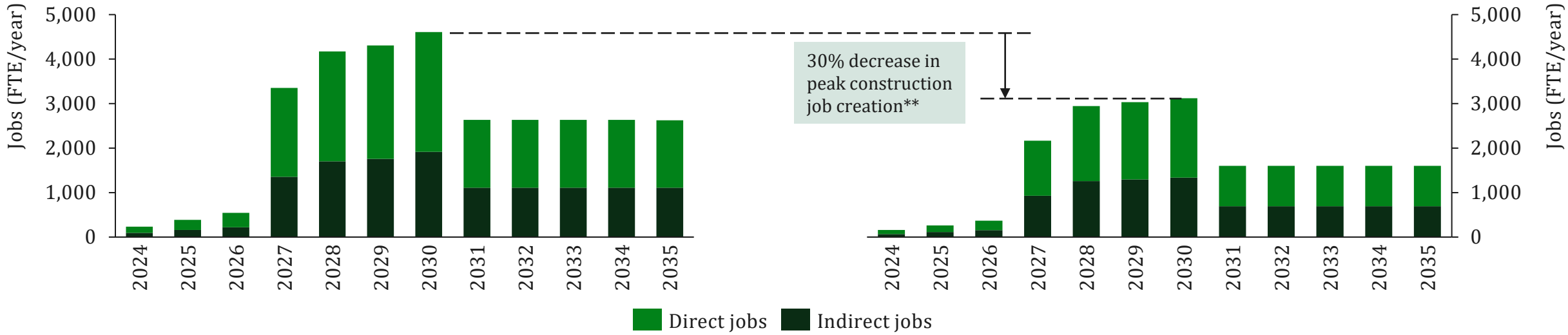
Within the updated scope, up to 20,600 FTE jobs could be created between 2024 and 2035

Original scenario

- At the peak of construction, this could have resulted in over 11,000 direct and indirect jobs, 4,600 of which would have been created.
- Excluding the economic benefits from the potential green hydrogen production plants, the capital expenditure in the region could create nearly 18,000 direct FTE years between 2024 and 2035.
- 57% of the employment creation is direct, while 43% is indirect.

Optimistic scenario

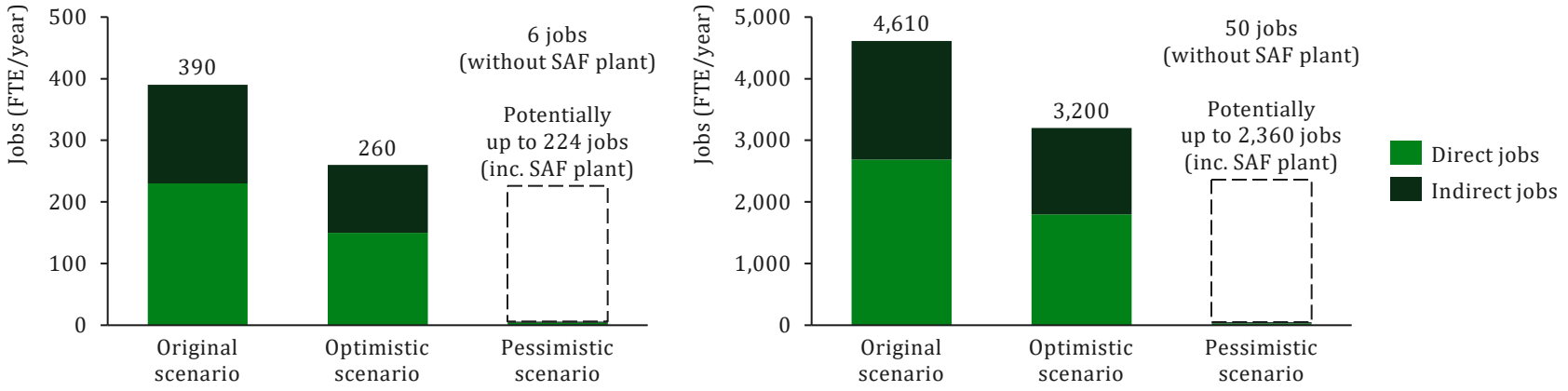
- The removal of the blue hydrogen plant and upgrades at the Fawley refinery result in a 30% reduction in peak job creation.
- Over 3,200 direct and indirect jobs are created at the peak of construction spend in 2030. An additional 3,600 direct and indirect jobs could be displaced.
- 20,600 direct and indirect FTE years are created during the construction and operational period from 2024 to 2035. The capital expenditure could lead to roughly 11,500 created direct FTE years.



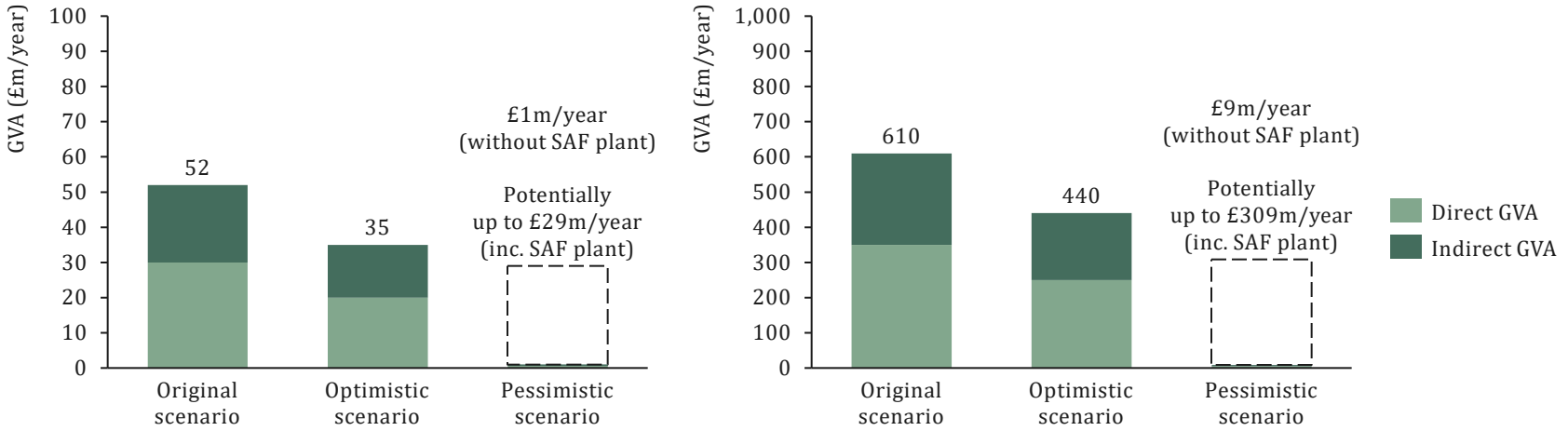
*FTE jobs refers to FTE years
**Direct and indirect job creation, these figures do not include displaced jobs

The Solent's capacity to contribute to the UK's GVA and job creation significantly increases with an enabling environment for e-fuels

- The pessimistic scenario assumes that the only realised large-scale decarbonisation project is carbon capture at the Marchwood Energy from Waste.
- Compared to the optimistic scenario, this results in an up to **98% reduction in direct and indirect jobs** created.
- However, most of the potential job creation from the 'optimistic scenario' could be preserved with the materialisation of a Sustainable Aviation Fuels plant in the region, whose feasibility is linked to the availability of CO_2, a feedstock for SAF.



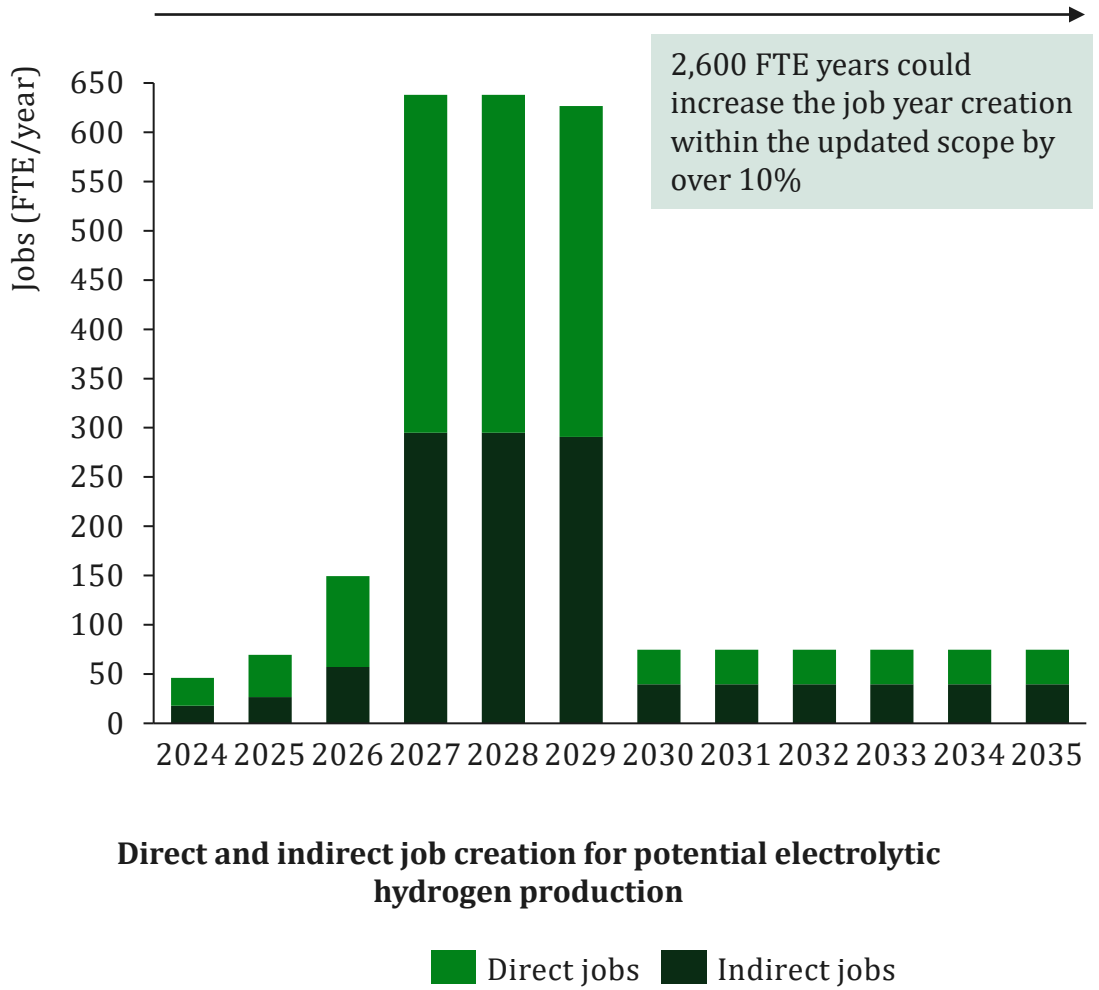
Direct and indirect job creation (rounded) for original, optimistic and pessimistic scenarios in 2025 (left) and 2030 (peak of construction period) (right)



Direct and indirect GVA creation (rounded) for original, optimistic and pessimistic scenarios in 2025 (left) and 2030 (peak of construction period) (right)

Green hydrogen production in the region could mitigate risks while also resulting in over 600 jobs sustained at peak construction

- In the Solent region, two green hydrogen production plants are planned with a combined capacity of 400 MW.
- The realisation of these plants could mitigate the risk of insufficient supply of hydrogen to the region, while resulting in local economic benefits.
- These plants are in early stages of development, and their construction and operation could result in:
  - Gross generation of over 600 direct and indirect roles
  - Cumulative direct and indirect GVA of over £130 million by 2035
  - 35 full-time roles and 40 indirect jobs
  - Over 2,600 direct and indirect FTE years from 224 to 2035
- The figure represents the potential gross employment generated by a project in operation by 2030.



Direct and indirect job creation for potential electrolytic hydrogen production

Several projects are planned and underway in the South of England, many of which can support decarbonisation in the Solent

- The Solent LIDP has considered projects key to the decarbonization of the region, which have been represented in the section above. In addition to these projects, the south of England is also home to range of projects across the hydrogen value chain.
- While these projects may not result in local economic benefits in the Solent region, their realization could contribute to hydrogen supply in the region.

Project	Technology	Value chain element	Location
ABSL Swindon	50 MW CCUS enabled gasification	Hydrogen production	Swindon
Shoreham Port Green Hydrogen Production	5 MW electrolysis, scaling to 20 MW at peak production	Hydrogen production	Shoreham
RWE green hydrogen production	10 MW electrolysis	Hydrogen production	Didcot
UKEn hydrogen storage	Salt caverns	Hydrogen storage	South Dorset
Project Union	Hydrogen pipeline transport	Hydrogen distribution	Across the UK
H2 Connect	Hydrogen pipeline transport	Hydrogen distribution	South England

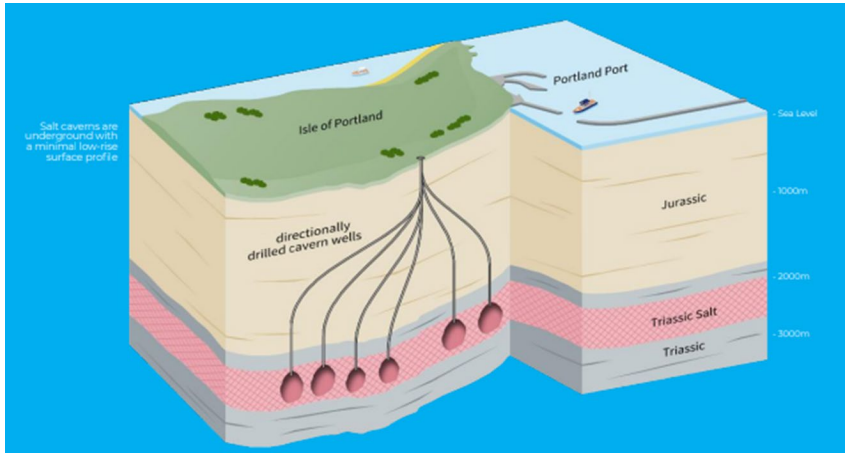
The following slides summarise the projects focused on hydrogen storage and transport

Large-scale underground hydrogen storage is being developed in the Port of Portland

Project summary[1]

Project description	**UK Energy Storage** (UKEn) is developing salt cavern hydrogen storage projects in South Dorset and East Yorkshire.
Capacity	**South Dorset:** 7 TWh (maximum annual capacity) • Phase I: 1 billion m^3 • Phase II: Additional 1 billion m^3 **East Yorkshire:** 4 TWh (initial annual capacity), with potential to match Dorset's capacity.
Timeline	Phase I could be operational by **2027/2028**
Potential interaction with the Solent	While the investment is expected to be beyond the geographical scope of the Solent region, the realisation of hydrogen storage an increase the security of the molecule's supply in the area and beyond. Specifically, it will encourage: • **Connection to southern England 'super-cluster':** The South Dorset location could potentially service hydrogen production and demand across Southern England, including Portland, the Solent Cluster and Greater London. The first phase of the South Dorset facility is over **7 times the expected annual hydrogen demand** in the Solent region by 2040[3]. • **Low-cost hydrogen storage:** Salt caverns could have a levelized storage cost of $0.15 to $1.2/kg, depending on the operating conditions. This could offer cost savings compared to compressed above ground hydrogen storage, which could have a levelized storage cost of $0.7 to $0.9/kg, accounting for compression costs[2].

Project visualisation



South Dorset salt cavern project

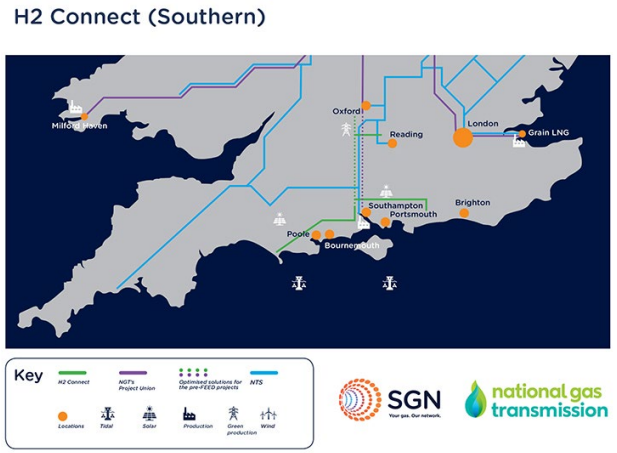
1 – Sources: UKEn Portland Whitepaper (2021), UKEn website
2 – The levelized cost of storage depends on the operational conditions and size of the hydrogen storage option. Source: UC Davis, Hydrogen Storage and Transport: Technologies and Costs
3 – This estimate is based on hydrogen demand modelling conducted by Ada Mode as part of the Solent LIDP project. It is based on a hydrogen salt cavern operating at 100 bar.

Hydrogen transport is being developed through H2 Connect and Project Union

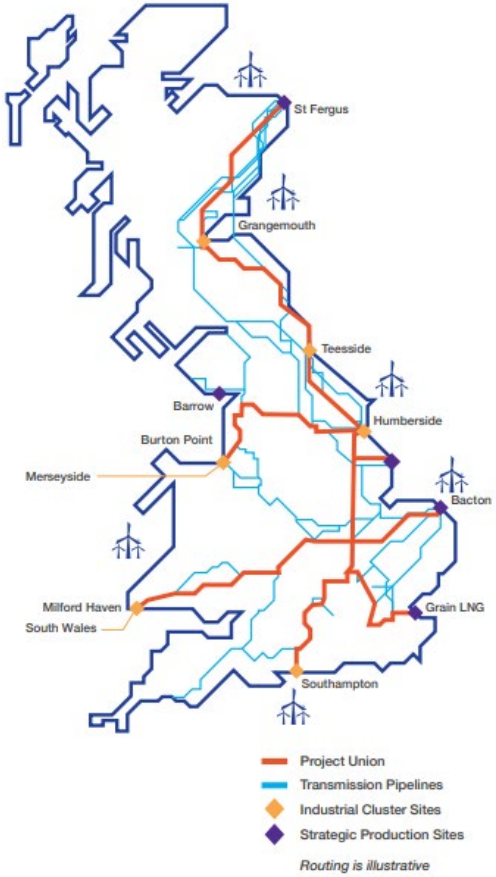
Project summary

Name	H2 Connect	Project Union
Description	SGN is developing a hydrogen network in central Southern England. The project will connect to the National Transmission System (NTS), operated by National Gas Transmission. The timeline for completion is unclear.	National Gas is repurposing and building a network of 1,500 miles of pipelines capable of transporting 100% hydrogen. The pipeline construction is expected to have concluded in the early **2030s**.
Project partners	SGN	National Gas
Potential interaction with the Solent	• **Local economic benefits**: Project Union is estimated to result in £300 million annual GVA and 3,100 jobs at peak construction[1,2]. As a proportion of the construction is to be in the Solent region, some spend in the region could result in local value creation. • **Connection between hydrogen production, storage and use:** a hydrogen transmission system can connect expand the available market for hydrogen producers, while increasing the security of gas supply for hydrogen offtakers.	

Project visualisation



H2 Connect (Southern)[3]



Project Union overview[1]

1 – Sources: National Gas, 2022, Project Union Launch Report;
2 – The estimate is based on 2021 prices;
3 – SGN, 2024, Long Term Development Statement