[*CONVENTIONAL POWER SYSTEM FLEXIBILITY IN GERMANY]*

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Overview

The integration of fluctuating renewable power generation in Germany's changing power system requires extended balancing options. Conventional power plants are currently providing system flexibility (balancing power, spot-markets). In a future power system with negative and highly changing residual loads the requirements for flexibility will be more complex. Without a sufficient storage solution flexibility will become the important variable to guarantee security of supply. This study aims to assess the current conventional flexibility in Germany and to outline economic and policy implications.

Methods

This study uses a bottom up approach in order to assess the conventional flexibility. In a first step the author identifies the key parameters for describing the flexibility of conventional power plants: start-up time, technical minimum power output and rate of power output change. In a second step the author defines flexibility profiles for each generation technology taking into account several technical aspects influencing flexibility. To describe the German power plant fleet a database providing specific data for every single power plant is used. A estimation of the flexibility is then evaluated based on best-case and worst-case scenarios.

Results

Altogether Germany's conventional power plant fleet has a capacity of 102 gigawatts, representing 58% of the country's overall capacity. A first analysis of the flexibility of Germany's conventional power generation estimates a maximized power output change of 50 to 66 gigawatts within 20 to 40 minutes. Most of the conventional power plants need to generate at minimum power output in order to provide this flexibility. To guarantee the whole flexibility a minimal residual load of 36 to 52 gigawatts is necessary. Only gas turbines and hydropower stations are able to run from standstill. Those high flexible power technologies can supply 12 to 14 gigawatts in less than 15 minutes.

Conclusions

Even though the findings suggest a high available flexibility in the current situation, the discrepancy between best-case and worst-case scenarios proves the necessity to precise technological specifications of power plants. Due to trade secrets the information over the single power plants and there techno-economic data are not specific enough. Regarding such an important topic, at least Germany's Federal Network Agency for Electricity should claim for these data. Especially for the most flexible generation technology, gas fired power plants, the data is insufficient. Intersectional interweaving between the heat and the power sector, i.e. combined heat and power stations, makes it difficult to estimate the flexibility of thermic power stations. Furthermore fossil fuel fired power plants need a minimal power output in order to provide flexibility. In a future power system with a high share of renewable generation there will be no base load as we know today. This fact should be taken into consideration for designing markets and providing incentives for investment decisions.