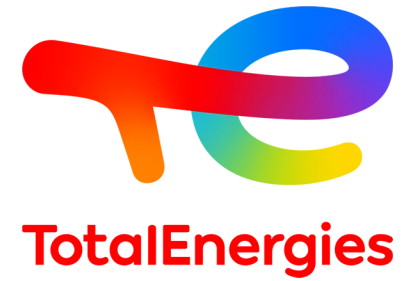


# BACTON GAS SUPPLY ROUTES & FORECASTS

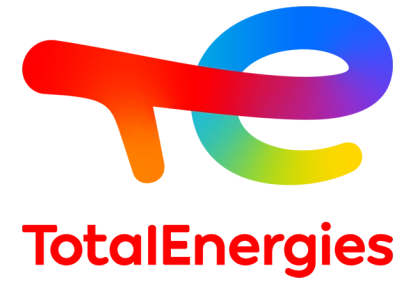
August 2022





# Agenda

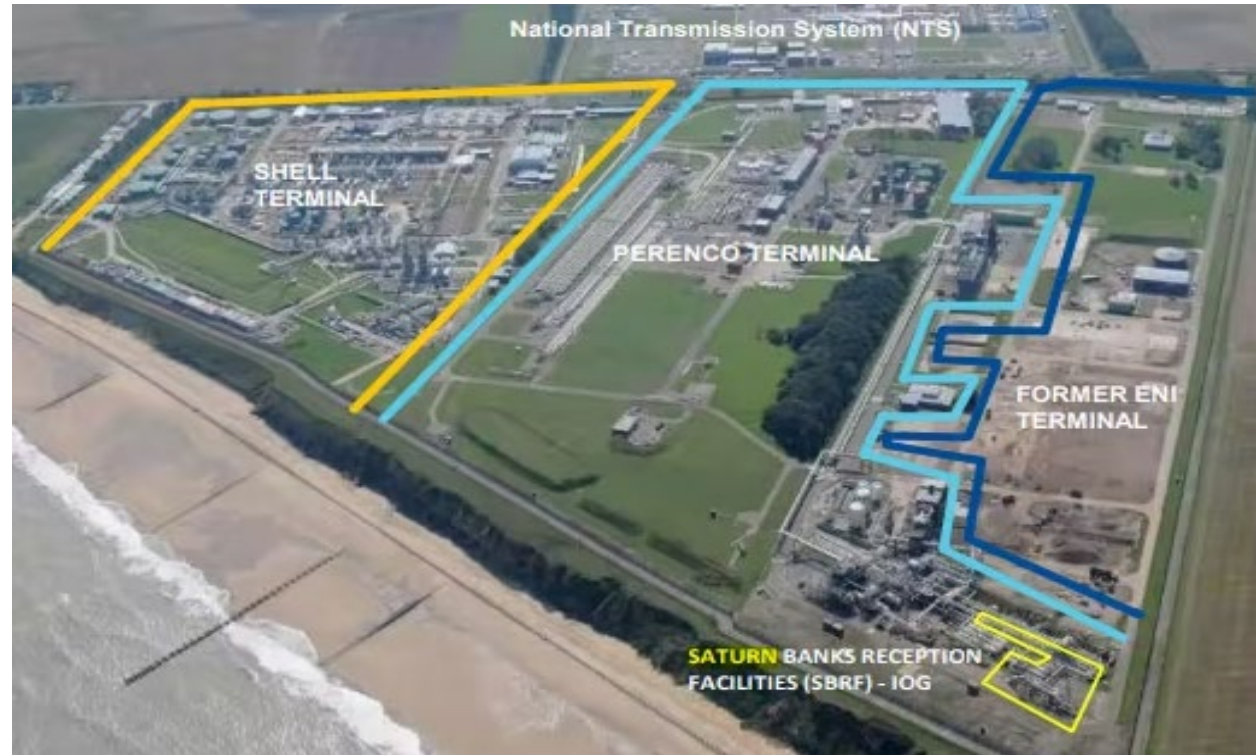
1. Bacton Overview
2. Woodmac Study of Future Gas Production into Bacton
3. National Grid Data and Forecasts



# 1. Bacton Overview

# Bacton Gas Terminal

- Established in 1968, the Bacton Gas Terminal is a complex of six gas terminals within four sites:
- 3 sites built to receive from Southern and Central North Sea areas
  - Shell
  - Perenco
  - Eni



- BBL Bacton Balgzand Line (Within Shell)
- National grid compression station
- Transco Entry Facility, which provides a direct link to the UK - Continent Interconnector (within National Grid)

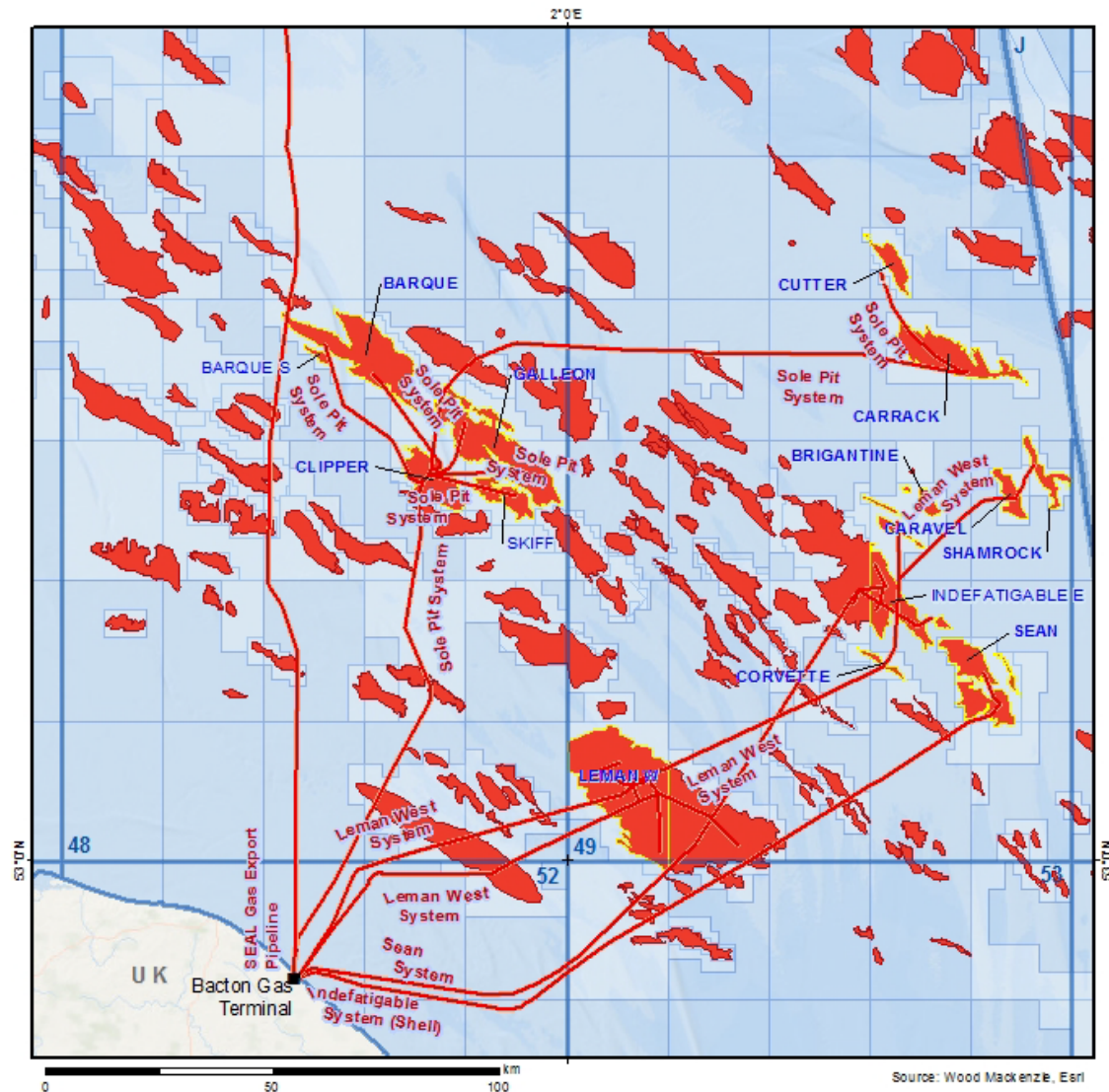
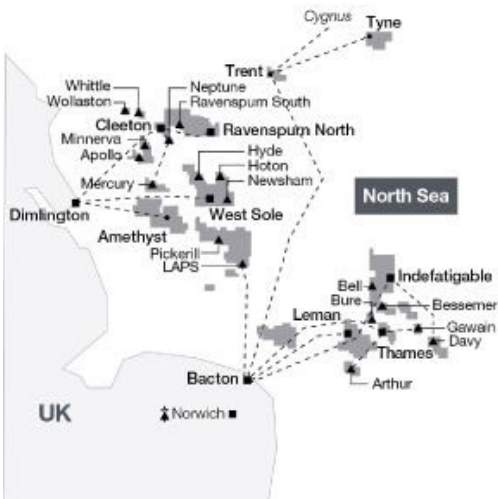
# Bacton Gas Terminal – Pipeline Maps



## Shell Pipeline Map



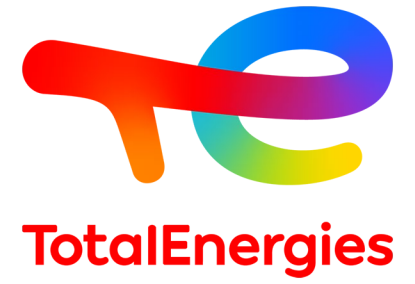
## Perenco Pipeline Map



# Pipeline Network & Major Feeders



Terminal	Arriving Pipelines	Main Feeder Platforms to Arriving Pipelines	Feeder Fields to Pipelines	Capacity
Shell	Leman West System Sean System Sole Pit System	Leman West Sean Barque, Clipper & Clipper South	Brigantine, Caravel, Corvette, Leman West & Shamrock Sean East, North & South Barque, Carrack, Clipper, Clipper South, Cutter, Galleon & Skiff	900 mmcf/d
	Shearwater Elgin Area Line (SEAL)	Elgin/Franklin	Elgin, Franklin, Glenelg & West Franklin	925 mmcf/d
Bacton (ENI) Systems In 2011, the Bacton (Eni) terminal was integrated into the Bacton (Perenco) terminal.	Hewett System	Ceased		over 2 bcf/d
	Lancelot Area (LAPS)  Saturn Banks Area (previously Thames)	Redirected to Bacton (Perenco) since Aug 2011  Being Refurbished as part of the recommissioning of the Saturn Banks Area Development	Excalibur, Malory & Waveney  Blythe, Elgood, Elland, Goddard, Nailsworth & Southwark	
Perenco	Leman East Area	Leman East	Leman East & Leman South	600 mmcf/d
	Indefatigable Area	Inde West & South West	Bell, Inde SW, Inde W, Wenlock	700 mmcf/d
	Esmond Transportation System (ETS) Area	Cygnus, Trent & Tors	Cygnus, Trent & Tors	400 mmcf/d
National Grid	2 Lines from ENI (now disused) 2 from Perenco 4 from Shell 1 from BBL Pipeline			
Interconnector UK (within National Grid)				26.9 bcm/year
BBL Bacton Balgzand Line (Within Shell)				16.4 bcm/year



## 2. Woodmac Study

# Bacton Energy Hub Gas Supply Study

## Gas Market Analysis

20<sup>th</sup> June 2022







## Approach and Objective

**Objective:** TotalEnergies is part of a consortium, led by the North Sea Transition Authority (formerly OGA), which is looking at the potential for Bacton to become an energy hub comprising low-carbon and hydrogen infrastructure to supply the UK market. This short study is to assess the gas supply outlook for Bacton to support the broader energy hub analysis and specifically the potential for blue hydrogen.

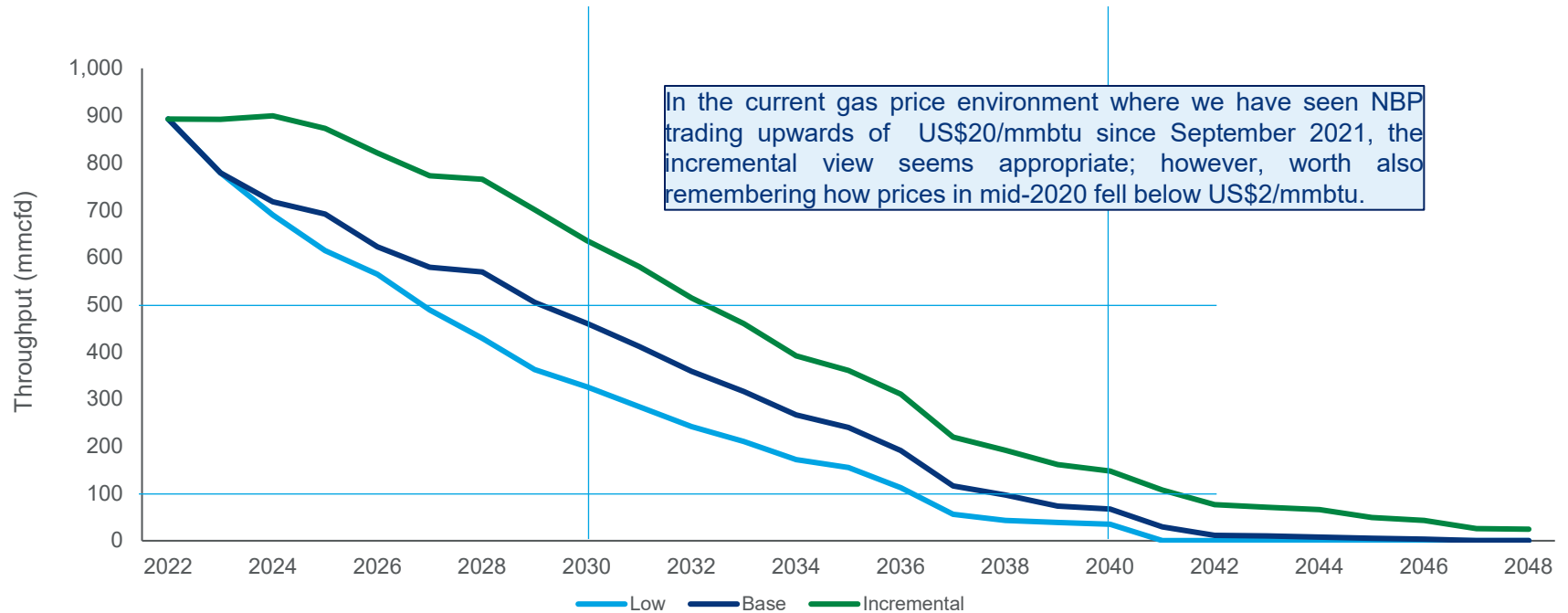
**Approach:** using its asset level analysis of the UKCS Wood Mackenzie has developed a bottom-up analysis of the gas supply into Bacton. The analysis includes a selection of different categories of supply, aggregated to create a range of views. These are: low, base and high:

- **Low Case** – bare-bones look at what is onstream and under-development
- **Base Case** – Wood Mackenzie's base view of onstream, under-development and commercial\* discoveries. In an operations view of the world this would be considered a conservative view.
- **Incremental Case** – building on the base case view we add reserves growth and YTF volumes.

The Incremental Case is probably the most representative of the future domestic supply into the Bacton hub especially given the robust gas price outlook; however, it is worth appreciating how this is built up through the Low and Base case views.

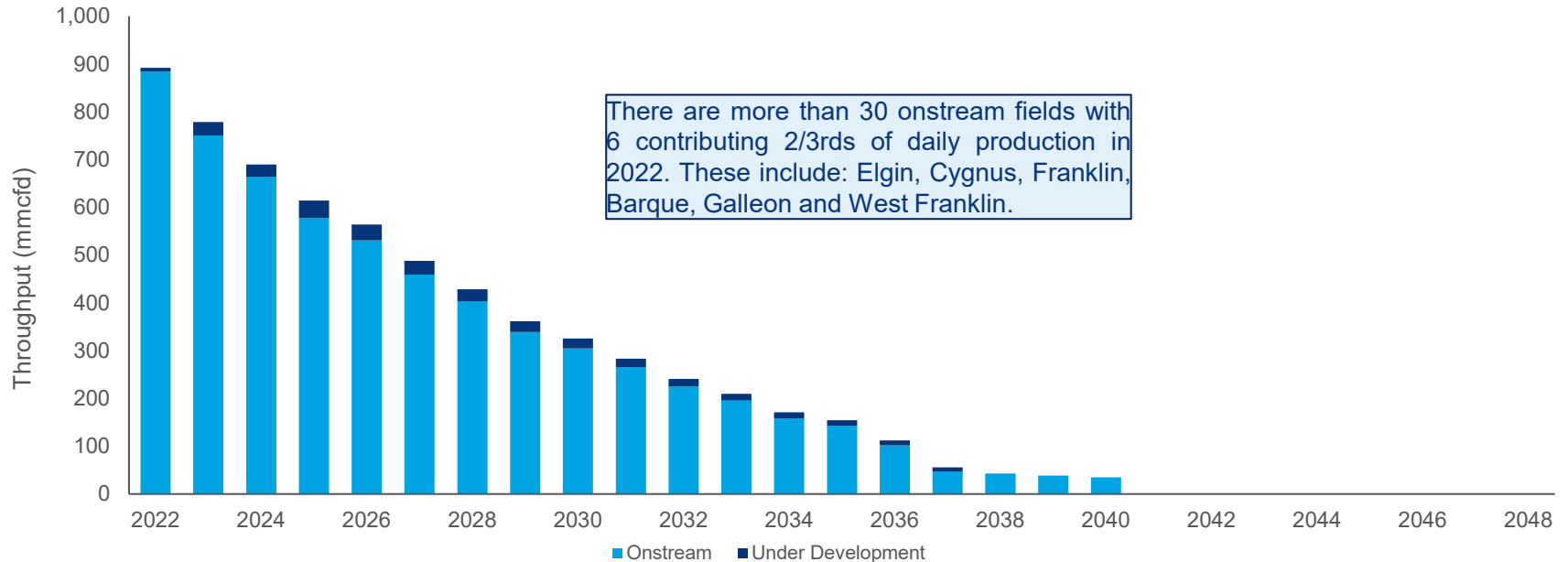
# With gas supply from the Southern Gas Basin and Central North Sea the declining supply to Bacton under all cases is a reflection of the maturity of the UKCS

Bacton Energy Hub Throughput – Scenario comparison



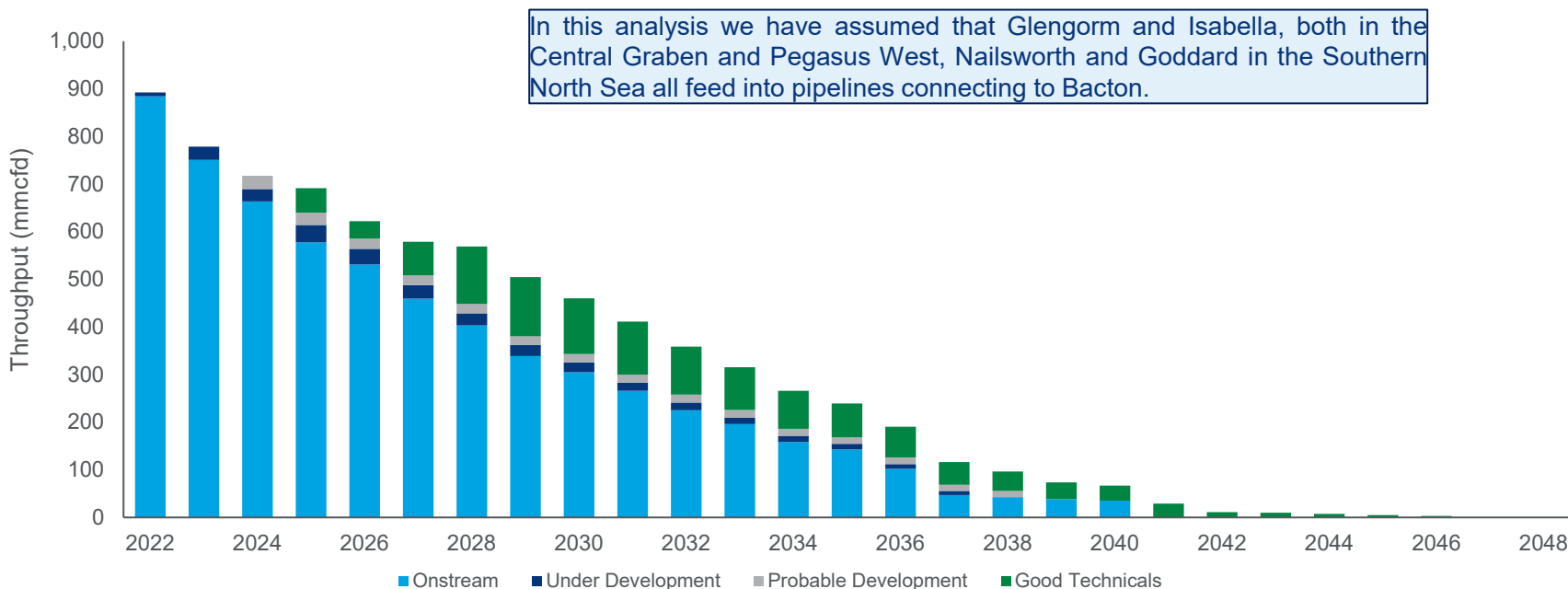
# The Low Case includes only the onstream and under-development (Southwark and Elland) fields but provides a useful view of ‘firm’ supply to Bacton

## Bacton Energy Hub Throughput – Low case



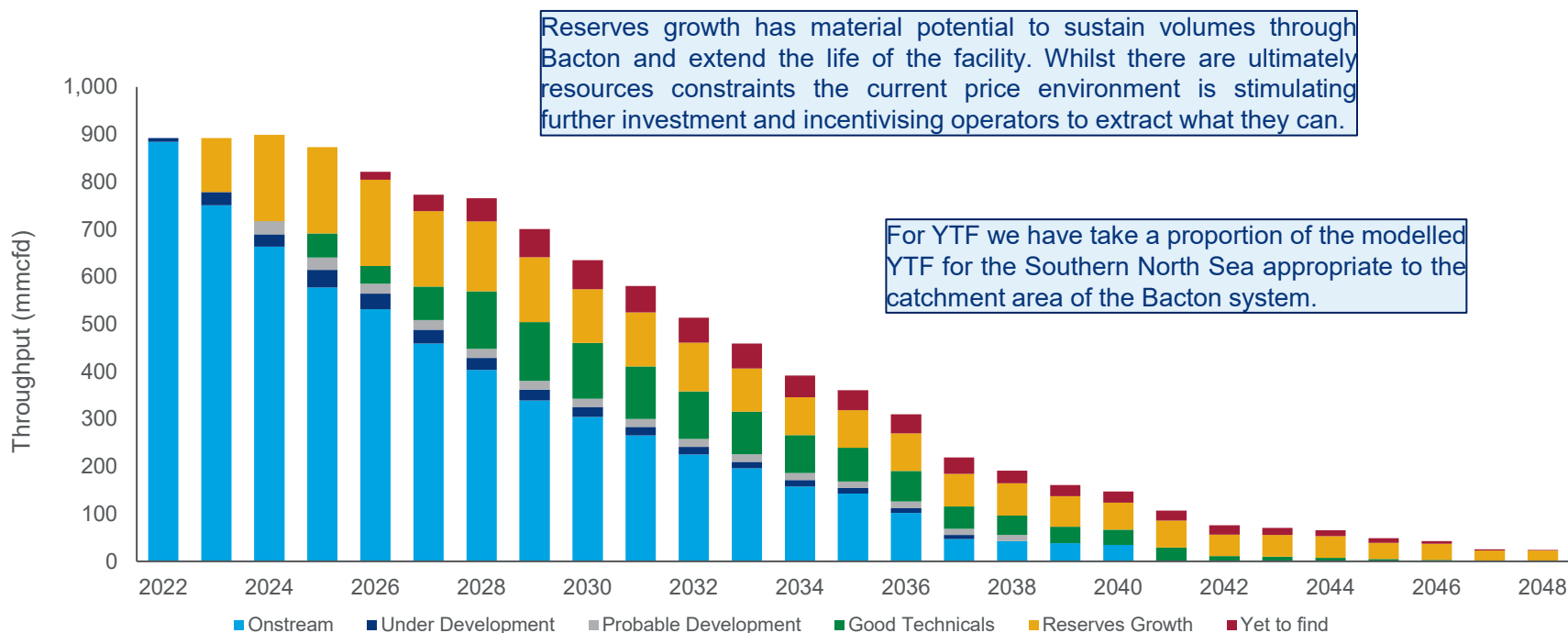
# The Base Case adds probable developments (Pegasus West and Nailsworth) and Good Technicals (Glengorm, Isabella and Goddard)

## Bacton Energy Hub Throughput – Base case

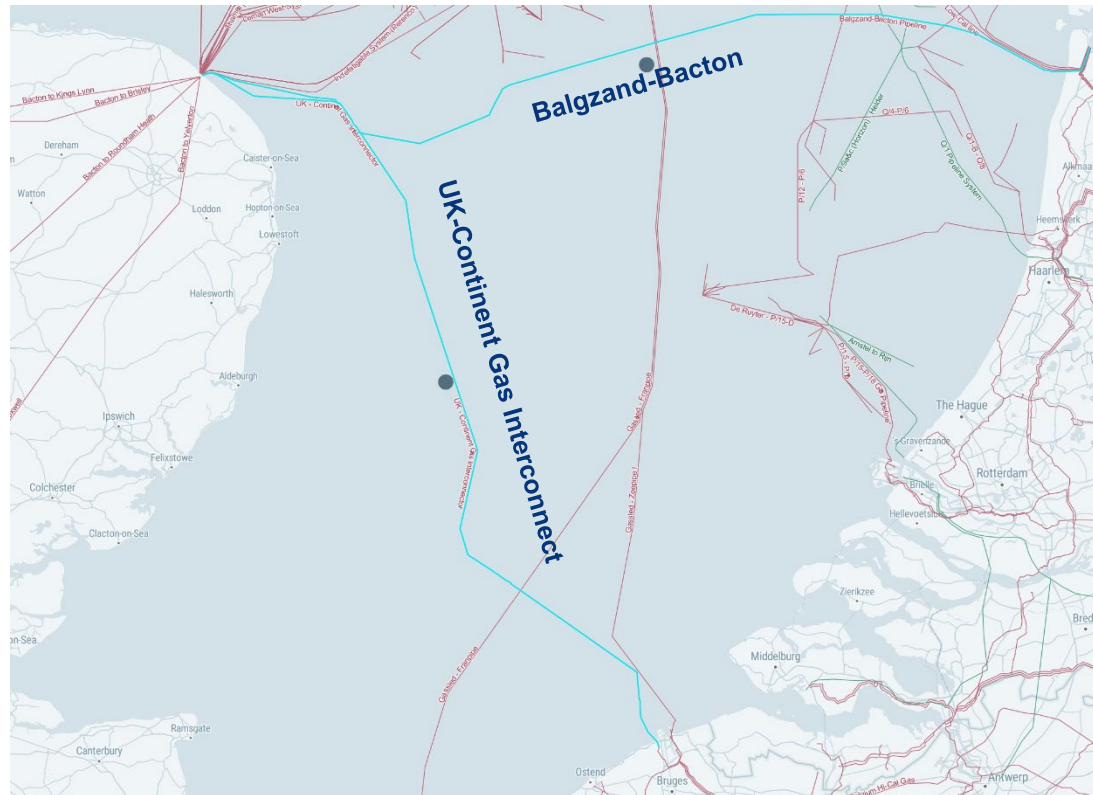


# The Incremental View develops a fuller outlook and includes Reserves Growth and YTF thereby extending the outlook into the 2040s

## Bacton Energy Hub Throughput – Incremental Case



## In addition to domestic gas supplies there are also two European pipelines including the UK-Continent Interconnector and Balgzand-Bacton pipeline



- Both pipelines are bi-directional however, UK-Continent Gas Interconnect forward flow is to the continent whereas forward flow for Balgzand-Bacton (BBL) is from the Netherlands to the UK
- The import gas capacity (into the UK) across the two pipelines is in excess of 3,000 mmcf
- The pipelines have become quite seasonal in their flows with gas flowing to the continent in the summer and reversing come winter
- In the current market the UK has become a critical LNG import hub for Northwest Europe and so the pipelines are at capacity and flowing to the continent
- Longer term the outlook for the European gas market is uncertain as Russian supplies are wound down. Without Russian gas the capacity for Europe to supply material volumes to the UK in winter comes into question



## Even under the ‘Incremental Case’ domestic gas supplies to Bacton fall below 100 mmcfd by 2042 at which point you would need to look further afield for gas supply

- In all the cases analysed we have assumed that all fields producing gas through Bacton continue to do so. Any changes especially for larger fields could materially change the outlook for gas supply to Bacton
- Under the ‘**Low Case**’ the outlook is constrained for Bacton’s domestic gas supply with supply falling below 100 mmcfd by **2037**; however, if you consider the current state of the market and the heightened concerns about energy security this outlook would seem unlikely
- Under the ‘**Base Case**’ an improved outlook pushes out the year when production falls below 100 mmcfd to **2038**. A more encouraging view but disappointing none-the-less if you were looking to secure long-term gas supply for a blue hydrogen plant
- Finally the most optimistic view, the ‘**Incremental Case**’ extends the life of the supply, principally through reserve growth and yet-to-find volumes, so that production falls below 100 mmcfd in **2042**
- A blue hydrogen plant requires both a supply of gas and a CCS facility. The lead times for both of these are considerable for commercial and technical reasons. If you assumed that such a combined development came onstream in 2030 this brings into sharp focus the domestic gas supply outlook
- A 1 GW blue hydrogen production facility operating with a capacity factor of 86% and a conversion efficiency of 80% would produce around 7.5 TWh (0.225 mtpa) of hydrogen in a year. A plant of this scale would require ~90 mmcfd (9.75 TWh) of gas\*.
- Under the ‘**Incremental Case**’, and considering just domestic gas supply, a 1 GW blue hydrogen plant starting in 2030 could only rely on domestic supply up until 2041\*\* after which point it would have to begin to rely on piped imports as well either from mainland Europe or Norway, or LNG imports from further afield.

\*Source: Scottish Hydrogen Assessment Report. <https://www.gov.scot/publications/scottish-hydrogen-assessment-report/pages/7/>

\*\*Assuming that the hydrogen plant took priority on gas supply



# License

## Ownership Rights

All reports are owned by Wood Mackenzie, protected by United States Copyright and international copyright/intellectual property laws under applicable treaties and/or conventions. User agrees not to export any report into a country that does not have copyright/intellectual property laws that will protect Wood Mackenzie's rights therein.

## Grant of License Rights

Wood Mackenzie, hereby grants user a personal, non-exclusive, non-refundable, non-transferable license to use the report for research purposes only pursuant to the terms and conditions of this agreement. Wood Mackenzie retains exclusive and sole ownership of each report disseminated under this agreement. User agrees not to permit any unauthorized use, reproduction, distribution, publication or electronic transmission of any report or the information/forecasts therein without the express written permission of Wood Mackenzie. Users purchasing this report may make a report available to other persons from their organization at the specific physical site covered by the agreement, but are prohibited from distributing the report to people outside the organization, or to other sites within the organization.

## Disclaimer of Warranty and Liability

Wood Mackenzie has used its best efforts in collecting and preparing each report.

Wood Mackenzie its employees, affiliates, agents, and licensors do not warrant the accuracy, completeness, correctness, non-infringement, merchantability, or fitness for a particular purpose of any reports covered by this agreement. Wood Mackenzie, its employees, affiliates, agents, or licensors shall not be liable to user or any third party for losses or injury caused in whole or part by our negligence or contingencies beyond Wood Mackenzie's control in compiling, preparing or disseminating any report or for any decision made or action taken by user or any third party in reliance on such information or for any consequential, special, indirect or similar damages, even if Wood Mackenzie was advised of the possibility of the same. User agrees that the liability of Wood Mackenzie, its employees, affiliates, agents and licensors, if any, arising out of any kind of legal claim (whether in contract, tort or otherwise) in connection with its goods/services under this agreement shall not exceed the amount you paid to Wood Mackenzie for use of the report in question.



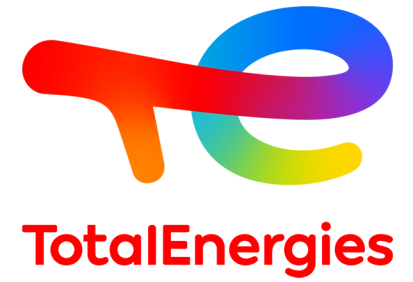
# Verisk



**Europe** +44 131 243 4400  
**Americas** +1 713 470 1600  
**Asia** +65 6518 0800  
**Pacific** [contactus@woodmac.com](mailto:contactus@woodmac.com)  
**Email** [www.woodmac.com](http://www.woodmac.com)  
**Website**

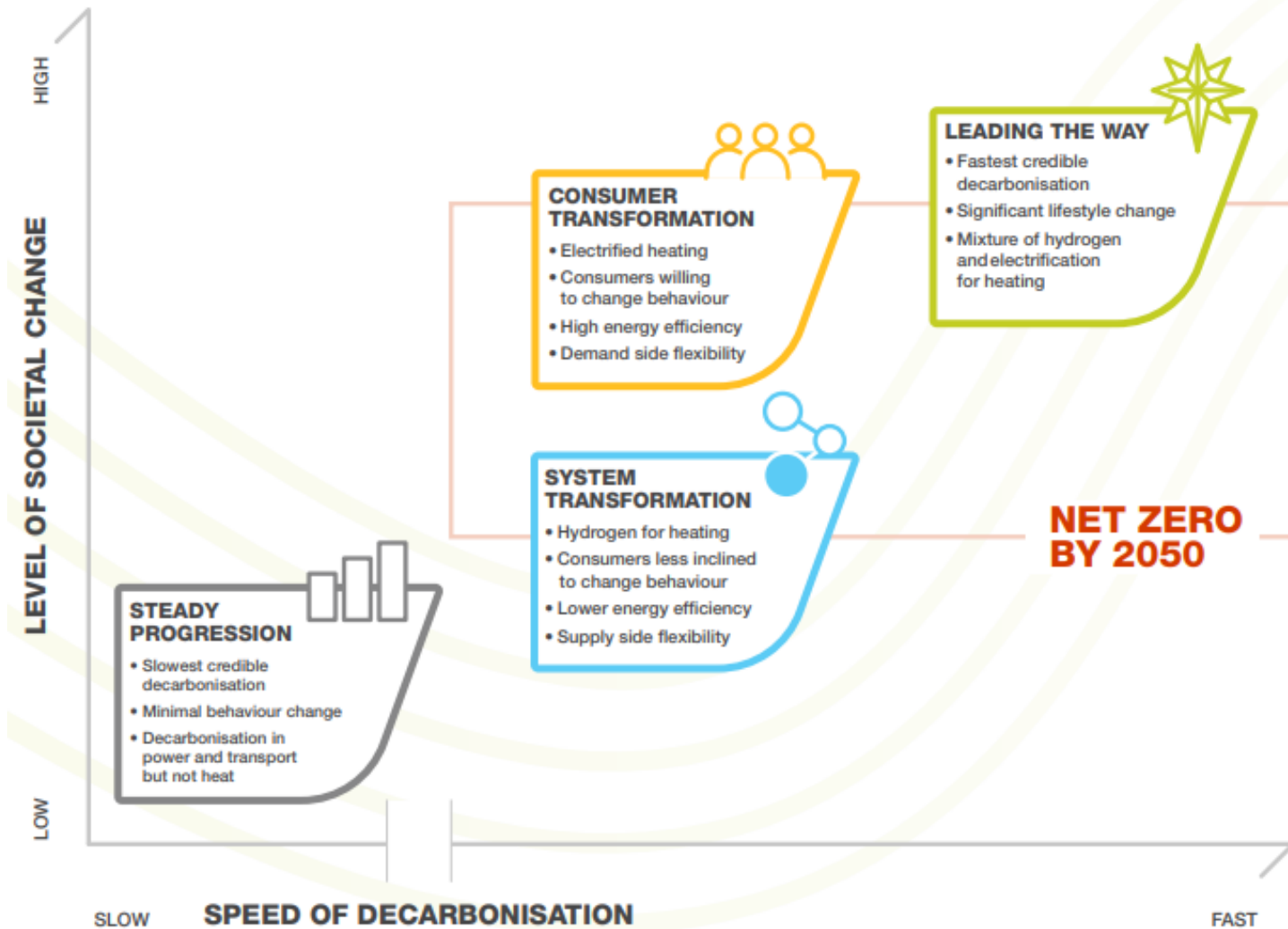
Wood Mackenzie™, a Verisk business, is a trusted intelligence provider, empowering decision-makers with unique insight on the world's natural resources. We are a leading research and consultancy business for the global energy, power and renewables, subsurface, chemicals, and metals and mining industries. **For more information visit: [woodmac.com](http://woodmac.com)**

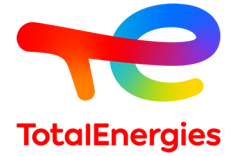
WOOD MACKENZIE is a trademark of Wood Mackenzie Limited and is the subject of trademark registrations and/or applications in the European Community, the USA and other countries around the world.



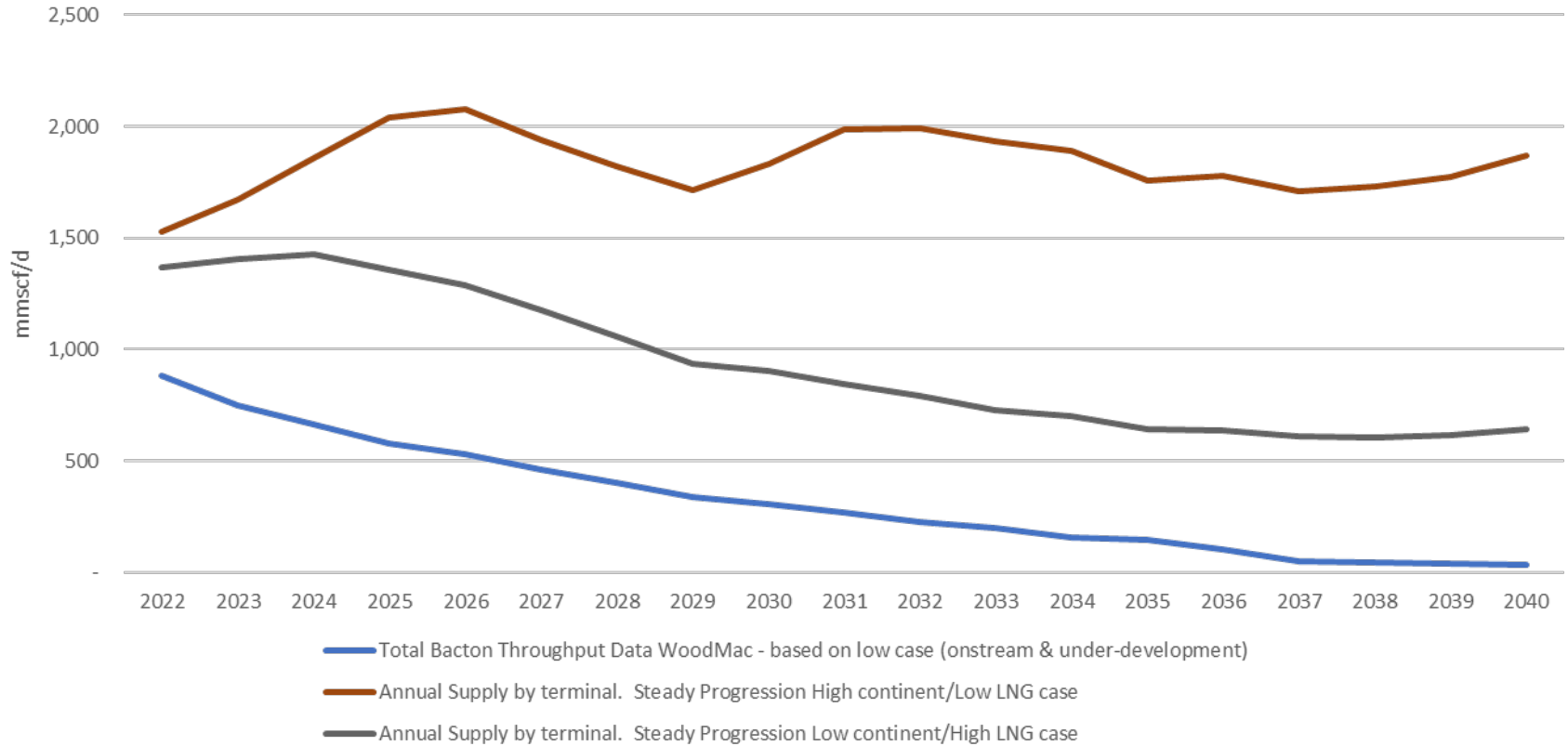
### 3. National Grid Forecasts (reference 2021)

## The Scenario Framework



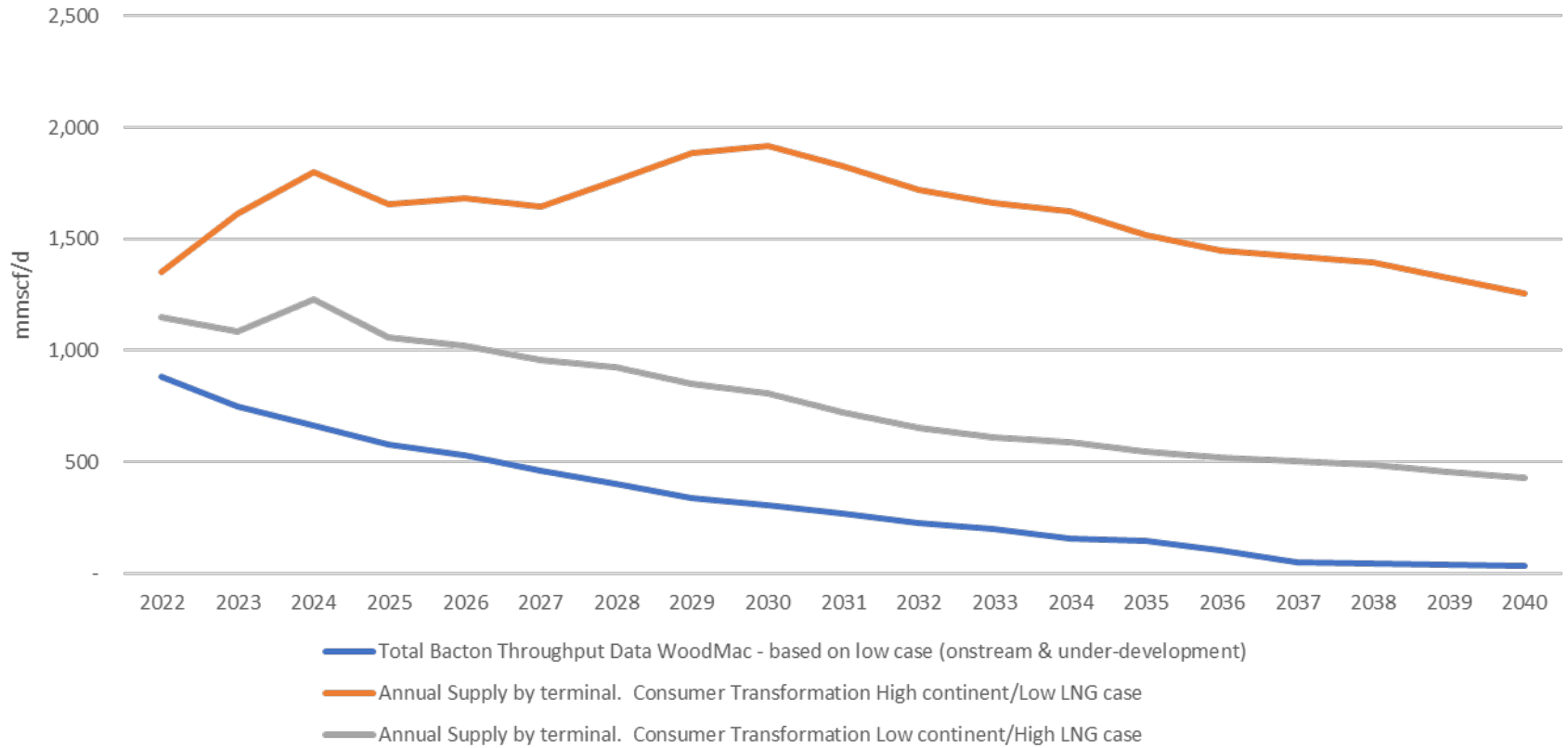


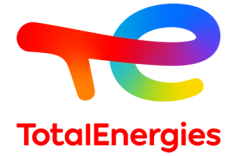
### Bacton WoodMac Comparison - Steady Progression



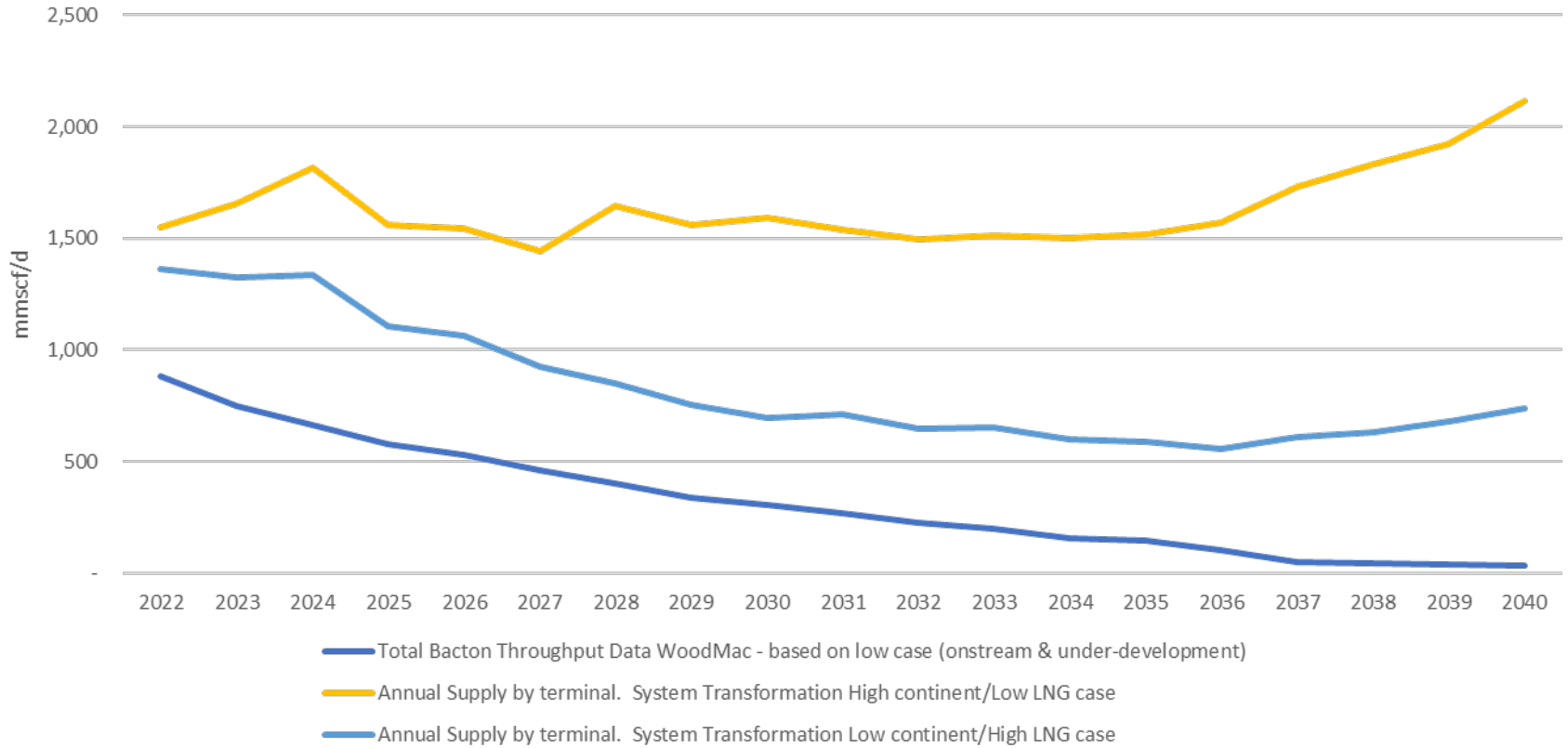


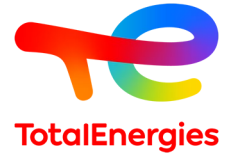
Bacton WoodMac Comparison - Consumer Transformation



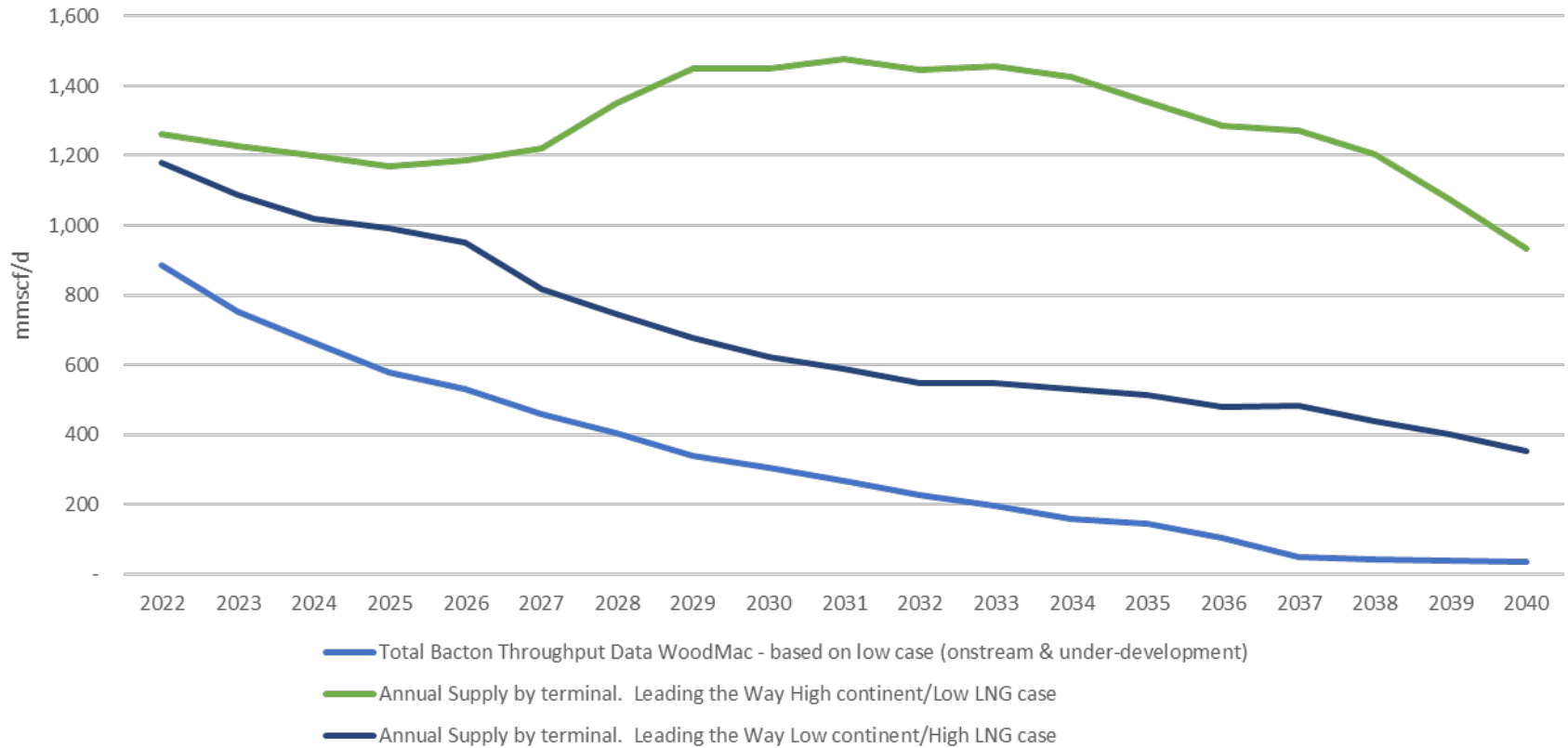


Bacton WoodMac Comparison - System Transformation





Bacton WoodMac Comparison - Leading the Way



# Disclaimer and copyright reservation



## **Definition - TotalEnergies / Company**

The entities in which TotalEnergies SE directly or indirectly holds an interest are separate and independent legal entities. The terms "TotalEnergies", "TotalEnergies company" and "Company" used in this document are generic and used for convenience to refer to TotalEnergies SE and its affiliates included in the scope of consolidation. Similarly, the terms "we", "us", "our" may also be used to refer to these entities or their employees.

## **Disclaimer**

This presentation may include forward-looking statement within the meaning of the Private Securities Litigation Reform Act of 1995 with respect to the financial condition, results of operations, business, strategy and plans of TotalEnergies that are subject to risk factors and uncertainties caused by changes in, without limitation, technological development and innovation, supply sources, legal framework, market conditions, political or economic events.

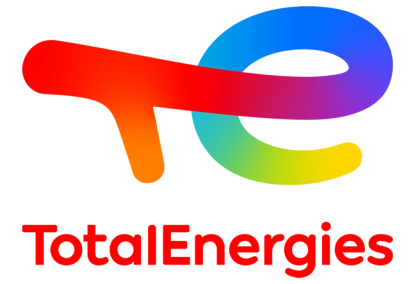
TotalEnergies does not assume any obligation to update publicly any forward-looking statement, whether as a result of new information, future events or otherwise. Further information on factors which could affect the company's financial results is provided in documents filed by TotalEnergies with the French *Autorité des Marchés Financiers* and the US Securities and Exchange Commission.

Accordingly, no reliance may be placed on the accuracy or correctness of any such statements.

## **Copyright**

All rights are reserved and all material in this presentation may not be reproduced without the express written permission of TotalEnergies.

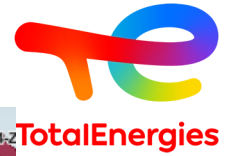




Thank you

# Appendix

# Bacton Gas Terminal - Maps



## Consumer Transformation

The 2050 net zero target is met with measures that have a greater impact on consumers and is driven by higher levels of consumer engagement. A typical homeowner will use an electric heat pump with a low temperature heating system and an electric vehicle. They will have made extensive changes to improve their home's energy efficiency and most of their electricity demand will be smartly controlled to provide flexibility to the system. The system will have higher peak electricity demands managed with flexible technologies including energy storage, demand side response and smart energy management.

## Leading the Way

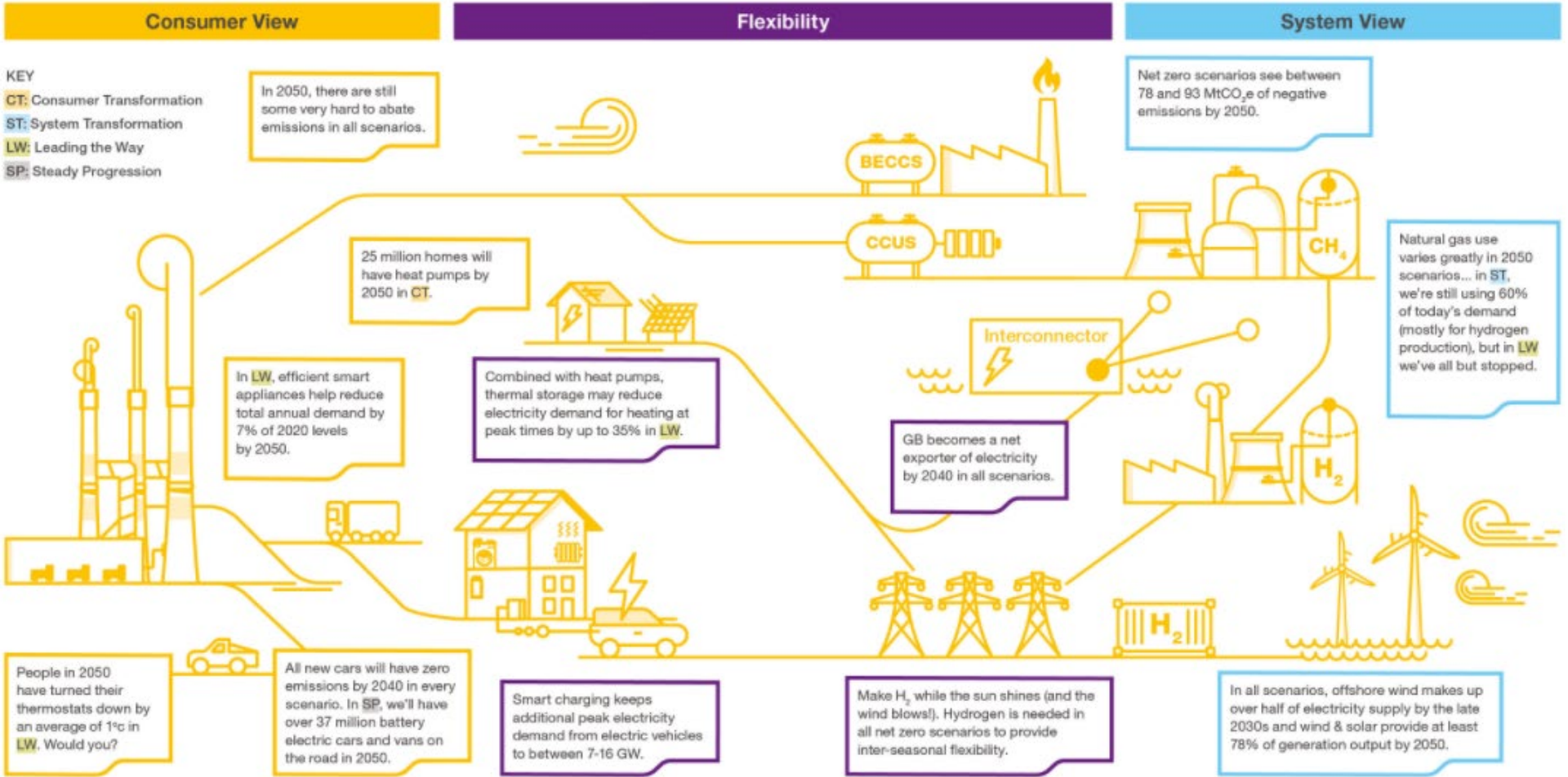
We assume that GB decarbonises rapidly with high levels of investment in world-leading decarbonisation technologies. Our assumptions in different areas of decarbonisation are pushed to the earliest credible dates. Consumers are highly engaged in reducing and managing their own energy consumption. This scenario includes more energy efficiency improvements to drive down energy demand, with homes retrofitted with insulation such as triple glazing and external wall insulation, and a steep increase in smart energy services. Hydrogen is used to decarbonise some of the most challenging areas such as some industrial processes, produced solely from electrolysis powered by renewable electricity.

## System Transformation

The typical domestic consumer will experience less disruption than in Consumer Transformation as more of the significant changes in the energy system happen on the supply side, away from the consumer. A typical consumer will use a hydrogen boiler with a mostly unchanged heating system and an electric vehicle or a fuel cell vehicle. They will have had fewer energy efficiency improvements to their home and will be less likely to provide flexibility to the system. Total hydrogen demand is high, mostly produced from natural gas with carbon capture and storage.

## Steady Progression

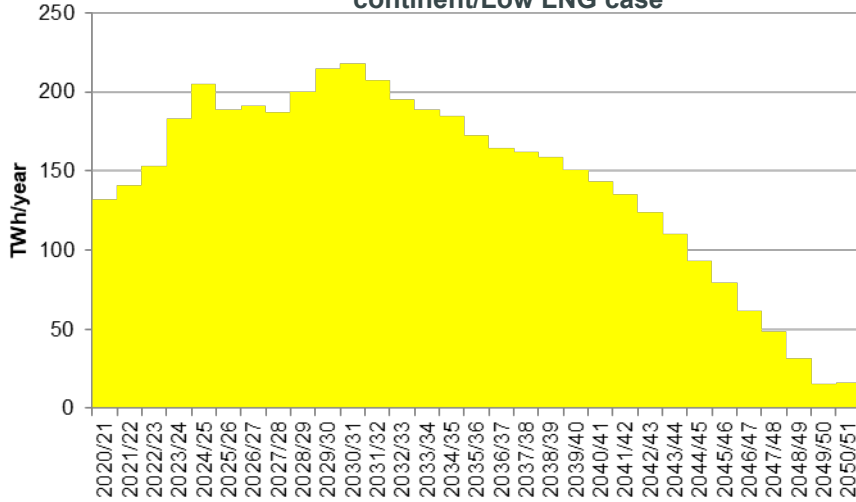
There is still progress on decarbonisation compared to the present day; however it is slower than in the other scenarios. While home insulation improves, there is still heavy reliance on natural gas, particularly for domestic heating. Electric vehicle take-up grows more slowly, displacing petrol and diesel vehicles for domestic use; however decarbonisation of other vehicles is slower with continued reliance on diesel for heavy goods vehicles. In 2050 this scenario still has significant annual carbon emissions, short of the 2050 net zero target.



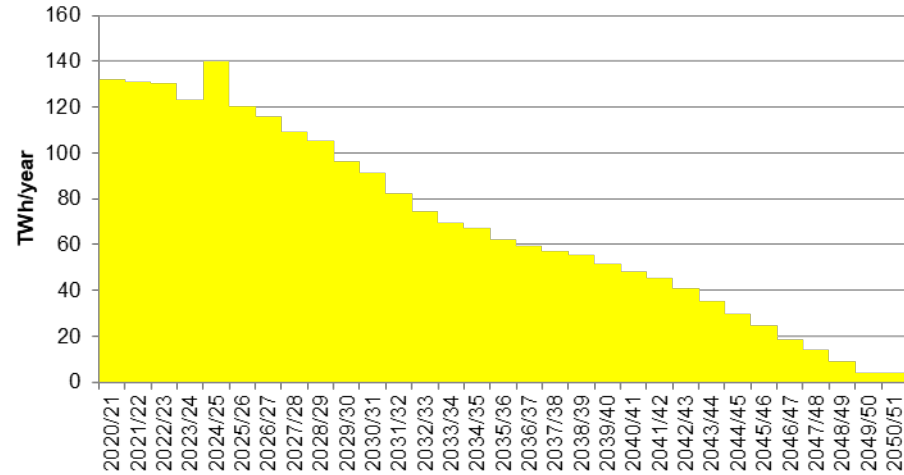
# Bacton Gas Forecast (From National Grid)



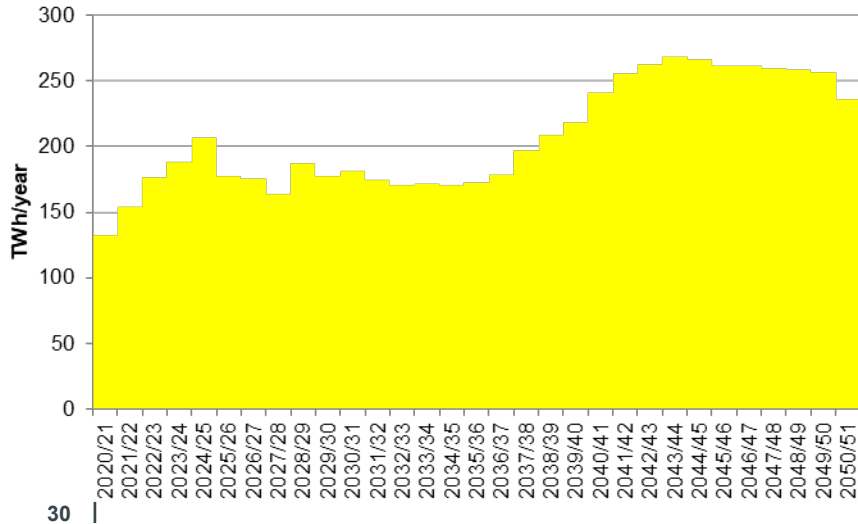
**Annual Supply. Consumer Transformation High continent/Low LNG case**



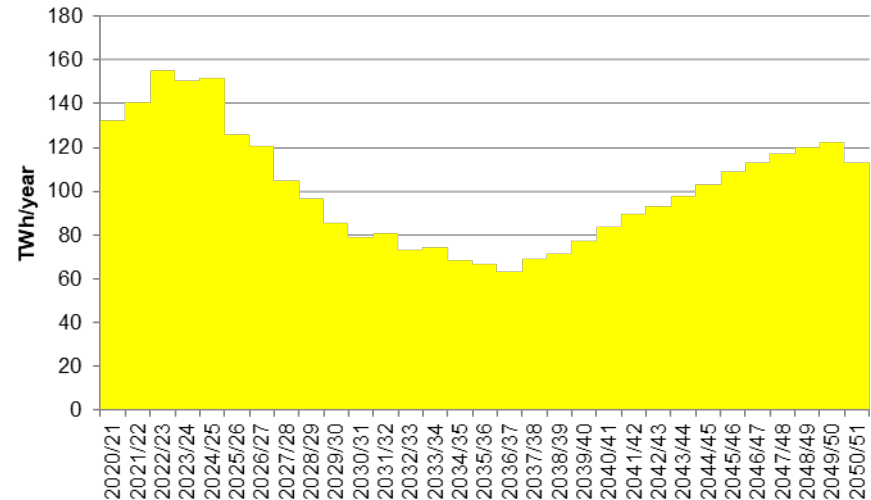
**Annual Supply. Consumer Transformation Low continent/High LNG case**



**Annual Supply. System Transformation High continent/Low LNG case**



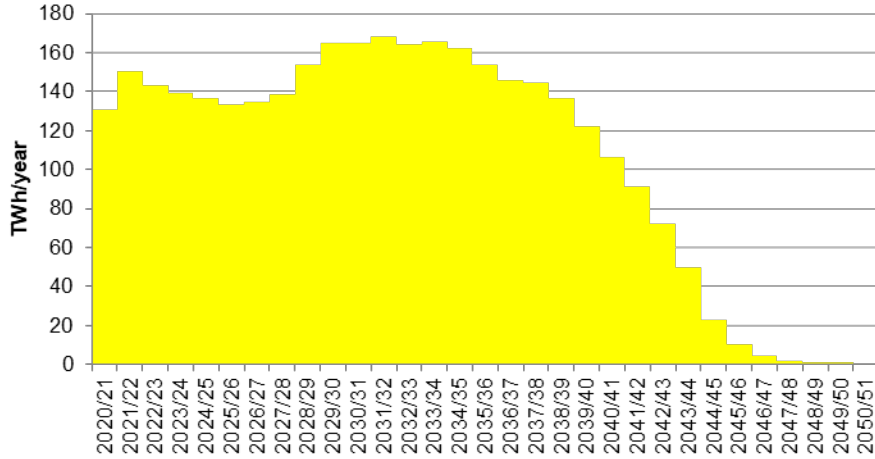
**Annual Supply. System Transformation Low continent/High LNG case**



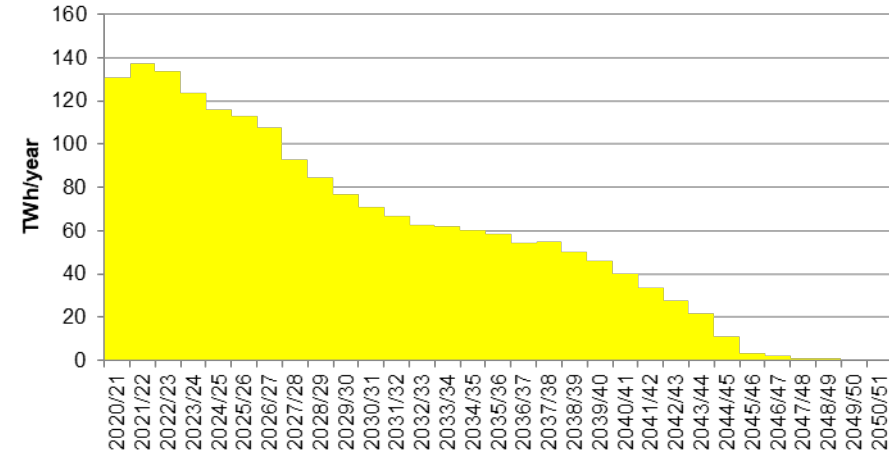
# Bacton Gas Forecast (From National Grid) – Page 1



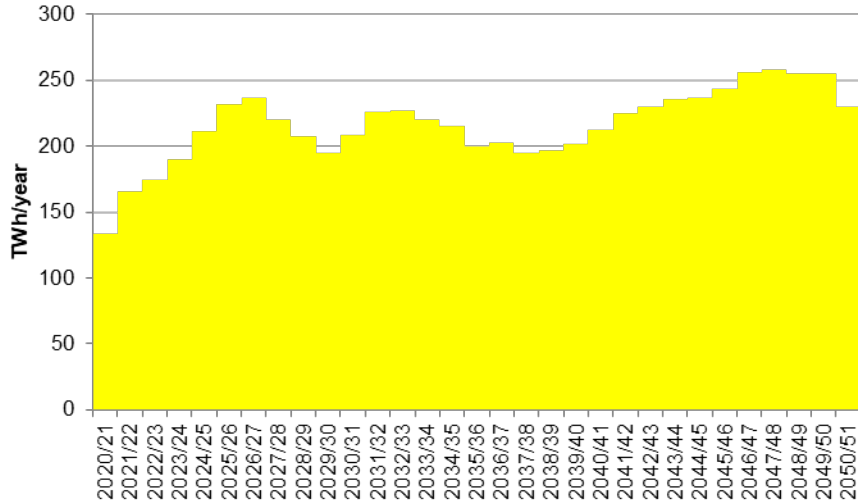
**Annual Supply. Leading the Way High continent/Low LNG case**



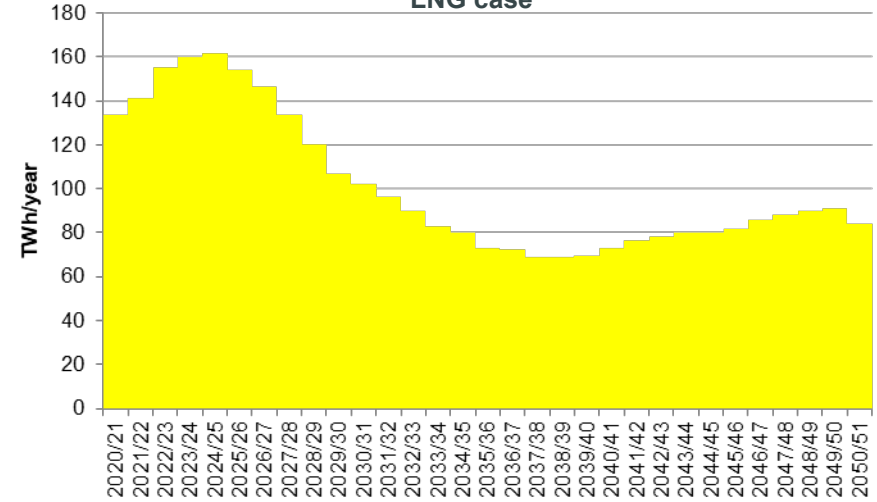
**Annual Supply. Leading the Way Low continent/High LNG case**



**Annual Supply. Steady Progression High continent/Low LNG case**



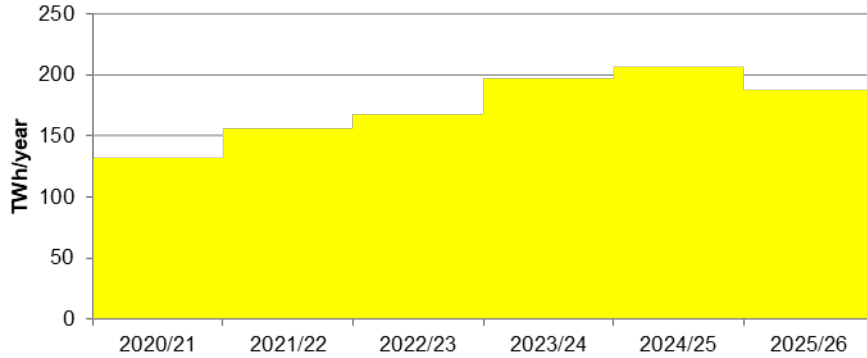
**Annual Supply. Steady Progression Low continent/High LNG case**



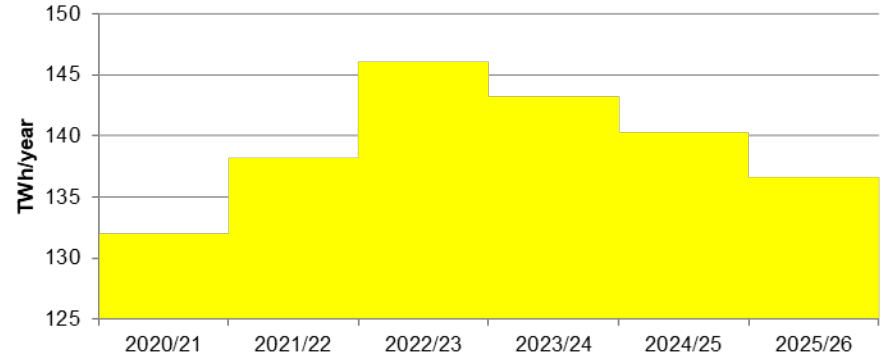
# Bacton Gas Forecast (From National Grid) – Page 2



Annual Supply. Central Forecast High continent/Low LNG case



Annual Supply. Central Forecast Low continent/High LNG case



Peak Supply. Central Forecast

