Methodological paper:

Benefits from the application of the recommendation of the Agency on capacity calculation

This methodological paper has been reviewed in detail and assessed to be "adequate" and "robust" by an external expert.

ACER
Agency for the Cooperation of Energy Regulators

Trg Republike 3
1000 Ljubljana
Slovenia

If you have any queries relating to this document, please contact:

ACER
press@acer.europa.eu

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Content

1. Introduction

(1) This document is one of a set of documents describing various methodologies applied in the electricity wholesale markets volume of the annual ACER/CEER Market Monitoring Report (MMR), which is aimed at presenting the results of the monitoring of the performance of the internal electricity market in the European Union (EU).

(2) Market integration is expected to deliver several benefits. One of these is enhanced economic efficiency, allowing the lowest-cost producer to serve demand in neighbouring areas. This paper is aimed at estimating the gross market welfare benefits[1] of expanding cross-zonal capacity in Europe, in line with the Agency's Recommendation on capacity calculation methodologies.

2. General approach

(3) Commercial cross-zonal capacity is a crucial enabler for the internal electricity market. Improving the use of the existing network – for example, by mitigating discrimination between internal and cross-zonal flows – would improve market integration.

(4) Market integration is expected to deliver several benefits, one of which is improved economic efficiency, allowing the lowest-cost producer to serve demand in neighbouring areas. As a result, providing large capacity significantly improves market welfare.

(5) The Agency issued recommendations[2] related to cross-zonal capacity calculation, leading to the following main principles

- "limitations on internal network elements should not be considered in cross-zonal capacity calculation methods"

- "the capacity of the cross-zonal network elements considered in the common capacity calculation methodologies should not be reduced in order to accommodate loop flow"

(6) Relying on these principles, benchmark capacities may be computed[3]. Several European power exchanges[4] are then asked to simulate (with the price coupling of regions (PCR) project Euphemia[5]) the market benefits stemming from these cross-zonal capacities, assuming all other things equal.

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[1] Gross welfare benefit includes, first, the 'consumers' and 'producers' surplus gained by consumers and producers who participate in power exchanges (welfare is measured as the difference between the prices bid into the market and the matched prices obtained, multiplied by the quantity), and second, congestion rents. The first component measures the monetary gain (saving) that could be obtained by consumers (producers) because they are able to purchase (sell) electricity at a price that is lower than the price they would be willing to pay (offer) as a result of changes in cross-border transmission capacity. The second component corresponds to price differences between interconnected markets multiplied by hourly aggregated nominations between these markets. It is important to note that gross welfare benefits, as opposed to net welfare benefits, exclude all costs incurred by TSOs to make this cross-border capacity available to the market, as well as long-term benefits.

[2] See https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2002-2016.pdf

[3] See the methodological paper 'Benchmark cross-zonal capacity calculation', available at https://www.acer.europa.eu/en/Electricity/Market%20monitoring/Documents_Public/ACER%20Methodological%20paper%20-%20Benchmark%20cross-zonal%20capacity%20calculation.pdf.

[4] EPEX SPOT, Nord Pool Spot, GME, OMIE, OTE, OPCOM and TGE

[5] See https://www.epexspot.com/document/35380/PCR%20Standard%20Presentation%20-%20August%202016.pdf

(7)   Comparing these benefits with realised market benefits allows us to estimate the gross benefits deriving from the application of the Agency's recommendation on capacity calculation.

3. Calculation process

(8)   The potential gross welfare benefit from the application of the Agency's recommendation is computed by comparing hourly market welfares between two configurations. Historical market results describe the reference market welfare, whereas benchmark market results simulate the market outcome if cross-zonal capacities are computed in line with the Agency's recommendation.

(9)   Both market welfare values rely on detailed information describing market participants' order books[6] and available cross-zonal capacity for a full year. For the latter, the relevant available transfer capacity (ATC) and FB constraints[7] were used as a proxy for capacity that is effectively made available.

(10)   The benchmark scenario builds on the historical scenario. It relies on the same input data, except for cross-zonal capacities, which are replaced with benchmark NTC and FB data. For each NTC border, hourly ATC values are replaced with the benchmark NTC. In FB regions (namely Core (CWE)), a benchmark FB domain (ignoring internal network elements and allocation constraints) is used.

(11)   Using the PCR algorithm, which is used for clearing the single European DA price coupling of power regions, both market welfare values can be obtained. Comparing the two values allows us to estimate the gross short-term market benefit stemming from the application of the Agency's recommendation.

4. Caveats

(12)   When applying the aforementioned methodology, the following caveats and considerations apply:

- Orders and long-term nominations are assumed to remain the same for all hours between the two configurations. In particular, market price boundaries, as well as (supply and demand bid) curve shapes have a strong influence on the calculated welfare. Moreover, only one year is simulated; benefits may change from year to year due to factors such as the weather pattern and generation (or network) availability.

- Benefits are assessed for borders for which benchmark capacities are available (i.e. most of Continental Europe).

- Benefits are assessed for the DA time frame; other time frames (such as forward and ID markets, balancing and OTC exchanges) are not considered, thus underestimating the benefit.

- Benchmark capacity calculation is subject to its own caveats[8]

- Gross short-term benefits are estimated, while additional costs (such as additional redispatching costs) or long-term benefits (such as improved network and generation investments) are ignored

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[6] Supply offers and demand bids

[7] ATC values were used for borders where capacity calculation is CNTC-based, and FB constraints for the borders within the CORE (CWE) region (where FB capacity calculation is applied).

[8] See footnote 3.

5. Data

Table 1: Required data

Description	Unit	Time granularity	Geographic granularity	Source
Historical NTC	MW	Market time unit	Bidding zone border	ENTSO-E TP
Benchmark NTC	MW	Market time unit	Bidding zone border	ACER calculations based on ENTSO-E common grid models
Benchmark FB data : CNECs, PTDFs, RAMs		Market time unit	Bidding zone	ACER calculations based on CWE hourly critical network elements data
Order books	euro/MWh, MW	Market time unit	Individual orders	PCR (confidentially stored in simulation facility)