NOT PROTECTIVELY MARKED - LIMITED CIRCULATION

equilibrion.

Midlands Nuclear Siting Study: Main Report

A project funded by Midlands Net Zero Hub and enabled by Midlands Nuclear

MIDLANDS NET ZERO HUB

Midlands Nuclear

By Equilibrion Limited

EQ-R-0028, Issue 1

Document Information

Prepared For	Kate Kirk-Walsh and Martin Freer	**Organisation**	Midlands Net Zero Hub and Midlands Nuclear
Prepared By	Philip Rogers	**Checked By**	Caroline Longman
Document Number	EQ-R-0028	**Version**	Issue 1
Date	1st July 2025	**Project ID**	EQ-PROJ-0024
Equilibrion Contract No.	EQ-CT-0015	**Customer Reference**	CPU 7080

Version Control

Version	Date	Description
Issue Draft	21/05/2025	Draft for review by MNZH and Midlands Nuclear
Issue 1	01/07/2025	First Public Issue

Copyright and Confidentiality statement:

This report has been prepared by Equilibrion Limited and is confidential to the company to which it is addressed. Equilibrion Limited's prior written permission is required before all or part of the information contained herein is disclosed to any other person or third party.

© Equilibrion Limited 2025

EQUILIBRION LIMITED is a company registered in England and Wales.
Company number: 14464139
Registered Address: Redlands, Cliftonville, Northampton, England, NN1 5BE

Confidentiality and Intellectual Property Statement

This document includes nuclear research information and data from the Energy Technologies Institute's (ETI) Power Plant Siting Study (PPSS) which is included under licence to Portinscale Consulting Limited through kind permission from the Energy Systems Catapult (ESC).

The ability to use ETI research and information under licence from the ESC was granted to Portinscale Consulting Ltd to enable its Director (Mike Middleton) to consult using the nuclear portfolio projects and reports from the ETI and ESC following his retirement from the ESC. This was granted because otherwise this knowledge would be lost and unavailable to the industry and associated stakeholders. The licence does not permit him to transfer the PPSS reports in whole or in part, because this would be a step towards sublicensing which is not permitted.

Document Control Statement

This report is one of a series produced under the Midlands Nuclear Siting Study project. It is classified as not protectively marked and is suitable for Midlands Net Zero Hub onward transmission to its selected parties.

Executive Summary

This report presents the findings of the Midlands Nuclear Siting Study, commissioned and funded by the Midlands Net Zero Hub, supported by Midlands Nuclear and delivered by Equilibrion Limited with expert input from Portinscale Consulting and Ennuvo. It provides a comprehensive evidence base to support the Midlands' ambition to deploy new nuclear technologies in support of clean growth, enhanced energy security, and achievement of net zero targets.

The Midlands, historically a driver of the UK's industrial economy, now faces a strategic opportunity to host new nuclear development, enabling the delivery of clean electricity, industrial heat, hydrogen, and sustainable fuels.

Recognising this opportunity, the study undertook a structured site appraisal based on the nationally recognised Power Plant Siting Study (PPSS). Sites were assessed using a methodology aligned with current and emerging national policy (National Policy Statements EN-6 and draft EN-7) and tested against strict exclusionary and discretionary criteria. Key factors appraised included cooling water availability, grid connectivity, flood risk, ground conditions, population demographics, access to transport infrastructure, environmental designations, and proximity to industrial demand centres.

Over 80 candidate sites across the Midlands were assessed, with 21 sites in seven counties shortlisted for further consideration. In total these sites would theoretically support up to greater than 20GW of nuclear generation subject to comprehensive impact assessment and appropriate regulatory review and approvals.

Following a detailed comparative appraisal, two sites were selected as the Midlands' most strategic, nearer-term potential nuclear deployment opportunities. These sites underwent more detailed appraisal and offer significant advantages compared to some other sites including brownfield status, proximity to existing and future industrial demand hubs, potential for transmission grid access, reliable cooling water sources, and potential for near-term readiness to support advanced nuclear development programmes. Their identification reflects not only technical suitability, but also strategic location and alignment with regional economic development priorities. In addition to siting appraisal, the study examines the wider economic and supply chain benefits associated with new nuclear deployment.

Suitable sites in the Midlands would need to be technically feasible and socially acceptable. However, for projects to be developed, the site and the project (including the technology) must also be economically viable. The PPSS introduces indicators for several site factors to identify issues which would require additional developer investment to mitigate known issues but the true economic viability can only be established by a developer steeped in knowledge of nuclear developments, relevant markets and supporting frameworks. A developer that understands this, is well organised, well-resourced and well-funded is likely to be capable of developing a project plan and business case with potential to successfully deliver and operate a new nuclear plant.

Experience from major projects such as Hinkley Point C and Sizewell C highlights the transformational impact of nuclear investment, delivering tens of thousands of jobs, billions of pounds of investment, and long-term skills development opportunities. The Midlands' strong industrial base, supply chain capability and strategic location mean it is exceptionally well positioned to capture these benefits.

The Midlands Nuclear Siting Study enables regional authorities, Midlands Nuclear, and other stakeholders to proactively engage with UK Government, developers and investors, presenting credible, evidence-based nuclear investment opportunities at a critical time for national energy transition planning.

Key Findings

- **High levels of generation possible in the region:** The 21 shortlisted sites could support 20 GW of nuclear generation from brown and greenfield sites across the Midlands.

- **Projects require committed, capable and well-funded organisations:** Coordination and commitment between the developer, technology vendor, operator, investor, Engineering, Procurement and Construction company, and other organisations is crucial to maximising the chances of a project successfully reaching operation. These collaborations should be secured early in any development.
- **Strategic importance of sites:** Multiple sites that could be technically suitable for nuclear development have already been built upon for purposes that do not need to be in these locations. There is a risk of an ever-reducing stock of suitable sites.
- **There are no perfect sites:** This is true of the Midlands and the rest of England and Wales as all sites will have unique characteristics and some of these shall require mitigations that may involve investment or other accommodations or compensatory measures. This principle should be understood early by all parties and high risk or high cost aspects of sites considered and addressed.
- **Strong technical and strategic fit:** Both selected sites are well-positioned to support near-term nuclear deployment and align with regional economic development priorities.
- **Nuclear is critical to achieving the net zero transition:** New nuclear is valuable to support decarbonising electricity, industry, heat, hydrogen production, and transport fuels production in the Midlands.
- **Major economic opportunity:** Deployment could unlock thousands of jobs, billions of pounds of investment and strengthen the Midlands supply chain and skills capacity.
- **Nuclear projects provide major employment opportunities:** Opportunities for socio-economic development at the location of the build and at factory sites for SMRs and AMRs, which are designed for greater proportion of factory build modules. There are strong regional benefits for large and small businesses.

Recommendations are based on the current nuclear deployment landscape in the UK and the ambition shown by both central and local government organisations for nuclear development. They are made in cognisance of the opportunities and challenges outlined in this report and the importance of projects reaching operation on an accelerated timescale.

- **Secure political and community support:** A broad coalition of political, business, academic, and civic stakeholders can form a strong advocacy approach for Midlands nuclear development. Visible, coordinated support will help secure national investment prioritisation and maintain momentum behind Midlands nuclear ambitions. This need is not focus on a specific site or location but offers a pathway to building a general foundation of support prior to further progress and announcements.
- **Undertake foundational strategic engagement with Government and other stakeholders:** There are many priorities associated with clean energy production in the UK and understanding whether and when a Midlands nuclear deployment project may be best positioned amongst them, in the context of GBN and NESO SSEP, will be important to bringing important stakeholders on the journey.
- **Understand the range of developer and technology options thoroughly:** It is vital that regional organisations that are approached to support nuclear new build proposals and projects discover early which proposals are serious and therefore likely to progress, and which are less credible and could block sites or take comparatively longer for the region to realise the project benefits. Capability, funding and technology readiness are three important factors, but there are also many other indicators and these should be explored and understood as part of decision making.

- **Ensure appropriate steps to resolve highlighted mitigations early:** Where known mitigations are required, reduce risks associated with these early so better understand site economics and risks.
- **Establish a strategic plan for short, medium and long-term site opportunities:** This study has established that several sites that may otherwise have been technically suitable for new nuclear deployment are already blocked, or in the process of being blocked by other developments that may need to be on these sites. Strategic planning may recognise that sites with the potential to be suitable for nuclear new build are strategic assets to the Midlands and the UK.
- **Engage with national system operators:** Understanding the development of the national energy infrastructure and how Midlands projects can both align with current plans and present national opportunities to reduce system costs of the transition
- **Develop a Midlands Nuclear supply chain strategy:** A dedicated strategy should be established to maximise regional supply chain participation. This should include capability mapping, SME engagement programmes, nuclear certification readiness support, supplier development initiatives, and clear signposting of forthcoming contract opportunities.
- **Invest in skills and workforce development:** Significant investment is needed in apprenticeships, technical education, retraining programmes, and specialist skills academies aligned to nuclear sector needs. Partnerships with universities, colleges, and industry bodies should be expanded to build a resilient and future-ready workforce.
- **Strengthen planning and infrastructure readiness:** Regional authorities should proactively engage with regulators, planning bodies, and network operators to identify and address potential planning, permitting, environmental, and infrastructure challenges early. This will de-risk deployment and increase attractiveness to developers.
- **Maximise economic and industrial legacy:** Clear plans should be developed to capture long-term benefits from nuclear projects, including supply chain growth, SME participation, skills development, community benefits, and regional innovation. Lessons from HPC and SZC should be embedded early to maximise regional economic impact.

Acronyms

Acronym	Description
AMR	Advanced Modular Reactor
AGR	Advanced Gas Cooled Reactor
AIL	Abnormal Indivisible Loads
CCC	Climate Change Committee
CNC	Civil Nuclear Constabulary
DAC	Design Acceptance Certificate
DCO	Development Consent Order
DESNZ	Department of Energy Security and Net Zero
DfT	Department for Transport
DWMP	Decommissioning and Waste Management Plan
DNO	District Network Operators
EA	Environment Agency
EPC	Engineering, Procurement and Construction
ESC	Energy Systems Catapult
EMAGIC	East Midlands Airport Gateway Industrial Cluster
EN-6 & EN-7	National Policy Statement for Nuclear Power Generation
EPR	Environmental Permitting Regulations
ETI	Energy Technologies Institute
FDP	Funded Decommissioning Programme
FID	Final Investment Decision
GBN	Great British Nuclear
GDA	Generic Design Assessment
GHG	Greenhouse Gas
GVA	Gross Value Added
GW	GigaWatt
HPC	Hinkley Point C
HRA	Habitat Regulation Assessment
kV	kiloVolt
LLWR	Low Level Waste Repository
MAG	Manchester Airports Group
MNZH	Midlands Net Zero Hub
NCERM	National Coastal Erosion Risk Mapping
NDA	Nuclear Decommissioning Authority
NDF	Nuclear-derived Fuel
NESO	National Energy Systems Operator
NOAK	Nth of a Kind
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NSL	Nuclear Site Licence
NWS	Nuclear Waste Services
ONR	Office for Nuclear Regulation

Acronym	Description
ONS	Office for National Statistics
PI	Planning Inspectorate
PV	Photovoltaic
PPSS	Power Plant Siting Study
PWR	Pressurised Water Reactor
RAB	Regulated Asset Base
RCM	Revenue Certainty Mechanism
REPPIR	Radiation (Emergency Planning and Public Information) Regulations
RESP	Regional Energy Strategic Planning
SAF	Sustainable Aviation Fuel
SEA	Strategic Environmental Assessment
SME	Small and Medium-sized Enterprises
SMR	Small Modular Reactor
SODA	Statement of Design Acceptability
SSEP	Strategic Spatial Energy Plan
STEP	Spherical Tokamak for Energy Production
SZC	Sizewell C
UK-EPR	The UK design of the EDF EPR technology. EPR previously stood for European Pressurised Reactor, but this was changed in favour of simply 'EPR' for an international market.

Contents

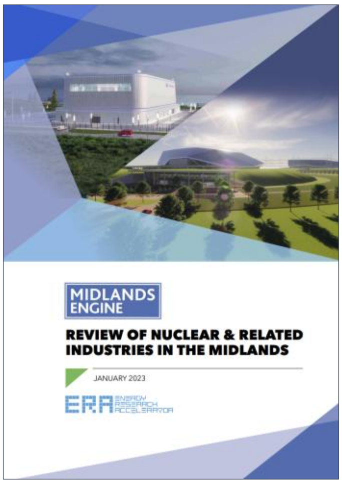
Table of Figures

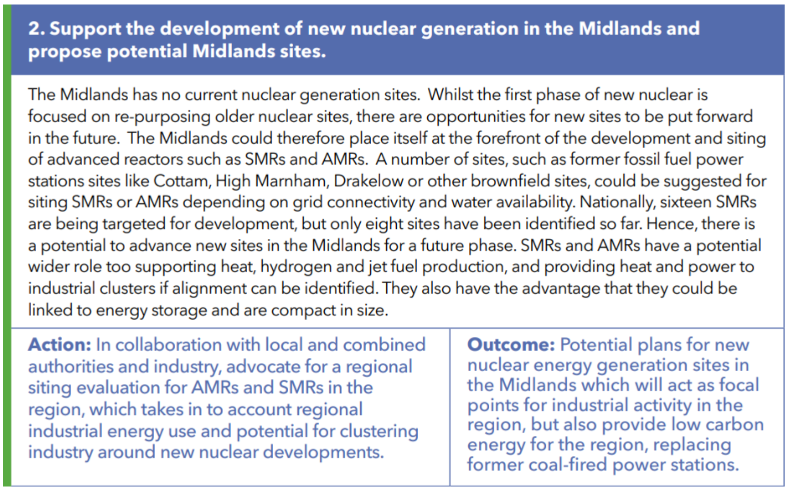
Table of Tables

1. Introduction

This report represents the main output from the Midlands Nuclear Siting Study; a groundbreaking project commissioned and funded by Midlands Net Zero Hub (MNZH) (a Department for Energy Security and Net Zero (DESNZ) funded organisation) on behalf of Midlands Nuclear to enable the Midlands region to consider the role for nuclear to achieve low-carbon growth. This report, and other supporting reports produced as part of the project outputs, provides evidence to support decisions on nuclear and energy system planning, and a substantiation to any positions and approaches taken on nuclear deployment.

The commissioned project has been enabled by the setting up of Midlands Nuclear in 2024 and the recommendation by the Midlands Engine [1] to: ***Support the development of new nuclear generation in the Midlands and propose potential Midlands sites***, recommendation 2 from the report (Figure 1), and has been delivered by Equilibrion Limited as the lead organisation with Portinscale Consulting providing expert site analysis input and Ennuvo as the regulatory experts.





2. Support the development of new nuclear generation in the Midlands and propose potential Midlands sites.

The Midlands has no current nuclear generation sites. Whilst the first phase of new nuclear is focused on re-purposing older nuclear sites, there are opportunities for new sites to be put forward in the future. The Midlands could therefore place itself at the forefront of the development and siting of advanced reactors such as SMRs and AMRs. A number of sites, such as former fossil fuel power stations sites like Cottam, High Marnham, Drakelow or other brownfield sites, could be suggested for siting SMRs or AMRs depending on grid connectivity and water availability. Nationally, sixteen SMRs are being targeted for development, but only eight sites have been identified so far. Hence, there is a potential to advance new sites in the Midlands for a future phase. SMRs and AMRs have a potential wider role too supporting heat, hydrogen and jet fuel production, and providing heat and power to industrial clusters if alignment can be identified. They also have the advantage that they could be linked to energy storage and are compact in size.

Action: In collaboration with local and combined authorities and industry, advocate for a regional siting evaluation for AMRs and SMRs in the region, which takes in to account regional industrial energy use and potential for clustering industry around new nuclear developments.	**Outcome:** Potential plans for new nuclear energy generation sites in the Midlands which will act as focal points for industrial activity in the region, but also provide low carbon energy for the region, replacing former coal-fired power stations.

Figure 1 – Recommendation 2 from Midlands Engine Report highlighting need to identify potential nuclear deployment sites

1.1. Purpose of the Work

The study has been commissioned to investigate the opportunities for the Midlands to host new nuclear facilities, including Small and Advanced Modular Reactors (SMRs and AMRs), collectively known as Advanced Nuclear Technologies (ANTs). The study supports the ambitions of Midlands Nuclear and MNZH, aiming to accelerate regional progress toward net zero, promote economic development, and unlock inward investment.

It will provide a robust evidence base that can be used to encourage public, private, and governmental stakeholders to prioritise the Midlands for new nuclear deployment.

The purpose of the project is therefore:

To support the Midlands in understanding the potential opportunities for the siting of nuclear generation across the region, and the benefits this could provide.

1.2. Rationale for the Study

As the UK transitions to a low-carbon economy, nuclear energy will be vital for delivering secure, affordable, and sustainable energy. The Midlands has recognised that there could be a future role for nuclear in the region to support growth and the provision of low-carbon energy for current and future industries and homes. Simultaneously, the UK's Modern Industrial Strategy is being rescoped by the current UK Government with the ambition for government enabling action and interventions to:

- **Rebuild Britain**. In the context of the Midlands, the region previously hosted almost 20 GW of electricity generation with this diminishing to less than 12 GW. There is a prime opportunity for the nation to utilise the regions assets to rebuild, while simultaneously supporting the energy transition;
- **Support good jobs**. In the context of the Midlands, unlocking inclusive economic growth, enhanced business competitiveness and private sector investment with new infrastructure projects can drive local job creation and growth of Gross Value Added (GVA);
- **Unlock investment**. In the context of the UK's nuclear new build fleet strategy, for which Great British Nuclear (GBN) is currently tasked with delivering, nuclear is a highly attractive long term investment. Projects based on SMRs and AMRs are intended to be more investable due to the relatively lower upfront investment required and predicted shorter build times;
- **Improve living standards across the country**. East and West Midlands have the second and sixth lowest median wage in the country, both below the UK median wage [2] , leaving only minimal remaining income after basic living expenses. Creating well-paid jobs through development of nuclear energy generating assets could significantly improve outcomes.

The Midlands region (Figure 2) is centrally located and economically diverse, offering exceptional opportunities to host new nuclear generation, industrial decarbonisation hubs, and associated manufacturing facilities. Yet, until now, no study has comprehensively mapped nuclear siting potential across the Midlands.

Figure 2 – Midlands region covered by the siting study

By leveraging regional assets, there is a potential opportunity to create new jobs, attract new industry and grow the regional supply chain to support in-region and national nuclear projects. This project will support the region in building a substantiated position for where and how nuclear deployments could be achieved to deliver on these benefits. However, successful deployment depends on identifying technically and commercially viable sites.

Therefore, by leveraging Energy Technologies Institute (ETI) Power Plant Siting Study (PPSS) dataset [3] described further in this report and considering additional contemporary information to complement the dataset, this project ensures that the Midlands is prepared to present credible, investor-ready nuclear opportunities at a time of growing national and international interest.

1.3. How the Project Supports the Midlands

This study plays a pivotal role in positioning the Midlands as a leader in the next generation of UK nuclear development. Specific ways the project supports the region include:

- Leveraging the latest policy developments: The Midlands is the first region to explore the opportunities presented by the anticipated new nuclear siting policy, which is due to open up options for building nuclear in wider range of locations;
- Economic growth: By unlocking new nuclear investments, the Midlands can create thousands of high-value jobs and catalyse wider industrial and infrastructure growth;
- Decarbonisation leadership: New nuclear developments can provide low-carbon heat, hydrogen, electricity, and synthetic fuels for Midlands industries;
- Supply chain strengthening: The study will highlight opportunities for Midlands companies to participate in nuclear supply chains, fostering local innovation and manufacturing;
- Community benefits: The detailed engagement plan will ensure that new developments deliver tangible social, educational, and employment benefits across local communities;
- Global competitiveness: By proactively preparing investment-ready propositions, the Midlands will be better placed to attract domestic and international investors seeking opportunities in advanced nuclear deployment.

1.4. Aims and Objectives

The Midlands Nuclear Siting Study has five core aims:

- Identify and map potential nuclear energy sites across the Midlands using a proven methodology consistent with EN-1 and EN-6 National Policy Statements (NPS) [4];
- Assess the technical, regulatory, and social requirements for successful nuclear development, considering modern SMR and ANT deployment needs;
- Engage with local authorities, landowners, and the nuclear industry to validate findings and strengthen regional buy-in;
- Select and appraise two “nominated sites” in detail, including an analysis of benefits, opportunities, and potential barriers;
- Produce an Investment Brochure that communicates the Midlands' nuclear opportunities to investors, developers, and UK Government.

1.5. Outputs

The project will deliver:

- A shortlist of locations where siting nuclear power stations in the Midlands could be technical feasible, including known mitigations that may be required for this to occur;
- A regional map displaying shortlisted nuclear development sites;
- A detailed appraisal of two nominated sites, including technical viability, site information, and potential risks;
- The ability for the Midlands to communicate the opportunities to a range of stakeholders including developers, landowners, supply chain partners, investors and the Government.

These outputs shall support the project recipients to:

- Form a strategic view on how nuclear could support achieving national and regional goals and factor the technology into regional plans based on substantiated output;
- Inform internal thinking on specific-site development options and opportunities, enabling decisions to be taken with all relevant information being available;

- Understand the full extent of what nuclear energy provision could achieve for the region;
- Engage with UK Government, potential developers and reactor technology companies based on a strong foundation of knowledge;
- Communicate more effectively with the energy users that seek low-carbon energy to support their growth, and to attract new industries.

The purpose of the project and output is not to provide advice directly on:

- Energy system planning related to the ideal approach or mix of technologies for meeting current and future energy demands;
- What industrial development should be prioritised;
- How energy infrastructure should be developed in the coming years;
- Whether a project located on a particular site would be commercially viable, which would require further detailed techno-economic assessment on a specific chosen technology and further practical site assessment.

Similarly, no guarantee is given or implied that a potential project at the sites identified in this study would ultimately pass through regulatory and planning processes successfully. This is in part owing to the potential for prevailing policy to change, and the fact that many commercial market frameworks to support the low-carbon energy transition are still in development. But it is also dependent on the developer making choices and decisions which enable the project to be economically viable and successfully delivered from inception through construction and operations.

1.6. Project Deliverables

To achieve these outputs, several deliverables have been produced. This report (EQ-R-0028) is the main report and is supported by other reports. The segmenting of the outputs enables the work to be of value to the widest range of stakeholders, while protecting sensitive information (such as specific site locations) from wider view.

This provides for timely and appropriate decision-making, consultation and public engagement when and if the relevant regional organisations and authorities wish to progress with any level of further engagement or discussion on nuclear energy. One or more of the outputs are designed for consumption by the public, and therefore for publishing on the MNZH website.

1.7. Structure and Use of This Report

This report is structured to address each element of the required scope and to provide a robust and substantiated reference for MNZH and Midlands Nuclear to rely upon in future considerations towards nuclear siting and related projects.

- Section 1 this section provides the introduction;
- Section 2 sets the context for the project including relevant policy, UK energy landscape, the Midlands opportunity, reactor technologies and recent developments. This section also introduces the PPSS;
- Section 3 provides a short review or relevant previous nuclear siting related reports;
- Section 4 covers regulatory considerations and aspects important to enabling nuclear projects to be successful;
- Section 5 presents the approach and methodology taken to reach the shortlist of sites;
- Section 6 includes the results from the siting assessments and describes each site at a high level;
- Section 7 outlines the potential demand for nuclear energy and the applications that it could support and considers the opportunities and challenges of these applications;
- Section 8 presents a series of case studies related to the application of nuclear in the Midlands;
- Section 9 covers an overview of the supply chain and economic opportunities from nuclear development in the region;
- Section 10 provides the conclusions and recommendations.

2. Project Context

Section Summary

The Midlands is well-placed to support new nuclear development, with a strong industrial legacy and existing energy infrastructure. As the UK transitions to net zero, nuclear energy is increasingly recognised as essential for delivering low-carbon, secure, and affordable power. Wider deployment of nuclear is supported by recent policy changes, including EN-7 and the Civil Nuclear Roadmap, which could open up opportunities for siting reactors in the region. A detailed siting study has therefore been used to identify potential, technically viable sites across the Midlands as a foundation to attracting interest and investment to the region.

Section Contents

The need to develop and deliver low-carbon solutions to meet the needs of regional and national development has never been more pressing. The energy trilemma of achieving low cost, low carbon and secure energy has been brought into sharp relief by recent international events and changes to the approach through which energy infrastructure is proposed and developed.

As the UK seeks to decarbonise more of its energy use towards net zero in 2050, the Midlands is seeking to better understand what role nuclear could play in regional energy provision and growth. Nuclear energy currently provides 15% of the UK electricity needs and 10% internationally. The UK, as a past and present leader has existing skills, capability and supply chains, including in the Midlands, that can be applied to support achieving growth based on energy production and use.

Many locations in the region have previously hosted energy generating assets, which were strategically positioned, mainly through the late 1950's to 1980's to be relatively close to centres of electricity demand. The current trend for more dispersed energy production assets, increasingly located on the periphery of the UK leads in part to the need to reconfigure the UK's electricity grid infrastructure with on average longer distances between energy generators and consumers.

This has spawned the largest investment in the UK's energy transmission infrastructure in a generation, led by the Great Grid Upgrade [5], which includes notable projects in the Midlands, including the upgrade of the Willington to Chesterfield overhead connection to be a larger 400kiloVolt transmission route. Therefore, the opportunity to locate low-carbon generators closer to centres of demands could provide disproportionately large benefits in supporting reduced costs of the energy transition to consumers.

Electricity demand is set to increase as more energy users look to electrification to reduce reliance on fossil fuels and abate emissions while maintaining the ability for the region and the nation to produce and consume large quantities of energy. Concurrently, the demand for other low-carbon energy vectors including hydrogen, heat and synthetic fuels is set to increase, creating opportunities for regions that choose to be hosts for these new industries. These sectors can create many new jobs and drive economic development but must be underpinned by a robust energy supply strategy, and by locating energy generation in the region alongside industry provides additionality by ensuring jobs are secured in the region from right across the value chain of energy production and use.

This project is:

- **Timely**. UK Government support for the development of new nuclear projects is at a high and new project developments and proposals are welcomed, alongside the GBN projects. Concurrently, low-carbon policies and strategies continue to be developed with a stronger than ever drive towards lower-emission energy end use;

- **Relevant**. The Midlands is strategically located for energy production and previously hosted up to 20 GW concurrently. The national electricity grid has therefore developed around the production and use of electricity in the Midlands and is well suited to a return to this status;
- **Appropriate.** The anticipated publication of the new nuclear siting policy would be a critical enabler for any nuclear development in the Midlands, which does not currently host an identified nuclear development site. This project is being delivered in tandem with the process of finalising the revision to the nuclear siting policy in the Department for Energy Security and Net Zero (DESNZ).

Concurrently with the development of new policies and market frameworks for the energy end use sectors, the Government has maintained its position that nuclear has a key role to play in providing for the countries energy needs. Recent developments have reinforced this position meaning that the activity in the UK nuclear sector, primarily but not exclusively driven by the Government, is increasingly positive towards the building of a new fleet of nuclear reactors.

2.1. Midlands Energy Context

The Midlands has historically been at the heart of the UK's energy and industrial development, playing a crucial role in powering national growth from the Industrial Revolution through to the modern energy transition. The region's energy legacy is rooted in coal mining, steel production, and heavy manufacturing, which has evolved significantly over time, positioning the Midlands today as both a major consumer of energy and an emerging leader in low-carbon and innovation-driven energy sectors.

Electricity generation in the Midlands has undergone dramatic shifts from the Industrial Revolution to today. Initially coal dominated, peaking by the mid-20th century (Figure 3 and Figure 4), with gas became more prevalent in the late 20th century. Large gas-fired power stations like Staythorpe and West Burton B now supply electricity to the grid. Today, gas remains crucial in the Midlands for both direct use and power generation and the region remains a net exporter of electricity but to a much lesser extent than historically indicating that the Midlands' natural and infrastructure assets are well suited to generation.

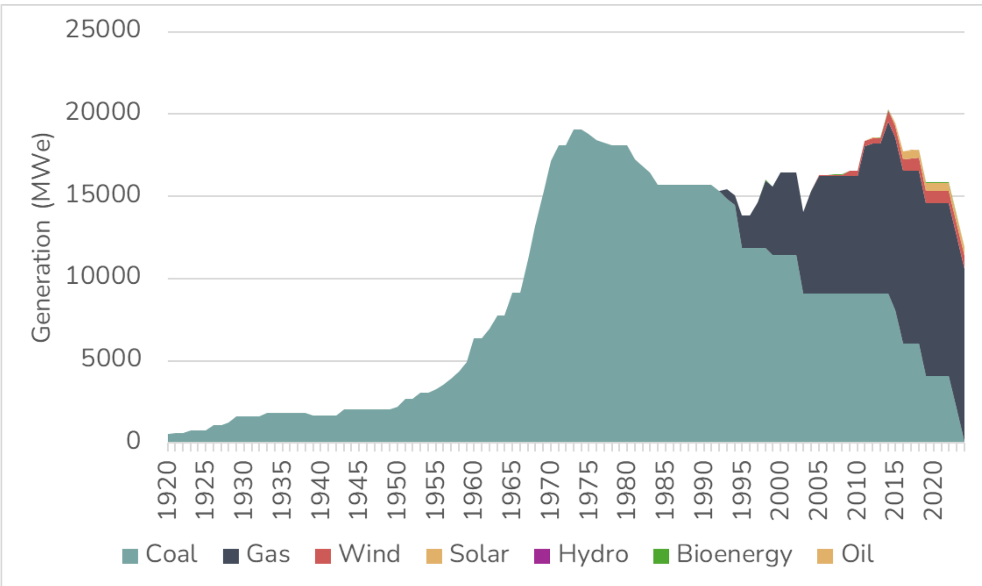


Figure 3 – Midlands electricity production by generation source over time since 1920 [6]

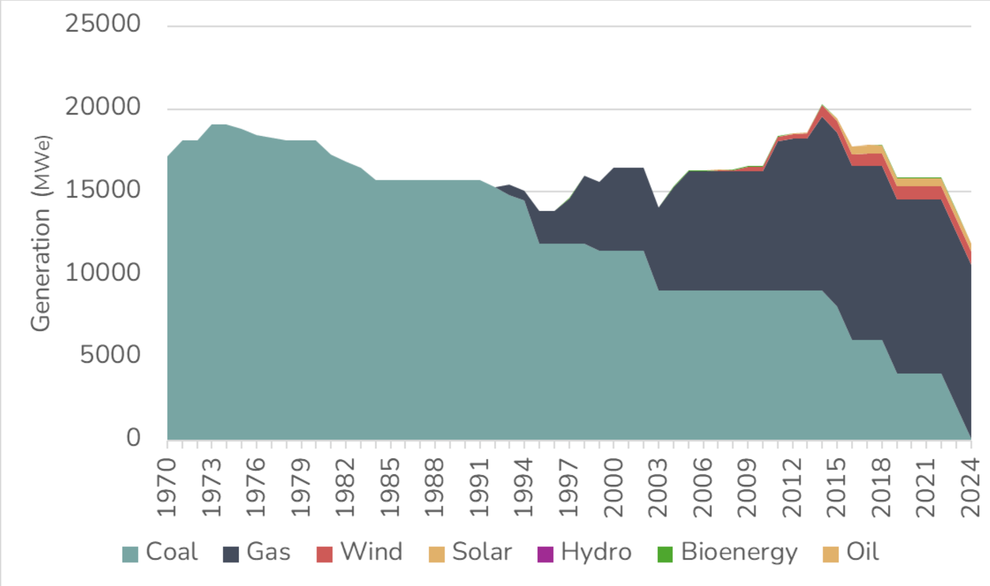


Figure 4 – Midlands electricity production by generation source over time since 1970 [6]

As of 2025, the Midlands has an estimated 11.8 GW of installed electricity production capacity, dominated by gas-fired power (~10 GW), solar Photovoltaic (PV) (~500 MW) and wind (~800 MW). Key gas-fired assets include Staythorpe CCGT (1,650 MW), West Burton B CCGT (1,332 MW). Coal-fired generation was phased out completely with the closure of Ratcliffe-on-Soar (1,980 MW) in 2024.

Renewables are a relatively recent addition to the Midlands' energy landscape. Lincolnshire, with its flat, open farmland and some coastal exposure, became a focal point for regional wind energy. By the 2010s, several wind farms were operating in Lincolnshire and neighbouring parts of Nottinghamshire and Leicestershire. Energy from offshore wind farms in the North Sea is fed into the grid in Lincolnshire directly linking the region to some of the world's largest wind farms.

Solar energy, like wind, is a new and growing part of the Midlands' energy profile, primarily developing since the 2010s. Utility scale projects around 2013–2015 took advantage of falling solar panel costs and available land. For example, a former airfield in Leicestershire (Wymeswold) was converted into a solar farm of around 33 MW, one of the largest in the UK at the time of its commission. By the mid-2020s, practically every county in the Midlands had at least a handful of notable solar installations, from small 5 MW community arrays up to multi-tens of MW solar parks.

2.2. Nuclear Policy

Since the Climate Change Act was amended in 2019 to reflect 100% decarbonisation, UK Governments have been consistent in their positions that nuclear has a role in achieving net zero. Recent developments and announcements have reinforced this, including on GBN and the setting of a target of up to 24GW ambition for new nuclear by 2050. This was first announced in the British Energy Security Strategy in 2022 and reinforced in the Civil Nuclear: Roadmap to 2050 (Figure 5).

The deployment of nuclear capacity to achieve a lowest cost energy system is estimated by modelling, the output from which can vary depending on the source of energy system modelling carried out and the input assumptions made. For example, modelling supported by UK Government in the 2050 energy pathways report (Figure 5) has identified that up to 75 GW of new nuclear would be needed to support the energy transition [7], alongside the CCC who called for one new nuclear plant every 18 months from 2018 [8] (Figure 5). The CCC continued to state that "A failure to increase build rates for nuclear would incur an annual cost of £1.1 billion in 2030 (and increasing thereafter) for every 5GW shortfall in nuclear capacity installed" or around 2 to 2.5GW annually.

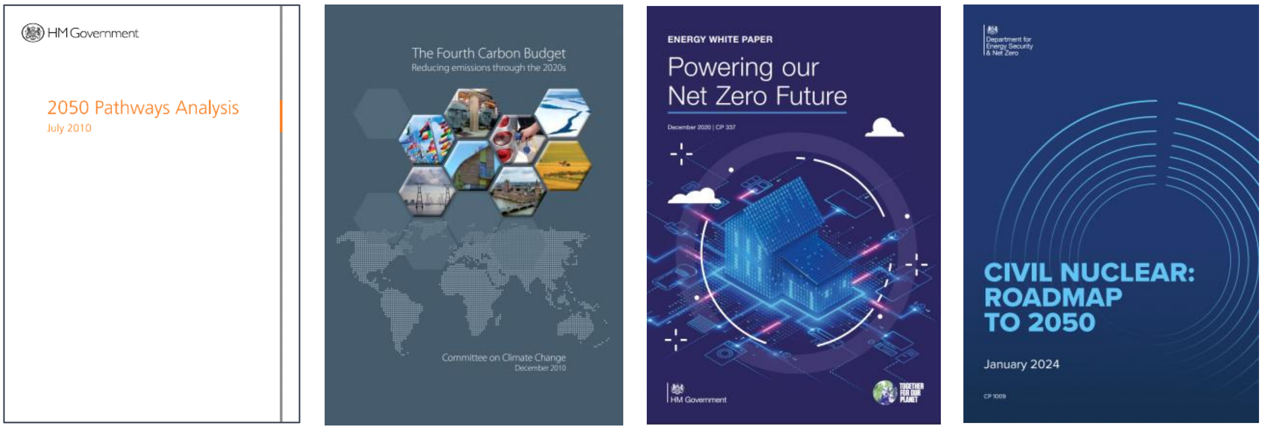


Figure 5 - Sources of Recommendations on Nuclear Deployment Levels

More recently, the Civil Nuclear Roadmap [9] stated the ambition for up to 24 GW of new nuclear by 2050, made up of GW-scale, SMR and AMR reactor types.

Most relevant to this project is the second consultation released on the siting of new nuclear reactors in England and Wales. The additional policy document EN-7 [10] is due to come into force in 2025 and will provide important additional policy on siting of new nuclear power stations, building on the extant EN-6 policy [4], which will also remain in place.

EN-7 is proposed to move away from the prescriptive approach taken by EN-6, which identifies eight locations as suitable for nuclear deployment, of which none are in the Midlands, to a goal-setting approach that could enable nuclear deployment in more locations subject to the meeting of specific criteria (Figure 6).

The criteria are largely unchanged between EN-6 and EN-7, and the PPSS assessments on over 600 sites in England and Wales are based on the same criteria ensuring consistency.

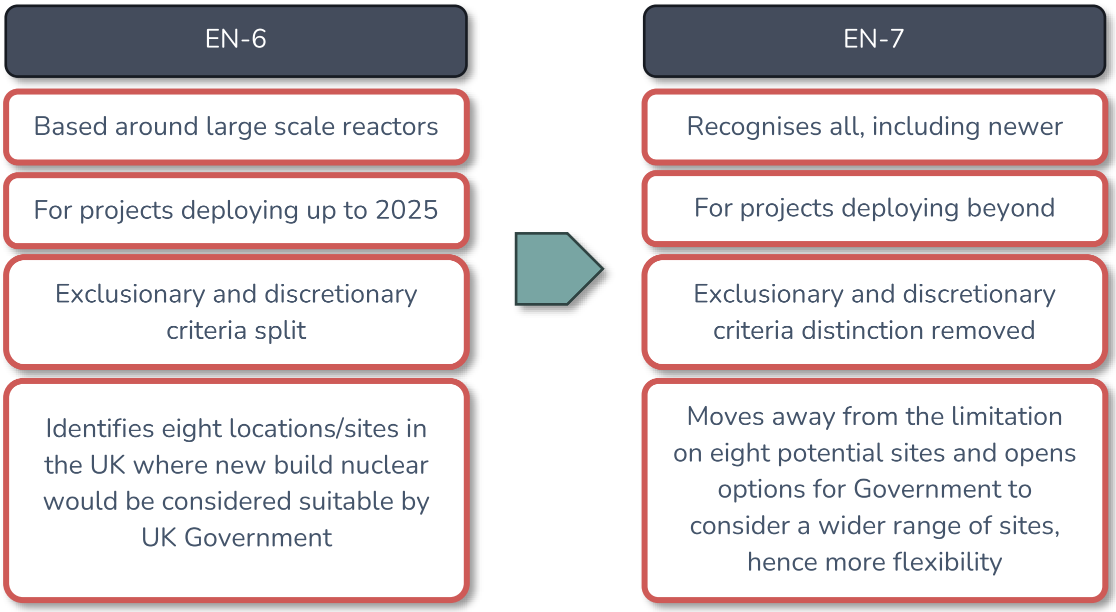


Figure 6 – EN-6 to EN-7 high level comparison

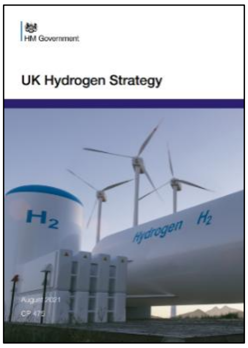
2.3. Other Relevant Policy

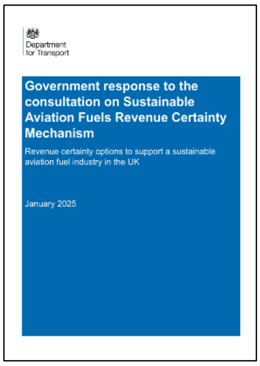
When the Government released Invest 2035: The UK's Modern Industrial Strategy [11] it wanted to drive growth; rebuilding Britain by supporting good jobs, unlocking investment and improving living standards across the country. Clean energy industry is one of eight growth sectors targeted, with nuclear energy explicitly recognised as a core component. This recognises the nuclear industries potential to drive growth with opportunities for deployment of both GW scale reactors and smaller SMR and AMRs.

Nuclear has historically been considered as a baseload electricity generator, but policy has increasingly associated nuclear with other energy vectors and the energy end use policies have, synergistically, increasingly included nuclear. These polices, the associated market frameworks and the recent primary legislation change to categorise Nuclear Derived Fuels (NDF) as 'renewable' in the context of the Energy Act 2023 [12], provide opportunities for nuclear in energy end use markets that have not previously been accessible. This has been further enabled by the categorisation of nuclear as a green asset within the proposed UK Green Taxonomy.

This section looks at key policies that have the potential to drive growth in nuclear from the perspective of sectors and policies that drive the demand for nuclear energy beyond for electricity.

UK Hydrogen Strategy [13] provides the overarching strategy for the development of the hydrogen production in the UK, aimed at positioning the UK as a leader in hydrogen production and use. The approach proposed is a 'twin track' with steam methane reformation with carbon capture, and electrolytic hydrogen. The strategy recognises that nuclear powered electrolysis will likely come to the market from 2030 onwards, supporting the hydrogen economy to meet net zero targets.

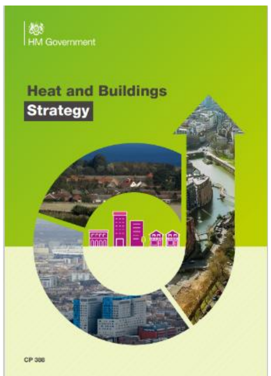


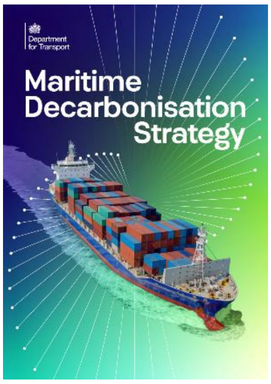


The **Sustainable Aviation Fuel (SAF) Mandate** [14] is a government policy that required an increasing percentage of jet fuel used in aviation to come from sustainable low-carbon sources rather than fossil fuels. The **Revenue Certainty Mechanism (RCM)** [15]; is a policy tool designed to reduce the financial risk and encourage investment in SAF production by guaranteeing a predictable revenue stream for producers.

SAF can be produced using nuclear energy, using electrolysis to generate hydrogen and carbon capture to create carbon dioxide, which are then processed to produce the fuel. This mechanism has a number of advantages over other SAF production systems, as there is no limit on the feedstock (unlike when producing fuel from biomass) and nuclear energy allows for a controllable and predictable price for the energy needed and therefore the fuel produced.

The Heat and Buildings Strategy [16] outlines a transition for the UK to high efficiency low carbon buildings. It focuses on reducing bills and improving comfort through energy efficiency, and building the markets required to transition to low-carbon heat and reducing costs, while testing the viability of hydrogen for heating. This strategy recognises the benefits of nuclear both as a generator of electricity but also as a potential source of heat for district heat networks.





The Maritime Decarbonisation Strategy [17] sets the pathway for our domestic maritime sector to reach zero fuel lifecycle Green House Gas (GHG) emissions by 2050 and provides regulatory certainty for the maritime sector. It sets out a number of policy areas to deliver this, the most relevant to the deployment of nuclear power is the commitment to introduce domestic fuel regulations to drive the uptake of zero and near-zero GHG emission fuels and energy sources. Nuclear power is referenced both as a potential Energy Input for direct use in ports and the generation of end fuels such as hydrogen, and also as an end fuel itself, through nuclear powered vessels.

The AI opportunities action plan [18] sets a plan to back the growth of AI in the UK. It includes initiatives that will help make the UK the number one place for AI and data centre firms to invest. This includes the creation of new AI Growth Zones, where the growth of data centres and large-scale computing facilities shall be prioritised. Such locations have the potential to demand GW-scale electricity supply with very high reliability. Nuclear is a candidate technology to meet these demands, driven by its low land requirement, predictable operation and high capacity factors.

2.4. Recent and on-going developments

This section continues to provide further information on recent developments that help to further position the opportunity for nuclear in the Midlands and set the scene for the consideration of sites for nuclear development projects.

Midlands Ambition

The Midlands has a thriving low-carbon economy built upon the multiple ambitious strategies in place across the region and the opportunity for growth. These are supported by the rich natural capital of the region and the strong focus on applying the regions strong heritage of industrial innovation, creating new opportunities in green industries including hydrogen, nuclear, renewables and synthetic fuels.

The two identified Freeport sites in the area provide anchor points for growth, but the opportunity and impact extend far beyond these locations. By aligning with national imperatives and leveraging natural assets to deliver growth, the region now possesses a large proportion of the UK's low-carbon businesses and a similarly significant proportion of jobs.

The region already hosts a nuclear licensed site in Derby, so it is familiar with the required skills and workforce for nuclear developments and can observe the jobs benefits created by such facilities. The Spherical Tokamak for Energy Production (STEP) project being developed on the West Burton site demonstrates the ambition of the region and the recognition by Government, the research communities and developer organisations in the regions ability to nurture innovation and projects and deliver on its high level of ambition.

Several recent reports have underlined the ambition of the region to explore new nuclear opportunities including a focus on skills [19] and the economic growth opportunity [20]. These are supported by the earlier report [1] that recommended the creation of Midlands Nuclear alongside several other recommendations, including one related to the identification of sites and therefore is directly applicable to this project (Figure 7).

1.	**Support bids for nuclear manufacturing sites.** There is the potential for a number of nuclear manufacturing facilities to be sited in the region building on the Midlands' strong manufacturing base.
2.	**Support the development of new nuclear generation in the Midlands and propose potential Midlands sites.** The Midlands is unique as it has no current nuclear generation sites. Whilst the first phase of new nuclear is focused on re-purposing older nuclear sites there are opportunities for new sites to be put forward in the future.
3.	**Support the development of the fusion energy sector.** The government's announcement that the new STEP Fusion plant will be built at West Burton A in north Nottinghamshire will enable a significant Midlands-based fusion technology sector to develop and will strengthen the local supply chain.
4.	**Establish a Midlands nuclear consortium to coordinate nuclear energy activities across the region.** This would bring together the supply chain, developers, generators, researchers and skills providers interested or already operating in the region.
5.	**Support nuclear skills development to meet Midlands and national demand.** Develop a Midlands nuclear skills roadmap and encourage universities and colleges to scale up skills provision to meet planned nuclear activity, especially given the scaling up in construction and deployment involved.
6.	**Support creation of nuclear test, validation and R&D facilities.** The Midlands has potential to become a leading cluster for the nuclear and fusion sectors but requires facilities to support the development of next generation nuclear to enable this.
7.	**Support the siting assessment of the UK's long-term Geological Disposal Facility (for example at Theddlethorpe).** Work with communities through the established Community Partnership to better understand what hosting a geological disposal facility entails, providing expertise where required.

Figure 7 – Recommendations from the Midlands Engine Review of Nuclear and Related Industries in the Midlands [21]

Great British Nuclear

Past nuclear development failures, for example Horizon on Anglesey and NuGen at Moorside, Cumbria, have focussed attention and challenge as to how the UK's nuclear ambitions can be realised. These two private company projects were set to be the first nuclear power stations in the world to be built by private companies with private finance but their failure to reach Final Investment Decisions (FID) led to a reframing of how nuclear projects can be developed in the UK.

In response to this, and coincident with the emergence of SMRs as a potentially lower cost and lower risk nuclear development option, UK Government set up GBN, an arm's length body with the remit to deliver the UK's new fleet of nuclear reactors [22].

GBN is set up to enable nuclear projects through both leading and supporting deployments. The first main activities of the organisation have been to purchase the Oldbury and Wylfa sites, build internal capability to deliver on the mission, and run a technology partner competition for SMRs. This competition is due to close in Spring/Summer 2025, with the awarded party or parties continuing to work with GBN on deployment projects.

During the recent announcements on new nuclear siting and the progression of the GBN technology partner competition, The Prime Minister was quoted as stating 'build, baby, build' in relation to the proposed new fleet of power stations and reinforcing the position that while GBN will initiate organisations capable of developing nuclear projects, Government similarly stands ready to enable other routes to market that may be forthcoming with private capital. The Government response to the consultation on Alternative Routes to Market, however, remains outstanding.

NESO Strategic Spatial Energy Plan and Regional Energy Spatial Planning

NESO is a new publicly owned organisation tasked with ensuring that the UK's energy system, including electricity and gas networks, are fit for the future. Through whole system coordination, NESO will ensure the UK energy system assets are capable of delivering on the Governments net zero and

Clean Power 2030 targets and that energy can be securely provided to industrial, commercial and domestic consumers where and when it is needed, and at least cost.

The current programme of work on the Strategic Spatial Energy Plan (SSEP) will help NESO achieve its goal by assessing the optimal locations, quantities and types of energy infrastructure required to meet our future energy demand, helping enable the clean, affordable and secure supply we need.

The SSEP is part of NESO's wider activities on energy planning (Figure 8) that includes the Regional Energy Strategic Planning (RESP) activities, designed to provide regions with the energy systems required to deliver on their goals.

In the context of these activities, the siting study is highly relevant and timely to enable suitable engagement with NESO and appropriate input to the planning activities to support the Midlands to achieve positive outcomes for its future energy system.

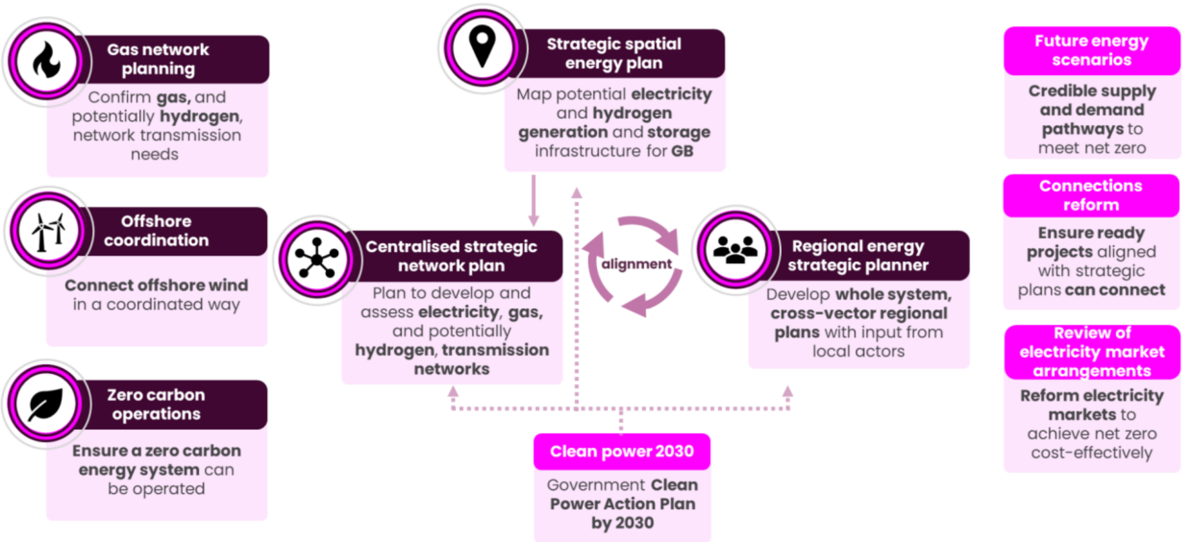


Figure 8 – NESO Strategic Energy Planning Summary Framework [23]

2.5. Reactor Technologies

The UK is advancing the deployment of new GW nuclear reactors with Hinkley Point C (HPC), currently under construction in Somerset. The HPC reactors are UK-EPRs, which is a type of Pressurised Water Reactor (PWR). The design of the UK-EPRs represents a major development on previous PWRs, making them amongst the safest and most efficient civil nuclear power generators ever designed. They have been designed to use 17% less uranium and produce almost a third less long-lived radioactive wastes compared with water reactors in operation today. HPC will deliver around 3.2 GW of low-carbon electricity, enough to power 6 million homes, once both reactors are operational, this is expected to be in 2029.

The government has also committed to Sizewell C (SZC), a near-replica of Hinkley, securing investment through a Regulated Asset Base (RAB) model to attract private capital and reduce financing costs. The principal advantage of replicating HPC is in the re-use of detailed construction design details and method statements that have already been tested and proven in the field and can therefore be re-used with the associated learning and experience from the construction of both HPC units. This duplication enables the UK to benefit from a learning curve that can reduce the risk associated with individual construction activities and lead to the predictable reduction in duration of individual construction activities. This build acceleration can deliver cost efficiency and is why developers seek to replicate plants in construction.

Advanced Nuclear Technologies (ANTs) refer to a new generation of nuclear reactors that offer significant improvements over existing large-scale nuclear plants. They mainly include two broad categories of SMR and AMR.

SMRs are essentially smaller versions of today's conventional nuclear plants, using well-understood water-cooled reactor designs but largely built in modular, factory-produced units that are predicted to offer faster, cheaper deployment.

In contrast, AMRs use new types of reactor designs and cooling systems, such as gas, molten salt, or liquid metal, that could operate at higher temperatures and efficiencies. These high-temperature reactors could unlock new non-electric applications, such as industrial heat and hydrogen production, that conventional reactors are not suited for.

Both SMRs and AMRs are designed to be smaller and capable of being deployed more flexibly and on a larger range of sites compared to traditional large-scale nuclear reactors, allowing faster construction, greater siting options, and better integration with local energy needs. Their smaller size can lead to a stronger learning curve as more unit builds are required to achieve the same capacity of deployments.

GBN is currently focused only on supporting the near-term deployment of SMRs, aiming for the first operational units by the early to mid-2030s. However, several private developers in the UK are actively pursuing AMR technologies, viewing them as the next frontier for both industrial decarbonisation and flexible clean energy with the potential to deploy at least on similar timescales as SMRs.

Figure 9 outlines predicted development and deployment timelines for the different reactor technologies clearly showing the variation in proposed timelines observed between Government and GBN, private developer organisations, and private reactor vendors. The precise timelines for deployment will depend on many factors but technologies that can demonstrate greater benefits from previous projects, operational experience and with lower levels of technology risk are likely to present the most investable propositions that can be delivered with greater certainty.

Sites included on the shortlist could be suitable for the deployment of one of more of the technologies included in Figure 9. While the Midlands may not be able to directly select preferred technologies, for this shall be the decision of the developer organisation(s), the region may wish to be cognisant of the potential time horizons on which technologies are likely to be available for deployment, and the uncertainty of when this could be. The range of uncertainty also varies between technologies with AMRs seeing the greatest spread in the predicted operational dates proposed by technology vendors and developers.

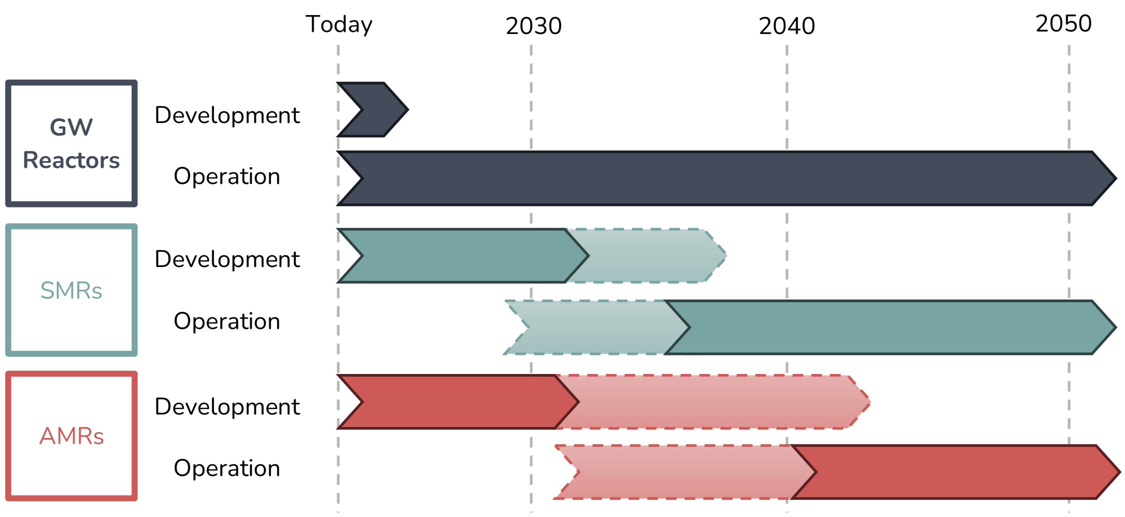


Figure 9 – Potential development and first commercial operation timelines for GW reactors, SMRs and AMRs. With the exception of GW reactors, the broad range of potential dates is representative of both reactor vendor claimed operational dates, and international estimates from respected organisations.

2.6. Power Plant Siting Study Dataset

This project leverages the PPSS dataset [3] to offer a time and cost-effective review of many potential nuclear sites across the Midlands against each of the siting criteria recognised as important to considering locations that are technically suitable for nuclear power deployment. The PPSS was the output from a project delivered in 2015 under contract with the Energy Technologies Institute (ETI). The summary report is publicly available but does not list potentially suitable deployment sites, so is of limited benefit to this project. Through a licensing agreement, this project therefore benefits from the whole dataset underpinning the project.

The goal of the ETI was to develop and own valuable IP which they and their members could exploit. The PPSS was procured with relevant permissions and licences such that the ETI and its members were free to pursue this goal. Due to its content, including the consideration of individual sites which some stakeholders may consider controversial, it was deemed unhelpful to place the full Project Technical report in the public domain.

The ETI closed in 2019 and much of its IP including the PPSS was assigned to the Energy Systems Catapult (ESC). Portinscale Consulting was the PPSS project designer, procurement lead and project manager for the ETI. Portinscale Consulting’s intimate knowledge of the goals of the PPSS, what it contains, the limits to its assumptions and conclusions, and how its learning may be applied to relevant projects is unique and was lost to the Energy Systems Catapult in September 2020 when he retired without replacement. To prevent this knowledge and understanding to be lost and to enable it to be utilised by the industry and associated stakeholders ESC granted him a licence to consult using the nuclear portfolio projects and reports from the ETI and ESC. The licence does not permit him to transfer the reports in whole or in part.

An underlying purpose of the PPSS was to identify potential siting locations for up to 75 GW of new nuclear capacity to align with other modelling work being undertaken at the time. This was to provide data for underpinning the development of the Energy Systems Modelling Environment (ESME) toolset. Since 2020, the PPSS dataset has been organised into a form that is suitable for sorting and shortlisting and it is this format that is of greatest value to this project. Under license with Portinscale Consulting, the non-public version of the dataset is used in this project, providing MNZH, Midlands Nuclear and partner regional authorities with enormous value and substantiation of outputs that would not have been possible without its use.

At the simplest level, the PPSS comprises a long list of sites subject to a baseline assessment, and then a long sequence of sensitivity studies to examine the suitability of these sites when considered against the NPS-EN6 criteria. As further sensitivity studies are performed, additional sites are identified and tested in an attempt to generate sufficient site capacity to meet the requirements of the defined scenarios. Over 630 locations are considered and examined with the PPSS with 84 falling in the Midlands region.

For the most promising sites, the PPSS also provides subjective guidance on four of the most important factors influencing the economic attractiveness of these sites:

- Cooling water availability, cooling system designs that are compatible, and impact on the thermal efficiency during operation due to the designated cooling water system
- Ground conditions and the extent to which improvement works are necessary to provide an adequate foundation
- Flood defences in that many inland sites are exposed to the risk of flooding. Flood mitigation usually involves platform raising sometimes with other engineered protection schemes
- Ease of access for the transport of bulk construction materials and Abnormal Indivisible Loads. Lack of access requires additional developer investment in local infrastructure facilities to enable deliveries to site

Staff at Portinscale Consulting Limited have interrogated the PPSS Technical Report and associated Technical Appendices to build a database recording each of these sites, together with the sensitivity studies against which it was examined and the performance of the site when tested against the exclusionary and discretionary criteria of EN6. The database has been used to sort the sites by region and identify the sites which perform most strongly against the criteria. The PPSS develops and justifies particular mitigations where some sites cannot satisfy all of the discretionary criteria and, in adopting these known mitigations each of the sites is then declared a pass or fail within the PPSS data. For sites that pass there is information on the source of cooling, the appropriate cooling water system to use with this cooling, and the nuclear generation capacity theoretically developable at this site.

As well as the sites which were declared a “pass” within the PPSS under certain sensitivity studies, it is also possible to reconsider selected sites that were deemed to “fail”, through expert consideration of the criteria that caused the difficulty and the reasons for the failure. One such example is the failure of locations due to the proximity of hazardous facilities. In the 10 years since the PPSS was completed, Net Zero legislation has been introduced and the future plans for petrochemical refineries and the inventory of flammable hydrocarbons stored on site are being reviewed. Similarly changes in the proposed boundaries of a site or reduction in proposed generating capacity may have the potential to convert a ‘failure’ into a potential ‘pass’. Within the database the PPSS data on such sites is not changed, but these sites are identified as ‘worthy of further consideration’.

Further to the categorisation process above, it is deemed most valuable for this study to present all sites on the shortlist equitably, regardless of the route by which they have been included and then highlight the required mitigations and potential challenges. Some of these factors may have resulted in one or more sites being a potential fail within the original PPSS, but to exclude these would be to limit the visibility of the true potential of the Midlands, which is deemed unhelpful.

3. Review of Historic Siting Reports

Section Summary

Siting of nuclear energy has historically led to the selection remote sites on the coast, except in one case at Trawsfynydd. This has evolved as operating experience of reactors increased leading to reactors placed nearer to populations. More recent developments in the sector have driven forward the national narrative on nuclear siting and are supported by a broad literature base which is discussed further in this section. The site features that may render a site feasible or infeasible for deployment are assessed against a set of criteria that have precedence in previous studies. Upcoming EN-7 siting policy does not alter the overall approach but can enable siting in more locations and is relevant to a wider range of technologies as compared to the current EN-6 policy.

Section Contents

The context for siting nuclear power stations dates from early in the deployment of the Magnox reactors, when it was judged by the nuclear regulator and development organisations at the time that siting away from population centres for new technologies with a small number of operating hours experience would be prudent. Suitable locations were identified, which includes sites that were owned by the Government and its agencies and had supported the second world war efforts, for example previous airfields, for a range of uses including experimental and commercial reactors.

As a greater number of reactor operational hours was compiled across the Magnox and later Advanced Gas-cooled Reactor (AGR) fleet, so the introduction of the semi-urban criteria from the UK nuclear regulator supported decision-making on where reactors could and should be located to meet the needs of the nation and its regions. As a result, the later reactors at Hartlepool and Heysham were located nearer to populations, and nearer to industrial centres than other reactors. There is rationale for newer types of reactors to follow this same staged approach to siting.

The prevailing policy is EN-6 for the siting of new nuclear installations, which is due to soon be joined by EN-7, although the semi-urban criteria for siting is set to continue to apply. The designers of AMRs claim that their technologies are 'safer' and therefore do not require the same criteria to be applied but the Office for Nuclear Regulation (ONR) takes a consistent approach to all technologies.

In the context of this project, sites that fail the semi-urban criteria therefore fail overall, so no site considered on the shortlist or the two detailed appraisals would challenge the prevailing population density criteria.

The review of relevant historic siting reports is limited to those that have relevance to the current project including those that support definition of the siting criteria, and those that could influence current national or regional strategies.

References of particular note that contribute to the national narrative on the siting of new nuclear power stations include:

- **ETI PPSS Phase 1 and Phase 2 Technical Reports** [3] [24]. A comprehensive peer reviewed study with supporting technical appendices that provides the major underpinning data for this project.
- **Siting New Nuclear Power Stations – Availability and Options for Government. Jackson Consulting** [25]. This report records the output of an expert advisory group to assist in policy development by Government. Key points are; the hierarchy of preferred site development,

recognising economics of site development, and the importance in transferring the energy delivered off-site (grid connection) once the power station is operational.

- **NPS for Nuclear Power Generation (EN-6): volume I and volume II** [4]**.** This document outlines the current prevailing policy on siting new nuclear power stations including the approach to Strategic Siting Assessment.
- **A NPS for New Nuclear Power Generation NPS EN-7** [10]**.** The "Consultation on the new approach to siting beyond 2025" was released in January 2024. "A response and further consultation" was issued in February 2025. This policy statement will when released inform criteria to add or vary beyond ETI PPSS including:
    - Potential cooling water relaxation for ANTs using air cooling;
    - Proximity of demand centres for heat, hydrogen or aviation fuel as additional or alternative energy markets to grid electricity supply.
- **Alternative Routes to Market for New Nuclear Projects** [26]**.** Consultation on how UK Government could enable the deployment of new nuclear projects for alternative applications and led by private development companies. This consultation has not been updated or responded to formally by UK Government since it was first issued.
- **Land Use Planning and the Siting of Nuclear Installations** [27]**.** Outlines the regulatory requirements associated with siting new nuclear nearer populations.
- **The Siting of UK Nuclear Power Installations; University of Cambridge Energy Policy Research Group** [28]. This report balances the caution of distance against the economic benefits of closer proximity of deployment.
- **W Bodel, A Bull, G Butler; Siting implications of nuclear energy: a path to net zero; Dalton Nuclear Institute March 2022** [29] (there is a significantly large social element to this and the need to consider lifecycle elements along with the Nuclear Decommissioning Authority (NDA) decommissioning and remediating existing nuclear sites).
- **Why lifting the ban on fracking is not the answer to the UK gas crisis; APPG Environment; October 2022.** The purpose of reviewing such a non-nuclear paper is to demonstrate that in the face of organised, determined, widely supported and law-abiding local opposition, any project will collapse even if pushed hard by the developer, Government policy and the law. Community engagement and development of agreed community net benefit is fundamental. Easier to achieve this outcome in this context through the re-use of an existing nuclear site (an adjacent development), or next best, the redevelopment of a site previously used for fossil fuelled power generation.

4. Siting Requirements and Considerations for New Nuclear Development

Section Summary

Development of new nuclear power stations in the UK requires alignment of multiple regulatory processes including Development Consent Order, Nuclear Site License and Environmental Permits. The combination of requirements that these entail leads to a hierarchy of preference for developers which can affect early siting decisions. Successful project delivery relies on regulatory readiness, site suitability, and proactive engagement with planning authorities and national energy strategies.

Section Contents

In combination with Appendix 1, this section provides a description of the regulatory considerations for the deployment of a nuclear reactor on a new site in the UK in the form of high-level regulatory roadmap. The purpose is to provide insights to the various processes by which approval is gained to build, operate and decommission on a specific site and the approximate timelines for their completion.

Some or all of the site-specific aspects covered in this section are considered and addressed in the shortlisting of sites, however since the shortlisting is currently reactor technology agnostic there are aspects of site licensing that cannot be wholly predicted due to the interaction between the site and the technology.

Similarly, to be most valuable to the reader this section does not consider any specific site but does assume that any such deployment site would be in the Midlands.

The section presents the regulatory roadmap and addresses some other important considerations to successful passing through regulatory processes and development, including the importance of different organisations and their capability in successfully bringing forward a nuclear development project. Appendix 1 explains on each element of the regulatory landscape covering:

- Site characterisation;
- Regulatory justification;
- Planning;
- Generic Design Assessment;
- Nuclear licensing;
- Environmental permitting;
- Emergency preparedness;
- Waste management; and,
- Health and safety.

4.1. Siting Regulatory Roadmap

Successful deployment of civil nuclear power in the UK requires the completion of several regulatory processes that can be either agnostic of the proposed deployment site, as in the Generic Design Assessment (GDA) or specific to the deployment site, as in site licensing and permitting.

These processes are often complex and interlinked with different parties allocated responsibility. The technology vendor will be responsible for GDA, while the developer shall he responsible for site licensing the permitting. Clear divisions of responsibility, coordination between these parties is essential for a lowest risk development project.

These can be time consuming and costly to complete and require organisations with the knowledge, capability and available funds to competently and completely pass through them. Similarly, the regulators shall require the knowledge and capacity to adequately review the relevant submissions, which relies on technologies and sites presenting evidence in a form that can be accepted for review.

Operators of nuclear facilities in the UK must be designated as a site licensee by the ONR. Any body corporate can be granted a license, provided it meets the site license criteria published by ONR. This includes a range of requirements, including demonstrating an organisational capability to safely operate the site [30].

The burden of responsibility for demonstrating that a technology and its construction and operation on a site has reduced risks to As Low As Reasonably Practicable (ALARP) falls to the Requesting Party (for GDA) or the applicant (for site license and permit). Evidence to support the case can be from varied sources, and have been generated through various means, however operating experience and evidence of past safe operation of the specific and related technologies can one source of evidence that carries appropriate weight. It can be more challenging therefore to make claims on operating experience where the technology is novel, as is generally the case for AMRs.

An overview of the regulatory roadmap is provided in Figure 10.

4.2. Other important considerations to successful passing through regulatory processes and development

Passing through these processes and achieving the end point goal of operating a nuclear power station requires relevant funding, skills, capacity of people and capable organisations.

There are different approaches that can be taken in the organisational construct of a project but generally there shall be organisations, or parts of the same organisation that fulfil the roles of:

1. **Developer:** Owns the project, coordinates the development and delivery of the project including financing, engineering, planning and stakeholder engagement. This organisation could transition to be the owner of the operating nuclear power station and potentially the licensee, or they may sell or lease the power station to another organisation. In any scenario, the capability transition from the developer to those involved in operating the power station should be well organised and effective to retain knowledge. The developer may be supported by an owners engineer to support intelligent customer capability for the project.
2. **Operator:** Aligning with a capable and experienced nuclear operator early in the project will reduce project risk in the later stages and enable operational considerations to be included in the project from an early stage.
3. **Technology Vendor:** This organisation is responsible for delivering the reactor power station design under license for integration to the site by the developer. This may require the completion of designs and for more innovative technologies potentially outstanding research and development, and adjustment for the specific site conditions.
4. **Investors:** A nuclear power station of any size is a major capital investment and building confidence in the ability of the project to deliver returns from an early stage is crucial.
5. **Engineering, Procurement and Construction (EPC) company:** A capable EPC company to deliver the power station construction under contract with the developer.
6. **Supply Chain and Skills:** Appropriate supply chain and skills development through the early stages of the project to de-risk the construction and delivery.

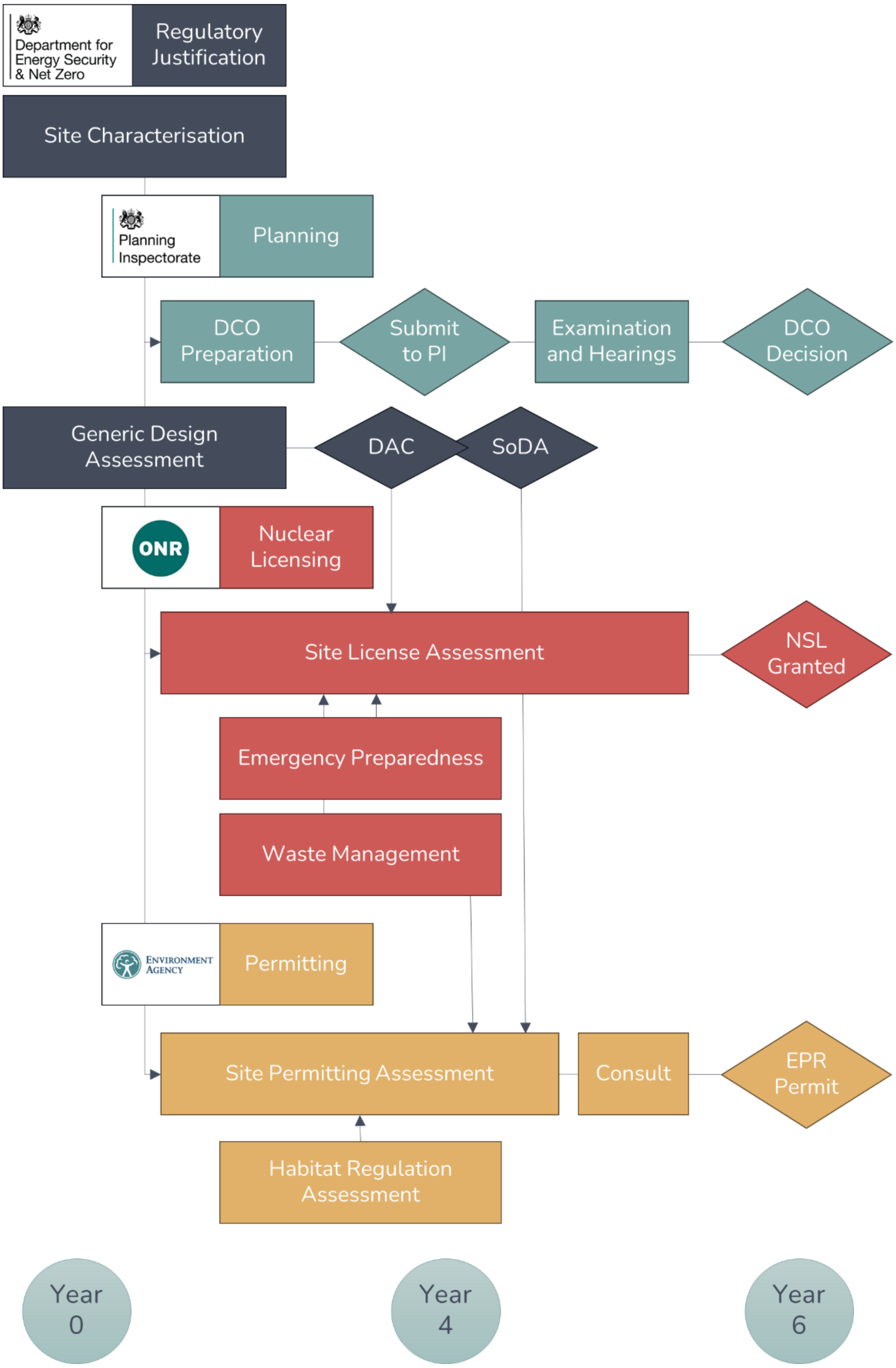


Figure 10 - Interaction of regulatory processes and indicative timescales

4.3. Site Development Hierarchy

Traditional thinking on nuclear development projects is that they are most likely to experience least headwinds in locations where nuclear projects are already operating, or have operated, whether or not these are greenfield or brownfield development locations. As part of the development of the EN-6 policy, therefore, Government invited credible nuclear operators to propose sites for new nuclear projects, with the outcome being that all proposed sites were in such locations; adjacent to existing operating or decommissioning nuclear power stations. This led to the sites identified in the EN-6 NPS and this policy is proposed not to be withdrawn with the introduction of EN-7.

EN-7 could also enable developers and regions to propose new sites for early development, which could be driven by:

1. Accessibility of land since not all developers will be able to secure land listed on the EN-6 policy through purchase or long-term lease;
2. The interest in nuclear developments is such that the capacity of EN-6 is used up leading to a need to consider alternatives. Previous studies have shown that this is likely to occur for a least cost net zero energy system;
3. Regional energy demand and the need to produce energy in particular locations because it is uneconomical or infeasible to deliver the same energy from the EN-6 sites.

It may also be that under EN-7 and relevant regulatory processes, other locations become more desirable than those listed in EN-6. For example, if the social acceptance of nuclear is very high then a brownfield site in a location that has not previously seen nuclear generation may be considered a lower risk option compared to a greenfield EN-6 site with attributes that lead to unfavourable economics or complex environmental mitigations.

Nevertheless, once alternative sites are being considered then it is generally accepted that brownfield locations shall pose fewer challenges than greenfield through the planning processes, and these are likely to be more desirable to developers compared to greenfield and more likely to be granted planning permission.

The current accepted hierarchy for nuclear site development is shown in Figure 11.

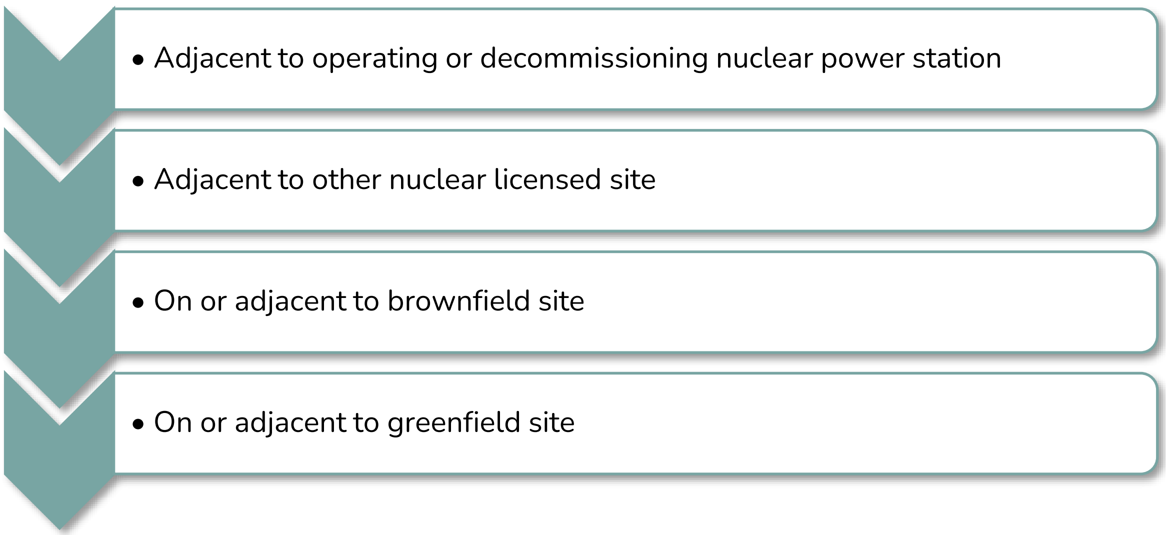


Figure 11 – Generally accepted hierarchy of nuclear site development

For the Midlands, there are no power stations operating or in decommissioning phase, and the single nuclear licensed site is unsuitable for adjacent development of a nuclear power plant. Therefore, as part of the shortlisting, brownfield sites are considered more likely to be developable in the near term. This would not preclude a determined regional entity and developer in pursuing a greenfield site, however where there are other options available, such a developer would need to make justifications under the Appraisal of Sustainability.

This characterises how the Midlands sites might be considered by UK Government and emphasises the importance of EN-7 and additional factors that may lead to a reactor deployment proposed at hierarchy level 3 or 4, leapfrogging over a hierarchy level 1 or 2 site in this new context. How the balance shifts between potential sites once the current Government's Planning and Infrastructure Bill is passed is uncertain and may be informed in part by the outcome from the NESO SSEP projects.

Any site outside of EN-6 would need to be considered on a case-by-case basis and require engagement with UK Government, GBN and the planning inspectorate to understand in detail how the planning laws will be applied pursuant to EN-7 and the Planning and Infrastructure Act passing into legislation.

5. Midlands Siting Approach and Methodology

Section Summary

The Midlands Nuclear Siting Study has applied an evidence-based and technology-agnostic approach to identifying potential nuclear development sites in the region. The approach recognises the importance of early but sensitive stakeholder engagement, technical suitability, and alignment with policy frameworks. A structured process using the PPSS dataset was used to assess 84 sites against exclusionary and discretionary criteria, leading to a shortlist and further detailed appraisal of two sites most likely to be suitable for potential nearer-term development, considering technical, social, and economic factors.

Section Contents

Sites that are proposed for new nuclear developments are more likely to be successful when a robust evidence base is available and carefully considered, and early stakeholder and public engagement occurs. For the latter, careful staging and phrasing of communications with local communities covering all relevant information can help prevent headwinds in development and planning. Identifying locations under consideration too early could lead to challenges in any stage of the development process.

The sensitivity associated with identifying any site or location as suitable for nuclear deployment was recognised by the ETI when commissioning the original PPSS, and this has been maintained by UK Government and Portinscale Consulting over the last decade with the detailed technical report remaining absent from public view.

The same approach is taken in this study to protect site owners, regional authorities and the public. Nuclear can be controversial, and the disappointment from aborted projects that were ill-founded or initiated on unsuitable sites can be as damaging as individuals and groups that campaign against the use of nuclear energy.

The rationale for this project leveraging the PPSS, therefore, is that it provides a proportionate, higher confidence approach to identifying potentially suitable sites than would be possible without a multi-million pound investment. By delivering the work in this way, Equilibrion and Portinscale Consulting are convinced that it provides the best means for the Midlands to proceed through the early stages of exploring nuclear development, should it wish to do so.

This section further articulates the principles and approach to the project, and the mechanics of accessing and analysing the PPSS datasets.

5.1. Principles of the Siting Activities

There is no perfect nuclear deployment site and any decision to proceed on a particular location needs careful and usually costly analysis and site investigation work. Staging investments in a proportionate manner is essential if investors, developers, technology providers and local and national Government are to be appropriately aligned and supportive of the progressive investment and commitment to a nuclear project.

The mantra for nuclear siting is that for a location to be considered it should be technically suitable, socially acceptable, and economically viable. These factors are not independent; sites can be improved technically and socially by spending money, but this reduces profitability and can affect viability.

The priority for this project is to provide a technology agnostic, substantiated and justified position on the most suitable sites using available data, expert judgement and anticipated future positions such that strategic decisions made now can be justified in the future.

The principles of this project are to:

- Be technically-led on which sites may be most suitable, while being cognisant of wider regional ambitions, potential constraints and in-flow projects;
- Consider the widest possible groups of reactor technologies;
- Provide the widest appropriate view on potential sites, within the constraints of the dataset;
- Be aligned to current regulatory, planning and siting policies and legislation and to consider all reasonable elements of these processes in reaching an end position;
- Assess all sites equitably against a clear criteria approach, while being measured to the fact that historical decisions on the siting of energy infrastructure must play a part in future strategies and decisions;
- Consider each area of the Midlands equitably and present reasonable opportunities for regions to consider nuclear energy development should they wish to do so. Highlighting the opportunities and known challenges while not unnecessarily removing opportunities;
- Be open on known site constraints. There are both known mitigations on some sites, which are highlighted, and certain detailed aspects of sites have not been assessed; for example, the specifics of a thermal plume dispersion have not and could not reasonably be carried out for each site;
- Transparency on the limitations and boundaries within the scope and scale of this project;
- Stakeholder engagement, including with site owners, should avoid unintended consequences and a conservative approach taken. Where it is considered that a particular engagement may perturb current thinking or planning around a certain location then engagement will likely do more harm than good. The responsibility for when and how to engage and with whom will fall to the local and regional authorities to judge.

Limitations of a project of this scale include:

- Anticipating lead times for infrastructure development that could enable the connection of a nuclear power station to electricity or hydrogen networks is not included. A review of available grid capacity at some locations has been carried out;
- Consideration of feedstock availability in particular locations for some applications has not been considered. For example, availability of potable water for hydrogen production is excluded. Considering the water requirements of the nuclear stations themselves is included;
- Climate change effects, for the task of considering the range and scale of potential effects for the large number of sites considered is too large even for the PPSS;
- The level of work available is insufficient for what would be needed to support any level of planning application and that the scope of this work is not to provide content suitable for presenting in such application.

5.2. Methodology

Within the overall project, which has many facets, the site down selection represents the most technical and detailed scope of work, so the methodology for this element is outlined in further detail below. To reach as robust an output as possible for the study, a staged process has been followed to site selection and investigation:

1. Summarise PPSS methodology based on NPS EN-6 with reference also to EN-7. In parallel report on the regulatory considerations for siting new nuclear noting that these are embedded to the PPSS methodology already;
2. Extract relevant PPSS assumptions and verify with latest information, reporting the assumptions to enable the outputs from the work to be fully understood;
3. Consider additional siting references published since the PPSS;
4. Initially assess all sites located in the Midlands region for which there is information in the PPSS and grade each criteria for each site. Exclude sites that do not pass the criteria and investigate those where there may be reason to include them with caveats and note as to aspects that could cause deployment challenges;
5. Establish a shortlist of most likely sites;
6. Capture further information and limitations on the sites including:
    a. recent developments that may impact on the ability to develop the site;
    b. Grid connectivity where available;
    c. Ownership where possible;
    d. Transport links that may make sites more or less attractive for delivery of bulk construction materials and Abnormal Indivisible Loads;
    e. Estimated generating capacity.
7. Select two sites that are likely to attract development interest in the nearer term and carry out further detailed work. These sites are covered in the Site 1 and Site 2 reports.
8. Produce output reports.

The siting project process is outlined at a high level in Figure 12.

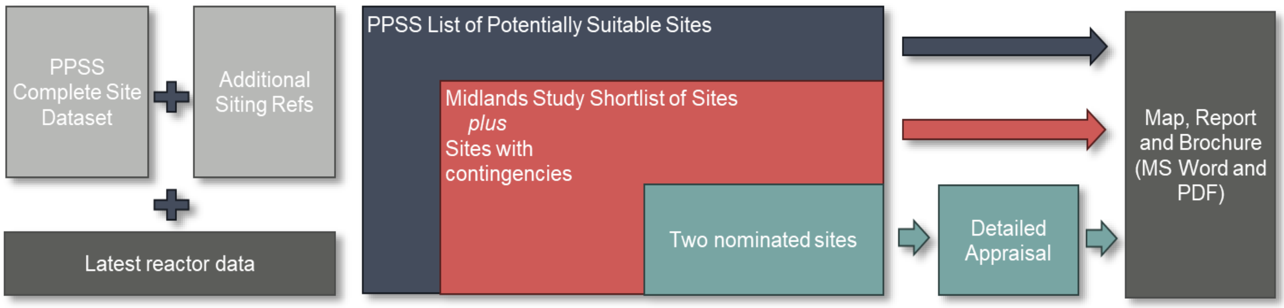


Figure 12 – Midlands Nuclear Siting Study high level methodology (for siting aspects)

5.3. Site Shortlisting Approach

Of the methodology steps 4 and 5 are crucial to ensuring a robust and complete output to the work and the sites shortlisted. This is where a database extracted from the PPSS is interrogated, individual locations are reviewed against the discretionary and exclusionary criteria, and judgements are made on the attractiveness of a site for development.

The process follows that taken for the Strategic Siting Assessments carried out on the sites nominated for as part of developing the EN-6 policy. These criteria were applied in the delivery of the ETI PPSS and are summarised in the ETI PPSS summary report as follows:

Stage 1: Exclusionary Criteria

The first stage reviews exclusionary criteria, which are considered to be features of a site that could exclude its potential as a developable site outright. This may vary determined by the particular technology under consideration, or other features that change over time and cannot be reasonably predicted. Within the context of the PPSS, technologies considered are GW scale reactors and SMRs. These are the technologies likely to be developable in the nearer term, as per the scope of the study, and site requirements are likely to bound those of AMRs. Exclusionary criteria are:

- Demographics;
- Exclusionary military activities;
- Presence within an internationally designated ecological site;
- Size of site;
- Access to sources of cooling water.

Stage 2: Discretionary Criteria

The second stage is to assess discretionary criteria, which are those features of a site where challenges could be presented but that these could be overcome through some compensatory measure, investment (spending more money to overcome poor ground conditions for example), or where there is precedent that suggest the scale of a challenge identified at first review could be reduced when considering all relevant adjacent or nearby developments. Discretionary criteria are:

- Flood risk;
- Coastal processes (as represented by coastal erosion);
- Proximity to hazardous facilities;
- Proximity to civil aircraft movements;
- Proximity to non-exclusionary military activities;
- Proximity to internationally designated ecological sites;
- Nationally designated ecological sites;
- Potential for negative effects on areas of amenity, cultural heritage and landscape value;
- Size of site to accommodate operations; and
- Access to suitable sources of cooling water.

For some of these criteria, there may be a consistent drawback across a range of sites, such that this particular drawback becomes non-differentiating. For example for inland locations, there needs to be fairly flat ground adjacent to a lake or river, which makes such locations typically vulnerable to flooding. All such locations would therefore require investment in flood protection. Given that the design standard is generally to protect nuclear power stations against a one in ten thousand year flood event, substantial investment is generally expected to be required in platform raising and other engineered flood protection measures. Even for established nuclear deployment sites included in the EN-6 policy statement such as at Oldbury, platform levels will need to be raised.

To enable sorting of the data under the exclusionary and discretionary headings, the project benefits from previous work undertaken by Portinscale Consulting to tabulate the data from otherwise narrative and graphical-based PPSS reports. This provides the ability to sort, shortlist and interpret the information in new ways and to consider sites on their merits and challenges to ensure the widest possible assessment of feasible sites.

Further assessment was then carried out limited to qualitative analysis from the PPSS on aspects that could make a site more or less desirable based on complexity and economic grounds, but where challenges are highly likely to be overcome by investment. These aspects are:

- Water availability. A more desirable site will likely have the potential for direct cooling and the site is not too elevated above sea level which reduces the energy needed to circulate cooling water. A less desirable site would use indirect or hybrid cooling, a high pumping load (elevation) and the cooling water requirement is close to the abstraction limit at the site location;
- Abnormal Indivisible Loads (AILs). All nuclear builds will need to transport unusually large and or heavy assembles onto the site both during construction and in operation. More desirable sites have the potential for one or more proven modes of transport for AILs and other bulk items;
- Ground conditions. Poor conditions such as weathered or weakened rock, or ground with voids and pits, will require a greater degree of ground works and preparation for the foundations. A more desirable site will include good, firm bed rock which is relatively flat;
- Flood defences. For sites vulnerable to flooding, the site platform level needs to be raised above the design level flood. This involves substantial additional civil engineering work. More desirable sites are likely to require minimum engineering necessary to protect against a design level flood.

Further Review of Shortlisted Sites

Following the review of exclusionary and discretionary criteria, further reviews were carried out during the project to:

- Determine whether recent development on any sites could lead to the site being unsuitable for development.
  - Several sites were found to be significantly or marginally developed. Some have been excluded from the shortlist as a result, but others have remained as the strategic importance of such sites could result in a change in relative priorities for stakeholders. Judgement based on press releases and local knowledge have been used to determine the approach on a case-by-case basis. Similarly, sites that have been marginally or fully redeveloped could hold the same or similar characteristics as adjacent sites.

- Grid connectivity opportunity and headroom.
  - Grid connectivity. Information on the National Transmission System and District Network Operators (DNOs) is constantly changing and where a site has previously hosted generation is not necessarily an indicator for the current scale of possible generator capacity. The best example of this is related to locations that previously hosted coal-fired power generation, whereby the reconfiguration of substations has reduced the available connection capacity. This occurs relatively soon after plant shutdown in order to repurpose the connections. There is therefore limited substation headroom across the Midlands. Some sites also have 400kV connections to the National Transmission System and while it has not been possible to determine the available connection capacity at each site, the presence of such a connection could lead to a site being more desirable. This is because even with capacity issues, the cost of strengthening the 400kV connection to a site would be far less costly than construction of a complete new line.

- Ownership of sites reviewed against the Land Registry.
  - For some sites it is likely that the owner of the functional site is the same across the area likely defined by the PPSS. This is most likely the case for brownfield sites. For other sites, it is likely there are one or more landowners and these are less likely to be large corporations. Where ownership could not be established by other means, for all or part of each shortlisted site Title Registers have been obtained and ownership information captured;

- Engagement with site owners through the project has been limited in efforts to protect the sensitivity of sites and to not perturb current thinking or planning for sites. This is particularly necessary for sites that may already have some limited activities or investment underway or be under lease option to another entity.

- Estimated generating capacity to provide an overall perspective on the Midland deployment opportunity.
    - For most sites the generating capacity is based on the PPSS. Where this is not included, a statement is provided as to what may limit the site capacity.

- Transport links.
    - Based on overhead imagery and a common-sense approach on what infrastructure may need reinstatement, a judgement has been made on how bulk and indivisible loads may be delivered to the sites. This includes rail, road, sea, river and canal. No assessment of transport routes has been carried out, although high-level relevant information is available on the Highways Agency website [31].

For each shortlisted site, a narrative is also provided and graphics extracted from public sources to aid interpreting the site features covering:

- Population density available from the Office for National Statistics (ONS) 2021 census information;
- Flood risk available from the Flooding Map Planning Service.

The shortlisted sites are described in Section 6.

Note on PPSS Site Detail

The study has been based on site information that can be variable in depth and detail for each site. Across the 84 sites assessed in this study this is for two main factors:

1. Sites considered in the PPSS that were considered highly likely to be attractive development locations were allocated more time and cost during delivery of the PPSS project;
2. Brownfield sites are likely to have more available information that greenfield sites,

All sites nevertheless have received the same expert review, but this leads to some sites being classed as 'likely to pass' where there are known mitigations. Known mitigations on all sites are noted in this report and supporting documentation. These sites require a higher level of expert judgement to be applied in their assessment, but this has not excluded these locations from the Midlands shortlist owing in part to:

1. UK is entering a fleet deployment programme for new nuclear and this will lead to more sites being considered. These sites can therefore position the Midlands for a range of potential fleet deployment approaches;
2. There are an increasing number of brownfield sites being allocated to housing, which means that the region would need to look at a greater number of greenfield sites to achieve regional generating capacity requirements;
3. The new context for nuclear to support a wider range of applications, and the need to promote economic growth in deprived areas could drive decision-making to different outcomes than in the past.

5.4. Selection of Sites for Detailed Appraisal

Sites selected for detailed appraisal are those that, based on the available information and in the view of the Equilibrion and Portinscale Consulting experts, are likely to be most attractive for development in the nearer term. Considerations for such sites include:

1. Quantitative scoring on discretionary criteria given that all exclusionary criteria will have been passed;
2. Any known issues or challenges;
3. Status of developments on the sites;
4. Ordnance Survey mapping to fully appreciate topography;
5. Any rationale where site ownership could indicate a willingness or otherwise to develop new nuclear upon it;
6. Size of site;
7. Population density available from the ONS 2021 census information;
8. Flood risk available from the Flooding Map Planning Service;
9. Assessment against each exclusionary and discretionary criteria;
10. Recent use of a site that indicates a potentially supportive local community and potential workforce;
11. Grid capacity or connection headroom that could indicate an opportunity for early deployment relative to a site where a grid connection needs to be newly established;
12. Other potential applications suited to a site (hydrogen or synthetic fuels production, for example) that could provide purpose where a grid connection cannot be obtained on a reasonable timescale;
13. Any demographic considerations, for example if the site is in a socially deprived area;
14. Historical usage for brownfield sites.

Not all these factors carry equal weighting and a detailed quantitative scoring was not carried out other than for the discretionary criteria.

6. Siting Results

Section Summary

From the 84 sites reviewed, the study identified 21 shortlisted locations across the Midlands (9 brownfield and 12 greenfield) with an estimated generating capacity exceeding 20GW. Each site was assessed using exclusionary and discretionary criteria from siting policy, considering technical, environmental, and socio-economic factors. Two sites underwent further detailed appraisal. Brownfield sites were prioritised due to development feasibility, cooling water access, and grid connectivity. However, all sites face ongoing uncertainties including for some related to flood risk, water abstraction, ground conditions, and transport logistics, which require further, developer-led investigations.

Section Contents

Based on the outlined approach a shortlist of 21 sites has been selected that have the potential for nuclear development and could be favourable against the criteria are for further consideration, comprising 9 brownfield sites and 12 greenfield sites. All greenfield sites are likely to experience greater headwinds in planning than brownfield sites and may be worthwhile considering where there is a specific need for energy in a location distant from a current or previous nuclear or brownfield site, those alternative sites have reached capacity or are otherwise not accessible.

Table 1 – Categories of site on the shortlist. Note that sites classed as passed may still have issues or challenges that are currently unknown and would require detail site investigations to be carried out

	Brownfield	Greenfield
Identified	6	10
Identified with known challenges, limitations or required mitigations	3	2
TOTAL	**9**	**12**
Estimated Generating Capacity	>20 GW	

Of the brownfield sites:

- Two otherwise fail on proximity to hazards but have been included since further work could establish the hazard to be less than assumed in the PPSS, or that engineered solutions could mitigate the risk, or that the risk is reduced or removed in the future;
- Six are subject to some stage of planning or development of commercial or domestic property, or have publicised alternative plans in place;
- Three are located in proximity to internationally designated ecological zones, which could require mitigations;
- Two must account for complex make-up water cooling flows that require further work and exploration;
- All would require in-direct cooling, with the effect of reducing plant economics compared to a source of appropriate direct cooling water.

Of the greenfield sites:

- Six are located within reasonable proximity of brownfield sites and these may have headwinds through the alternative options analysis required as part of the Appraisal of Sustainability;
- Two are located within reasonable proximity to previously operational nuclear power station sites, which are likely to be preferred deployment locations until such time that their site capacities are reached.

6.1. Shortlisted Sites

The following high-level descriptions of the sites outlines how each site will have its own unique challenges, issues and mitigations and will need to be considered further on a case-by-case basis by a development organisation.

Sites are provided with a unique identifier, which is not related to a hierarchy or preference across the shortlist, except for those sites stated as being selected for detailed appraisal. These sites fall within the counties of:

- Derbyshire
- Lincolnshire
- Nottinghamshire
- North Lincolnshire
- Shropshire
- Staffordshire
- Warwickshire
- Worcestershire

MSS01

MSS01 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and the site may require engineered solutions to satisfy the requirements for a nuclear development. Commercial or housing development on or near the site previously identified in the PPSS could now restrict or prevent nuclear development. However, its strategic location and the potential for adjacent land to be used to mitigate the local redevelopment leads to its inclusion in the shortlist.

MSS02

MSS02 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development.

MSS03

MSS03 is a greenfield site that has the potential to host a typical sized SMR or multiple smaller AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means most likely forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and the site may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development. Driven by preferential economics offered by the construction of multiple reactors per site, smaller units may be preferred on this site over a single typical sized SMR.

As a greenfield site in the vicinity of a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS04

MSS04 is a greenfield site that has the potential to host a multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means most likely forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and the site may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development.

As a greenfield site in the vicinity of a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS05

MSS05 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development.

MSS06

MSS06 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is currently subject to potential redevelopment.

MSS07

MSS07 is a greenfield site that has the potential to host a typical sized SMR or multiple smaller AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and part of the site could be within Zone 2 or Zone 3 flood zones and is therefore likely to require engineered flood protection solutions and an assessment for more extreme flood events to satisfy the requirements for a nuclear development. The site is not currently under development. Driven by preferential economics offered by the construction of multiple reactors per site, smaller units may be preferred on this site over a single typical sized SMR.

As a greenfield site along the same stretch of river as a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS08

MSS08 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and part of the site could be within Zone 2 or Zone 3 flood zones and is therefore likely to require engineered flood protection solutions and an assessment for more extreme flood events to satisfy the requirements for a nuclear development. The site is not currently under development.

MSS09

MSS09 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development, although there have been proposals to do so.

MSS10

MSS10 is a brownfield site that has the potential to host nuclear development of a scale limited by the available land at an estuarine location where cooling water would be from an estuary. There are mitigations associated with this site related to proximity to both international ecological sites and facilities that could cause a hazard to the facility. The specific site or land adjacent to it could be suitable for development providing options should there be redevelopment of the site for other purposes. The challenges or issues with this site could have led it to be discounted, however the current expert view is that there could be engineering, compensatory or other measures (for example, planning precedent) that enable nuclear development to be considered. An assessment of climate change effects in respect of sea levels and coastal flooding, amongst other investigations, would be required to satisfy the requirements for a nuclear development.

MSS11

MSS11 is a brownfield site that has the potential to host a GW reactor or multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is currently subject to redevelopment, which may render some or all of the site unsuitable. It is included in the shortlist owing to it possessing appropriate technical characteristics and being a size of site that could accommodate multiple developments.

MSS12

MSS12 is a greenfield site that has the potential to host nuclear development of a scale limited by the available land at an estuarine location where cooling water would be from an estuary. There is a mitigation associated with this site related to proximity to international ecological sites, which could have led it to be discounted. However, the current expert view is that there could be compensatory or other measures (for example, planning precedent) that enable nuclear development to be considered in the wider context of extant policy. An assessment of climate change effects in respect of sea levels and coastal flooding, amongst other investigations, would be required to satisfy the requirements for a nuclear development.

MSS13

MSS13 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently subject to development.

As a greenfield site in the vicinity of a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS14

MSS14 is a brownfield site that has the potential to host at multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and is not within the Zone 2 or Zone 3 flood zone. Although all or part of the site may have a raised platform height, an assessment would be required for more extreme flooding events and may require engineered flood protection solutions to satisfy the requirements for a nuclear development. There is a mitigation associated with this site related to the site of the developable plot, which would limit the scale of development or the type/size of technology that could be located here. Further review by a developer would be required to determine suitable technology types. Commercial or housing development on or near the site previously identified in the PPSS could now restrict or prevent nuclear development. However, it is believed that the re-development is currently focussed on small packets of land, which may still mean nuclear development was possible and its strategic location leads to its inclusion in the shortlist.

MSS15

MSS15 is a brownfield site that has the potential to host a typical sized SMR or multiple smaller AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. Commercial or housing development on or near the site previously identified in the PPSS could now restrict or prevent nuclear development. However, it is believed that the re-development is currently focussed on small packets of land, which may still mean nuclear development was possible and its strategic location leads to its inclusion in the shortlist. Driven by preferential economics offered by the construction of multiple reactors per site, smaller units may be preferred on this site over a single typical sized SMR.

MSS16

MSS16 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means most likely forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and the site may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently under development.

As a greenfield site in the vicinity of a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS17

MSS17 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently subject to development.

As a greenfield site in the vicinity of a brownfield site, this location is likely to be less desirable to developers than its counterparts until such time that the brownfield sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS18

MSS18 is a greenfield site that has the potential to host nuclear development of a scale limited by the available land at a coastal location where cooling water would be from an estuary. There are mitigations associated with this site related to proximity to both international ecological sites and facilities that could cause a hazard to the facility. The specific site or land adjacent to it could also be suitable for nuclear development. The challenges or issues with this site could have led it to be discounted, however the current expert view is that there could be engineering, compensatory or other measures (for example, planning precedent) that enable nuclear development to be considered. An assessment of climate change effects in respect of sea levels and coastal flooding, amongst other investigations, would be required to satisfy the requirements for a nuclear development. The site is not currently under redevelopment, although there are active developments in the area that could impact its ability to host a nuclear power station.

MSS19

MSS19 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides a significant distance from the cooling water source, however its location and consideration are due to its potential to provide heat to heat networks within a reasonable radius of the site. In this respect it is unique for this study and is included as a demonstration of variety of potential uses of nuclear and how this effects siting choices. All or part of the site could be within Zone 2 or Zone 3 flood zones and is therefore likely to require engineered flood protection solutions and an assessment for more extreme flood events to satisfy the requirements for a nuclear development. The site is not currently under development.

MSS20

MSS20 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently subject to development.

As a greenfield site along the same body of water as current nuclear licensed sites that were previously electricity generating, this location could be less desirable to developers than its counterparts until such time that the other sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability and on social acceptability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

MSS21

MSS21 is a greenfield site that has the potential to host multiple SMRs or AMRs at an inland location where cooling water would be from a river. The power station cooling would be by indirect means with natural or forced convection cooling towers. The site resides within proximity of the cooling water source and close to or on the Zone 2 or Zone 3 flood zone. An assessment would be required for more extreme flooding events and although part of the site may have a raised platform height it may require engineered flood protection solutions to satisfy the requirements for a nuclear development. The site is not currently subject to development.

As a greenfield site along the same body of water as current nuclear licensed sites that were previously electricity generating, this location could be less desirable to developers than its counterparts until such time that the other sites are already developed, or for other reasons deemed undevelopable. This is due to the potential challenges in justifying the development within the alternatives analysis of the Appraisal of Sustainability and on social acceptability. Whether there are factors weighing sufficiently in favour of the greenfield site would be for a developer to assess as part of its considerations.

6.2. Key Project Assumptions and Inputs

The ETI had specified a set of assumptions which was to be used as the basis for the baseline assessment and which informed the detailed, staged site investigation activities. These assumptions specified the basic principles that were to be applied in the PPSS and therefore also this project. Additional assumptions that were important in bounding the scope, budget and breadth of the project were also collated and recorded.

The key project assumptions include the following:

- Criteria for the siting of new nuclear power plants beyond 2030 will be the same as those for nuclear power plants developed up to 2030;
- Developers will preferentially seek sites with access to sufficient cooling water for direct cooling;
- For a range of reasons, future nuclear power plants are highly likely to be developed as twin or triple reactor units with an individual unit generation of between 1,150 MWe and 1,650 MWe and a combined site generation capacity of around 2.5 GWe to 3.5 GWe per site;

- A hierarchy of site selection will apply as follows: existing nuclear reactor licensed sites; other UK nuclear licensed sites; conventional power plant sites (brownfield sites); and greenfield sites;
- The effects of climate change on the availability of cooling water for abstraction and on the dispersion of the plume of water with an elevated temperature arising from the discharge of cooling water will not be considered;
- For the two river catchments sensitivity analyses carried out in the PPSS, plus a reappraisal of all sites later in the PPSS project, the identification of additional sites and the heat demand networks sensitivity analyses, the EA's Water Resources Geographical Information System will be used in the cooling water assessment to determine cooling water availability for rivers;
- For the reappraisal of the long list, the identification of additional sites and the heat demand networks sensitivity analyses, the distance for access to sources of cooling water will be relaxed to be 20 km or less (rather than 2 km or less);
- For the reappraisal of the long list, the identification of additional sites and the heat demand networks sensitivity analyses, the presence of existing development and major waterbodies between the site and the source of cooling water will not be taken into account and therefore will not be considered to be a barrier.

A detailed set of assumptions most relevant to potential stakeholders, developers and vendors for the Midlands siting study is provided in the detailed site reports. The assumptions are set to ensure the PPSS and any work derived from it is as broad as possible, in respect of technology types and the challenges that can be reasonably expected on sites, while maintaining alignment with UK nuclear, environmental and planning guidance.

6.3. Detailed Appraisal of Two Nominated Sites

The study has found significant potential for nuclear deployment in the Midlands, which positions the region to lead the UK's next generation of clean energy development, industrial decarbonisation, and net zero delivery, while supporting regional economic development and jobs through nuclear deployment.

Following the strategic shortlisting outlined in Section 6, a detailed appraisal process was undertaken for the two sites selected for in-depth evaluation.

The shortlisting exercise has already assessed all candidate sites against key criteria, including estimated electricity generating capacities and availability of cooling water sources, notable siting issues, transport infrastructure, land ownership, and the discretionary and exclusionary criteria consistent with national siting policy.

The detailed appraisal phase built upon this initial evaluation and expanded the level of assessment considerably to develop a robust understanding of each site's true potential and challenges, the scope of which included:

- A site-specific assessment, identifying any caveats or limitations affecting development feasibility;
- Precise location and boundary definition;
- Confirmation of total available site size;
- Site history and legacy industrial uses;
- Commentary and qualification against the EN-6 NPS siting criteria;
- Estimation of the site's electrical generating capacity potential and identification of any constraints, including land area or cooling water limitations;
- An assessment of the number of reactor units the site could support, with appropriate space allowances for construction, operation, and eventual decommissioning;
- Environmental and planning considerations were thoroughly reviewed, including flood risk analysis, potential impacts from coastal processes (where relevant), proximity to hazardous

facilities, civil aviation activities, military activities, and proximity to internationally and nationally designated ecological or heritage sites;
- Any mitigations required on the sites;
- The appraisal also assessed potential effects on areas of landscape, cultural, or recreational value, access to reliable cooling water sources, and any economic challenges that could impact site development.

Further technical assessments included the site's accessibility for the transport of Abnormal Indivisible Loads (AILs) by road or water, preliminary evaluation of ground conditions and stability (including risks of landslides), and a high-level assessment of the likely flood defence works that would be required to safely manage flood risks.

Cooling system considerations were examined in more detail, including a high-level assessment of the extent to which sufficient cooling water could be secured to support normal reactor operations without impacting environmental limits. In addition to the technical appraisals, a simple stylised "attribute map" is produced for each site to visually identify key features.

Historical industrial use was considered, confirming the brownfield status of both sites. Site connectivity was assessed, including the status of rail links for importing bulk construction materials and the navigability of adjacent rivers for transporting heavy components and large modules.

Each site's previous energy generation capacity was also considered as an indicator of likely grid export potential. Relevant notes were recorded concerning planning history, ownership status, and any known redevelopment plans that could impact or support future nuclear deployment.

Finally, a summary assessment was produced for each site, highlighting the distinctive characteristics that made these sites stand out as the Midlands' most strategic opportunities for early, investor-ready nuclear development.

6.4. Further Siting Considerations

The shortlist and detailed assessments reported offer the Midlands with information that can support further exploring of nuclear energy, however there are several factors common to all sites that will continue to pose risks until such time that a well-funded developer makes the appropriate investments on full site investigations and development of mitigation solutions as may be required across all areas not limited to those covered below.

Some of the factors that will pose future uncertainties but are those most relevant to this study are outline below. These will require further assessment by development organisations.

Flood Risk

Flood risk remains a fundamental consideration when assessing nuclear deployment sites. Sites are evaluated against the UK Government's classification of flood zones, ranging from Zone 1 (lowest risk) to Zone 3b (highest functional floodplain risk). Priority is given to sites located within Flood Zone 1, which require minimal additional engineering to manage flood risk. Sites located within higher-risk zones would require significant civil engineering works, such as platform raising or enhanced flood protection, which would increase both costs and development timescales. Managing long-term flood risk is essential to ensure the safety, resilience, and economic viability of future nuclear installations, particularly in the context of climate change.

Water Abstraction Permitting

Access to sufficient cooling water remains critical to nuclear siting. In the Midlands, abstraction from the river catchments is regulated by the EA through strict permitting controls designed to protect river health and biodiversity. Water abstraction permits must comply with low-flow protection standards and seasonal variability, which can constrain available capacity during periods of drought or in areas of high ecological sensitivity. In estuaries, additional tidal dynamics complicate abstraction management, requiring more detailed environmental assessments. Therefore, securing reliable, sustainable water abstraction rights is a prerequisite for successful site development.

Ground Conditions

Ground conditions at potential nuclear sites directly affect construction feasibility and costs. Sites situated on flat, stable bedrock are preferred, as they allow for simpler foundation engineering and reduced ground preparation costs. In contrast, sites with soft soils, steep gradients, or variable sub-surface conditions would necessitate major civil engineering interventions such as piling, ground improvement, or terracing. These measures would add both financial and programme risks. Early geotechnical characterisation is essential to reduce uncertainties and to optimise reactor design and deployment strategies.

Conjunctive Capacity Analysis

Discovering multiple candidate sites along the same river does not imply that all can be developed concurrently.

The EA imposes cumulative limits on cooling water abstraction across entire catchments, based on river flow rates, ecological quality, and seasonal conditions. Typically, only a defined percentage of river flow, between 10% and 20%, can be abstracted during low-flow periods, depending on environmental sensitivity.

The PPSS conducted a Conjunctive Capacity Analysis to account for these cumulative effects across the river catchments. This analysis is highly relevant to Midlands site selection, as it confirms that abstraction capacity is finite. To optimise cooling allocations, it is preferable to prioritise brownfield sites within the catchments first. Should a brownfield site ultimately be ruled out, greenfield reserve sites could be brought forward, but only within the ecological abstraction limits already defined.

Shipment of Abnormal Indivisible Loads (AILs)

The ability to transport large, heavy components, such as reactor pressure vessels, steam generators, and turbines is crucial to the viability of nuclear construction projects.

The availability of waterborne transport for AILs significantly strengthens the practical deliverability of Midlands river-accessible sites by reducing dependency on disruptive and costly road transport, while supporting efficient construction logistics.

Similarly, access to railway lines can be attractive for the transport of materials, equipment and people. This includes where these may require recommissioning or extension/development work.

7. Nuclear Deployment Potential and Demand

Section Summary

Nuclear energy has the potential to decarbonise not only electricity but also key sectors such as heat, transport, hydrogen, and synthetic fuels, which together represent 80% of global energy use. Nuclear offers reliable, large-scale, low-carbon energy, uniquely suited to address the limitations of electrification in heavy industry and long-distance transport. SMRs and AMRs can support grid supply, power data centres, enable hydrogen and synthetic fuel production, and open new investment pathways for regional and national net-zero goals.

Section Contents

Nuclear energy's role in the energy system can range from providing baseload power to the national grid, to flexible private wire deployment for local users, but it extends far beyond electricity alone enabling multiple energy vectors including industrial heat, hydrogen production, and synthetic fuels to support economy-wide decarbonisation. By integrating nuclear into these broader energy uses, the Midlands and the wider UK can decarbonise not just power generation, but also hard-to-abate industries that are essential to the economy. In this way, nuclear energy becomes a versatile foundation for the entire future energy system and through the local supply of these low carbon products can attract new industries.

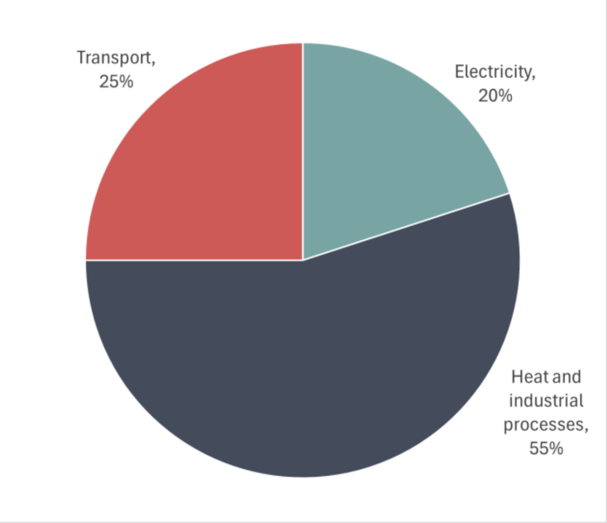


Figure 13 - Share of Energy Use (Globally)

Electricity generation accounts for around 20% of total energy use (Figure 13), therefore, the Midlands' broader energy decarbonisation challenge extend far beyond the electricity sector. The much greater challenge lies in decarbonising the heat, industrial, and transport sectors which together dominate the Midlands' energy consumption and when considering the deployment potential of nuclear energy, it is useful to consider the sectors that could be decarbonised with nuclear energy, and this is addressed below.

Estimated Energy consumption (excluding electricity) in the Midlands is dominated by heating (Table 2), which accounts for approximately 45% of total demand, covering space heating, water heating, and industrial process heat. Transport fuels, including those used for cars, trucks, aviation, and shipping, make up around 30% of consumption. Industrial activities such as manufacturing, processing, and heavy industry contribute roughly 20%, reflecting the region's strong industrial base. The remaining 5% is consumed by services, agriculture, and other sectors. This profile highlights the critical need for decarbonisation strategies that go beyond electricity generation, addressing the substantial demands for clean heat, transport fuels, and industrial energy.

Table 2 – Estimated energy consumption by sector

Sector	Share of Total Energy Use
Heat (space heating, water heating, process heating)	45%
Transport (cars, trucks, aviation, shipping)	30%
Industry (manufacturing, processing, heavy industry)	20%
Other (services, agriculture, etc.)	5%

(Patterns of energy use in the Midlands broadly mirror the UK overall, with an even greater share of consumption in industrial sectors) [32] [33] [34] [35].

Heat is by far the largest single energy need, because Midlands' cities (Birmingham, Leicester, Nottingham) and industries use huge amounts of heating fuel (gas, oil, electricity).

Transport is a strong second, because of the Midlands' role as a logistics hub (major road freight corridors and airports like East Midlands Airport). Industrial energy is higher than the UK average, but still less than heat overall, mostly driven by heavy manufacturing (ceramics in Stoke-on-Trent, automotive in Coventry, aerospace in Derby). Services and other sectors (like agriculture and public buildings) are a relatively small share.

Electrification will help decarbonise certain sectors, for example, short-haul road transport, trains, and some building heating, but it cannot easily address the Midlands' heavy industries, long-haul freight, aviation, or high-temperature manufacturing. Relying solely on renewable electricity alone would demand unprecedented renewable build-out rates, already strained by growing residential and commercial demand, major increases to the investment in national energy transmission infrastructure, backup generation (which would most likely be fossil powered) to provide energy when renewables do not, and vast quantities of energy storage.

To fully decarbonise the Midlands' economy, particularly sectors where direct electrification is not feasible, the region must develop the capability to produce cost-competitive alternative fuels at scale, including low-carbon hydrogen, industrial heat, and synthetic fuels. The Midlands therefore lends itself to nuclear energy as a strategic energy source to address these non-electric energy demands, offering reliable, low-carbon heat for industry, the potential for large-scale hydrogen and SAF production, and continuous clean energy to support the decarbonisation of transport, heating, aviation, and heavy manufacturing sectors.

Meeting this challenge demands a vast, reliable, and low-carbon energy source with a small land footprint. In this context, SMRs and AMRs emerges as the only realistic solution. The ability of nuclear to deliver consistent, large-scale clean energy makes it uniquely suited to power hydrogen production, provide zero-carbon heat for Midlands industries, and supply energy for alternative fuels, securing the region's future as a net-zero industrial powerhouse (Figure 14).

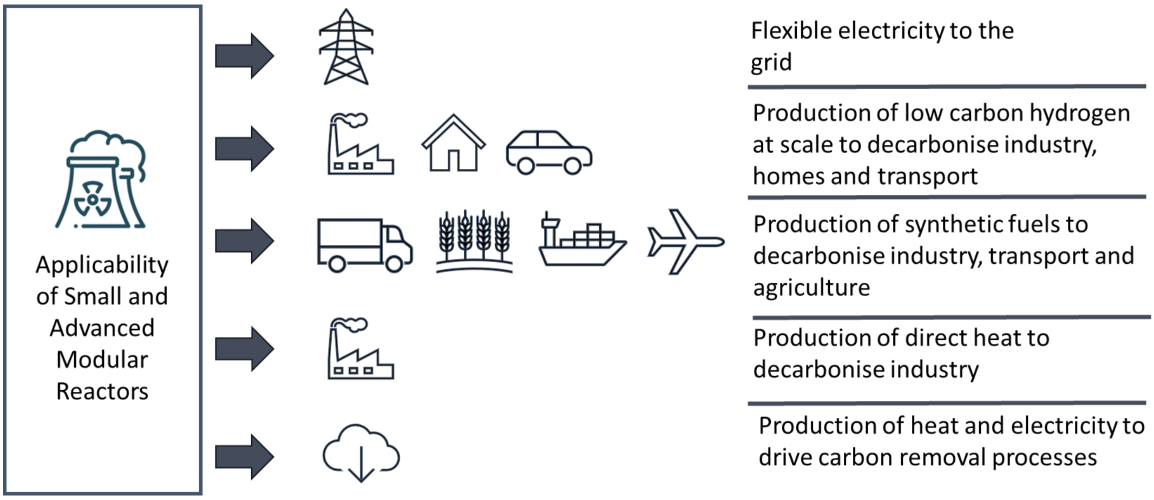


Figure 14 – Applications of SMRs and AMRs

Approaches for decarbonising and providing low-carbon energy to new users offer various opportunities, considerations and potential challenges in the current UK environment. All applications face common planning considerations and potential opportunities and risks posed by the Planning and Infrastructure Bill. In the context of meeting the needs of the Midlands and national energy systems and seeking to bring forward credible and investable nuclear projects, Table 3 considers some of the opportunities and challenges for a subset of the potential applications to underline the complex decision-making landscape.

Table 3 – Opportunities and considerations for development of nuclear projects for a range of energy applications

Application	Opportunity	Consideration	Potential challenges
Electricity to Grid	Established market frameworks (Contract for Difference and RAB)	Negotiation with Government and low carbon contracts company	Priority of Midlands projects versus others
	Certainty of demand	Long term offtake to underpin investment and FDP	Variable renewable deployments with the potential for periods of high output and curtailment could alter conventional market dynamics
	Government support and engagement	Clean Power is one of the Governments priorities	Timelines for Midlands projects in the context of Clean Power 2030 and GBN projects
	Established regulatory framework	There is significant operational experience for safety cases based on providing electricity to the grid	No commentary
	Established transmission system	Access to wide range of national users	Constraints in the transmission and distribution system could constrain development potential at some locations

Application	Opportunity	Consideration	Potential challenges
Data Centres (non-grid connected) **(For grid connected data centres with a full capacity grid connection for the nuclear station should refer to 'Electricity to Grid' row)**	Increasing demand, driven by large corporations with a strong connection to public and commercial demand for data services and AI	Potential to drive investment from the corporations that desire the low-carbon energy	Investments likely to be measured through conventional investment rules and approaches. Data centres and AI growth zones are still in the planning phase, leading to uncertainty
	Lower cost electricity through a private wire arrangement, thus avoiding grid charges (subject to capacity restrictions)	Reliance of the nuclear power station on a single, or few, connected off-takers is a new scenario for UK nuclear deployment	The strength of the off-take agreement and the counterparty organisations risk appetite will determine the potential for the project to demonstrate a firm commercial approach to the FDP
	The AI Growth Zone locations are not yet confirmed, leaving an opportunity to plan data centre and nuclear energy deployment in parallel.	Significant demand has been signalled of a scale that could drive the deployment of a small fleet of advanced nuclear technologies	Project on project risk including the potential for one or other project to be delayed, thus impacting the other
Hydrogen	Access to a new user based for the energy from nuclear through a fuel that it likely to be desirable for decarbonisation of heat and transport (through use of hydrogen as a feedstock)	Potential to access a new investment based linked to low-carbon production of a range of chemicals and new low-carbon products	The demand signal is present but yet to fully emerge, creating uncertainty in the future market scale
	Existing market framework	Hydrogen business model treats nuclear-enabled hydrogen the same as that produced by renewables. Collectively these are electrolytic hydrogen	The business model is unproven with nuclear energy, the volumes currently allocated are restively small and the contract durations are likely to be relatively short and therefore currently insufficient to support the investment in a nuclear power station build
	Local availability of hydrogen can for growth	Direct production and supply of hydrogen can excite businesses to remain or grow in the region	The transportation of hydrogen in bulk quantities through the gas network is uncertain, limiting the potential market access to customers
	UK nuclear regulatory environment can be an enabler	There is scope for a developer to develop a safety case suitable for assessment by the	The mitigations and ALARP considerations for this deployment scenario are untested

Application	Opportunity	Consideration	Potential challenges
		ONR where the nuclear power station produces hydrogen	
	Technology innovation opportunity	Some electrolyser technologies are in development stage, presenting opportunities for innovation and local manufacturing	Technology development risk and supply chain scale up risks for large scale projects, as would be the case for a nuclear project
Synthetic fuels	NDFs introduced to the UK legislature through the Energy Act 2023	Provides access for nuclear energy projects to new markets, which can drive investment and support decarbonisation in alignment with Government policy and legal commitments	NDFs yet to be included in the Renewable Transport Fuels Obligation secondary legislation. Untested market for nuclear energy inputs.
	SAF mandate and RCM are providing	Legal commitment on fuel producers to buy and supply certain quantities of SAF	The details of processes and frameworks (eg, the RCM) are still being finalised
	UK nuclear regulatory environment can be an enabler	There is scope for a developer to build a safety case suitable for assessment by the ONR where the nuclear power station produces synthetic fuels	The mitigations and ALARP considerations for this deployment scenario are untested
	Technology innovation opportunity	Some of the technologies required are in development stage, presenting opportunities for innovation and local manufacturing	Technology development risk and supply chain scale up risks for large scale projects, as would be the case for a nuclear project
	Supply of SAF across the UK	Bulk transport of liquid fuels across the UK by road and pipeline	No commentary
Desalination **(For grid connected desalination plants with a full capacity grid connection for the nuclear station should refer to 'Electricity to Grid' row)**	Some regions of the UK may experience water debt in the coming years, if not already	Electricity and heat supply to desalination units can support make-up of lost resources thus providing for industry needs	No commentary

8. Use Cases

Section Summary

This section presents four illustrative examples to outline how nuclear energy could enable scalable, low-carbon solutions. Nuclear power could support the carbon transition at East Midlands Airport via SAF production, support 24/7 clean electricity for AI-driven data centres, and provide consistent heat, hydrogen, and electricity to industrial clusters. At the East Midlands Freeport, nuclear could supply green fuels and power logistics and manufacturing. Collectively, these applications show nuclear's potential to anchor regional net-zero goals, drive investment, and create high-value jobs.

Section Contents

This section contains use cases that illustrate how nuclear deployment could deliver practical, scalable solutions across industrial processes, transport fuels, aviation, and heating, helping the Midlands transition toward a fully net-zero economy. They are illustrative examples only and are not linked to particular sites discussed within this report but provide tangible examples of the decarbonisation potential of nuclear energy. The use cases are:

- Support to the Decarbonisation of East Midlands Airport;
- Energy Supply to Low-carbon Data Centres;
- Decarbonisation of Midlands Industrial Energy Usage;
- East Midlands Freeport.

Use Case: Support to the Decarbonisation of East Midlands Airport

East Midlands Airport is the region's largest airport and a major UK cargo hub, representing a key strategic opportunity for clean fuel deployment to decarbonise freight and aviation. The airport is expected to grow further as UK air freight and passenger demand rises.

The airport does not yet regularly use SAF on a major scale. However, it is preparing for SAF integration, driven by industry pressure and upcoming UK-wide mandates. It is part of the MAG Group (Manchester Airports Group) alongside Manchester and London Stansted, which has committed to supporting SAF adoption across all their airports by 2030.

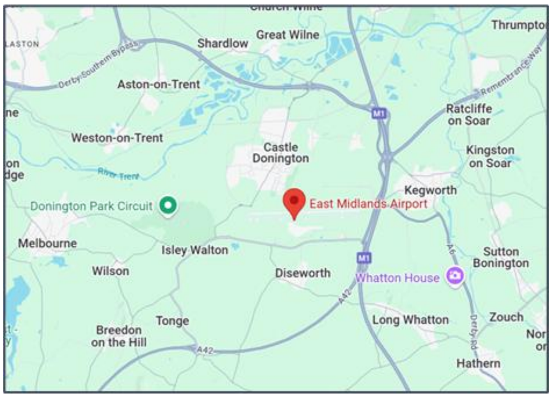
The UK Government, through the Department for Transport (DfT), is introducing a SAF Mandate beginning in 2025. Under the mandate, airlines will be required to blend increasing amounts of SAF into their fuel supply, with a target of achieving 10% SAF by 2030, measured by energy content. A gradual ramp-up is planned between 2025 and 2030, allowing the industry time to scale up SAF production and distribution infrastructure to meet the mandated levels. [36].

Assumptions for aviation fuel use at East Midlands Airport [37].

Air Transport Take Offs per Year (2024)	22,738 per year
Cargo/Passenger flights per year	9,567 cargo flights/13,171 passenger flights
Flight estimated fuel (European destination)	~8,000 litres/flight
Total Fuel	181.9 million litres a year
SAF required for 10% Blending	18.19 million litres a year

The energy output from One SMR (300MW) has the potential to produce 105 million litres/year of SAF. This means that 17% of the energy from a single SMR is sufficient to meet the mandate targets for the fuel used at East Midlands Airport [38].

This would leave sufficient headroom for the reactor to also provide other products (such as hydrogen and flexible electricity) or be completely dedicated to SAF production leading to the supply of SAF to



meet the mandate demands for a greater proportion of the supply chain. SMRs would also typically be deployed in multiple-unit configurations, meaning additional units could provide redundancy and further support low-carbon energy provision across the region.

Currently, aviation fuel at East Midlands Airport is delivered by road tankers, with no direct pipeline connection to major fuel terminals. As aviation demand grows and the transition to SAF accelerates, developing dedicated fuel infrastructure, such as a pipeline from future hydrogen or SAF production sites or locating fuel production nearer to the airport could significantly enhance efficiency, reduce transport emissions, and ensure secure, large-scale fuel delivery. This could also provide for the export of low-carbon fuels to other parts of the UK, thereby growing Midlands economic activity.

Farther into the future, integrating hydrogen pipeline infrastructure would also future-proof the airport's fuel supply, supporting the Midlands' wider ambitions for clean growth in logistics and aviation by enabling continuous, reliable supply to support future hydrogen use in freight, logistics, including aviation refuelling at the Freeport, while also reducing transport emissions and operational costs.

Use Case: Energy Supply to Low-carbon Data Centres

Artificial Intelligence is driving rapid growth in the demand for global computational power. Globally, datacentres consumed around 1.5% of the world's electricity in 2024, but the advent of AI is driving a forecast doubling of this energy demand by 2030, with further growth forecast beyond this. AI datacentres create a more concentrated demand for energy than traditional datacentres, due to their intense processing workloads.

Datacentre developers are under intense pressure to ensure new developments have access to the reliable energy required. They must also ensure that energy it is low-carbon as their corporate customers require carbon emissions reductions from IT services to align with industry-led decarbonisation goals. Maintaining operations 24 hours a day, 7 days a week requires access to always-on low carbon energy, something that nuclear electricity is particularly well suited to.

In 2024, Amazon, Google and Microsoft all signed agreements with nuclear developers for new nuclear capacity in the US, directly to support AI energy demands. Amazon invested approximately $500 million into X-energy, developer of AMRs, with an agreement to support a new X-energy project in Washington state. Across the world, developers of SMRs and AMRs are seeing a growing market for new energy capacity dedicated to AI requirements and are chasing their development.

In 2025, His Majesty's Government launched a call for AI Growth Zones across the UK [18], specifically targeted at attracting the development of large scale datacentres and associated jobs into UK regions with access to the energy and space that can drive an increase in demand for clean power. Sites identified within this study could be well suited to powering AI datacentres as part of an AI zone, where facilities to date have agglomerated around existing datacentre capacity. These zones require access to a minimum of 500 MW of capacity, which could be provided by a pair of SMRs. The sites identified in the study could provide the Midlands with the ability to power data centres from in-region assets and therefore benefit from the inward investment and jobs created from parallel developments.

Nuclear could also meet the need for uninterrupted supply of energy to data centres through either building in redundancy by constructing multiple units ensuring that any combination of units is capable of meeting demand including during periods of reactor outage and refuelling; or by producing low-carbon synthetic fuels that can be used to power back-up generators.

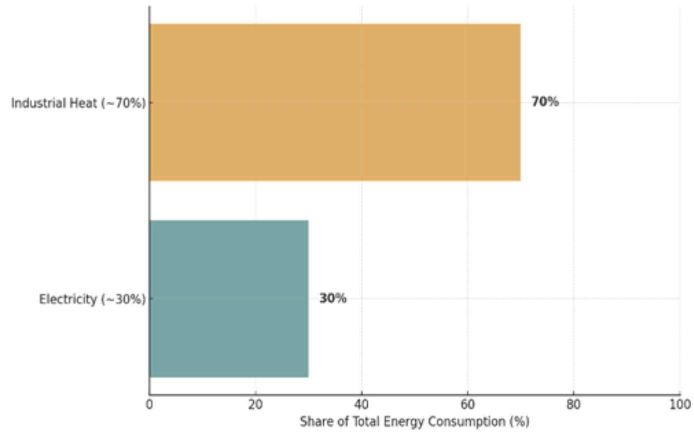
Use Case: Decarbonisation of Midlands Industrial Energy Usage

The Midlands, and in particular the area of the Humber Cluster, hosts energy intensive industry which drives a demand for heat to produce chemicals and plastics, refine fuels, deliver food products, produce steel and, in the future, for producing hydrogen. Maintaining a constant supply of electricity, heat, water and other feedstocks, including hydrogen and ethanol is foundational to maintaining the region as a major industrial hub in which jobs and economic prosperity follows directly from the ability of industry to secure low-cost energy.

Heat input has traditionally been provided by fossil fuels, which represent a lower cost option compared to low-carbon alternatives but are incompatible with the UK's legal commitment to net zero. There are few to no alternatives with hydrogen, electrical resistive heating and direct heat supply from nuclear reactors being the most credible options.

Nuclear can support industrial clusters through the local supply of multiple energy products as are required by industry to support the energy transition including:

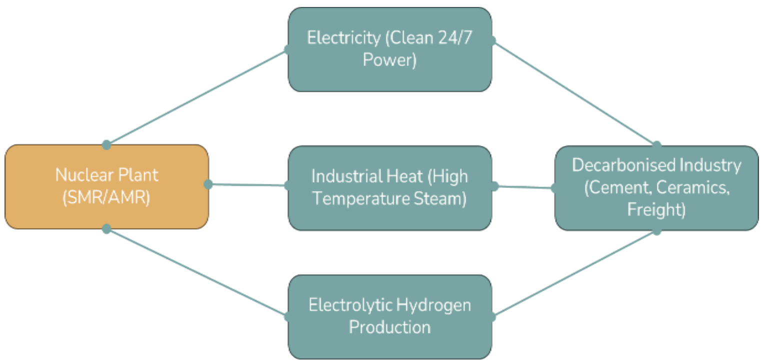
- Local, constant supply of electricity. This can avoid grid constraints and provide certainty of supply even in periods where the wind is not blowing and the sun is not shining Private grid or wire arrangements can provide electricity behind the meter to reduce costs to users.
- Regional hydrogen production. Producing and using hydrogen in closer proximity can complement other hydrogen production projects by attracting more users to the region through certainty of supply, decoupled from the gas network transition to hydrogen.
- Direct heat supply from nuclear to heat networks or straight to user. Positioning higher and lower temperature nuclear power stations where they can directly provide heat offers the opportunity for up to a 67% improvement in efficiency and corresponding reduction in cost by avoiding electricity and hydrogen completely.



Estimated industrial energy usage in the Midlands

In due course, it is anticipated that the region will be connected to a hydrogen gas grid as proposed and bring developed through the East Coast Hydrogen project with long-term plans involve a shared hydrogen backbone linking Nottinghamshire, Lincolnshire, Derbyshire industries into the national network. Early adopters of nuclear energy for this purpose have the potential to become major regional suppliers to national customers when the hydrogen transition enters the next phase.

The Midlands therefore has an opportunity through the nuclear siting study to extend ambition of the region to drive low-carbon industry and by doing so not only attract the jobs related to the nuclear power project, but also those supported by the industry that the region is accustomed to. Nuclear can therefore be a risk reducer and opportunity creator, when projects and sites are appropriately developed with robust planning and availability of early information as presented in the siting study.



Routes by which SMRs/AMRs can decarbonise midlands Industry

Use Case:
East Midlands Freeport

East Midlands Freeport is the only inland UK Freeport, located at the heart of the UK, offering a prime central location. It spans three major sites: East Midlands Airport and the Gateway Industrial Cluster (EMAGIC) in Leicestershire, , and the East Midlands Intermodal Park in Derbyshire. Each of these locations is exceptionally well connected, with strong transport links and freight infrastructure that support national trade and seamless access to other freeports across the country.

The Freeport is being positioned as a green logistics and clean fuels hub. Hydrogen will be produced locally and used:

- To decarbonise freight (hydrogen trucks, heavy goods vehicles);
- For industrial heating and process fuel switching (especially food processing, ceramics, glass);
- For aviation refuelling trials (East Midlands Airport aims to support hydrogen trials for cargo and short-haul aircraft post-2030).

The Freeport includes high-energy demand sectors: logistics hubs, manufacturing, freight and aviation. These sectors will need large volumes of low-carbon electricity and heat to meet net-zero commitments. Nuclear energy could supply clean power directly or via sleeved power purchase agreements for heavy freight electrification, green hydrogen production (for transport and industry) and powering East Midlands Airport's future SAF production.

The Freeport's special status allows accelerated planning and investment pathways, advantageous for deploying new modular nuclear reactors quickly. Having a nuclear source would shield industries from volatile fossil fuel prices and grid constraints, supporting long-term investment confidence.

Secure energy access makes the Freeport more attractive to new investors, including green logistics companies and advanced manufacturers. Developing hydrogen hubs around nuclear power plants could attract additional investment in clean fuels infrastructure, with knock-on growth in logistics, vehicle manufacturing, and aviation sectors.

Nuclear deployment could support the East Midlands Freeport stand out among the UK's Freeports and green investment zones. It would give the region a first-mover advantage in low-carbon industrial energy. The Midlands could become a national showcase for clean industrial growth, attracting new green supply chains and export opportunities. Additionally, deploying nuclear energy to power the East Midlands Freeport would create thousands of high-quality jobs, secure reliable clean energy for growing industries, unlock hydrogen and clean fuel production, and position the region as a national leader in net-zero industrial growth [39] [40].

Image courtesy of East Midlands Freeport website

9. Supply Chain and Economic Opportunity

Section Summary

Nuclear development could offer substantial economic benefits to the Midlands, drawing on lessons from major projects like Hinkley Point C and Sizewell C. Hosting SMRs or AMRs can generate thousands of high-quality jobs and support regional supply chains, especially if factory facilities are also secured locally. Both direct and indirect supply chain opportunities exist, including for SMEs, across all project phases. Strategic early engagement, skills development, and transparent procurement are key to maximising regional participation and long-term economic growth.

Section Contents

The economic opportunities provided to regions that choose to host nuclear are expansive with thousands of additional jobs and hundreds of millions of pounds of supply chain opportunities on offer. In February 2025, the Midlands Engine and Midlands Nuclear highlighted this specific opportunity for the Midlands, publishing the report "The Nuclear Industry in the Midlands: A major economic growth opportunity" which highlighted the range of advanced manufacturing business set to benefit from growth in the nuclear sector [41] This section reviews the opportunity by leaning on recent examples, for which the most recent and up to date information is available on the scale and breadth of opportunity. These examples provide data and information that is relevant but not directly from SMR and AMR projects due to the lack of on-going developments and the commercial sensitivity that some organisations place on such information. Projects including Hinkley Point C and Sizewell C provide the best examples, but differ from SMRs and AMRs, and therefore the opportunity that the Midlands may experience, in several ways. These are:

- SMRs and AMRs are designed such that a greater proportion of the power station can be built in a factory and transported to site as modules, where they can be assembled. This is predicted to lead to faster build times and a more dispersed workforce and supply chain compared to a design that necessitates being built and constructed mostly on the site itself. For this reason, if the Midlands is to secure a greater proportion of a power station supply chain locally, then also securing factory locations in the region will help maximise the opportunity. This is a noted priority action in the seven point action plan for nuclear in the Midlands [21];
- Site works to prepare ground and foundation are much smaller scale, meaning they should be faster and involve fewer workers. However, AMRs and SMRs are most economically advantageous when deployed as multiple units per site and where this occurs, reactors are most likely to be built in sequence, meaning the duration of site construction activity could be longer than for a single unit GW reactor build.

Understanding these differences, while maintaining up to date knowledge on the evidenced opportunity at Hinkley Point C and Sizewell C, provides the best evidence base on which to build the case for supply chain and economic opportunity garnered from hosting new build SMRs and AMRs.

9.1. Scale and complexity of the nuclear supply chain

The supply chain required to deliver a nuclear power station is one of the most complex and demanding of any major infrastructure project. Nuclear construction involves thousands of individual components, specialist materials, highly skilled labour, and strict regulatory compliance across every phase, from design and manufacturing to commissioning and decommissioning. Projects typically engage a vast network of suppliers, ranging from global engineering giants to highly specialised Small and medium-sized enterprises (SMEs) providing niche products and services. The scale of procurement spans civil engineering, advanced manufacturing, mechanical and electrical systems, instrumentation and control, cybersecurity, logistics, and environmental management, creating a deeply interconnected and multi-tiered supply chain ecosystem.

Managing this complexity requires early planning, precise coordination, and rigorous quality assurance across multiple tiers of suppliers. Nuclear-specific requirements, such as nuclear-grade material standards, safety classification of components, and traceability of manufacturing processes add additional layers of scrutiny and control beyond what is seen in most other sectors. The interaction between Tier 1 contractors, Tier 2 and 3 suppliers, and a wide range of indirect service providers introduces further complexity, particularly when managing interfaces, integration, and supply chain risks. Building and sustaining such a supply chain not only demands significant investment but also strategic engagement to ensure capability development, resilience, and long-term competitiveness, particularly when aiming to maximise regional and national content.

However, this complexity also represents a major opportunity for local communities hosting nuclear projects. By positioning themselves within this extensive and highly specialised supply chain, local businesses can secure high-value contracts, drive skills development, and create long-term, sustainable employment opportunities. With the right strategic support, nuclear projects can leave a lasting economic legacy, strengthening regional economies and building world-class industrial capabilities.

9.2. In-Direct Supply Chain Opportunities

In addition to the direct industrial supply chain, nuclear projects generate significant indirect economic opportunities for local communities. The scale and duration of construction, often spanning over a decade, creates sustained demand for a wide range of supporting goods and services beyond the immediate project needs. Local businesses such as hotels, serviced apartments, catering companies, cleaning services, transportation providers, and leisure facilities experience increased demand from the large, often transient workforce brought in during peak construction periods. This can trigger a wave of new investments, from the building of new accommodation to the expansion of retail and hospitality offerings.

The benefits extend even further into the local economy as new business start-ups emerge to meet the needs of workers and contractors, from sandwich shops and coffee outlets to gyms, restaurants, hotels and mobile technology providers. These indirect opportunities not only boost local employment and entrepreneurial activity, but also help diversify the regional economy, making it more resilient for the future. By planning strategically to capture these secondary benefits, for example, through workforce accommodation strategies or local business support programmes, communities can maximise the long-term economic uplift that nuclear development can deliver, ensuring the positive impacts are felt well beyond the construction site perimeter.

9.3. Supply chain economic impacts from new nuclear deployment

Nuclear projects have a profound impact on regional economies, both during their construction phases and throughout their operational lifespans. For instance, HPC currently under construction in Somerset, has already delivered significant economic benefits to the Southwest of England. As of 2023, over £5.3 billion has been invested directly with companies based in the Southwest. This investment has supported approximately 22,000 jobs across the UK, with 3,700 UK businesses engaged in the HPC supply chain.

Beyond direct employment, nuclear projects stimulate local economies through increased demand for goods and services. The influx of workers and their families boosts local businesses, including hospitality, retail, and transportation sectors. Moreover, projects like HPC have invested in community infrastructure, with £139 million allocated to local infrastructure and community support, exceeding the initial target of £130 million.

The long-term operation of nuclear power stations continues to provide economic stability. EDF Energy's current fleet of nuclear power stations has contributed over £123 billion to the UK economy since 1976, supporting 31,000 jobs annually. For every direct job at EDF Energy, five additional jobs are supported in the wider economy, highlighting the extensive economic reach of nuclear energy. [42]

Nuclear projects therefore offer substantial and sustained economic benefits to regional economies, fostering job creation, supporting local businesses, and contributing to long-term economic growth.

9.4. Key sectors and industries involved

The UK has a long and established history of supplying expertise and services to the civil nuclear sector. Many of the specialist skills developed for nuclear construction are also actively deployed across the decommissioning industry, demonstrating the depth and versatility of the UK's nuclear workforce. In addition, the successful delivery of major national infrastructure projects reflects the UK's strong capabilities in project management, precision engineering, and large-scale delivery, all of which are directly transferable to new nuclear build projects.

The UK nuclear industry offers a comprehensive range of capabilities across the full lifecycle of project development and delivery. These capabilities can be broadly summarised into the following key areas:

- **Owner and Operator Support:** Expertise in regulation, planning, licensing, safety case development, environmental management, legal advisory services, and financial structuring to support project inception and approval processes;
- **Civil Engineering and Construction:** Strong track record in the design, delivery, and management of large-scale civil works, including complex foundation engineering, structural assembly, and major site infrastructure;
- **Plant and Equipment Supply:** Advanced manufacturing and supply of nuclear-grade components, systems, and materials, with a focus on quality assurance, precision engineering, and compliance with international standards;
- **Plant and Equipment Installation and Commissioning:** Specialist skills in the installation, integration, testing, and commissioning of nuclear systems and components, ensuring operational readiness and compliance with stringent performance and safety requirements.

9.5. Timeline of Supply

The timeline for supply chain opportunities on a nuclear project is closely tied to the construction schedule and project phases. Different types of suppliers will be required at different times, depending on the specific activities underway. Early visibility of the indicative construction schedule is therefore essential for businesses to prepare appropriately, meet prequalification requirements, and align their capabilities to project needs. Figure 15 is an indicative overview of how supply chain opportunities typically align with the construction phases.

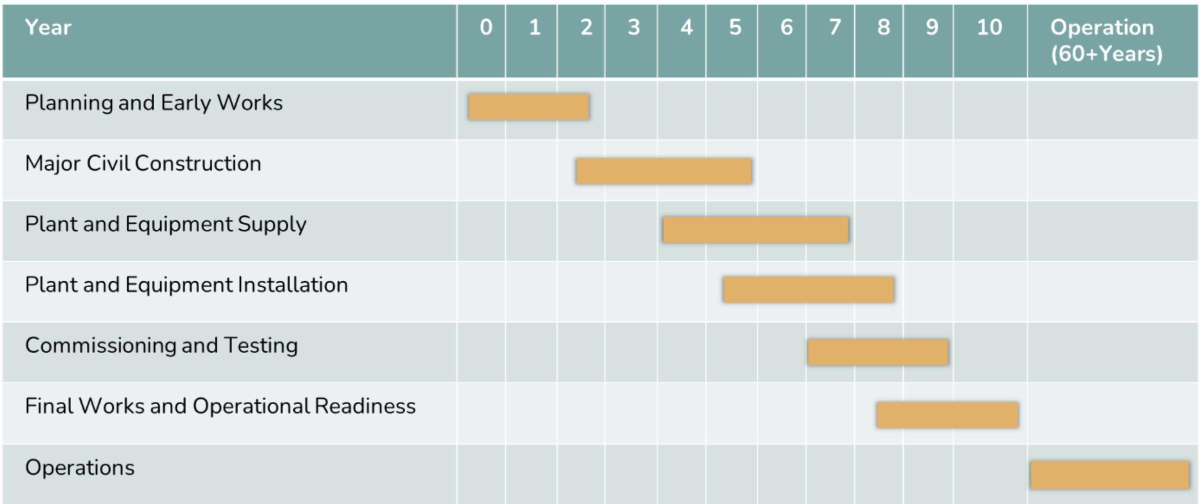


Figure 15 – Estimated timeline a new nuclear build project and key activities

9.6. Small and Medium-sized Enterprise engagement opportunities

SMEs play a vital role in the success of major nuclear projects, offering specialist skills, innovation, flexibility, and regional economic value. Opportunities for SMEs engagement exist at multiple levels of the supply chain from providing niche manufacturing services, specialist engineering support, and bespoke technological solutions, to delivering logistics, maintenance, and facilities management during construction and operation. Early engagement activities, such as supply chain briefings, matchmaking events, capability mapping exercises, and transparent procurement portals, are essential to ensure that SMEs are aware of upcoming opportunities and can position themselves effectively to participate.

9.7. Employment opportunities

Nuclear projects generate substantial employment opportunities. During the peak of construction, tens of thousands of direct jobs can be created across a wide range of roles, from civil engineering and mechanical installation to project management, logistics, and specialist technical services. In addition to the core workforce on site, significant indirect employment is supported across the supply chain, including in manufacturing, transport, accommodation, catering, and professional services. As projects transition into commissioning and operations, they provide a stable source of long-term, highly skilled employment, supporting careers that can last for decades. The scale and duration of employment opportunities created by nuclear projects (Figure 16) also have important secondary benefits. Investment in skills development, apprenticeships, and training programmes can help build a pipeline of future talent not only for the nuclear sector, but also for wider industries requiring similar high-value capabilities, such as aerospace, energy, and advanced manufacturing.

Regional communities hosting nuclear developments have the chance to create resilient local workforces, strengthen their economies, and retain young people in meaningful, well-paid technical and professional careers. With strategic workforce planning and local engagement, nuclear projects can become major catalysts for sustainable economic growth and social mobility.

The most recent UK data on jobs is based on Hinkley Point C and the projections for Sizewell C, with a small number of SMR developers predicting peak job numbers of approximately:

- 1000-3000 jobs in construction, which will vary depending on site conditions, multi-unit stations and fleet effects;
- 5000-7000 jobs in manufacturing and engineering for design, development and initial deployment;
- 200-500 long term jobs during operation.

A proportion of this workforce will need to be local to the site but the opportunity for supply chain and factory manufacturing facilities can be felt across the region.

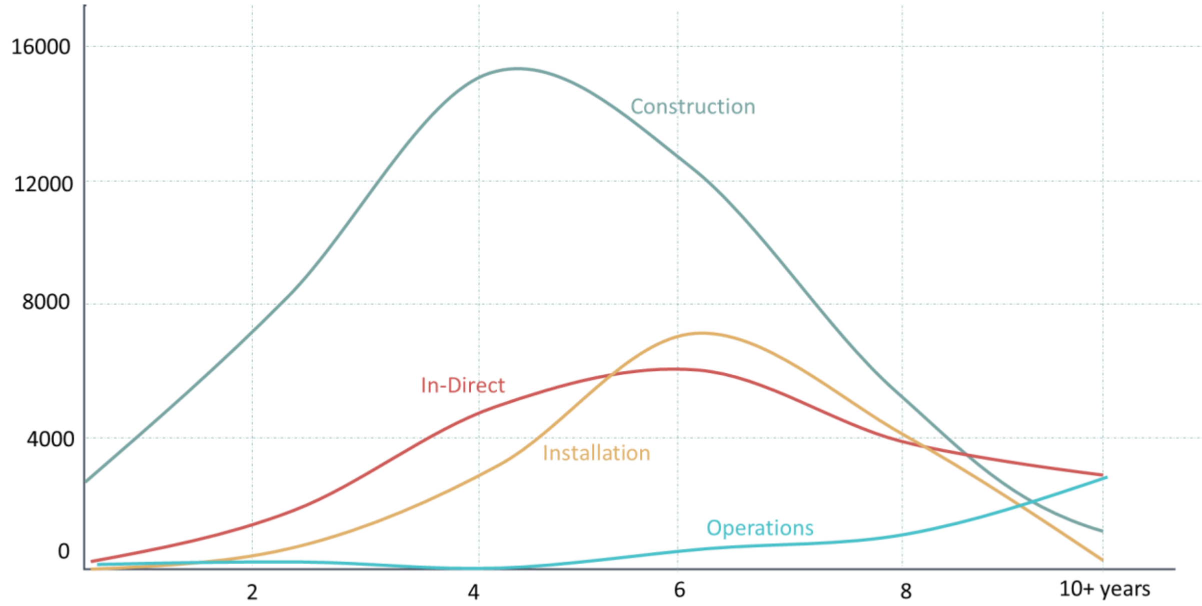


Figure 16 – Estimated jobs profile for a new nuclear build project [43]

9.8. Experience from UK's Current New Build Developments

This section draws comparison with other nationally significant infrastructure projects to assess the economic opportunity that could be derived from new build nuclear projects in the Midlands, noting the previous overview of comparative differences that can be expected for SMR and AMR projects.

9.8.1. Hinkley Point C

HPC represents one of the most ambitious and wide-ranging supply chain mobilisation efforts seen in UK infrastructure. EDF Energy set clear targets to maximise UK supply chain participation, aiming to stimulate regional economic development and ensure knowledge and skills remained within the country. Over £5.3 billion in contracts has been awarded to companies in the South-West alone.

A critical part of HPC's strategy involved working closely with potential suppliers to help them meet nuclear-specific standards for quality, safety, and traceability. Significant investment was made in skills development through new training centres, Bridgewater College, with HPC has created over 1,300 apprenticeships across all phases of its construction. Special efforts were also made to lower barriers for SMEs, including breaking down large work packages into manageable contracts and encouraging Tier 1 contractors to open up their own supply chains to smaller companies. This inclusive approach helped over 3,700 UK businesses become involved in the HPC supply chain, supporting thousands of jobs across multiple regions.

However, EDF Energy and its partners brought with them an established French nuclear supply chain, with companies that already had experience delivering the same reactor design (UK-EPR technology) in France and elsewhere. As a result, UK suppliers often had to compete directly with well-established French firms who were already familiar with the project's technical specifications and quality requirements.

The lessons from HPC underline the importance of early planning, supplier development, and clear communication. Future projects, such as SZC and potential SMR deployments, can benefit from replicating and enhancing this model ensuring that regional businesses and the wider UK economy fully capture the long-term value offered by major nuclear investments.

9.8.2. Sizewell C

SZC is building on the experience of HPC. From the outset, the project has set ambitious targets for local and national content, with particular attention to opportunities for SMEs and regional businesses in the East of England. Early engagement activities, including supply chain mapping, Meet-the-Buyer events, and prequalification support initiatives have been central to helping UK businesses position themselves for future contract opportunities linked to the project.

SZC's developer consortium will inevitably draw on the experience and relationships formed through the HPC programme. This includes utilising parts of the established French supply chain that supported the UK-EPR reactor design, particularly for highly specialised nuclear components and systems. While this provides confidence in technical delivery, it also means that UK suppliers will once again need to demonstrate their ability to compete against experienced international providers. Strategic support mechanisms, including tailored supplier development programmes and active Tier 1 supply chain transparency requirements, are being put in place to help maximise UK involvement across all tiers of the project.

The SZC supply chain strategy places strong emphasis on early visibility of opportunities, skills development investment, and ensuring that regional businesses particularly those in Suffolk, Norfolk, and the wider East of England are well positioned to benefit. Targeted investment in skills academies, nuclear certification readiness programmes, and regional business support networks is being prioritised to ensure that local firms can meet the demanding quality and regulatory requirements of the nuclear sector. This proactive approach aims to widen participation, build regional resilience, and create lasting economic benefits well beyond the lifetime of the project.

9.9. Activities to Optimise Supply Chain Content

To develop a robust strategy for maximising the contribution of industry across the Midlands to a new build project, it will be essential to establish early and coordinated collaboration between the developer, the vendor, and the wider supply chain. This approach should make full use of the developer's information regarding their own contracting strategy and forthcoming opportunities, enabling proactive supplier engagement and preparation.

An early priority is for local business representatives to build strong working relationships with the vendor–developer consortium. This engagement should focus on understanding the consortium's contracting strategy, the established supply chains they intend to bring with them and identifying areas where gaps or challenges exist. It is crucial that local suppliers gain this insight well in advance, so they have sufficient time to understand and meet the prequalification criteria required for participation. By identifying opportunities early and developing the necessary capabilities and

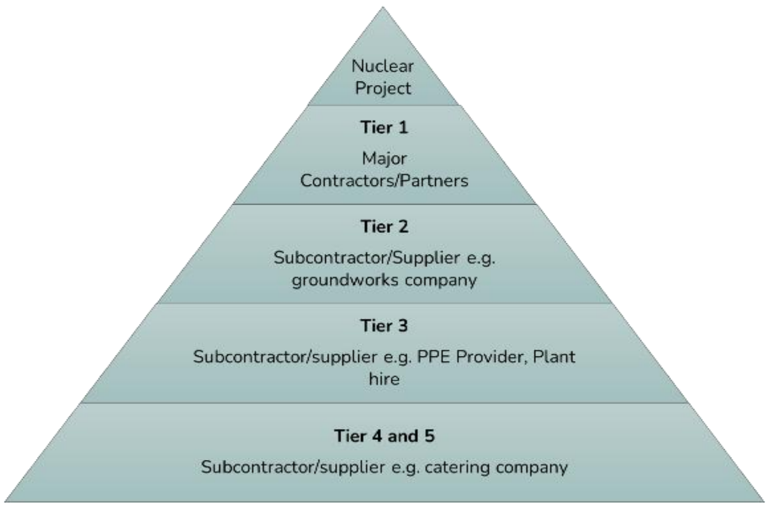


Figure 17 – Typical tiered structure of a nuclear supply chain

capacity, local businesses can position themselves to play a meaningful role in supporting project delivery across the supply chain hierarchy (Figure 17).

Equally important is proactive engagement with major Tier 1 contractors, who will be responsible for delivering significant work packages. Supply chain opportunities exist at all tiers, not just through the developer directly, and clear visibility of subcontracting opportunities is critical. Local businesses need to understand how they can access opportunities across the entire supply chain hierarchy, whether directly or through Tier 1 and Tier 2 contractors.

Lessons can be drawn from major infrastructure programmes such as the London 2012 Olympics, where strong supply chain visibility from Tier 1 to Tier 5 of the supply chain, and a requirement for all tiers to compete contracts helped open up significant opportunities for SMEs and regional businesses. [44]

Clear visibility of supply chain opportunities at all levels is critical to ensuring that businesses of all sizes can participate meaningfully in major infrastructure projects. By providing early, transparent access to the pipeline of contracts from Tier 1 principal contractors down to smaller subcontracts projects can enable a wider pool of companies to prepare, prequalify, and compete effectively.

This approach supports the growth of regional economies, strengthens the resilience and diversity of the supply chain, and maximises the overall value of investment. It ensures that SMEs, specialist suppliers, and new market entrants are not excluded simply because of a lack of access to information.

Supplier guides can provide regional supply chains with clear information on how to access project opportunities, alongside key details about the project itself and available government support initiatives. These guides play a critical role in helping businesses prepare effectively and maximise regional content and participation in major projects.

Single procurement portals, such as the CompeteFor procurement portal operated by the Olympic Delivery Authority can increase supply chain visibility and reduce barriers to entry for SMEs and regional businesses. For the London 2012 Olympics, over 1000 buying organisations at all supply chain tiers posted contract opportunities, the most of which were at Tiers Two and Three of the supply chain.

10. Conclusions and Recommendations

The Midlands has a credible and compelling opportunity to host new nuclear deployments directly supporting UK net zero, enhancing energy security, and delivering on regional economic and development goals. A robust, nationally consistent siting methodology based on the PPSS and aligned with NPSs EN-6 and EN-7 has been applied to assess, shortlist, and appraise candidate sites.

This foundational work presents the very start of potential new build projects and provides the Midlands with an evidence base on which it can move forward with further engagement towards potential nuclear projects, should it and its regional authorities wish to do so. Much is yet to develop and many more building blocks are required if the vision of developing nuclear energy projects in the Midlands is to be realised.

In delivering the scope and objectives of the defined projects including a structured siting process, 21 sites across 7 counties were shortlisted, which could theoretically support greater than 20 GW of nuclear generating capacity subject to conjunctive analysis, appropriate regulatory review and approval, social acceptance, commitment from capable and well-funded organisations and government support.

Two sites have been selected on which to carry out a deeper level of siting assessment, and these have the potential to be the most technically and commercially suitable for nearer-term nuclear development. Both offer brownfield land status, strong existing grid infrastructure, reliable cooling water access and pass the relevant criteria. There may be mitigating measures required on both sites, as is the case with most or all sites on the shortlist.

The process adopted in the project has been to use an established dataset to examine potential sites through applying criteria used to identify those sites included in NPS EN6. The same criteria area due to be applied in NPS EN-7, which is due to be published in 2025. The criteria focus on site characteristics that could determine whether potential site is technically suitable. However, for projects to be developed, the site and the project (including the technology) must also be economically viable and socially acceptable.

The PPSS introduces indicators for several site factors to identify issues which would require additional developer investment to mitigate known issues but the true economic viability can only be established by a developer steeped in knowledge of nuclear developments, relevant markets and supporting frameworks. A developer that understands this, is well organised, well-resourced and well-funded is likely to understand this and be capable of developing a project plan and business case with potential to successfully deliver and operate a new nuclear plant.

New nuclear deployment would unlock significant regional supply chain participation, stimulate high-value job creation, attract inward investment, and support long-term skills development across the Midlands.

Realising this opportunity requires early, coordinated action by regional authorities, developers, government, industry and national energy system operators to position the Midlands competitively within the emerging UK nuclear programme.

10.1. Recommendations

Recommendations are based on the current nuclear deployment landscape in the UK and the ambition shown by both central and local government organisations for nuclear development. They are made in cognisance of the opportunities and challenges outlined in this report and the importance of projects reaching operation on an accelerated timescale.

- **Secure political and community support:** A broad coalition of political, business, academic, and civic stakeholders can form a strong advocacy approach for Midlands nuclear development. Visible, coordinated support will help secure national investment prioritisation and maintain momentum behind Midlands nuclear ambitions. This need is not focus on a specific site or location but offers a pathway to building a general foundation of support prior to further progress and announcements.

- **Undertake foundational strategic engagement with Government and other stakeholders:** There are many priorities associated with clean energy production in the UK and understanding whether and when a Midlands nuclear deployment project may be best positioned amongst them, in the context of GBN and NESO SSEP, will be important to bringing important stakeholders on the journey.
- **Understand the range of developer and technology options thoroughly:** It is vital that regional organisations that are approached to support nuclear new build proposals and projects discover early which proposals are serious and therefore likely to progress, and which are less credible and could block sites or take comparatively longer for the region to realise the project benefits. Capability, funding and technology readiness are three important factors, but there are also many other indicators and these should be explored and understood as part of decision making.
- **Ensure appropriate steps to resolve highlighted mitigations early:** Where known mitigations are required, reduce risks associated with these early so better understand site economics and risks.
- **Establish a strategic plan for short, medium and long-term site opportunities:** This study has established that several sites that may otherwise have been technically suitable for new nuclear deployment are already blocked, or in the process of being blocked by other developments that may need to be on these sites. Strategic planning may recognise that sites with the potential to be suitable for nuclear new build are strategic assets to the Midlands and the UK.
- **Engage with national system operators:** Understanding the development of the national energy infrastructure and how Midlands projects can both align with current plans and present national opportunities to reduce system costs of the transition
- **Develop a Midlands Nuclear supply chain strategy:** A dedicated strategy should be established to maximise regional supply chain participation. This should include capability mapping, SME engagement programmes, nuclear certification readiness support, supplier development initiatives, and clear signposting of forthcoming contract opportunities.
- **Invest in skills and workforce development:** Significant investment is needed in apprenticeships, technical education, retraining programmes, and specialist skills academies aligned to nuclear sector needs. Partnerships with universities, colleges, and industry bodies should be expanded to build a resilient and future-ready workforce.
- **Strengthen planning and infrastructure readiness:** Regional authorities should proactively engage with regulators, planning bodies, and network operators to identify and address potential planning, permitting, environmental, and infrastructure challenges early. This will de-risk deployment and increase attractiveness to developers.
- **Maximise economic and industrial legacy:** Clear plans should be developed to capture long-term benefits from nuclear projects, including supply chain growth, SME participation, skills development, community benefits, and regional innovation. Lessons from HPC and SZC should be embedded early to maximise regional economic impact.

11. References

[1] Midlands Engine, "Review of Nuclear and Related Industries in the Midlands," January 2023. [Online]. Available: https://midlandsnuclear.co.uk/wp-content/themes/midlands-nuclear-child/docs/Midlands-Nulcear-and-Related-Technologies-Review.pdf.

[2] Statista, "Median annual earnings for full-time employees in the United Kingdom in 2024, by region," May 2025. [Online]. Available: https://www.statista.com/statistics/416139/full-time-annual-salary-in-the-uk-by-region/. [Accessed June 2025].

[3] Energy Technologies Institute, Power Plant Siting Study Technical Report (Phase 2), 2015.

[4] Department of Energy and Climate Change, "National Policy Statement for Nuclear Power Generation (EN-6) Volume I and Volume II," July 2011.

[5] National Grid, "The Great Grid Upgrade," 2025. [Online]. Available: https://www.nationalgrid.com/the-great-grid-upgrade.

[6] Department for Energy Security and Net Zero, "Historial Electricity Data," 2024. [Online]. Available: https://www.gov.uk/government/statistical-data-sets/historical-electricity-data.

[7] HM Government, "2050 Pathways Analysis," 2010.

[8] Climate Change Committee, "4th Carbon Budget," 2010.

[9] Department for Energy Security & Net Zero, "Civil Nuclear: Roadmap to 2050," January 2024.

[10] Department for Energy Security & Net Zero, "National Policy Statement for nuclear energy generation (EN-7): new consultation, and response to earlier consultation," 2025.

[11] UK Government, "Invest 2035: The UK's Modern Industrial Strategy," 2024.

[12] UK Government, "Energy Security Bill factsheet," 2023. [Online]. Available: https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-recycled-carbon-fuels-and-nuclear-derived-fuels-for-transport.

[13] Department for Business, Energy and Industrial Strategy (BEIS), "UK Hydrogen Strategy," 2021.

[14] His Majesty's Government, *The Renewable Transport Fuel Obligations (Sustainable Aviation Fuel) Order 2024*.

[15] Department for Transport, "Government response to the Consultation on Sustainably Aviation Fuels Revenue Certainty Mechanism," January 2025.

[16] Department for Business, Energy and Industrial Strategy, "Heat and Buildings Strategy," 2021.

[17] Department for Transport, “Maritime Decarbonisation Strategy,” 2025.

[18] Department for Science Innovation and Technology, “AI Opportunities Action Plan,” Independent Report, 2025. [Online]. Available: https://www.gov.uk/government/publications/ai-opportunities-action-plan/ai-opportunities-action-plan.

[19] Midlands Engine, “Nuclear Skills Academy Energy White Paper Case Study,” November 2024. [Online]. Available: https://midlandsengine.org/wp-content/uploads/2024/11/Nuclear-Skills-Academy_Energy-White-Paper-Case-study.pdf.

[20] Midlands Engine, “The Nuclear Industry in the Midlands: A Major Economic Growth Opportunity,” January 2025. [Online]. Available: https://midlandsengine.org/wp-content/uploads/2025/02/ME_The-Nuclear-Industry-in-the-Midlands_a-major-economic-growth-opportunity_January-2025.pdf.

[21] Midlands Engine, “Review of Nuclear and Related Industries in the Midlands,” 2023.

[22] Great British Nuclear, “Annual Report and Accounts,” March 2024. [Online]. Available: https://assets.publishing.service.gov.uk/media/67c71ab5a0f0c95a498d229d/GBN-Annual-Report-24-V4.pdf.

[23] National Energy System Operator, “Strategic Energy Planning - A Summary - Version 2,” March 2025. [Online]. Available: https://www.neso.energy/document/349121/download.

[24] Energy Technologies Institute, Power Plant Siting Study Technical Report (Phase 3), March 2016.

[25] J. Consulting, “Siting New Nuclear Power Stations - Availability and Options for Government,” 26th April 2007.

[26] UK Government, “Alternative routes to market for new nuclear projects - GOV.UK,” January 2024. [Online]. Available: https://www.gov.uk/government/consultations/alternative-routes-to-market-for-new-nuclear-projects.

[27] Office for Nuclear Regulation, “ONR-LUP-NS-001 Rev 0 Land Use Planning and the Siting of Nuclear Installations,” July 2018.

[28] M. Grimston and W. Nuttall, “The Siting of UK Nuclear Power Installations,” 2013.

[29] A. B. G. B. WIlliam Bodel, “Siting Implcations of Nucleat Energy: A Path to Net Zero,” March 2022.

[30] ONR, “Licence Condition Handbook,” 2017.

[31] Highways Agency, “Abnormal loads and the ESDAL system,” 2025. [Online]. Available: https://nationalhighways.co.uk/road-safety/abnormal-loads-and-the-esdal-system/.

[32] Department for Business, Energy and Industrial Strategy (BEIS), “Regional Energy Consumption Statistics,” 2023 update. [Online]. Available: https://www.gov.uk/government/statistics/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2022.

[33] “UK Climate Change Committee (CCC) – Sixth Carbon Budget (2020 reports and sector summaries)”.

[34] “Midlands Net Zero Hub Energy Evidence Base (2022–2024 updates)”.

[35] Department for Business, Energy and Industrial Strategy (BEIS), “Industrial Decarbonisation Strategy,” 2021.

[36] “UK Department for Transport (DfT), Sustainable Aviation Fuel Mandate: Consultation Response and Policy Framework, March 2023”.

[37] UK Civil Aviation Authority (CAA), “Airport Traffic Statistics,” 2024.

[38] Equilibrion, “https://equilibrion.co.uk/eq-flight/,” 2025. [Online].

[39] “Midlands Engine Hydrogen Technologies Strategy (2022)”.

[40] East Midlands Freeport, “ Business Plan (2023),” 2023.

[41] Midlands Engine, “The Nuclear Industry in the Midlands: A major economic growth opportunity,” 2025.

[42] “Hinkley Point C Socio-Economic Report 2023 and EDF Energy – More Than Power Campaign”.

[43] “Hinkley Point C project data (EDF Energy, 2023) and UK Nuclear Industry Association workforce trends (NIA, 2023).”.

[44] Olympic Delivery Authority, “Using CompeteFor to drive competition in the supply chain,” October 2011. [Online]. Available: https://webarchive.nationalarchives.gov.uk/ukgwa/20130403013821/http://learninglegacy.independent.gov.uk/publications/using-competefor-to-drive-competition-in-the-supply-chai.php. [Accessed June 2025].

[45] HMG, “The Justification of practices involving ionising radiation regulations,” Department for Energy Security and Net Zero, 2004.

[46] HMG, “Regulatory Justification decisions on nuclear reactors,” 2010.

[47] HMG, “Overarching National Policy Statement for energy (EN-1),” Departement for Energy Security and Net Zero, 2008.

[48] HMG, “National Policy Statement for nulcear power generaton (EN-6),” Departement for Energy Security and Net Zero, 2011.

[49] HMG, "New nuclear power plants: Generic Design Assessment guidance for Requesting Parties," Office for Nuclear Regulation and Environment Agency, 2024.

[50] ONR, "Licensing nuclear installations," Office for Nuclear Regulation, 2021.

[51] HMG, "Civil Nuclear Constabulary (CNC)," UK Government, Accessed 2025. [Online]. Available: https://www.gov.uk/government/organisations/civil-nuclear-constabulary/about.

[52] EA, "Radioactive substances regulation (RSR) guidance," Environment Agency, 2011.

Appendix 1: Regulatory processes

This appendix provides a description of the processes involved in the regulatory approvals required for the development of a nuclear power station. It provides a high-level perspective to be read alongside the roadmap in Section 4. For any development project, relevant specialists will need to be engaged at the right time to assist in demonstrating compliance with and progression through the processes and in practice, many factors (e.g. design maturity, licensee competence and capability, financial arrangements) will influence the speed of progression.

In the context of this project, site information and early site assessments are important to determine at an appropriately early stage whether a site is likely to be suitable from technical, safety, regulatory, environmental and social perspectives. However, there is no guarantee that any amount of early site assessment work can reduce the risk of challenges emerging later in the process but a suitably staged process can minimise risk on incremental investments. The value of this study, of course, is that the information provided supports early assessment with a view to further incremental investments at lower risk.

Site Characterisation

Site characterisation includes but is not limited to environmental surveys (land and water related), archaeological surveys, ground investigations and traffic and transport surveys. The information gathered during site characterisation is required for planning, licensing, permitting and supports the Development Consent Order (DCO) process.

Regulatory Justification

Regulatory Justification is a process required under the Justification of Practices Involving Ionising Radiation Regulations 2004 [45], under which the DESNZ Secretary of State must decide whether a new class or type of practice resulting in exposure to ionising radiation is justified by its economic, social or other benefits in relation to the health detriment it may cause [46].

Typically, each nuclear reactor design requires Justification and this is expected to be the case for SMRs and AMRs. Previously reactors (e.g. AP1000, UK-EPR etc) have justified the use of nuclear fission for electricity production only. SMRs and AMRs will need to include other uses if seeking approval for co-generation activities which use steam output from the reactor. However, if the technology has been deployed before in the UK then it is unlikely to require Justification.

Planning

The Nationally Significant Infrastructure Projects (NSIPs) require a planning permission known as development consent which is issues under the Planning Act 2008. Nuclear reactor projects which plan to generate electricity over 50 MWe in England will be designated as NSIP, with policy for planning decisions detailed in an overarching NPS, EN-I [47] and specific nuclear NPS, EN-6, [48]. Consultation covering the planning associated with SMR and AMRs was undertaken in 2023 and will result in another NPS, EN-7. The Planning Inspectorate examines the planning application and evidence from other interested parties to weigh up any positive or negative impacts of the plan. NSIPs require a DCO which is decided by the DESNZ Secretary of State. This is effectively the large-scale planning permission for the project and will consider risks and impacts and the proposed mitigation. An important area that the DCO considers is demonstration that identified stakeholders, both statutory and non-statutory have been consulted and their views accounted for in the project. For lower power reactors (i.e. below 50 MWe) the current planning route will be via Town and Country Planning Act. There is also a statutory requirement for a Strategic Environmental Assessment (SEA) as part of the planning authorisation process for a nuclear facility.

Generic Design Assessment

GDA is not a mandatory process, however DESNZ anticipates that it will usually be requested for new nuclear power stations. It is a joint process operated by the ONR and the EA [49]. GDA is intended to assess whether a proposed technology (including SMR and AMR) could be constructed, operated and decommissioned in Great Britain. It does not include any particular site specific assessment. If a reactor technology has already been through GDA it will not need to be repeated for a particular site. So, it is not relevant to an nth of a kind (NOAK) technology deployment. Successful GDA results in a Design Acceptance Certificate (DAC) from the ONR and a Statement of Design Acceptability (SODA) from the EA.

Nuclear licensing

The ONR are responsible for regulation of nuclear safety, nuclear security, safeguards1 and nuclear transport in Great Britain. A Nuclear Site Licence (NSL) is a legal document, issued for the full lifecycle of the facility [50]. Licences are issued under the Nuclear Installations Act 1965. The act provides for a NSL to be granted to a named corporate body to install or operate specified nuclear installations in a defined location (including nuclear power stations, research reactors etc). The Licence is issued with a set of 36 Standard Licence Conditions, covering design, construction, operation and decommissioning. These conditions require Licensees to implement adequate arrangements to ensure compliance [30]. Included in the licence conditions is the need for the licensee to have adequate financial and human resources to ensure safe operation of the NSL and make arrangements to ensure that only suitably qualified and experienced persons perform any duties associated with the duties under the licence conditions. This includes the need for authorised persons to control and authorise operations.

The nuclear licensing assessment conducted by ONR will include assessment of the nuclear technology (which builds on any assessment undertaking during GDA), any siting considerations (including aspects such as external hazards which may build on work undertaken for site characterisation), the arrangements the licensee has to manage the site, the control of conventional health and safety, waste management and decommissioning.

Most UK civil nuclear generating sites are located on the coast, although there is precedent for power stations being sited inland with in-direct cooling and make-up water sourced from a lake (Trawsfynydd), rivers (Chapelcross and Calder Hall), and tidal rivers (Oldbury and Berkeley).

The lower demand on cooling for SMRs or AMRs should enable them to use abstraction from and discharge to inland water sources such as rivers and lakes, providing developers with a degree of flexibility to deploy the number of reactors that can be accommodated by the site and make-up water abstraction points. However, a key aspect of ONR's assessment will be the availability of cooling for normal operations and during fault and accident conditions. Due to the anticipated life of new nuclear power plants this will need to take account of climate change and its impact on the availability of cooling water to ensure safe operation.

As part of arrangements under the Nuclear Industry Security Regulations 2003 the Civil Nuclear Constabulary (CNC) oversee providing armed protection of civil nuclear sites and nuclear materials [51].

Over the course of the nuclear power plant's life and often as it transitions from one operational mode to another (e.g. generation to defueling to decommissioning) the licensee might move between one competent body to another. For example, the Magnox reactor site decommissioning is being undertaken in the UK by Nuclear Restoration Services which is part of the UK NDA. For the UK Advanced Gas Reactors decommissioning is being managed by EDF Energy and the NDA. On transfer of the license, the nuclear liabilities also transfer to the new licensee. Once a site has been declared free from danger from ionising radiation it can be delicensed.

Environmental Permitting

Operators who dispose of radioactive wastes require a Radioactive Substances Regulation (RSR) permit under the Environment Permitting Regulations 2016 (EPR). The issuing of an EPR permit is dependent on a satisfactory assessment by the EA in England. This includes a public consultation

[1] Nuclear safeguards are a set of technical measures that are applied on nuclear facilities and material to ensure that they are not misused and nuclear material is not diverted from peaceful uses.

process. A successful application will result in a permit which will set conditions and limits on an operator to minimise and mitigate aerial and liquid discharges and solid waste disposals to protect and enhance the environment. However, several other non-radioactive Environmental Permitting Regulations 2016 (EPR16) permits will be required during construction, operation and decommissioning [52].

The EA will assess the impact on people and the environment from a nuclear site. If a site were to be placed closer to an urban or industrial location the EA would assess the impacts taking into account public dose limits and principles of optimisation. This does not necessarily restrict siting of nuclear facilities as impacts will depend on the activity and volume of radioactive wastes, local population conditions and habits.

The EA also regulate both the abstraction from and the discharge into inland water bodies in England. Regulatory scrutiny of liquid effluent discharges and heat requirements for river water may be more stringent than for coastal water. Impacts to the environment from abstraction of large volumes of water and / or discharge of heated water will need to be assessed considering local environmental conditions and impacts to wildlife including the influence of climate change.

Depending on the location (i.e. if the development is likely to affect any special areas of conservation or special protection areas) a Habitats Regulation Assessment (HRA) may be required under the Conservation of Habits and Species Regulations 2017.

In a similar way to the NSL the environmental permit for a site can move between one organisation to another.

Emergency Preparedness

The Radiation (Emergency Planning and Public Information) Regulations (REPPIR) provide a framework for the protection of the public and workers from, and in the event of, radiation emergencies that originate from sites.

Regulatory authorisation will include assessment of calculated worst-case doses in accident conditions and may result in additional measures if located closer to dense populations, which may increase costs of the nuclear station.

The regulations also place duties on the local authority, to prepare (and if necessary, implement) an off-site emergency plan for dealing with the consequences of any reasonably foreseeable radiation emergency in an area surrounding the site that is determined by the local authority. The local authority is also required to ensure that relevant information is supplied to the affected population in the event that a radiation emergency should occur.

Waste Management

Section 45 of the Energy Act 2008 requires operators of new nuclear power stations in the UK to produce a Decommissioning and Waste Management Plan (DWMP) describing how the plant will be decommissioned and the wastes treated and stored as well as a plan on how this will be funded by the operator, the Funded Decommissioning Programme (FDP). Operators of new designs will need to ensure that wastes can be disposed of in the UK, through engagement with waste repository operators such as Low Level Waste Repository (LLWR) Ltd and Nuclear Waste Services (NWS) Ltd to ensure that the wastes being produced are included in the design and future inventories of their facilities.

Ultimately high level waste (i.e. waste with high amounts of radioactivity that also generates heat e.g. spent nuclear fuel) and intermediate level waste (i.e. higher level of radioactivity than low level waste and does not generate heat e.g. irradiated components) is destined to go into a UK Geological Disposal Facility (GDF). However, it is unlikely that a GDF will be ready in the near or medium term. Therefore, HLW and ILW is currently stored at facilities on the nuclear licensed site (e.g. Sizewell B dry fuel store) or in intermediate storage facilities at Sellafield.

Health and Safety

Additionally, to the regulation of risks from ionising radiation, ONR also regulate other health and safety risk under the Health and Safety at Work Act 1974 and other relevant regulations. These place duties on the licensee to have in place risk assessments and effective arrangements for planning, organising, controlling, monitoring and the review of preventive and protective measures. Nuclear facilities including power stations often come under the Control of Major Accident Hazards Regulations 2015 due to the quantities of dangerous substances that are kept or used on site (e.g. explosive gases such as hydrogen and corrosive chemicals). The Construction (Design and Management) Regulations 2015 apply to all construction projects from concept to completion.

Note that in practice timescales for the regulatory processes can vary significantly due to factors such as design maturity, licensee / permit holder capability and capacity and financial arrangements. The indicative time scales shown are broadly based on the HPC example where GDA started in 2007 and GDAs are anticipated to take 4 years. The nuclear license and permit were granted in 2012.

EQUILIBRION LIMITED is a company registered in England and Wales.
Company number: 14464139
Registered Address: Redlands, Cliftonville, Northampton, England, NN1 5BE