Unlocking Advanced Modular Reactors in the UK

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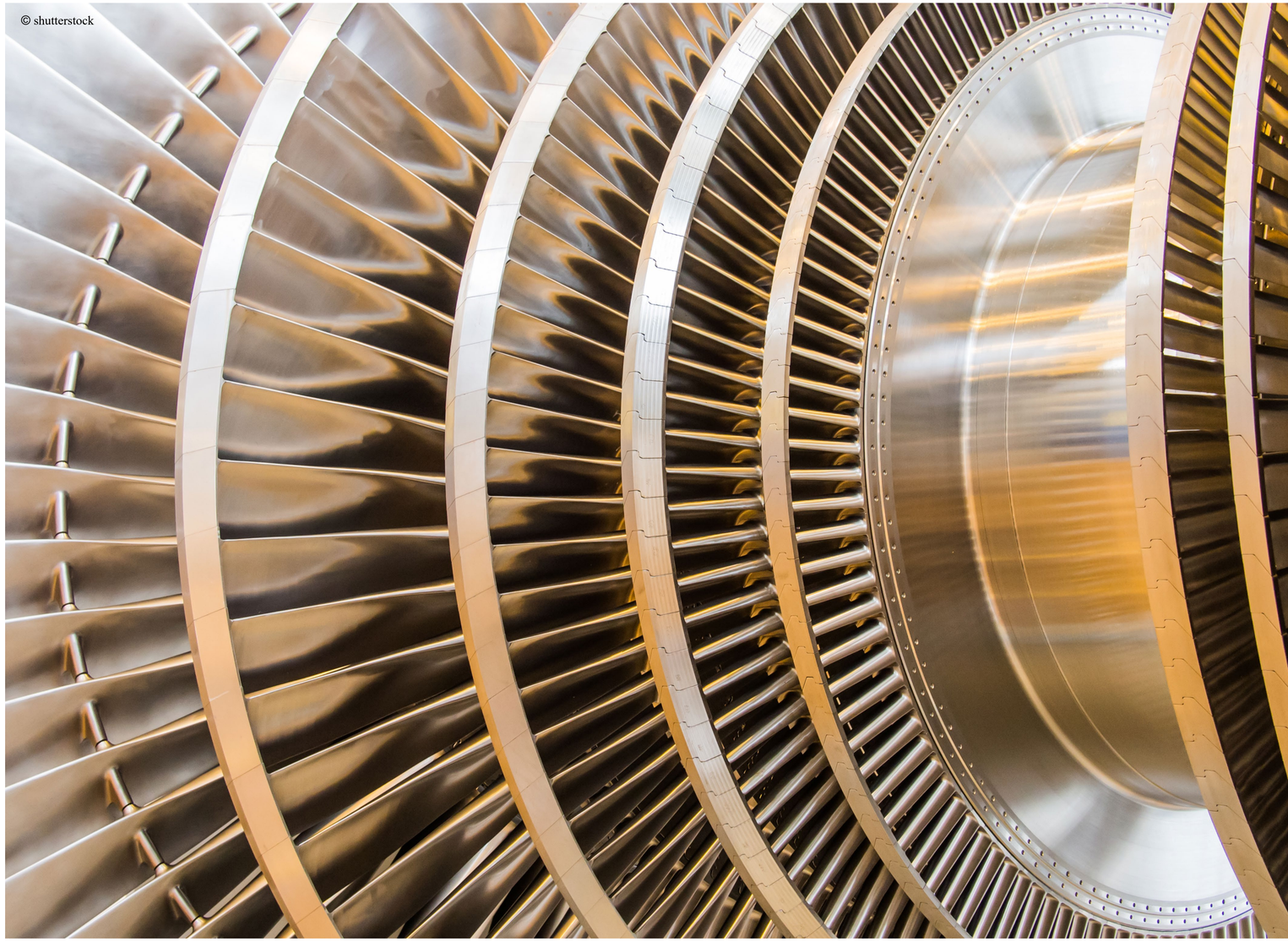
Executive summary

Advanced Modular Reactors (AMRs) have the potential to make an important contribution to the UK's clean energy transition, offering flexible, cost-effective power generation as well as supporting industrial decarbonisation applications through the supply of high-temperature steam (e.g. hydrogen production).

However, deployment is being slowed by systemic barriers that deter investment and delay progress at a time when energy demand is rising.

This paper explores some potential steps to overcome these barriers and outlines how an enabling framework – focused on reducing early – stage risks, supporting infrastructure, providing regulatory clarity, and coordinating delivery – could unlock private capital and accelerate first-of-a-kind (FOAK) projects. With the right support, AMRs could open new opportunities for private investment, supply chain growth, and skilled employment, while helping the UK meet its energy and climate objectives.

In this document:



Unlocking Advanced Modular Reactors in the UK

The UK risks falling behind in the global race to deploy next-generation nuclear technology. Advanced Modular Reactors (AMRs) offer a transformative opportunity to deliver clean, flexible, and cost-effective energy.

Yet, despite their potential, development is constrained by systemic barriers that are slowing overall progress. This comes at a time when the UK's energy needs are intensifying:

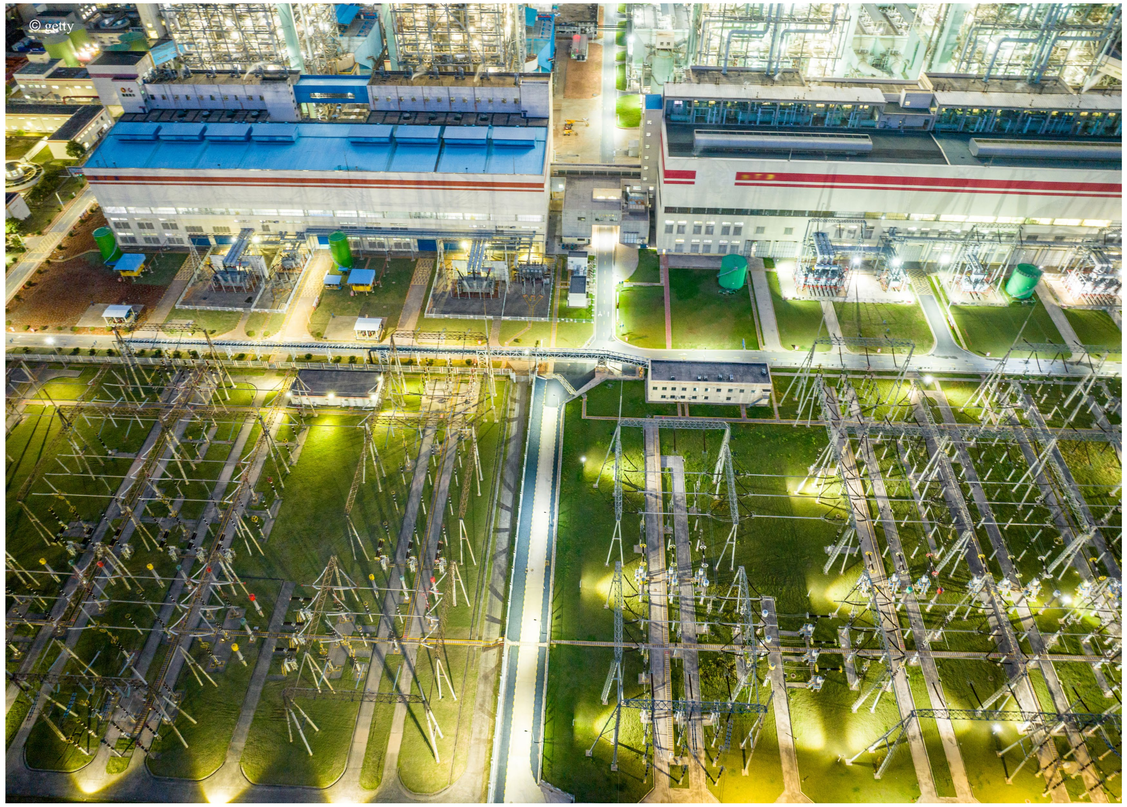
According to the International Energy Agency (IEA), global electricity demand is projected to double by 2050.*

Without targeted intervention, the UK risks missing a critical opportunity to establish global leadership in advanced modular reactors, attract private investment, and achieve its net zero and energy security objectives.

So what exactly are Advanced Modular Reactors? AMRs are a new generation of modular nuclear technology. They are designed to be quicker and cheaper to build than traditional power stations, while also being more flexible in how they can be utilised. Some AMRs also open up cogeneration options, such as supplying industrial heat alongside electricity.

Importantly, they have real potential to become part of the UK's clean energy mix.

Here, we explore five of the most critical barriers to deployment and consider how targeted support could accelerate deployment and establish AMRs as a credible part of the UK's clean energy mix.



* https://statics.teams.cdn.office.net/evergreen-assets/safelinks/2/atp-safelinks.html

Five major barriers to the deployment of AMRs in the UK

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1. Lack of deployment-ready sites

Historically, UK nuclear development has taken place on a small number of legacy sites, many of which are already committed to large projects or are constrained by environmental, grid, or community factors.

While the proposed new nuclear planning policy (EN-7, the draft National Policy Statement for Nuclear Energy Generation) allows for development across a broader range of sites than previously, the process of securing and preparing land remains complex, costly, and uncertain for AMR developers.

Securing land rights, engaging local stakeholders, carrying out site characterisation studies, and pursuing major planning permission applications are high-risk, expensive activities. Without government support in identifying or preparing sites, developers are forced to carry this burden upfront, often before financing or regulatory clarity is in place. This slows the pipeline of credible projects reaching maturity.

2

2. Uncertain route to revenue

Investors need confidence in how AMR projects will generate reliable returns once operational.

In practice, this means a clear view of long-term revenues and risk-sharing before committing capital. The challenge is heightened by the fact that nuclear projects typically involve long construction periods, with little or no income until the plant is commissioned – extending the timeframe over which capital is tied up.

In the US, the Department of Energy has recognised this by co-funding two first-of-a-kind advanced reactor projects – TerraPower's Natrium and X-energy's Xe-100 – through the Advanced Reactor Demonstration Program[1]. Cost-shared support provides a bridge to revenue, ensuring private capital is not left to carry the entire burden of proving untested designs.

In the UK, a range of potential commercial models exists – from long-term contracts with industrial users to mechanisms such as Power Purchase Agreements (PPAs), Contracts for Difference (CfDs), or a Regulated Asset Base (RAB) approach. Most, though not all, would require some form of government support. The barrier is not the absence of options, but the lack of early certainty over which model will apply and how it can be accessed. Without predictable revenue signals at the outset, even well-backed projects are likely to remain stuck at early development.

1. https://www.energy.gov/ne/advanced-reactor-demonstration-program

Five major barriers to the deployment of AMRs

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3. Planning and regulatory uncertainty

For developers, the licensing pathway for AMRs remains uncertain, with nuclear safety and environmental regulators already stretched by large projects and SMR proposals.

Early engagement routes exist but remain relatively untested, creating further uncertainty over licensing and approval timelines.

In addition, greater cross-border regulatory alignment will be essential if AMR designs are to be deployable internationally. Without progress towards harmonisation, developers risk having to pursue costly re-design and re-licensing for each individual market, undermining the potential for global deployment at scale.

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4. No central coordination

No single body currently oversees AMR deployment across government.

Developers must navigate planning, licensing, regulation, infrastructure, and local engagement largely on their own. This fragmented approach adds risk, slows progress, and forces each project to solve the same systemic hurdles in its own way.

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5. High construction phase delivery risk

Even with land generic design approval progressed and a credible revenue model in place, AMR projects face significant risks during construction.

FOAK projects are especially exposed to planning delays, cost overruns, and infrastructure constraints – many of which lie outside the control of individual developers. These risks are amplified by the complexity of nuclear projects and the long lead times before revenue generation.

While mechanisms to share delivery risks exist in principle, there is currently no clear framework or assurance that government support will be available, particularly for high-impact, low-probability events. Without such risk-sharing arrangements, developers may struggle to attract sufficient investment to reach financial close. As a result, projects that look viable on paper can still fail to progress into construction.

Options for a government-enabling framework

Government support for AMRs does not necessarily need to involve large-scale capital expenditure.

Instead, support could be structured to enable progress by lowering early-stage risks, providing clarity on delivery, and targeting interventions to the most credible projects. A good framework should:

Reduce early-stage risks – help projects past the most uncertain stages, such as securing sites and planning approval.

Prioritise readiness – support developers who can demonstrate real progress on siting, investors, and regulatory engagement.

Work alongside private finance – give investors the confidence to commit by sharing risks selectively.

Be clear and transparent – ensure prospective AMR developers understand from the outset what interventions and support may be available, reducing uncertainty and sending clear market signals.

Deployment focused – ensure support results in commercial deployment in the 2030s, not indefinite research and demonstration programmes.

Possible elements of a government-enabling framework

1. Government-nominated or facilitated site access

Finding suitable land is one of the biggest early hurdles for AMR projects. Government could help by identifying and taking steps to prepare at least one site for development – whether on public land, in partnership with local authorities, or through targeted acquisition. This might also include carrying out technical studies, such as environmental or grid assessments, and clarifying how projects would fit within the planning system.

By reducing uncertainty around sites, government would lower entry barriers for developers and avoid multiple projects competing over the same constrained locations.

2. Contract-based risk sharing for investors

First-of-a-kind nuclear projects typically require investors to commit large sums over long timelines, with capital tied up before revenues are generated. AMRs are designed to reduce some traditional barriers to nuclear investment - such as lengthy build times - but FOAK deployment still carries a fundamental technology risk: whether the design will perform as intended at scale.

To help unlock capital, government could offer targeted contractual mechanisms that provide confidence these risks will be shared in defined circumstances, giving greater certainty from the outset. Such arrangements would be limited in scope, apply only under clear conditions, and focus on developers that have already secured land, investors, and regulatory engagement. This would give investors' confidence while ensuring delivery responsibility remains with the project sponsor.

3. Targeted support for enabling infrastructure

Even advanced projects can be delayed by practical barriers such as grid connections, road access, or water supply factors that are essential for delivery but sit largely outside a developers control. These issues often require coordination across multiple entities, for example making sure that grid upgrades are delivered in step with AMR projects so that suitable export connections are available when reactors come online.

Government could help by intervening selectively to address these bottlenecks, drawing on existing tools such as the UK Infrastructure Bank or Local Growth Funds. Ensuring these enabling connections are in place would de-risk projects and enable construction, in turn unlocking private investment, jobs, and regional growth - without the need to create a new subsidy scheme.

Cross-cutting enablers

Beyond these core elements, there are additional steps that could help create the right environment for AMRs to succeed:

Industrial demand matching

AMRs are most viable when paired with long term energy users. Connecting developers with industrial customers, supporting early feasibility studies at major sites, and encouraging demand aggregation in industrial clusters would strengthen commercial cases and open up options for cogeneration, such as heat or hydrogen production.

Programme coordination

Currently, no single body is responsible for AMR delivery. A dedicated coordination function could act as a central point across departments, regulators, and infrastructure agencies – such as National Grid ESO on connections, the Planning Inspectorate (PINS) on consents, and the Office for Nuclear Regulation (ONR) and Environment Agency (EA) on licensing and permitting. This would give developers and investors a clearer interface, reduce duplication, and keep projects moving.

Planning guidance

The new EN-7 policy is expected to broaden siting options, but it remains unclear how it will apply in practice – especially at ports, industrial zones, or other non-traditional sites. Clearer guidance for developers, planners, and local authorities would help reduce uncertainty and avoid inconsistent decisions.

Regulatory capacity

Licensing AMRs will require specialist expertise in areas such as advanced reactor fuels, digital systems, and novel cooling technologies. Regulators have made early moves to prepare, but their capacity is limited. Targeted investment in specialist teams would help ensure that reviews are timely and predictable, giving developers and investors greater confidence.

Conclusion

Realising the potential of AMRs will require close partnership between government and industry, with support centred on helping projects move from design to deployment, supported by clear regulation and investment pathways.

Without this, the UK risks losing momentum to international competitors and missing the chance to establish AMRs as a viable part of its future energy mix. With the right enabling framework, AMRs could progress from concept to deployment in the 2030s – attracting private capital, creating skilled jobs, and supporting wider industrial opportunities such as hydrogen production and low-carbon heat, alongside contributing to energy security and net zero goals.

The task now is to put the right framework in place so AMRs can move from concept to deployment.

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