IMPORTING, SURE, BUT FROM WHERE?

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Overview

Traditionally, in the European electricity industry, the focus has not been on capacity adequacy. Indeed, before the wave of deregulation throughout the nineties and early this century, the sector was composed of national monopolies, whose main responsibility was to plan generation capacity in order to insure a sufficient supply. It would have been particularly embarrassing for any government to incur blackouts, or be forced to implement planned outages. Consequently, at the start of the deregulation process most national monopolies were characterised by healthy reserve margins. However, these have eroded slowly over the last two decades for a number of reasons. On the one hand, there have been political decisions to accelerate the closure of nuclear generation plants for safety reasons in a number of jurisdictions, thereby reducing existing capacity. On the other hand, the rush towards large quantities of intermittent renewable generation, often heavily subsidised, has led to periods of relatively low prices. This, combined with frequent changes in governmental policies, leading to a high degree of uncertainty, has made investment less attractive. Reluctance to build new coal power plants, or thermal plants in general due to pollution worries, combined with the intermittency of the most common renewables are accelerating the trend towards lower capacity margins.

Given this evolution, should we expect Europe to face capacity adequacy problems in the medium to longer term? Most people would have considered this question a purely theoretical one just a decade ago, when most countries still had large reserve margins, interconnection capacity was being expanded rapidly, and neither a rapid growth in renewables, nor the early closing nuclear generation were on the table. The EU was promoting its single electricity market which, despite an initially slow uptake, was making progress, and we are witnessing a growth in cross-border trade, with increasing price convergence. However, today a number of national regulators are realising that their country may face a capacity shortage at certain times, in particular winter evenings. An often heard reaction is assurances concerning the ability to rely on interconnectors to import electricity from neighbouring countries. This raises several questions, which are the focus of this article: (i) To what extend can a country rely on imports from its neighbours? (ii) What are the consequences of the decreasing "diversity" of generation technologies? And (iii) Are policy makers in European countries ready to accept a situation where "national" capacity does not allow sufficient generation to meet national demand at certain times, in particular during winter evening peaks?

Methods

We have analysed a number of long-term assessment reports from different regulators in Europe, as well as studies performed for interconnected countries, e.g., the Pentalateral Energy Forum. We have also looked at academic forecast and other literature focussing on these issues.

Results

Country specific reports consider a variety of time-horizons, up to 10 years, and estimate future capacity adequacy under different conditions. This includes, e.g., the UK regulator, whose reports in recent years have expressed serious concerns about capacity adequacy. The same observation applies to regulators in, among others, France, Belgium, and Scandinavia. There are many examples of regulators stating, implicitly or explicitly, that their country will need to rely on imports in some periods.

Most of these reports indicate a concern that, in a relatively near future, there will be periods, ranging from hours to potentially days, where national generation capacity will be insufficient to satisfy demand, but express confidence that imports will be available as their neighbours will make the necessary investments. For instance, in the UK, National grid writes in its Winter outlook report 2018/2019 that *"Based on this year's modelling of GB and interconnected markets, we have assumed 2.6 GW of net import flows to support GB supply adequacy this winter."* (National grid, 2018, p.14). The Swiss Federal council states in a 2017 report on the impact of the EU energy policy on Switzerland that *"given the existing transmission capacity, Switzerland should not fear a supply shortage, even with a very cold winter and a dry year"* (p. 9, own translation), but adds in the next sentence that without imports, Switzerland would be unable to cover its own consumption for over 1,000 hours per year.

The tendency of smaller countries to rely on the ability to be able to import from their neighbours is also apparent in the 2017-2027 adequacy report of the Belgian grid operator Elia: *"It is assumed that the larger countries (Germany, France, Great Britain) cannot afford to depend on their neighbours for their security of supply, or depend on them in a limited way (as is the case for France). Additional closures in those countries give rise to a replacement by gas plants so as to keep adequacy."* (Elia, 2016, p. 46, own translation). This same report assumes that French nuclear capacity will be reduced by only 7GW by 2025, which rests on the hypothesis that the EPR from Flamanville will come on-line before that date, a rather optimistic assumption.

Conclusions

Capacity adequacy has been a central theme in the electricity sector in recent years. While during the monopoly era excess capacity could easily be financed by the (regulated) price, since deregulation prices are market based and capacity decisions (both new investments and retirement of old capacity) are driven by expected returns. While regulators are righty concerned about future capacity adequacy, the most commonly proposed solution, importing from neighbouring countries during periods of shortage, may not be viable, for a number of reasons.

(i) Over the last decades, we can observe that the diversity of generation portfolios has become smaller, both within and across countries. This implies that production patterns, particular from intermittent renewables, become increasingly aligned between countries. In other words, the probability that neighbouring countries face a shortage at the same time increases. To make matters worse, as pointed out by Elia (2016), peak demand tends to occur "*in winter in the absence of sun and often under conditions of severe cold when wind generation is low"* (Elia, 2016, p. 56, own translation).

(ii) This evolution may lead to situations where, in periods of tight capacity, and despite the existence of regional markets, the fear of simultaneous shortages induces countries to take preventive measures to protect the integrity of their own system, making the “importing” strategy unreliable.

(iii) With nuclear plants being gradually phased out, and investment in thermal generation becoming less profitable, intermittent generation technologies are increasing their share of both installed capacity and generation. In the absence of a cheap, efficient way to store electricity, the likelihood of countries being unable to satisfy national demand at specific times (in particular cold winter evenings) is increasing. While batteries and pumped hydro storage offer an option for short-term storage, these technologies are not yet profitable for the inter-seasonal storage that would be required to absorb excess summer PV to be used in winter.

Consequently, overreliance on the possibility to import electricity during a crunch could be a dangerous strategy as the different interconnected countries may need to import at the same time. Our conclusion is that regulators must take extreme care when analysing future capacity adequacy, paying particular attention to the need to maintain sufficient thermal reserves, at least until large-scale storage solutions are developed and implemented. This means that regulators will most likely have to consider how to subsidies the required thermal capacity.

References

Elia (2016), Étude de l’adéquation et estimation du besoin de flexibilité du système électrique Belge, Période 2017-2027

Conseil fédéral (2017), Incidences de la politique énergétique des pays de l’UE sur la sécurité d’approvisionnement en électricité et sur la compétitivité en Suisse

National grid (2018), Winter outlook report 2018/2019