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G7 POWER SYSTEMS SCORECARD

COUNTRY PROFILE: UNITED KINGDOM[1]

May 2024

Synopsis

OVERALL COUNTRY SCORE: 229/400

The UK is not currently on track to have a net zero power system by 2035, but has good latent potential to achieve that target – and potentially even sooner. The country must continue to build out the full pipeline of potential offshore wind, and remove barriers to scaling onshore wind and solar. It must also focus on scaling low-carbon assets, such as demand side flexibility and long-duration storage, as well as removing barriers in the planning system and grid network. Commendably, the UK is set to entirely stop using coal in power generation – but does not yet have a clear plan to do the same with gas and is in fact building new stations. More focus on decarbonising buildings will also support the development of a low-cost, efficient net zero power system.

Headline message – Benchmarks 1–2 (Section 1: Infrastructure/Energy mix)

SCORE: 52/120

The UK has a relatively high share of low-carbon energy sources in the power mix. This is made up of nuclear and renewables; notably, a large capacity of nuclear is set to retire within the next decade. The UK is making progress towards renewables becoming a high share of the electricity system, with solar and wind producing 33% of the UK's electricity in 2023.[2] Coal power stations, which were briefly on standby while there were concerns over gas availability, are now almost all closed. The final coal power station in the UK is set to close in September 2024. However, the UK is still building new gas power stations – and is set to continue, without yet having a clear exit strategy.

Headline message – Benchmarks 3–5 (Section 2: Policies/Targets)

SCORE: 177/280

The UK's target to decarbonise the power system by 2035 is welcome, but would benefit from being made clearer and more robust. It has an ambitious target to

[1] To see the whole Scorecard, including the scoring methodology, visit **https://www.e3g.org/g7-power-systems-scorecard**

[2] Ember, 2024, **Record fall in UK and EU power sector emissions in 2023**

phase out coal, but lacks an equivalent target for phasing out gas. The UK has a wide array of policies underway to prepare for the transition to a renewables-based system. These need to be pulled together into an overarching strategy for creating a net zero power system by 2035 – or sooner.

The UK is falling behind in some areas – including low rates of delivery on energy efficiency schemes, and slow progress towards transitioning to heat pumps. Across the UK, long lag times in connecting to the network are causing major issues for the renewables industry. The planning system is also slowing down the rollout of renewables.

The UK shows good international leadership, which it can strengthen further by joining the Beyond Oil and Gas Alliance, and providing more financial support to the Just Energy Transition Partnerships.

Benchmark 1: Reducing fossil fuel reliance

SCORE: 25/60

Coal power stations, which were briefly on standby during concerns over gas availability, are now almost all closed: the final coal power station in the UK is set to close in September 2024. However, the UK is still building new gas power stations – and is set to continue – with these being used to provide a high percentage of the UK's electricity. The UK's fossil fuel use is reduced by a legacy fleet of nuclear power stations which are set to retire within the next decade. These need to be replaced by the rapid rollout of renewables and other low-carbon assets for energy security.

1.1 New unabated coal and gas power plants in planning or construction

SCORE: 4/15

The UK has no new coal power stations in the pipeline, but new gas plants are set to be procured now and in the future. Currently there are approximately 8 GW of new gas capacity in the pipeline, most of it in the pre-construction stage.[3] The ambition is that these will mainly be used as flexibility and back-up capacity. There is also policy in development in the UK to ensure new gas power stations are built so that they can be decarbonised in the future. However, this has not yet been introduced and the efficacy is unclear.

[3] Global Energy Monitor, February 2024, **Oil and Gas Power Plant Tracker – Summary tables**

1.2 Share in electricity generation: fossil fuels

SCORE: 7/15

In 2023 the share of fossil fuel generation in the power mix was approximately 39.9%, with gas accounting for over 85% of total fossil fuel-based generation.[4]

1.3 Share in electricity generation: non-renewable low-carbon tech

SCORE: 4/15

14% of the UK's electricity was generated by nuclear power plants in 2023. It is worth noting that a large capacity of nuclear is set to retire within the next decade.[5]

1.4 Carbon intensity of power index

SCORE: 10/15

In 2023 the carbon intensity of electricity in the UK was 237.59 gCO_2/kWh, the third-lowest level in the G7 after France and Canada.[6]

Benchmark 2: Ramping up renewables

SCORE: 27/60

The UK is making progress towards renewables making up a high share of the electricity system. Solar and wind produced 32.7% of the UK's electricity in 2023, with wind playing the key role.[7] However, deployment must be ramped up further if the country is to stay on track. The 2023 Contracts for Difference (CfD) auction – the main policy mechanism to boost renewables in the UK – failed to procure new offshore wind, and it does not look like the 2024 auction will make up the shortfall. There are still barriers to the construction of onshore wind, which is effectively banned under the UK's planning system. The UK needs to redouble its efforts and rapidly resolve these challenges.

[4] Ember, **Electricity Data Explorer** (online database; data retrieved April 2024)

[5] World Nuclear Association, March 2024, **Nuclear power in the United Kingdom**

[6] Carbon Brief, 2024, **Analysis: UK electricity from fossil fuels drops to lowest level since 1957**

[7] Ember, **Electricity Data Explorer** (online database; data retrieved April 2024)

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2.1 Share of variable RES in electricity generation

SCORE: 8/15

In 2023 the share of variable RES generation (solar and wind) in the power mix was 32.7%.[8] Wind-based generation plays the dominant role with 28.1% of the total power mix, while solar-based generation contributed 4.6%.[9] The renewables industry has seen impressive growth. However, the 2023 CfD auction – the main policy mechanism to boost renewables in the UK – failed to procure new offshore wind, and it does not look like the 2024 auction will make up the shortfall. There are still barriers to the construction of onshore wind, which is effectively banned under the UK's planning system.

2.2 Share of other RES in electricity generation

SCORE: 3/15

In 2023 the share of "other" RES capacity in the power mix was 12.7%. Biomass contributed the largest share – 10.9%.[10] We note that there are sustainability and social justice concerns about Drax; the National Audit Office has recently posed questions about the government's continued support for this wood pellet-burning plant.[11]

2.3 Variable RES pipeline capacity vs country's announced target

SCORE: 8/15

The UK was on track to have an impressive capacity of renewables by 2030, but procurement slowed in the last year, rather than ramping up. The 2023 renewables auction failed to procure new offshore wind, and the next looks set to not make up the difference. Major planning barriers remain which hinder the rollout of onshore wind.

The UK has 128.4 GW wind projects in the pipeline, 92% of which risk not delivering (45.5 GW are only announced, 72.8 GW are in a pre-construction stage).

UK has 20.4 GW of utility-scale solar projects in the pipeline, 95% of which risk not delivering (3.3 GW only announced, 16.1 GW in the pre-construction stage).

[8] Ember, Electricity Data Explorer: United Kingdom **https://ember-climate.org/data/data-tools/data-explorer/**

[9] Ember, **Electricity Data Explorer** (online database; data retrieved April 2024)

[10] Ember, **Electricity Data Explorer** (online database; data retrieved April 2024)

[11] National Audit Office, January 2024, **The government's support for biomass**

Given how many projects are yet to enter the construction stage, the risk of not delivering on targets is high unless the financing and permitting processes can be facilitated.[12]

2.4 Average permitting time for VRE

SCORE: 8/15

In 2022 the government said that they would cut consent times for new offshore wind farms from four years down to one. It is unclear what progress has been made against this target.[13]

Benchmark 3: Adapting power systems to high RES share

SCORE: 71/120

The UK is making good progress to adapt the power system for a high capacity of renewables. In many places policies are in development or in the early stages of implementation. These policies now need to be delivered at pace and to a high standard to start having a real-world impact. For example, the promised support mechanisms for hydrogen to power and long duration storage need to be established and rapidly start funding projects.

3.1 Policies to limit curtailment to a minimum that ensures optimal RES capacity utilisation

SCORE: 8/15

Curtailment is on the rise and is raising the cost of managing the electricity system. Great Britain had 3.4 TWh of curtailment in 2022.[14] There are some actions underway to seek to address this, but more action is needed.

The government is looking to build new transmission lines and to accelerate planning and consent time, which will speed up the rollout of renewables and reduce curtailment. At a market design level, the government is considering the introduction of stronger locational pricing to reduce curtailment. The government is also looking to boost long-duration storage and demand side

[12] Based on the Global Energy Monitor data on planned solar and wind power capacity in the "announced" and "pre-construction" categories: Global Energy Monitor, **Global wind power tracker** and Global Energy Monitor, **Global solar power tracker** (both last updated December 2023)

[13] UK government, April 2022, **British energy security strategy** (PDF)

[14] Carbon Tracker, June 2023, **Britain wastes enough wind generation to power 1 million homes**

flexibility to permanently reduce these costs – although is yet to bring these mechanisms forward.

The electricity system operator for Great Britain, National Grid Electricity System Operator (National Grid ESO), has also taken steps to try and reduce the cost of curtailment. For example, they have introduced a Local Constraint Market[15] which pays consumers in Scotland to turn up their demand when renewables would otherwise be curtailed. It is important to note that Scotland is the location of the majority of renewable curtailment.

3.2 Active steps by the national grid operator to plan for short spells of 100% RE power

SCORE: 12/15

Great Britain's system operator, National Grid ESO, has a target to be able to operate periods of zero carbon operation by 2025 and a clean grid by 2035.

They have a set of programmes underway to trial how services currently provided by fossil fuel generators (like inertia and black start) can be provided by low-carbon assets.[16]

The government is currently consulting on National Grid ESO being mandated to create an electricity system operability strategy for 2035 to outline how this target will be met, and how system operability can be maintained.

3.3 Effective policies to ramp up electricity storage

SCORE: 7/15

The short-duration storage market is progressing, but barriers remain. The long-duration storage market is still nascent. Great Britain is still awaiting the creation of a support mechanism.[17]

Short- and medium-term storage is being deployed across the UK, with the market gradually building. Policies are underway to remove barriers – starting in 2017 through the Smart Systems and Flexibility Plan, which was updated in 2018 and 2021. This progress needs to continue amid the changing landscape.

[15] ESO, **Local Constraint Market** (webpage, accessed April 2024)

[16] ESO, **Network services procurement** (webpage, accessed April 2024)

[17] Department for Energy Security and Net Zero, March 2024, **Long duration electricity storage consultation**

The need for long-duration storage has been identified as an area in need of further development. There is not yet a route to market for these technologies, but a funding mechanism has been promised by the end of 2024.

3.4 Effective policies to increase end use flexibility

SCORE: 11/15

There are policies to enable and encourage demand side response (DSR), but the UK is yet to fulfil its full potential in this area. A wider range of policies are needed to fully realise the benefits.

There are both suppliers and aggregators in the UK offering flexibility propositions to consumers. Since the launch of the UK's Smart Systems and Flexibility Plan in 2017,[18] some of the barriers to DSR participating in markets have been removed. However, the penetration of smart meters is still relatively low, with only 54% of all meters in households and small businesses in Great Britain operating smartly by the end of 2023.[19] It is also still not clear whether DSR will become the norm for electric vehicle (EV) drivers without further intervention to educate consumers on these options, and ensure their accessibility.

Non-domestic DSR has struggled in recent years. Additional support and policies are needed to achieve this option's full potential.

3.5 Effective policies to accelerate grid development

SCORE: 7/15

The UK's electricity industry is suffering from chronic difficulties in connecting to the electricity network, with long delays and issues with "zombie" projects in the queuing system. Work is underway to try and resolve this, but the pace needs to accelerate.

The need to build additional transmission networks has long been highlighted, and has finally received high level political support. Processes are underway to plan where these new transmission lines should be built, but there are concerns these are still too slow. A set of reforms is to be introduced to try and accelerate

[18] UK government, 2017, **Smart Systems and Flexibility Plan**

[19] Department for Energy Security and Net Zero, March 2024, **Smart meter statistics in Great Britain: Quarterly report to end December 2023**

the process, which include looking to ensure communities are engaged early, and environmental assessments are an integral part of the process.

National Grid ESO has also taken steps to improve the use of the current networks through smart solutions. This is admirable progress, but there is still considerably more work to be done before the network issues are fully resolved.

3.6 Effective policies to enable the required digitalisation of power systems

SCORE: 10/15

The value of digitalising the electricity system has been identified and work is going on to embed this across several areas.

Great Britain has an Energy System Digitalisation Strategy and Action Plan.[20] The smart meter rollout is underway, though as mentioned, this is progressing slower than planned. Reforms are underway to modernise the retail market and promote smart tariffs.

Several taskforces have explored how data can be made more available throughout the industry, with particular focus on network companies. This has led to regulation to encourage networks to make data available.

National Grid ESO and the Distribution Network Operators are also trying to improve use of networks through digitalised flexibility markets. There is still more to be done to improve these Distribution System Operators' markets, making them more coordinated and outward facing.

3.7 Effective mechanisms or frameworks to prevent preferential treatment for fossil fuel-based generation over RES on the market

SCORE: 10/15

There have been several policies and frameworks which support the construction of renewables – including Contracts for Difference, feed-in tariffs, the Renewable Obligation, and various other market mechanisms to support deployment. However, there is also support being given to new gas power stations. There is not currently a clear process to decide where one is prioritised over the other.

[20] National Grid ESO, 2023, **The ESO Digitalisation Strategy and Action Plan**

3.8 Electrification rate target and roadmap to support delivery

SCORE: 6/15

There is no overarching target for electrification. The need to electrify housing, transport and some areas of industry has been highlighted. This has not yet been backed up with commensurate policy to deliver it – and many policies originally set out in the 2021 Heat and Buildings Strategy have recently been delayed and derailed.

The government has a target to install 600,000 heat pumps per year by 2028, but is not currently on track to deliver this – and regularly comes bottom of the league table for heat pump installations. Some recent steps have been taken to seek to increase deployment, such as by increasing the scale of the grant. This is welcome, but further policy action is needed to create a mass market – for example, by reducing heat pump running costs. Currently, levies paid on energy bills are disproportionately loaded on electricity, making it more expensive per unit than gas.

The sale of internal combustion engines is due to end by 2035, recently moved back from 2030. Nonetheless, this is an area where the UK is generally making steady progress. Further action could be considered to support more active travel and affordable public transport.

There is not yet policy to support the electrification of industry though the need has been highlighted. A lack of overarching plans for electricity and hydrogen is making it harder for industry to plan and invest, and as with households, the higher running costs of electricity can act as a disincentive for electrification.

Benchmark 4: Governance / International leadership

SCORE: 56/80

While the UK's target to decarbonise the power system by 2035 is welcome, it would benefit from being made clearer and more robust. It needs to be backed up by a more robust strategy for creating a net zero power system by 2035 (or sooner), including a focus on phasing out the use of gas. Engagement internationally has been positive, with examples of leadership, but there are opportunities for the UK to go further.

4.1 2035 carbon neutral power system commitment adopted in national legislation

SCORE: 8/10

The UK is committed to decarbonising power by 2035 "subject to security of supply".

This caveat makes the target vaguer and less robust. It allows the government to achieve its target while still having substantial emissions from unabated gas power stations.

4.2 Global leadership on supporting power systems decarbonisation in developing countries

SCORE: 7/10

The UK has shown good leadership in this space in many ways, but the lack of funding for Just Energy Transition Partnerships (JETPs) needs addressing.

The UK has taken a welcome leadership role in the Clean Energy Transition Partnership and the Clean Green Initiative. It has also shown signs of positive leadership on JETPs, but this is limited as the UK has failed to follow up with the promised funding.

The UK had made welcome high-level statements of support for decarbonisation such as the Clean Green Initiative and the G7 statement on phase-out of international financing for unabated coal.

4.3 International commitments on power systems decarbonisation through alliances or networks such as the PPCA, Glasgow Coal to Clean Power Initiative, etc.

SCORE: 8/10

The UK has made clear international commitments to phase out coal and has engaged with several networks to promote this action.

The UK has engaged with the Powering Past Coal Alliance (PPCA) and The Clean Energy Transition Partnership, and has provided clean energy transition support through the Energy Transition Council.

UK participation in other fossil fuel related diplomatic initiatives beyond the power sector such as Beyond Oil and Gas Alliance (BOGA) would be helpful in

securing a more joined up, comprehensive approach among these different initiatives and help strengthen UK leadership. Disappointingly, this hasn't happened yet as the current government is still encouraging new oil and gas production in the North Sea basin.

4.4 Net zero power system roadmap to drive delivery of the 2035 commitment

SCORE: 6/10

The UK has released several high-level strategies for decarbonising the power sector. There now needs to be a much more coherent roadmap on rollout and implementation.

The country has produced several policy documents relating to power decarbonisation. However, independent government advisors at the Climate Change Committee and National Infrastructure Commission warn that a clearer plan is needed.

The Climate Change Committee have said that the government "has not yet provided a coherent strategy to achieve its goal nor provided essential details on how it will encourage the necessary investment and infrastructure to be deployed over the next 12 years. This is urgently needed."[21]

The UK government has released several reports, notably the Energy Security Strategy 2022 and the Strategic Policy Statement. It has also set up the National Energy System Operator.

4.5 Critical role of renewables, interconnection, and demand side measures reflected in the country's energy security framework

SCORE: 8/10

Policy generally supports the deployment of renewables, interconnectors, energy efficiency measures and DSR, and acknowledges their value in boosting energy security.

Since the start of the gas crisis, the government has identified the value of renewables in boosting energy security by reducing the country's reliance on international commodities. There has also been work to boost DSR. This has included work to ensure they are properly considered within energy security arrangements and can fully participate.

[21] Climate Change Committee, 2023, **Delivering a reliable decarbonised power system**

The UK has targets for energy efficiency but is failing to meet them. It also rarely considers the value of energy efficiency in the context of the electricity system and there is no mechanism for it to be valued for its contribution to energy security.

4.6 Unabated coal phase-out date and roadmap to support delivery

SCORE: 10/10

The UK aims to have entirely phased out unabated coal power stations by the end of 2024.

The UK is on track to meet its target. Coal generated only 2% of UK electricity in 2022, a reduction of 94% from 2010.[22] There is now only one coal power station still open in the UK – Ratcliffe on Soar power station – and it is set to close in September 2024.[23,24]

4.7 Unabated gas phase-out date and roadmap to support delivery

SCORE: 0/10

The government does not have a target date to fully phase out gas use in the power sector. While it has a 2035 target to decarbonise power, the way this target is defined still allows for continued use of gas. It also does not have a strategy as to how it will reduce gas use and take gas power stations offline by 2035.

The UK has a target to decarbonise power by 2035 subject to security of supply, however it does not have a clear target to phase out gas power stations or a roadmap to fully reduce their use. To reduce the need for gas power stations, support mechanisms need to be set up for low-carbon flexibility assets, such as hydrogen to power and long-duration storage.

The UK is also considering introducing emissions limits for gas power stations. These may apply from 2034 for any new gas power stations procured through the Capacity Market after 2026.

The government is also considering requiring new gas power stations to be built able to decarbonise. Much more work is needed to introduce this policy, to pull

[22] Ember, March 2023, **The UK's coal to clean journey**

[23] Power Stations of the UK, **Coal countdown** (webpage, accessed April 2024)

[24] Uniper, February 2023, **Clarification on Ratcliffe on Soar power station closure date**

it into a single coordinated strategy and to ensure it is sufficient to meet the target.

4.8 2030 target for share of total RES in electricity generation

SCORE: 9/10

The UK has various targets for renewable energy generation, although it lacks an overarching target and a specific target for onshore wind. Nonetheless, the current targets for renewables roughly equate to over 80% clean power by 2030.

Great Britain has a target to deploy 50 GW of offshore wind by 2030 and 70 GW of solar by 2035. The Scottish Government has a target to deploy 20 GW of onshore wind by 2030.

Northern Ireland has a target for 80% of consumed electricity to come from renewable sources by 2030, as well as technology specific targets.

There is no target across the other areas of the UK for onshore wind or the overall proportion of energy to be supplied by renewable sources. There is also a UK target for there to be 24 GW of nuclear power in 2050.

Benchmark 5: Reducing energy waste

SCORE: 50/80

The current government has set an ambition to reduce energy demand by 15% from 2021 levels by 2030. However, there is no overarching strategy to deliver the target and the current fragmented policies are struggling to deliver.

Despite problems, energy efficiency has improved over the past two decades. To continue and steepen the UK's trajectory of improvements, a more strategic approach and increased investment are needed.

5.1 Efficient policies to retrofit / renovate buildings

SCORE: 11/20

There are several domestic energy efficiency policies in place, but these are largely underdelivering. The policy landscape needs to be improved with greater focus on implementation particularly for badly insulated and low efficiency buildings.

By 2035, the government aims to have upgraded as many of the 15 million homes below Energy Performance Certificate level C (EPC C) as possible. If deployment continues at its current rate, it would take roughly 173 years to meet this target. England has a statutory target to upgrade as many fuel-poor homes as possible which are below EPC C before 2030.[25] At the current rate this will take around 73 years. Thus, there is a significant need to ramp up delivery, or these targets will be missed by a wide margin.

The UK also plans to improve the efficiency of domestic heating systems and reduce emissions by transitioning to electric heating, predominantly using air source heat pumps. The UK has an interim target to install 600,000 heat pumps a year in 2028. However, in 2022, the country installed only 55,000 heat pumps, meaning installations will need to ramp up significantly in the following four years to meet the target.

In the past decade, the UK and devolved governments have introduced 30 policies to improve the efficiency of buildings. Many of the policies are specific to each of the four devolved nations. These policies have struggled to deliver, often significantly underspending their budget. The reasons for this include a decade of reduced investment (2012–2022), a limited number of skilled installers, inconsistent and changeable scheme guidelines, a decade of cuts to local authority budgets and the high cost of delivering to new standards.

5.2 National energy / power savings target

SCORE: 11/20

There was a target to reduce energy consumption from buildings and industry by 15% by 2030 compared to 2021, which is suitably ambitious. However, it is unclear if the target is still in place, as there have been no public reports since its introduction in 2021. An Energy Efficiency Taskforce was set up to help the government to achieve the target, but it was disbanded shortly after its creation.

There is no policy strategy to show how the target will be achieved and the UK is currently not on track to meet this target.

[25] UK government, March 2015, **Cutting the cost of keeping warm – a fuel poverty strategy for England**

5.3 Sufficient spending on energy efficiency programmes

SCORE: 10/20

Though government investment in energy efficiency has increased recently from a very low level, there is an urgent need to boost delivery to meet the statutory fuel poverty target and the 2035 target for energy efficiency in domestic buildings. Also, these increases need to be partnered with improved policy design (discussed in 5.1) to be effective.

Investment in energy efficiency has increased in recent years, but this follows a significant fall in investment between 2012 and 2020 – which significantly damaged supply chains. The coalition government (2010–2015) drastically cut investment in energy efficiency, which has led to a reduction in the installer workforce. Targeted policies are now needed to boost skills and supply chains.

In 2020, investment in energy efficiency was increased substantially, and maintained. The government has promised another tranche of funding between 2025 and 2028 which will increase annual investment by around 5% or £100 million. These increases in investment are welcome, but need to be partnered with improved policy design (discussed above) to be effective. With improved delivery, the overall investment envelope needs to be increased significantly to meet targets on home decarbonisation and fuel poverty.

5.4 High-quality appliance and equipment standards and labelling

SCORE: 18/20

The UK has appliance and equipment standards and labelling through energy labels and Ecodesign. The energy labels have recently been re-scaled to reflect the higher energy efficiency of new appliances. The UK was ranked as having some of the best Minimum Energy Performance Standards of the world's large economies.[26]

[26] Clasp, January 2023, **World's best MEPS: Identifying top energy efficiency standards for priority appliances**

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About E3G

E3G is an independent climate change think tank with a global outlook. We work on the frontier of the climate landscape, tackling the barriers and advancing the solutions to a safe climate. Our goal is to translate climate politics, economics and policies into action.

E3G builds broad-based coalitions to deliver a safe climate, working closely with like-minded partners in government, politics, civil society, science, the media, public interest foundations and elsewhere to leverage change.

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