The Great Texas Blackout is a warning; we must be prepared for a Dunkelflaute in the UK

At the time of writing some four million Texans are reportedly without power in freezing conditions. Winter storm Uri and a loop in the jet-stream bringing the polar vortex south, have led to record-breaking low temperatures across parts of the southern US. Rising electricity demand coupled with failure of power stations mean that the grid operator, the perhaps ironically named Electric Reliability Council of Texas (ERCOT), is unable to balance demand and supply. **They have so far avoided complete grid failure through a system of rolling blackouts, but this is cold comfort for those freezing in the dark. For those of us observing their difficult situation from afar this begs the question, could we be next?**

It will take some time to understand exactly what went wrong, but it seems that the generators were not prepared for such cold weather. **Around one-third of generation capacity is unavailable, apparently as a result of the freezing conditions.** Initial reports blamed frozen wind turbines, but the failures appear to cover all technologies including coal, gas, nuclear and wind. The fact that ERCOT is an island grid with very limited interconnection to the two other US grids is further compounding the problem, as it prevents Texas from receiving power from other parts of the country.

Some commentators have blamed low revenue for ERCOT's lack of new capacity and failure to maintain existing plants. In common with many power systems, ERCOT has seen a surge in renewable energy over the past 10 years, to the extent that traditional coal generation has been overtaken by wind in terms of energy production, and falling photovoltaic prices are likely to reduce fossil fuel generation further.

So, what can we learn from Texas? The most obvious lesson is not to ignore Black Swan events. Power systems need to be resilient to rare events, whether they are weather related, medical pandemics or a computer hack. In Germany there is growing fear of *Dunkelflaute* or dark doldrums – periods of days or weeks in winter when there is neither wind nor sun to power the grid.

In UK our power network is vulnerable to flooding, although measures are being taken to make the grid infrastructure more resilient, taking into account the impacts of climate change. We are also vulnerable to *Dunkelflaute*, possibly occurring at the same time as in Germany. In the last two Beasts from the East the wind has kept blowing, keeping grid supply from wind farms at high levels. However, in February 2018 we came close to load shedding: huge gas demand for heating coupled with delivery problems meant there was insufficient gas to supply our power stations. The lights were kept on by wind energy and our dwindling fleet of coal-fired generators, which have their own stockpiles of coal. **In 2025, once we have lost all of our coal and most of our nuclear generators, we may not be so lucky. If a continental high pressure weather system extends across the North Sea and the wind stops blowing, we could suffer the same fate as the Texans.**

Our strategy to deal with this involves more interconnections with continental Europe. This works well most of the time, allowing imports when required and in future, export of our surplus renewable energy. **However, we cannot bank on it being summer in Europe when it is winter here.**

As in Texas, falling plant factors mean that our remaining gas generators are receiving reduced revenue from energy sales. It seems unlikely that energy revenues will justify building new gas generation, and possibly will not support keeping existing plants open. National Grid is finding some plant contracted in the Capacity Market is not available when needed.

Our planners need to ensure that adequate supply is always available from domestic sources. This is likely to be a mix of predictable renewables, storage, modular (and preferably dispatchable) nuclear and back-up generation.

The main lesson learned from Texas is the need to plan and build for rare events. It provides insurance that may be seldom used, but as we increase our reliance on electricity, the consequences of grid failure become more serious. Such insurance comes at a price but following the events of the past days many in Texas will wish they had paid a bit more for grid resilience.