KEADBY 3
**CARBON CAPTURE POWER STATION**

A collaboration between **SSE Thermal** and **Equinor**

# POWERING THE NEXT **GENERATION**

Exploring the potential socio-economic impacts of Keadby Carbon Capture Power Station

sse Thermal equinor

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# About this report

SSE Thermal and Equinor are progressing plans to develop the world-leading Keadby Carbon Capture Power Station in North Lincolnshire. The power station could become one of the UK's first to be equipped with carbon capture technology, removing around 1.5 million tonnes of $CO_2$ emissions every year.

Keadby Carbon Capture would replace older, carbon-intensive generation on the electricity system, backing up renewable energy with flexible, low-carbon power.

This report looks at some of the expected socio-economic benefits that would be generated by the investment in the project, with economic contribution analysis undertaken by BiGGAR Economics.

# About SSE Thermal

SSE Thermal, part of the FTSE-listed SSE plc, is a leading developer, owner and operator of electricity generation and energy storage assets.

The business has a strategy to create value for shareholders and society by developing, owning and operating low-carbon energy infrastructure in a sustainable way. Its vision is to become the leading provider of flexible thermal energy in a net zero world, and it has set independently verified, science-based targets for carbon reduction aligned to the Paris Agreement.

As part of its commitment to a net zero future, the business has a core focus on decarbonising its operations through carbon capture and storage (CCS) and hydrogen technology. In addition to the Keadby Carbon Capture project, SSE Thermal is progressing plans with Equinor for a 100%-hydrogen-fired power station at the site. Elsewhere, the companies are advancing the development of a carbon capture-equipped power station at Peterhead in Scotland, and one of the world's largest hydrogen storage facilities at Aldbrough on the East Yorkshire coast.

SSE plc employs 12,000 people directly across the UK and Ireland and is proud to be a real Living Wage and Fair Tax Mark accredited company.

# About Equinor

Equinor has been operating in the UK for over 35 years and is the country's leading energy provider, supplying natural gas, oil and electricity. Headquartered in Norway, the company aims to reach net zero emissions globally by 2050. Equinor operates one offshore oil field and three offshore wind farms in the UK and its expansion plans include Dogger Bank, the largest offshore wind farm in the world. Equinor is also a leader in carbon capture and storage (CCS) and hydrogen, developing the H2H Saltend hydrogen production plant at the heart of the Zero Carbon Humber alliance, and partnering in the Net Zero Teesside project and the Northern Endurance Partnership to create the East Coast Cluster, which has made a bid into the BEIS Cluster Sequencing process (phase one). Equinor also has partnerships with SSE Thermal for the world's first at-scale 100% hydrogen power station at Keadby, North Lincolnshire, and hydrogen storage at Aldbrough on the East Yorkshire coast.

# FOREWORD

At SSE Thermal and Equinor, we share a commitment to delivering the low-carbon infrastructure the UK needs to achieve a net zero future, while ensuring a just transition for workers and communities.

***"By bringing new, low-carbon investment to North Lincolnshire, and the wider Humber region, we can revitalise the UK's 'energy estuary', safeguarding and creating high-quality jobs and delivering major benefits for our communities."***

As companies committed to a net zero future, SSE Thermal and Equinor are working together to deliver the low-carbon infrastructure the UK needs to transition to a cleaner, more sustainable economy.

We know renewable energy will do the heavy lifting when it comes to decarbonising the energy sector, and we're proud to be leading by example through our joint development of Dogger Bank, the world's largest offshore wind farm. However, we also recognise that the UK continues to need flexible power stations on the grid to keep the power flowing when the wind doesn't blow, and the sun doesn't shine.

So, the question is - how do we continue to provide this essential power generation, while rapidly cutting our carbon emissions? That's where our Keadby Carbon Capture Power Station comes in. With the potential to be operational by the mid-2020s, Keadby Carbon Capture would deliver flexible, low-carbon power generation, replacing traditional power stations and complementing the growth of renewable energy.

As one of the UK's first power stations equipped with carbon capture technology, Keadby Carbon Capture would offset 1.5 million tonnes of $CO_2$ every year, playing an important role in the UK's fight against climate change. The power station will plug into the shared $CO_2$ transport and storage infrastructure being developed through the East Coast Cluster project, supporting the decarbonisation of the UK's largest and most carbon-intensive industrial region.

However, we know the project's impact will go well beyond its role in power generation and carbon reduction. As responsible developers, we are committed to creating lasting value from this next generation of energy infrastructure at a local, regional, and national level. By bringing new, low-carbon investment to North Lincolnshire, and the wider Humber region, we can revitalise the UK's 'energy estuary', safeguarding and creating high-quality jobs and delivering major benefits for our communities.

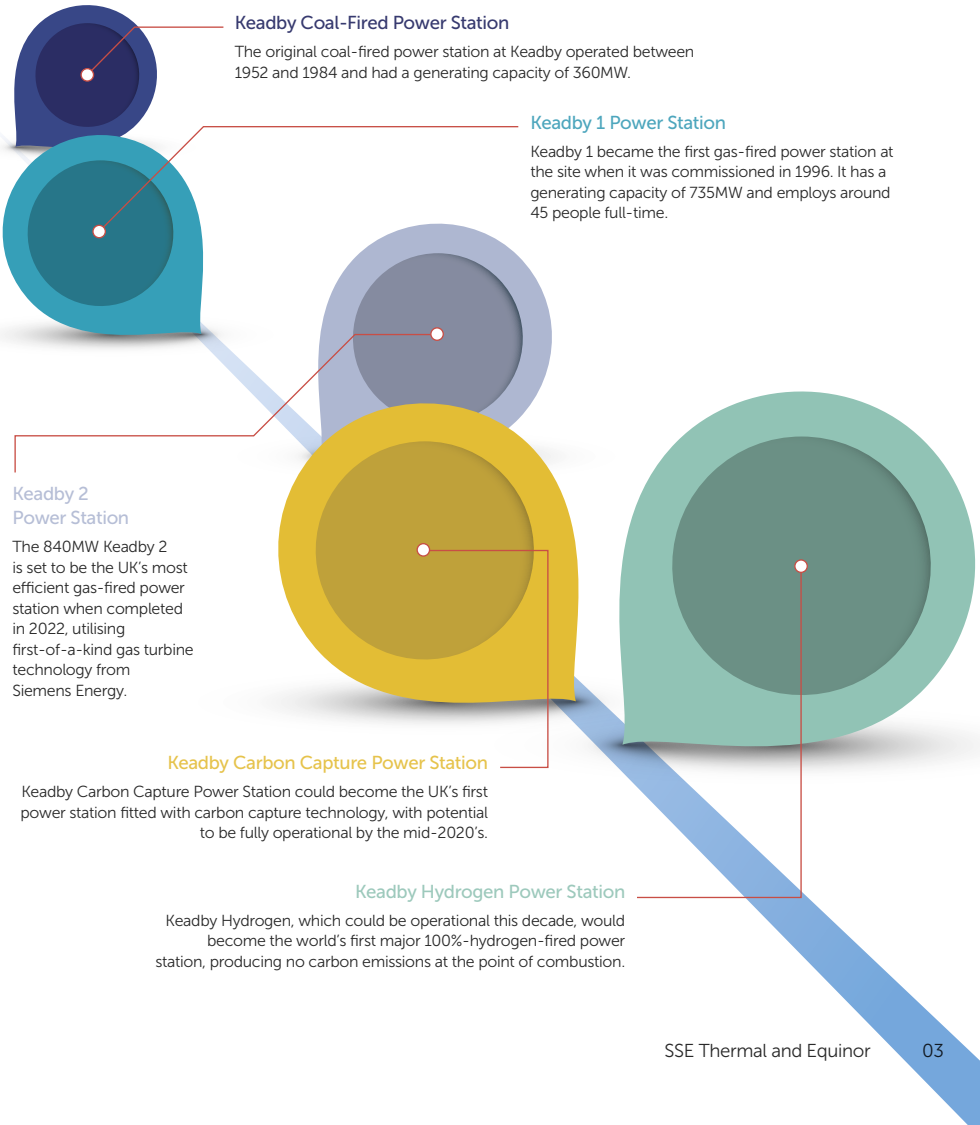
We hope you find this report valuable in demonstrating the expected socio-economic benefits of the project. As we work to bring Keadby Carbon Capture Power Station to life in the years ahead, we look forward to engaging with our communities and other stakeholders to maximise the benefits of this world-leading power generation project.

John Johnson
**Director of Development SSE Thermal**

Grete Tveit
**Senior Vice President for Low Carbon Solutions Equinor**

# POWER **GENERATION AT KEADBY**

Power generation has been at the heart of Keadby and the surrounding area for many generations, with the village itself being established to provide a community for those working at the original coal-fired station.



### Keadby Coal-Fired Power Station

The original coal-fired power station at Keadby operated between 1952 and 1984 and had a generating capacity of 360MW.

### Keadby 1 Power Station

Keadby 1 became the first gas-fired power station at the site when it was commissioned in 1996. It has a generating capacity of 735MW and employs around 45 people full-time.

### Keadby 2 Power Station

The 840MW Keadby 2 is set to be the UK's most efficient gas-fired power station when completed in 2022, utilising first-of-a-kind gas turbine technology from Siemens Energy.

### Keadby Carbon Capture Power Station

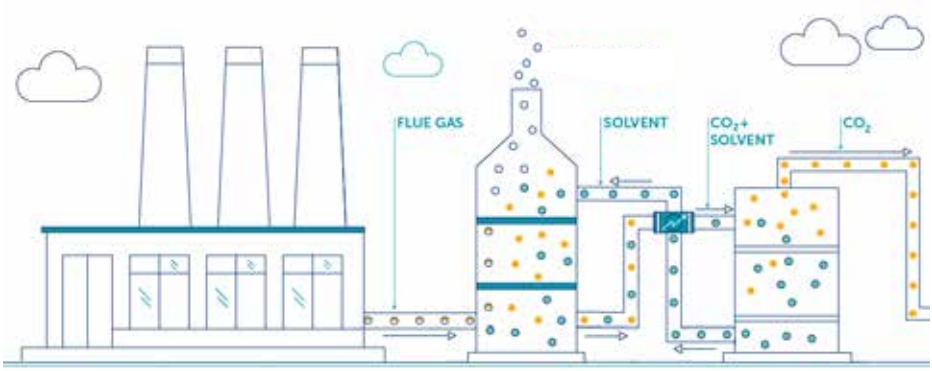
Keadby Carbon Capture Power Station could become the UK's first power station fitted with carbon capture technology, with potential to be fully operational by the mid-2020's.

### Keadby Hydrogen Power Station

Keadby Hydrogen, which could be operational this decade, would become the world's first major 100%-hydrogen-fired power station, producing no carbon emissions at the point of combustion.

# BRIDGING THE GAP **TO NET ZERO**

Delivering flexible, low-carbon power generation will be vital in backing up renewables and ensuring security of supply through the net zero transition. In SSE Thermal and Equinor, we're progressing Keadby Carbon Capture with a view to addressing this underlying challenge in an efficient, just, and affordable way.




*How Carbon Capture Technology works*

**About Keadby Carbon Capture**

Keadby Carbon Capture Power Station will be a new power generating station located on land at the existing Keadby generation site to the west of Scunthorpe in North Lincolnshire.

The power station will have a generating capacity of up to 910MW, with carbon capture infrastructure fitted to remove the majority of its $CO_2$ emissions.

With the right policy mechanisms and pipeline infrastructure in place, Keadby Carbon Capture could be operational by the mid-2020s, capturing at least 1.5 million tonnes of $CO_2$ annually.

If planning permission is granted for the development, construction could commence during 2023 taking three years to complete followed by commissioning of the station.

**What is CCS?**

Carbon capture and storage (CCS) is a technology that can capture at least 90% of the carbon dioxide emissions produced from the use of fossil fuels in electricity generation and industrial processes, preventing the carbon dioxide from entering the atmosphere. The CCS chain consists of three parts; capturing the carbon dioxide, transporting the carbon dioxide, and securely storing the carbon dioxide emissions underground, in depleted oil and gas fields or deep saline aquifer formations.

Keadby Carbon Capture would connect into the shared CCS infrastructure being developed by the East Coast Cluster. This would see its emissions transported through shared pipelines and safely stored under the Southern North Sea.

# DECARBONISING **THE UK'S LARGEST INDUSTRIAL REGION**

SSE Thermal and Equinor are working with partners in Zero Carbon Humber, and the wider East Coast Cluster, to kick-start decarbonisation in the UK's industrial heartlands.

***"The Humber is the most carbon intensive industrial cluster in the country, emitting 12.4 million tonnes a year."***

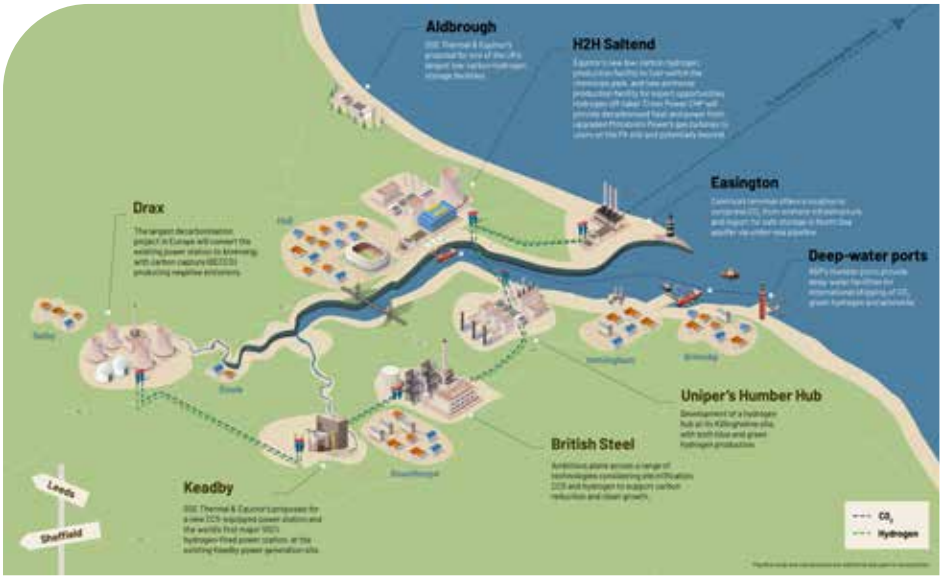
As an industrial powerhouse, the Humber is essential to the UK's economy, however, as the country's most carbon-intensive region, it's vital that we're building a more sustainable future.

SSE Thermal and Equinor are working with partners as part of the Zero Carbon Humber project to deliver CCS and hydrogen infrastructure across the region. This would allow energy and industrial emitters to capture and store their $CO_2$ emissions, safeguarding jobs and investment, and creating new opportunities for low-carbon development.

As part of the wider East Coast Cluster, these technologies could accelerate decarbonisation in the North of England, greatly contributing to the UK's net zero target.

Given the readiness of carbon capture technology in power generation, Keadby Carbon Capture could be an early customer for the CCS infrastructure, kick-starting wider deployment in the region.

In total, across the Humber and Teesside, the East Coast Cluster could remove 50% of the UK's industrial cluster $CO_2$ emissions, while supporting thousands of jobs.



# OUR ECONOMIC CONTRIBUTION **LOCALLY, REGIONALLY AND NATIONALLY**

Keadby Carbon Capture will bring a new scale of investment to the North Lincolnshire region, with an estimated £2.2bn pounds expected to be invested throughout its development, construction and the first 25 years of its operational life. To fully understand the scale of the opportunity, BiGGAR Economics was engaged to undertake independent analysis to calculate the economic contribution at a local, regional and national level.

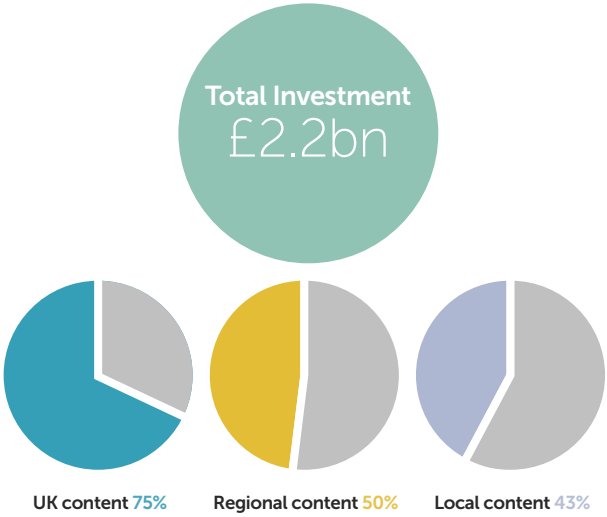
## Investing in Keadby 3

BiGGAR Economics analysed the contribution that the Keadby Carbon Capture Power Station could make across three areas of study:

- Local, defined as Doncaster, East Riding of Yorkshire, Kingston upon Hull, Lincolnshire, North East Lincolnshire, North Lincolnshire and Nottinghamshire;
- Regional, defined as Yorkshire and Humber, East Midlands; and
- National, defined as the UK.

Over two thirds of the total project spend for Keadby Carbon Capture is expected to be within the UK. Around half of total spend is expected to be within the region, the majority of this within the local area.

Analysis of this investment by BiGGAR Economics helps us to understand the potential benefits that Keadby Carbon Capture can bring and how these economic benefits are shared throughout the UK at a local, regional and national level.




## Adding economic value

The investment in the Keadby Carbon Capture project will create onward economic impact. This impact was calculated by BiGGAR Economics in terms of Gross Value Added (GVA) to the economy, which is a measure of economic activity that includes wages and profits, and employment, measured in terms of years of employment and jobs supported.

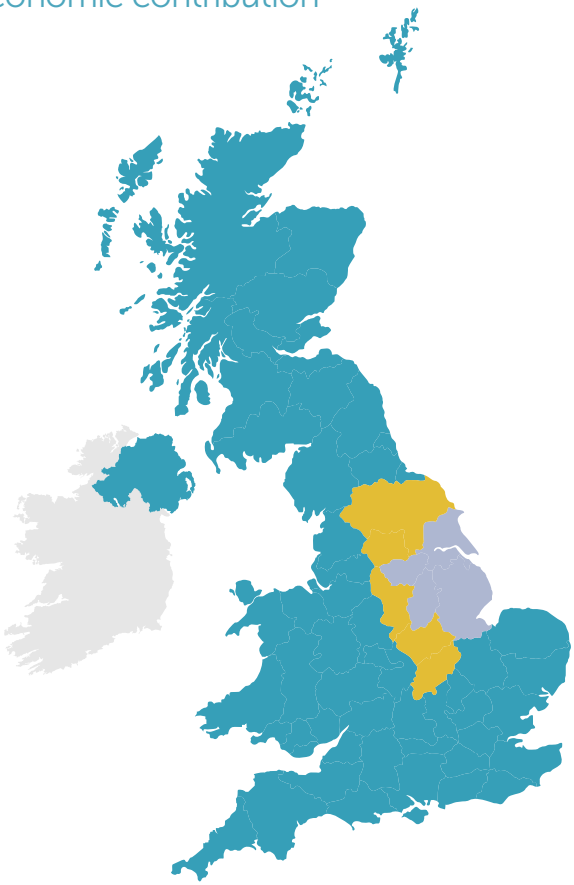
During the development and construction phase it is estimated that Keadby Carbon Capture has the potential to generate:

- £70 million GVA and 1,130 years of employment in the local area;
- £120 million GVA and 1,930 years of employment in the region; and
- £470 million GVA and 7,300 years of employment in the UK.

This economic activity includes those directly employed by SSE Thermal, their contractors, the wider supply chain and the spending of wages by workers in the wider economy.

There will also be long-term economic impacts during the first 25 years of operation of the power station.

# Keadby Carbon Capture economic contribution



**Lifetime UK economic contribution: £1.2bn**
Development and Construction
**£470m**

Operation
**£700m**

**Lifetime regional economic contribution: £570m**
Development and Construction
**£120m**

Operation
**£450m**

**Lifetime local economic contribution: £450m**
Development and construction
**£70m**

Operation
**£380m**

UK

Regional area

Local area

It is estimated that an average year of the first 25 years of operation has the potential to generate:

- £28 million GVA and 250 jobs in the local area;
- £34 million GVA and 320 jobs in the region; and
- £53 million GVA and 560 jobs in the UK.

The potential total economic contribution of the Keadby Carbon Capture project over its development, construction and first 25 years of operation is estimated by BiGGAR Economics to be:

- £450 million GVA in the local area;
- £570m GVA in the region; and
- £1.2 billion GVA in the UK.

**Note:**
Totals may not sum due to rounding. Total contribution over the first 25 years of operation has been discounted to net present value. Local contribution is included in total regional contribution and regional contribution is included in total UK contribution.

# BUILDING THE **SUPPLY CHAIN**

The Keadby Carbon Capture Project could be amongst the first commercial scale post-combustion carbon capture projects in the UK, presenting a significant opportunity for supply chain growth.

Due to the nature of this emerging technology and the relative infancy of the existing supply chain market, the BiGGAR Economics analysis assumes as its central scenario for calculating UK content, and therefore UK economic contribution, that there will be no growth in the capacity of the UK supply chain to meet the demands of a new CCS market. The analysis does however also outline a number of other scenarios for supply chain development alongside estimation of how this could impact the economic contribution of the project.

The nature of the projects connected to CCS infrastructure means it is reasonable to assume that the supply chain growth will occur in the regions that are likely to see the highest level of development of the technology.

These projects are likely to form clusters to take advantage of infrastructure. These clusters will be attractive to those organisations that are looking to specialise in services supporting CCS.

The full report, including the results of the scenario analysis and the methodology used for this analysis, is available online at: **ssethermal.com/sustainability**

# GENERATING **FUTURE GROWTH**

Developing the world's first major fully hydrogen-fired power station.

***"In addition to power generation, hydrogen will undoubtedly play a key role in the decarbonisation of heavy industry, heat and transport across the UK."***

In addition to Keadby Carbon Capture, SSE Thermal and Equinor are progressing plans for the world's first major 100%-hydrogen-fired power station at the Keadby site.

Keadby Hydrogen Power Station would have a peak demand of 1,800MW of hydrogen, producing $CO_2$ at the point of combustion. Like Keadby Carbon Capture, it would back up a renewable-led electricity system with large-scale and flexible, low-carbon power.

As a large hydrogen user, it would help secure demand for hydrogen in the region for decades to come. In addition to power generation, hydrogen will undoubtedly play a key role in the decarbonisation of heavy industry, heat and transport across the UK.

With the appropriate policy mechanisms and infrastructure in place, Keadby Hydrogen could come online before the end of the decade.

# SUPPORTING
# OUR COMMUNITIES

As responsible developers, constructors and operators, SSE Thermal and Equinor are proud to make a positive difference to our surrounding communities.

***"The Humber Region will play a key role in the UK's strive towards a Net Zero future and I am pleased to see there are plans for continued investment. Projects like Keadby Carbon Capture not only deliver direct benefits to the area through supply chain and employment opportunities but also indirect benefits by supporting our local communities."***

***Andrew Percy,***
***MP for Brigg and Goole***

*Supporting pupils at Reedness Primary School through our community based donations scheme*

# SECURING A
# JUST TRANSITION

**Just Transition**

SSE plc was the first company to publish a "Just Transition" plan, which will help to protect workers and communities as the UK moves towards net zero. This outlines how SSE will approach the social implications of delivering net zero; from jobs and training, to working with communities and ensuring no one is left behind.

Retraining and redeployment will be the first options available to employees affected by business change. SSE has successful and growing businesses which will play an important part in delivering a netzero world in both the UK and Ireland. People working in higher-carbon activities often have valuable skills that are transferable to the low-carbon ones. SSE has a long-standing commitment to avoid compulsory redundancy if possible. If redundancy is unavoidable, SSE will work with its employees and trade union partners to ensure it is able to offer a package of terms which support onward transition.

**SSE'S 20 PRINCIPLES FOR A JUST TRANSITION**

| TRANSITIONING INTO A NET-ZERO WORLD | | | TRANSITIONING OUT OF A HIGH-CARBON WORLD | |
|---|---|---|---|---|
| SSE'S PRINCIPLES FOR GOOD, GREEN JOBS (PAGE 9) | SSE'S PRINCIPLES FOR CONSUMER FAIRNESS (PAGE 12) | SSE'S PRINCIPLES FOR BUILDING AND OPERATING NEW ASSETS (PAGE 13) | SSE'S PRINCIPLES FOR PEOPLE IN HIGH-CARBON JOBS (PAGE 15) | SSE'S PRINCIPLES FOR SUPPORTING COMMUNITIES (PAGE 18) |
| 1 Guarantee fair and decent work<br>2 Attract and grow talent<br>3 Value employee voice<br>4 Boost inclusion and diversity | 5 Co-create with stakeholders<br>6 Factor-in-whole-system costs and benefits<br>7 Make transparent, evidence-based decisions<br>8 Advoctae for fairness | 9 Support competitive domestic supply chains<br>10 Set social safeguards<br>11 Share value with communities<br>12 Implement resonsible developer stanards | 13 Re-purpose thermal generators for a net-zero world<br>14 Establish and maintain trust<br>15 Provide forward notice to change<br>16 Prioritise retraining and development | 17 Deliver robust stakeholder consultation<br>18 Form partnerships across sectors<br>19 Promote further industrial development<br>20 Respect and record cultural heritage |

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