The Future of UK Base-Load Generation

Base-load generation is formed from nuclear, coal and gas power; due to their flexibility to ensure a reliable output. However, by 2025 a total of 15.4 GW of generation capacity will be offline, with a future 4.8 GW going offline by 2035. This is the result of the UK government’s zero coal target forcing all coal generation to be offline by 2025 and from current nuclear facilities reaching the end of their life cycle. With these changes taking place, the preparation of the electricity supply industry needs to be reviewed to ensure that no issues will arise.

The reduction of coal use has not been an issue for ensuring base-load generation is constant or to meet extra demand. In 2019 there have been significant periods of generation where coal has not been used at all. This has been due to the availability of renewable technologies as well as the cheaper prices and availability of gas power. The seven remaining coal power stations will be offline by 2025, however, this does not appear a concern. Electricity suppliers have prepared for the removal of coal by ensuring gas can be used in its place, which still has environmental consequences but does protect the base-load generation required. When a zero gas target is put in place, electricity supplies will look to new ways of providing base-load generation, likely from renewable energy.

The UK government met their 2020 target of producing 30% of its electricity from renewable technologies in 2018, with a total renewable capacity of 44.4 GW. There is a continual increase in renewable generation being connected to the grid, which could be used to provide more base-load generation. Due to improved predictability of wind, power produced from wind farms can be and is being used to provide base-load generation. Electricity suppliers are putting gas power stations offline to allow for periods of wind power to be used instead. This ensures that the base-load is met, while also reducing carbon emissions. However, electricity suppliers are not at a point where renewable generation can be solely relied upon for base-load generation resulting in nuclear power still playing a major factor.

Nuclear power has provided between 5-10 GW of base-load generation since 2018, which is roughly ¼-½ of the total base-load. The current nuclear capacity is 9.4 GW with half going offline by 2025 and the remaining going offline by 2035. Only 3.26 GW of capacity is under construction for completion by 2026, and 5.64 GW is planned and could be completed as late as 2035. This indicates that within the next 15 years there will be a serious reduction of nuclear generation currently available for the UK’s base-load. This needs to be considered by electricity suppliers when thinking about the future and what generation they use to meet base-load. Without more nuclear generation being secured or constructed quicker, a major proportion of the base-load generation will be missing, requiring electricity suppliers to find other means. This could arise from renewable energy, but due to its infrequency of constant generation output, it would not be suitable as a replacement. One solution for this is the increased implementation of battery storage technology.
The National Grid’s ‘Future Energy Scenarios’ predict the increasing use of battery storage in the UK network. In 2025, only 5 GW of storage is predicted. This provides some flexibility for electricity suppliers but is likely not to be enough. By 2035, storage is estimated to be between 7-17 GW. The larger numbers are a good sign to indicate that electricity suppliers could allow for power generated by renewable sources to be stored and then used to provide base-load generation. This will allow gas generation to be put offline permanently and cover missing generation from lack of nuclear new build.

Electricity suppliers have the preparations in place that will prevent any disruptions to base-load generation from occurring, from coal and nuclear power stations going offline in the near future. There is minimal cause for concern regarding the difference in nuclear supply, however, with a focus on renewable energies and battery storage, a balance can be made to provide a clean and reliable base-load generation in the UK.