

# Investment thresholds for the capacity remuneration mechanism in Belgium: Experience from European countries

Report for SPF Economie, P.M.E., Classes moyennes et Energie

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# 1 Introduction

## Context

- 1.1 After the nuclear phase-out is completed in 2025, Belgium will need investment in firm and flexible capacity. To support such investment Belgium is setting up a Capacity Remuneration Mechanism (CRM). In order to enable new capacity to compete with existing capacity and to enter the market, multi-year capacity contracts can be awarded to capacity providers in case the investment required to make the capacity available exceeds a certain investment threshold (expressed as EUR/MW of capacity).
- 1.2 Regulatory authorities (regulator, TSO, Ministry for Energy) are discussing the right level for the investment thresholds allowing the award of long-term capacity remuneration contracts. Several proposals for the investment thresholds in the Belgian CRM were made as summarised in Table 1 below.

**Table 1: Propositions of investment thresholds for long-term capacity contracts**

<b>Contract duration</b>	<b>Thresholds proposed by CREG</b>	<b>New proposal from Belgian Government</b>	<b>Thresholds proposed by PwC</b>
<i>Years</i>	<i>€/kW</i>	<i>€/kW</i>	<i>€/kW(derated)</i>
15y	600	384	320
8y	400	255	212
3y	177	113	94

Source: *SPF Economie*

## Mandate

- 1.3 Compass Lexecon was mandated by SPF Economie, P.M.E., Classes moyennes et Energie to present an overview of the current debate associated with investment thresholds in Belgium and an economic analysis of capacity auction outcomes in relation to the eligibility of capacity units for long-term contracts in other European countries' Capacity Remuneration Mechanisms.

## Structure of the report

- 1.4 In this report we provide an economic analysis of the existing proposals of the investment thresholds and assess the threshold level that would be appropriate for Belgium based on the existing economic analyses of and the experience from other European countries with CRM.
- 1.5 In particular, the report develops the following elements:
- the economic justification of the CAPEX thresholds;
  - the current state of discussion on the CAPEX thresholds in Belgium; and
  - the experience with the CAPEX thresholds in comparable European CRMs.

## Key findings

- 1.6 First, the report recalls that investment thresholds to allow long-term contracts are justified in order to provide a level playing field for existing and new build units in a market-wide capacity

mechanism, and to incentivise investment by lowering financing costs for developers. On the other hand, too much capacity awarded with long-term contracts creates a risk of lock-in for a technology in the market, too little competition and extra costs for the final consumer. Therefore, the investment thresholds aim to strike the right balance between the expected advantages provided by the long-term contracts while mitigating their potential adverse effects.

- 1.7 Second, the report reviews the currently considered approaches to set the investment thresholds for the longest contract duration (15 years) in Belgium. One of the latest proposals prepared by PwC for the Government<sup>1</sup> relies on a country-specific assessment of the best new entrant technology that can fulfil the capacity need and results in a range between 320 and 420€/kW. Another approach is laid out by the Belgian energy regulator CREG in the proposal of Royal Decree.<sup>2</sup> Rather than providing a country-specific threshold, it is largely based on the assessment of the CAPEX threshold for a 15-year contract used initially in the Polish CRM and results in the value of 600€/kW.
- 1.8 Third, we find that the methodology to determine CAPEX thresholds for the longer-term contracts in other European CRMs generally aims at technological neutrality. The thresholds are often set at the lowest bound of the possible CAPEX range of the best new entrant or at a fraction of the average investment costs. Such approach is in line with the proposal of PwC and Belgian government. In contrast, the proposal of the CREG is largely based on a threshold established in Poland with a different range of best new entrant technologies, technology-specific costs and eligible CAPEX. We also note that Poland revised its threshold for the last completed auction. Applying CREG's approach to the latest Polish threshold would correspond to a 15-year threshold of 420€/kW.
- 1.9 Finally, the review of the experience of the European CRMs does not indicate that a relatively low investment threshold is associated with adverse effects on the market outcomes. In particular, the relatively low CAPEX thresholds used as the eligibility condition for 10 to 15-year capacity contracts do not seem to materially contribute to the reduction of competition in the subsequent CRM auctions. However, the competition in the subsequent auctions is reduced by the total amount of the capacity contracts with duration over one year, including the contracts with the intermediate (3-7-year) duration.

## **2 Economic justification of the CAPEX thresholds for long-term capacity contracts**

- 2.1 Investment thresholds are set to allow capacity participating in the capacity market to obtain a capacity contract with duration longer than the default 1-year capacity contract in case making the capacity available in the CRM delivery period requires significant investment. The objective of this arrangement is to:
- a. Create a level playing field for existing units, newly build units, and refurbished units; and
  - b. Allow the most CAPEX intensive capacity to secure long-term remuneration and lower their financing costs.

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<sup>1</sup> PwC (2019), Observations relatives au document de consultation publique de la CREG (19/11/2019)

<sup>2</sup> CREG (2019), Proposition d'arrêté royal fixant les seuils d'investissements et les critères d'éligibilité des coûts d'investissement en vue du classement des capacités dans les catégories de capacités

- 2.2 Several analyses of National Regulators<sup>3</sup>, the European Commission<sup>4</sup> and researchers, justify the use of long-term contracts in the CRM auctions by listing advantages such as:
- a. Reducing the investment risk in order to lower financing costs and, therefore, the overall costs of the power system for consumers;
  - b. Spreading the investment cost over a longer period of the capacity contract in order to lower the bid prices in the capacity auction;
  - c. Mitigating entry barriers for new entrants that cannot finance investment capacity with revenues from other plants in their portfolio;
  - d. Points b. and c. allow to increase competition in the capacity auctions and therefore control the total costs of the power system's adequacy for the final consumer.
- 2.3 On the other hand, several risks can be associated with the introduction of long-term capacity contracts:
- a. Lock-in of the CRM cost associated with long-term contracts may make the cost of CRM too high for customers in case the CRM prices decrease over time.
  - b. Lock-in a technology in the market, which can hamper the evolution of the mix (in relation to climate targets for instance) and innovations.
  - c. Decrease competition in future auctions, as long as the capacity with long-term contracts does not participate in these auctions.
- 2.4 The investment thresholds defining a condition for the eligibility for obtaining long-term capacity auctions are used in the market-wide capacity mechanisms in Europe to strike the right balance between the expected advantages provided by the long-term contracts creating a level playing field for new and existing capacity while mitigating the potential adverse effects on competition and lock-in effects.

### **3 The current state of discussion of the CAPEX thresholds in Belgium**

- 3.1 Below we present the current state of discussion on the CAPEX threshold in Belgium, including:
- The method suggested by CREG in the proposal of Royal Decree;
  - Reactions of interested parties;
  - PwC's analysis on behalf of the Federal Energy Administration; and
  - Latest proposal of the Belgian Government

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<sup>3</sup> *Idem*, p.24.

<sup>4</sup> European Commission (2016), Final report of the Sector Inquiry on Capacity Mechanisms, p. 92, §303, and

### The method put forward in the CREG's proposal

- 3.2 In its proposal of Royal Decree,<sup>5</sup> the CREG sets the threshold for the 15-year contracts at 600€/kW, relying on the references from other European CRMs, in particular, the CRM in Poland.
- 3.3 CREG focuses on the CAPEX threshold for the 15-year contracts, calling it "pivot" value. CREG's "pivot" value is based on the benchmark of other CRM with investment thresholds in Europe (see Table 2 below).

**Table 2: Benchmarks of investment thresholds for contracts >1 year used by CREG**

Country	Nb delivery periods (years)	Investment thresholds (€/kW)
Ireland	10	300
GB	3	153
	15	305
Italy	15	186 to 232
Poland	5	118
	15	706

Source: CREG

- 3.4 Given that the only expenses directly related to the physical characteristics of the investment are considered in the CAPEX calculation in Belgium, CREG applies a 20% discount on these thresholds and compares the discounted "pivot" values of 600 (derived from the Polish threshold), 250 (GB and Ireland) and 170€/kW (Italy), against the investment costs (and refurbishment costs) used by Elia in the 2019 Adequacy Study.<sup>6</sup>
- 3.5 Given that at a pivot value of 250€/kW or lower, all new technologies would be eligible to 15-year contracts, the CREG chooses to use the pivot value of 600€/kW. This value is largely based on the initial CAPEX threshold used in Poland. It should be noted that since CREG's proposal, for the auction with delivery year 2025, Poland's Regulatory Authorities lowered the threshold levels for long-term contracts to 520€/kW (2400 PLN/kW).<sup>7</sup>
- 3.6 Investment thresholds for 3 and 8-year contracts are calculated in order to equal the annuity of an investment with a 3-year (respectively 8-year) lifetime, with the one of 15-year lifetime.
- 3.7 Hence, the CREG proposed the following investment thresholds:
- a. For 15-year contracts: 600€/kW
  - b. For 8-year contracts: 400€/kW

<sup>5</sup> CREG (2019), Proposition d'arrêté royal fixant les seuils d'investissements et les critères d'éligibilité des coûts d'investissement en vue du classement des capacités dans les catégories de capacités, p.24.

<sup>6</sup> Elia (2019), Adequacy and flexibility study for Belgium 2020-2030

<sup>7</sup> Journal of Laws of the Republic of Poland N°1355, 2020, Regulation of the Ministry of Climate on parameters for the main auction for delivery year 2025 and the parameters for the additional auctions for delivery year 2022. [https://www.pse.pl/documents/20182/98611984/Regulation\\_on\\_parameters.pdf](https://www.pse.pl/documents/20182/98611984/Regulation_on_parameters.pdf)

c. For 3-year contracts: 177€/kW

#### **Reaction of interested parties<sup>8</sup>**

- 3.8 A number of interested parties have considered the thresholds proposed by CREG to be excessive and potentially, creating biased incentives for investment, making the most efficient new technologies ineligible for long-term contracts.
- 3.9 Febeg considered that these investment thresholds were excessive and that the assumptions of standard CAPEX per technology used by CREG were too high. Therefore, reaching the thresholds could prove more difficult than expected, especially for the newest most efficient CCGT units.
- 3.10 Febeg and GE Power pointed out that the investment thresholds proposed by CREG would lead new capacity developers to opt for less efficient, more costly technologies (choosing E and F class turbines instead of H/HA turbines).
- 3.11 Building on a study prepared by PwC<sup>9</sup> on behalf of the Federal Energy Administration which advises to lower the thresholds for 15-year contracts to between 320 and 420€/kW, market parties called for a re-evaluation of the investment thresholds.
- 3.12 CREG maintained its assessment of investment thresholds considering that the principle of technological neutrality had to be respected. Therefore, according to CREG, the fact that new-built efficient CCGT units might not obtain a 15-year contract is irrelevant to the determination of investment thresholds. CREG has rejected the argument that developers will turn to less efficient technologies in order to be granted a 15-year contract.

#### **PwC's analysis on behalf of the Federal Energy Administration**

- 3.13 In its 2019 analysis, PwC has proposed the CAPEX threshold for the 15-year contract eligibility between 320 and 420€/kW based on the technological neutrality principle set out in the CRM framework and the analysis of the CAPEX of standard generation technologies.
- 3.14 PwC's analysis starts with a benchmark of investment costs for new plants builds in Europe. Drawing from JRC ENTRI's 2014 study,<sup>10</sup> they identify that most new technologies would have investment costs (corrected by a 20% discount to follow CREG's methodology) above the highest proposed threshold of 600€/kW, except for:
- a. CCGT
  - b. OCGT advanced
  - c. Commercial solar >2MW without tracking
- 3.15 The analysis by PwC shows that, with the 600€/kW threshold, recent OCGT would not be eligible to 15-year contracts, nor would CCGT and Solar having investment costs situated in

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<sup>8</sup> All quotes in this section are taken from : CREG (2019), Proposition d'arrêté royal fixant les seuils d'investissements et les critères d'éligibilité des coûts d'investissement en vue du classement des capacités dans les catégories de capacités, ARTICLE 6, p. 24-34.

<sup>9</sup> PwC (2019), Observations relatives au document de consultation publique de la CREG (19/11/2019)

<sup>10</sup> JRC - ETRI (2014), Energy Technology Reference Indicator projections for 2010-2050, (<https://publications.jrc.ec.europa.eu/repository/bitstream/JRC92496/Idna26950enn.pdf>).

the low range. Figure 1 below shows in orange the technologies for which CAPEX does not reach the threshold levels proposed by CREG and in green the technologies for which CAPEX is below these thresholds.

**Figure 1: CAPEX of technologies (OCGT, CCGT and solar) relative to CREG’s CAPEX threshold proposals**

<b>Seuil 15 périodes (600 EUR/kW)</b>	<b>Low</b>	<b>Ref</b>	<b>High</b>
OCGT advanced	324	445	526
CCGT	566	687	768
Commercial Solar PV >2MW without tracking	526	687	728

<b>Seuil 8 périodes (400 EUR/kW)</b>	<b>Low</b>	<b>Ref</b>	<b>High</b>
OCGT advanced	324	445	526
CCGT	566	687	768
Commercial Solar PV >2MW without tracking	526	687	728

<b>Seuil 3 périodes (177 EUR/kW)</b>	<b>Low</b>	<b>Ref</b>	<b>High</b>
OCGT advanced	324	445	526
CCGT	566	687	768
Commercial Solar PV >2MW without tracking	526	687	728

Source: PwC

- 3.16 PwC concludes that the proposed threshold does not abide by the technological neutrality principle set out in the CRM framework.<sup>11</sup> Therefore, they recommend the following options for a revision of the “pivot” threshold for the 15-year contracts:
- a. Apply a conservative approach to continue incentivising plant developers to seek efficiency when investing. The “pivot” threshold could thus be set just below the JRC’s low estimation at 320€/kW; or
  - b. Consider JRC’s reference scenario and apply a discount, setting the “pivot” threshold at 420€/kW.
- 3.17 PwC has also cross-checked its conclusions with the data from Gas Turbine Handbook 2019,<sup>12</sup> to confirm the relevance of an investment threshold for 15-year contracts between 320 and 420€/kW.
- 3.18 Finally, PwC validates CREG’s methodology to derive 3 and 8-year contracts’ thresholds from the 15-year “pivot” value.

#### **Latest proposal of the Belgian Government**

- 3.19 Based on the available arguments and the PwC analysis, the Belgian government has proposed a 15-year contract CAPEX threshold at the level of 384€/kW.

<sup>11</sup> PwC (2019), Observations relatives au document de consultation publique de la CREG (19/11/2019), p.5.

<sup>12</sup> Gas Turbine World (2019), Handbook volume 34, section 5: “Gas Turbine Pricing”.

- 3.20 The Belgian government then further analysed<sup>13</sup> whether it is justifiable that new CCGT's cannot benefit from 15-year contracts and whether there would be unwanted effects if such projects would qualify only for an 8-year contract. It concluded that:
- a. Regarding competition, *“lowering the investment threshold to qualify for a 15-year contract, these larger and more efficient CCGT power stations are put in equal competition with other gas-fired power stations, so that the security of supply objective is achieved with fewer gas-fired power stations and, moreover, with less CO2 emissions”* and *“It is feared, and confirmed by some project developers, that limiting the contract period for large scale H-Class CCGT projects to 8 years will advantage large incumbent market parties”*<sup>14</sup>
  - b. Regarding costs, *“the closer the contract period is to the actual lifetime of the installations, the closer the bidding price will be to the actual missing money of the installations over their lifetime”* and *“even with a very low bid price as from 2033, the total cost of the CRM might exceed the cost [...] if these capacities were contracted for 15 years from the beginning.”*<sup>15</sup>
- 3.21 Thus, the Belgian government proposed to make sure that all new efficient CCGT would secure a 15-year contract by setting the “pivot” value at the lowest CAPEX assumptions of CREG discounted by 20%, i.e. 384€/kW. The thresholds for 8 and 3-year durations are determined as in the CREG's methodology.
- 3.22 Hence, the Belgian government proposed the following investment thresholds:
- a. For 15-year contracts: 384€/kW
  - b. For 8-year contracts: 255€/kW
  - c. For 3-year contracts: 113€/kW

## 4 Experience with CAPEX thresholds in the European market-wide CRMs

- 4.1 The objective of this section is to analyse the experience of the existing European market-wide CRMs to inform the determination of thresholds adapted to the Belgian market.
- 4.2 First, we analyse the main characteristics of the existing European market-wide CRMs in Poland, Italy, the Great Britain and Ireland and the methodologies used in these CRMs to determine the eligibility conditions for long-term capacity contracts, including the investment thresholds and the eligible capital expenditure. Where available, we also summarise the relevant discussions and reactions of interested parties on the investment thresholds in these markets.
- 4.3 Second, we analyse the outcomes of the European CRMs to assess technologies awarded with a long-term contract in each country and to assess the relationship between the investment thresholds and competition in subsequent auctions, the share of long-term contracts awarded in the auctions and the auction clearing price.

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<sup>13</sup> FPE Economie (2020), Case SA.54915 - Belgium capacity remuneration mechanism

<sup>14</sup> *Idem*, p.5.

<sup>15</sup> *Idem*, p.8.

- 4.4 As it appears that there is no disagreement about the CREG's methodology to derive the thresholds for 8-year and 3-year contracts from threshold value of the "pivot" 15-year contract, we will focus our analysis on the 15-year contract (and 10-year contract in Ireland) threshold in other European capacity markets to the extent such markets provide contracts of such duration.

**Main features of CRMs in Poland, Italy, Great Britain and Ireland**

- 4.5 We analyse four European CRMs featuring centralised market-wide CRMs in Poland, Italy, GB and Ireland. In this analysis, we focus on the approaches for the calculation of the CAPEX thresholds, as well as other eligibility criteria for long-term capacity contracts and assess the impact of the CAPEX thresholds and the long-term capacity contracts on the outcomes of the recent CRM auctions.
- 4.6 Table 3 below summarises the main features of the four considered centralised European CRMs.

**Table 3: Main features of the considered centralised European CRMs**

	Poland	Italy	GB	Ireland
Demand curve	Centralised			
Eligible capacity	Existing capacity not subject to any incentive scheme, New capacity, Demand Side Response, Interconnectors, subject to the Emission Performance Standard of 550gCO <sub>2</sub> /kWh according to the Electricity Regulation 2019/943			
Auction periods	Y-5 main auction 4 Y-1 auctions for each quarter of DY Secondary market	Y-4 main auction Y-3 to Y-1 adjustment auction Secondary market	Y-4 main auction Y-1 adjustment auction Secondary market	Y-4 main auction Y-1 adjustment auction Secondary market
Price/bid cap (per kW of derated capacity)	Bid caps: new installations 76-95€/kW (2021-2023)  existing installations 45-47€/kW (2021-2023)	Price caps: new installations 75€/kW  existing installations 33€/kW	Bid caps: New installations ~90€/kW existing installations ~30€/kW	Bid caps: existing capacity 46.15€/kW for DY22-23 new capacity 138.45€/kW for DY22-23 Changes with every auction
Pay-back obligation (Reliability Options)	No	Yes	No	Yes
Settlement	Pay-as-clear	Pay-as-clear	Pay-as-clear	Pay-as-clear for "in-merit" units Pay-as-bid for "out-of-merit" units selected for locational issues
Contract duration	1 year 5 years 15 years	1 year 15 years	1 year 3 years 15 years	1 year 10 years
LT contract investment threshold (€/kW)	706€/kW (2019) 524€/kW (2020)	200€/kW	305€/kW	300€/kW

Note: Reliability Option refers to a capacity contract, where the capacity provider is obliged to pay back to the auction operator the difference between the market price and the pre-defined strike price, when this difference is positive.

Source: All: European Commission & Poland: Dentons, Italy: Terna, GB: National Grid, Ireland: SEM

4.7 The four jurisdictions have broadly similar CRMs when looking at their global features. However both the detailed market design specificities of the CRM and the national specificities beyond the CRM configuration presented in Table 3 may influence auction outcomes: adequacy situations, capacity mix (e.g. more coal in Poland), degree of interconnection (e.g. isolated in Ireland/GB, less so in Italy and Poland), other market design issues (e.g. central dispatch and locational constraints in Ireland, zonal market in Italy). This report does not assess these detailed differences.

## Calculation of investment thresholds in the analysed European CRMs

- 4.8 Below we present the approaches used in each of the four studied European CRMs to set the CAPEX thresholds for the long-term contracts eligibility.

### *Ireland*

- 4.9 The approach adopted in Ireland to define the CAPEX threshold for the longest capacity contract is based on a 40% of the Best New Entrant's investment costs.
- 4.10 The SEM Committee as well as Regulatory Authorities estimated the proper investment thresholds (known as New Capacity Investment Rate Threshold, "NCIRT") to be eligible to contracts of 10 years considering that:

*"only plant making a substantial financial commitment equivalent to the commitment for a new build plant is able to obtain a multi-year Reliability Option. Multi-year ROs should not be available to plant making a minor refurbishment. However, the threshold should not penalise investors who are able to build efficiently at low capital cost."*<sup>16</sup>

- 4.11 The calculation of the NCIRT is based on gross investment costs for the best new entrant ("BNE"):

*"As described in the initial CRM parameters decision paper, NCIRT for the first transitional auction was set at approximately 40% of the gross BNE (Best New Entrant) cost, or €300,000/de-rated MW."*<sup>17</sup>

- 4.12 After re-evaluation of the BNE in 2018 for the 2022/23 T-4 capacity auction. The SEM Committee concluded there was insufficient evidence to support a change in the NCIRT. Therefore, the SEM Committee decided to retain the NCIRT at €300,000 / derated MW, in all subsequent auctions.
- 4.13 When the calculation was first set out in Consultation documents in 2017, the proposal was to set the NCIRT at 50% of gross BNE investment costs. Most respondents focused their criticism on the absence of a category for plant refurbishment. Some pointed out that the risks of inefficient investment and competition distortion would likely follow from such a threshold are too high.
- 4.14 One respondent suggested that a lower share of BNE investment costs should be selected in order to match more closely the ISO NE benchmark, given that the tenor of I-SEM capacity contracts was closer to ISO New England's than to Great-Britain's.
- 4.15 The final rules retained that proposition and set the NCIRT at 40% of the BNE gross investment costs.

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<sup>16</sup> SEM Committee (2020), *Capacity Remuneration Mechanism 2024/25 T-4 Capacity Auction Parameters and Compliance with the Clean Energy Package*, p.15, <https://www.semcommittee.com/sites/semc/files/media-files/2024-25%20T-4%20Parameters%20Consultation.pdf>

<sup>17</sup> *Idem*, p.16.

### Great Britain

4.16 The approach adopted in GB to set the CAPEX threshold for the longest capacity contract is based on the lower range of estimates of new-build capital expenditure.

4.17 The investment thresholds for the British capacity mechanism was determined considering that:

*“Each expenditure threshold is intended to allow substantial capital investment projects to come forward at a CM price that is competitive with other participants by providing greater revenue certainty over more of the project lifespan. However, a threshold set “too low” could subsidise non-additional projects, i.e. those that would have gone ahead anyway (albeit with shorter agreements). A threshold set “too high” may incentivise plants to choose more costly investment plans than necessary or exclude plants that could justifiably benefit from longer agreements.”<sup>18</sup>*

4.18 Therefore, authorities chose to set the threshold for new-build plant to access 15-year contracts at the lower range of estimates of new-build capital expenditure. The threshold for refurbishment plant to qualify for 3-year agreements is based on the cost estimate of installing Selective Catalytic Reduction (SCR) equipment on a coal plant, for the purposes of NOx abatement.

### Poland

4.19 The investment threshold was calculated to ensure technological neutrality. Based on Table 4 below presenting the investment costs of new build capacity in Poland, the authorities concluded that 15-year contracts would be awarded to new capacities with CAPEX above 3 million PLN/MW (670€/kW with a 4.5 exchange rate).<sup>19</sup>

4.20 For the last completed auction for delivery year 2025, Authorities published a new set of parameters including a revision of the investment thresholds for long and medium-term capacity contracts:<sup>20</sup>

*“The unit level of net capital expenditures related to the net attainable capacity, entitling to offer capacity obligations in the main auction for the delivery period relevant for the year 2025 for no more than:*

*1) 15 delivery periods by a new generating capacity market unit amounts to 2400 PLN/kW [~540€/kW];*

*2) 5 delivery periods by a new and refurbishing generating capacity market unit or a demand-side response capacity market unit amounts to 400 PLN/kW [~90€/kW].”*

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<sup>18</sup> Department of Energy & Climate Change (2015), Setting Capacity Market parameters, p.5, <https://www.gov.uk/government/publications/setting-capacity-market-parameters>

<sup>19</sup> European Commission (2018), State aid No. SA.46100 (2017/N) – Poland – Planned Polish capacity mechanism, p13.

<sup>20</sup> Journal of Laws of the Republic of Poland N°1355, 2020, Regulation of the Ministry of Climate on parameters for the main auction for delivery year 2025 and the parameters for the additional auctions for delivery year 2022. [https://www.pse.pl/documents/20182/98611984/Regulation\\_on\\_parameters.pdf](https://www.pse.pl/documents/20182/98611984/Regulation_on_parameters.pdf)

**Table 4: Average investment costs per technology used by Polish authorities (2018PLN/EUR rate = 4.25)**

Technology	CAPEX [kzł <sub>2018</sub> /MW]	CAPEX [k€ <sub>2018</sub> /MW]	Comment
Coal/Lignite	6 100	1 435	Supercritical pulverized coal 1 000 MW class unit without CCS.As regards lignite CAPEX related to mining is not included.
Existing coal modernization	50-1 350 median c.a. 300-350	12 - 318 median c.a. 71-82	Retrofit to best available technology (BAT) + lifetime extension BAT modernization range depending on boiler type as well as existing deNOx/deSOx facilities
Combined Cycle Gas Turbine	3 500	824	449 MW class power plant
Open Cycle Gas Turbine/ Gas engine (diesel)	2 500	588	Gas/oil fired 50 MW class turbine or 20 MW class engine
Biomass	13 800	3 247	5-10 MW class unit
Biogas (agriculture)	15 500	3 647	0.5-1 MW class unit
Biogas (landfill)	11 000	2 588	0.5-1 MW class unit
Gas engine CHP 1	5 500	1 294	1.5 MWe class unit
Gas engine CHP 2	4 400	1 035	5.5 MWe class unit
Gas engine CHP 3	3 800	894	25 MWe class unit
Combined Cycle Gas Turbine CHP 1	5 800	1 365	49 MWe class unit
Combined Cycle Gas Turbine CHP 2	4 700	1 106	149 MWe class unit
Coal CHP 1	11 500	2 706	10 MWe class unit
Coal CHP 2	10 000	2 353	20 MWe class unit
Coal CHP 3	7 200	1 694	50 MWe class unit
Biomass CHP 1	15 700	3 694	10 MWe class unit
Biomass CHP 2	13 400	3 153	20 MWe class unit
Biomass CHP 3	9 700	2 282	50 MWe class unit

Source: European Commission, State aid No. SA.46100 (2017/N) – Poland – Planned Polish capacity mechanism

#### Italy

4.21 In Italy, the investment threshold is calculated based on the methodology developed for the Irish Capacity market.<sup>21</sup> To be eligible to 15-year contracts, new capacity must register

<sup>21</sup> European Commission (2018), State Aid SA.42011 (2017/N) – Italy – Italian Capacity Mechanism, p.17, [https://ec.europa.eu/competition/state\\_aid/cases/270875/270875\\_1979508\\_218\\_2.pdf](https://ec.europa.eu/competition/state_aid/cases/270875/270875_1979508_218_2.pdf)

investment expenses not lower than 40% of the average investment costs of the best new entrant. The best new entrant in the Italian market is, according to a study by TSO Terna, an OCGT with a capacity between 50 and 150MW. These investment costs were estimated at between 465 and 580€/kW.

#### **Criteria for eligible CAPEX in the considered CRMs**

- 4.22 In addition to the CAPEX threshold calculation method, other conditions may be important in allocation of the long-term contracts, for example the criteria defining the eligible expenditure to be considered towards the CAPEX threshold. Below we present such criteria used in the four considered European CRMs.

##### *Ireland*

- 4.23 The Capacity Market Code identifies the eligible capital expenditure to include in the assessment against the NCIRT as the “*the cost per MW of for that capacity*”.<sup>22</sup>
- 4.24 Although the Market Code is unclear on this point, it is likely that this cost corresponds to the “Total Project Spend”, defined as follows, with no time limitation:

*“in respect of a new or refurbished Generator Unit or Interconnector, means the total amount of Capital Expenditure (excluding contingency) incurred, or expected in the reasonable opinion of the Participant to be incurred, either by the Participant or another person, in undertaking the relevant construction, repowering or refurbishment works and commissioning the new or refurbished Generator Unit or Interconnector so that it is in a position to provide the relevant Awarded New Capacity by the commencement of the first Capacity Year to which the Awarded New Capacity relates. For the purposes of this definition, Capital Expenditure shall be determined in accordance with International Accounting Standard 16.”*<sup>23</sup>

- 4.25 An older version of the rules stipulates that applicants to a 10-year capacity contract shall provide the regulatory authorities with proof “*that the investment is directly attributable to bringing into operation all or part of the equipment that is essential to the delivery of capacity by the Candidate Unit*”.<sup>24</sup>

##### *GB*

- 4.26 Eligible CAPEX are all expenses incurred by the project developer up to 77 months before the first delivery year, as such:

*“total amount of Capital Expenditure (excluding contingency) incurred, or expected in the reasonable opinion of the Applicant to be incurred (either by the Applicant or another person) with respect to the [capacity unit], between the date which is 77 months prior to the commencement of the*

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<sup>22</sup> I-SEM (2020), Capacity Market Code, version 4.0, Glossary p. 198.

<sup>23</sup> I-SEM (2020), Capacity Market Code, version 4.0, Glossary p. 198.

<sup>24</sup> I-SEM (2017), Capacity Market Code, Draft 5, p. 80, §E.5.1.2.

*first Delivery Year to which the Application relates and the commencement of the first Delivery Year”<sup>25</sup>*

- 4.27 Capacity providers must provide the regulatory authorities with a statement by an independent technical expert guaranteeing that the level of capital expenditure incurred for the construction of the capacity unit divided by the derated capacity of the unit is above (between or below) the investment threshold(s) for 15-y (3-y or 1-y) contracts.

*Poland*

- 4.28 Eligible expenses are CAPEX incurred up to 5 years before the commissioning of the new capacity. Important, to note that as stated by the European Commission : “*An exception is provided for the very first main auction, in which CMUs will be eligible for 5 or 15-year contracts on the basis of their CAPEX incurred since January 2014, i.e. since a few months after the announcement by the Government of its plans to introduce a capacity mechanism, and provided that the concerned CMU did not start generating electricity before 1 July 2017. This aims at avoiding potential new projects artificially delaying their development to take advantage of the long-term contracts.*”<sup>26</sup>

*Italy*

- 4.29 In line with the eligible capital expenditure in the Irish CRM, all project related expenses are to be communicated to the Regulatory Authorities to derive the project cost in €/MW and compare it to the 15-year threshold.

#### **Analysis of auction outcomes in relation to the investment threshold**

- 4.30 Below we provide our analyses of the outcomes of the CRM auctions in the four analysed CRMs and assess the extent to which these outcomes could have been driven by the allocation of the long-term contracts and the associated investment thresholds.

*Technology breakdown of new capacity awarded long-term contracts*

- 4.31 Figure 2 below shows the share of capacity awarded with contracts with duration over one year in the recent Y-4 CRM auctions held in the studied countries.
- 4.32 Gas fired units invariably represent the highest share of the capacity awarded with long term contracts, although storage accounted for almost 10% of awarded capacity in the GB. In Poland, however, a large volume of contracts with duration over one year was allocated to the coal capacity and the associated modernisation investments.

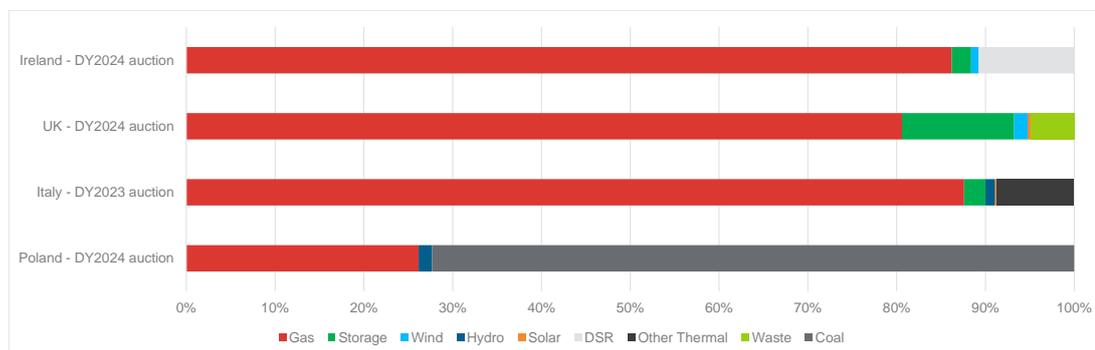
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<sup>25</sup> Department for business, energy and industrial strategy (2020), Capacity Market: Consultation on future improvements, p.48.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/862674/capacity-market-consultation-future-improvements.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862674/capacity-market-consultation-future-improvements.pdf)

<sup>26</sup> European Commission (2018), State aid No. SA.46100 (2017/N) – Poland – Planned Polish capacity mechanism, p.14.

**Figure 2: Share of technologies awarded with long term contracts in the recent auction**

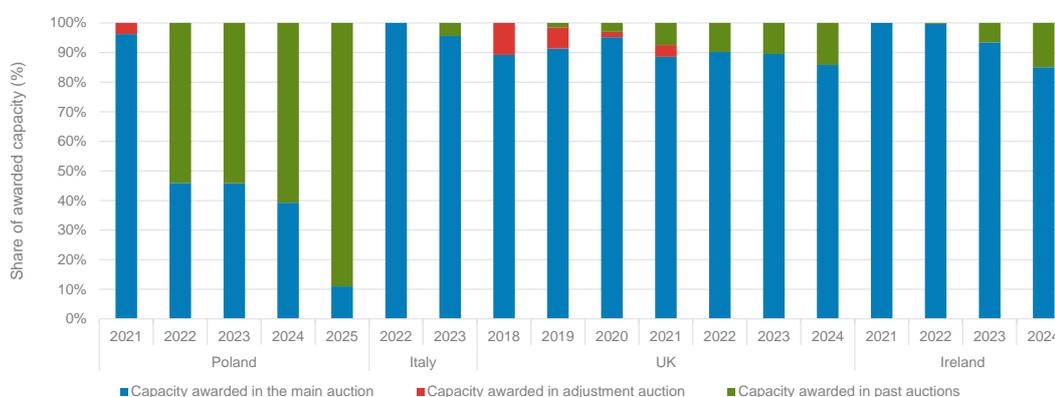


Source: Ireland: SEM-O, [Capacity auction results](#), GB: National Grid ESO, [EMR Portal](#), Italy: Terna, [Mercato della capacità : Rendiconto degli esiti - Asta madre 2023](#), Poland: [Biznesalert \(2019\)](#), [Forum Energii: The last such auction](#)

*Competition depletion in successive auctions*

- 4.33 Reduction of competition in the subsequent auction is frequently pointed out as a downside of the long-term capacity contracts. Below we provide insight on the relationship between the investment thresholds and the volume of contestable capacity in subsequent auctions.
- 4.34 In three of the analysed markets, namely Italy, Ireland and the GB, the share of capacity awarded in the past auctions for a given delivery year has remained well below 20%, ensuring a good level of competition in subsequent auctions despite the fact that their investment thresholds for the award of long-term contracts were the lowest.
- 4.35 On the contrary, in Poland, there was a rapid decrease of capacity awarded in the main auction for a given delivery year. This is due to the fact that a considerable share of capacity was eligible to receive medium-term contracts of 5 to 7 years and long-term contracts of 15 to 17 years. As soon as the first main auction for delivery in 2021, 8.3GW of capacity was awarded a 5/7-year contract over the 22.8GW contracted (40%). Another 4.1GW of capacity was awarded a 15/17-year contract (18%).

**Figure 3: Breakdown of awarded capacity for a given delivery year according to time of auction**



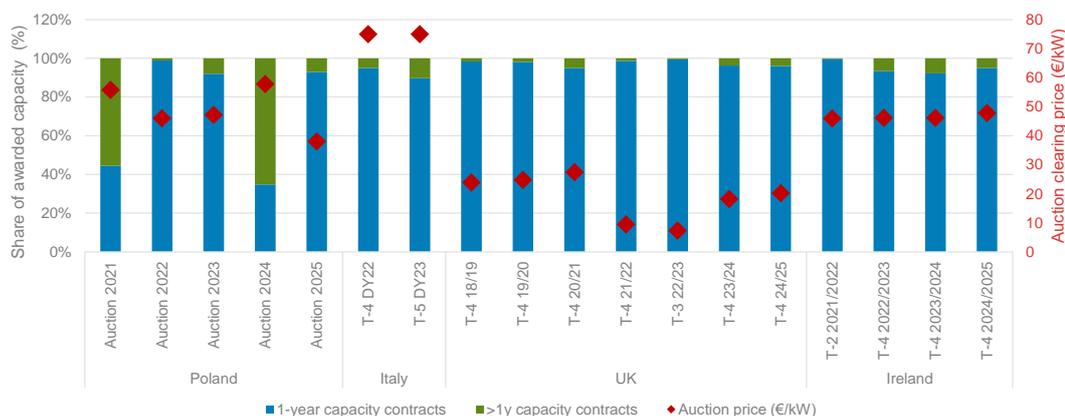
Note: Figure shows the volumes of capacity needed for a given delivery year depending on the auction in which they were contracted

Source: Ireland: SEM-O, [Capacity auction results](#), GB: National Grid ESO, [EMR Portal](#), Italy: Terna, [Mercato della capacità : Rendiconto degli esiti](#), Poland: [PolskieSieci Elektroenergetyczne, capacity auctions results](#)

### Share of long-term contracts and auction clearing prices

4.36 Figure 4 shows, for each main auction, the respective shares of awarded capacity with 1-year contracts and multi-year contracts as well as the auction clearing price.

**Figure 4: Breakdown of awarded capacity between contract duration (%), and auction clearing prices (€/kW)**



Notes: Figure shows the volumes of capacity awarded with 1-year vs. longer contracts in each main auction in four analysed countries, as well as the clearing price in each auction.

Source: Ireland: SEM-O, [Capacity auction results](#), GB: National Grid ESO, [EMR Portal](#), Italy: Terna, [Mercato della capacità : Rendiconto degli esiti](#), Poland: [PolskieSieci Elektroenergetyczne, capacity auctions results](#)

4.37 The conclusions that could be made from this analysis are as follows:

- In Italy, both auctions cleared at the price caps for existing and new units, which impedes any relevant analysis in relation to auctions clearing prices.
- In Ireland, the investment threshold allowed new units to compete effectively with existing units since the clearing price reached the existing unit bid cap in all auction but did not materially exceed it.
- In Poland, a higher share of long-term contracts and hence of clearance of the new and/or refurbished units appears to be associated with a higher clearing price.
- In the GB, in the first three auctions, the clearing prices grew with the share of long-term contracts awarded to new/refurbished capacity, while in the 21/22 and 22/23 auctions, prices sunk when close to no long-term contracts were awarded.

4.38 The relationship between auction clearing prices and the volume of cleared new and refurbished capacity obtaining contracts longer than one year observed in the GB and in Poland could suggest that the lower financing costs associated with long term contracts did not entirely bridge the competitive gap between the existing and the new/refurbished units.

## 5 Conclusion and recommendations

### Methodology of setting the CAPEX thresholds

5.1 In relation to the methodology, European experience with CRM auction seems to suggest that:

- The methodology to determine CAPEX thresholds for the longer-term contracts aims at technological neutrality,

- b. Therefore, the threshold is often set at the lowest bound of the possible CAPEX range of the best new entrant or at a fraction of the average investment costs.
- c. Beyond the CAPEX threshold, other eligibility criteria are important. For example, the possibility to qualify for a long-term contract based on the past investment can simplify obtaining such contracts by projects for which investment has happened prior to the first CRM auctions.

5.2 Such approach is in line with the proposal of PwC and Belgian government. In contrast, the proposal of the CREG is largely based on a threshold established in Poland with a different range of best new entrant technologies, technology-specific costs and eligible CAPEX. We also note that Poland has revised its threshold for the last completed auction. Applying CREG's method to the new Polish threshold would set the 15-year threshold to  $524 \times 0.8 = 420 \text{€}/\text{kW}$ .

### **Impact of the CAPEX thresholds on the CRM outcomes**

- 5.3 In relation to economic outcomes, European experiences show that:
- a. The CAPEX thresholds including the “pivot” contract thresholds resulted in contracts longer than 1 year awarded to predominantly gas capacity in GB and Ireland while a large proportion of coal capacity have obtained such contracts in Poland;
  - b. The European experience does not provide evidence of low investment thresholds hampering competition in the CRM auctions. The previously awarded contracts mostly reduced competition in Poland, where the investment threshold was relatively high and did not much reduce competition in GB, Ireland and Italy, where the thresholds are relatively low. It should also be noted that reduction of competition in Poland was partly driven by contracts with intermediate duration and the associated thresholds. Although the CRM in the GB also features intermediate duration contracts, the GB did not seem to experience competition depletion.
  - c. The information available from the European experience with CRMs does not provide evidence of the capacity price being lower in presence of longer-term contracts. Clearance of the capacity eligible for contracts of more than one year is often associated with a higher clearing price (Poland and GB). However, multiple other factors can drive the CRM clearing price beyond the contract duration and the CAPEX thresholds.

### **Recommendation for the Belgian CRM**

- 5.4 The report concludes that the methodology for setting the investment thresholds for the longest contract duration (15 years in Belgian case) should rely on a country-specific assessment of the best new entrant technology that can fulfil the capacity need. While PwC's assessment follows this approach, this does not seem to be case for the CREG's approach that is largely based on the initial assessment of the Polish CAPEX threshold for a 15-year contract.
- 5.5 The experience of the European CRMs shows that an investment threshold in the lower range is not associated with the reduction of competition in the subsequent auctions. However, it should be noted that the competition in the subsequent auctions is reduced by the total amount of the capacity contracts with duration over one year, including the contracts with the intermediate (3-7-year) duration.