

Title: Remuneration of Flexibility using Operating Reserve Demand Curves: A Case Study of Belgium

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Executive summary

Motivation. The recent proliferation of renewable resources has resulted in a decrease of electricity prices and a reduced remuneration of conventional units, which are progressively being retired from operations. This is occurring at the same time that renewable energy integration increases the need for flexibility in operations. Such flexibility can be provided naturally by conventional units. Operating reserve demand curves (ORDC) have been advocated as an economically justified mechanism for pricing flexible capacity in order to compensate conventional units for the loss of energy revenue, and the mechanism has been implemented recently in a number of US markets. The goal in this study is to quantify the impact of ORDC and assess its implementation possibilities in the European electricity market, with a specific focus on the Belgian electricity market which experienced severe shortage in capacity in late 2014.

Performed Research. With the exception of a few European electricity markets, there is no day-ahead co-optimization of energy and reserves in the EU market design. Reserves and energy are cleared sequentially, with reserve capacity auctions (typically weekly, monthly or annual) followed by day-ahead energy market clearing. We solve a unit commitment model with a monthly horizon, as a proxy of the Central Western European market design where reserve auctions are followed by the running of a day-ahead market clearing algorithm (known as EUPHEMIA). We then validate that this proxy fits reality by comparing the predictions of our model to observed outcomes in terms of dispatch by fuel and in terms of market prices.

We conduct a case study that covers the interval from January 2013 until September 2014. The Belgian system consists of 14765 MW of installed capacity. In order to estimate the profits of individual units, we use the historical energy and reserve prices and the output of the unit commitment model in order to estimate revenues and operating costs. We focus specifically on CCGT units, which are the main source of reserve in Belgium. The profits of CCGT units are computed for historical prices as they occurred over the duration of the study, as well as for profits that would have occurred if the ORDC price adder were applied to the energy price. These profits are compared against the running investment cost of a typical CCGT unit in order to ascertain the economic viability of CCGT resources.

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Conclusions. Three notable conclusions can be drawn from the analysis: (i) CCGT profits, as estimated by the methodology set forth in the present paper, are adequate for covering the variable costs of all existing CCGT units; (ii) CCGT profits are not sufficient for covering the investment costs of any CCGT unit. (iii) Adders, as computed in the study, could potentially render the majority (seven out of eleven) of CCGT units economically viable.

Potential Benefits, Applications, and Policy Implications. Discussions on whether energy-only markets or capacity remuneration mechanisms should be used to restore incentives to invest in the European power sector have been going on since several years without clear-cut conclusions. The Directorate General for Competition (DG COMP) of the European Commission and its Sector Inquiry provided a new element to the debate: according to DG COMP, capacity remuneration mechanisms, as implemented in the EU, are conducive of "State Aids" and hence cannot be used as a generic incentive for investment; they can be accepted in particular situations and only when properly justified. At the same time the power industry repeats that it sees those mechanisms as indispensable for remedying the lack of incentives to invest in the power sector. This dichotomy of positions justifies exploring whether a mechanism such as ORDC, which has been absent from the discussions so far, could help bridge or reduce the gap between these positions. Our study finds that ORDC reveals that value, using an instantaneous time granularity where the distinction between the capacity and energy markets evaporates and the value of scarce flexible capacity is expressed in the instantaneous price of energy. This principle can be at the origin of a full overhaul of the current system. It remains to be seen how far European competition authorities will be willing to use their power to achieve this needed overhaul.

Keywords Flexibility; Energy-only markets; Renewable integration; Operating reserves; Capacity remuneration.