Cross-product netting model for the Electricity Forward Market – sample calculations

In connection with the launch of the cross-product netting model for the Electricity Forward Market by Izba Rozliczeniowa Giełd Towarowych S.A. ("IRGiT"), we hereby present sample applicaitons of the netting mechanism, depending on the design of a contract portfolio.

According to the algorithms, after cross-product netting, initial margins are calculated based on net synthetic positions held by Clearing House Members in the relevant delivery period for a given contract type (BASE/PEAK/OFFPEAK). Net synthetic positions are determined while taking into account the fact that, from the point of view of delivery, a BASE type contract is equivalent to the sum of PEAK5 and OFFPEAK type contracts. Information on net positions and synthetic net position are included in the "Initial Margins" report in the clearing system.

All the presented designations and formulas refer to § 17a of the Detailed Clearing and Settlement Rules of the Exchange Clearing House (hereinafter: "Detailed Clearing and Settlement Rules"), which contains the rules for calculating cross-product netting on the Electricity Forward Market.

Example 1.

We are considering the following portfolio of BASE, PEAK5 and OFFPEAK contracts for the following <u>delivery periods</u> *and* (net positions), in which long positions (purchases) are presented as positive, while short positions (sales) are presented as negative ones:

$$BASE - Jan - 21 = BASE_i = 50$$

$$OFFPEAK - Jan - 21 = OFFPEAK_i = 0$$

$$PEAK - Jan - 21 = PEAK5_i = -100$$

1. According to § 17a item 4 of the Detailed Clearing and Settlement Rules, a BASE contract is decomposed into synthetic positions in PEAK5 contracts and OFFPEAK contracts (in accordance with Formula A):

Formula A

$$PEAK5_i' = BASE_i + PEAK5_i$$

$$OFFPEAK5_i' = BASE_i + OFFPEAK_i$$

Calculated synthetic position in PEAK5 and OFFPEAK contracts during the corresponding delivery period:

$$PEAK5_i' = 50 + (-100) = -50$$

$$OFFPEAK_i' = 50 + 0 = 50$$

2. Under § 17a item 6 of the Detailed Clearing and Settlement Rules, for delivery period *i*, the synthetic net position in a BASE contract is calculated (according to *Formula B*):

Formula B

$$BASE_i' = 0$$

The above case is presented in scenario d) in § 17a item 6 of the Detailed Clearing and Settlement Rules, in which the synthetic position in PEAK5 contracts ($PEAK5_i'$) is short, while the synthetic position in OFFPEAK contracts ($OFFPEAK_i'$) is long.

3. Under § 17a item 7 of the Detailed Clearing and Settlement Rules, for each delivery period *i*, the quantity of contracts corresponding to the synthetic net positions in PEAK5 and OFFPEAK contracts during the respective delivery period *i* after netting is calculated (according to *Formula C*):

Formula C:

$$PEAK5_i'' = PEAK5_i' - BASE_i'$$

$$OFFPEAK_i'' = OFFPEAK_i' - BASE_i'$$

The quantity of contracts corresponding to the synthetic net positions in PEAK5 and OFFPEAK contracts, calculated in accordance with the above formula for the analyzed case

$$PEAK5_i'' = (-50) - 0 = -50$$

$$OFFPEAK_i'' = 50 - 0 = 50$$

4. Under § 17a item 8 of the Detailed Clearing and Settlement Rules, for each delivery period *i*, the value of cross-product netting of the initial margin is calculated using the following formulas:

$$NW_{MP_{BASE_i}} = (|BASE_i| - |BASE_i'|) * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP}$$

$$NW_{MP_{PEAK_i}} = (|PEAK5_i| - |PEAK5_i''|) * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}$$

$$NW_{MP_{PEAK_i}} = (|OFFPEAK_i| - |OFFPEAK_i''|) * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}$$

Cross-product netting values calculated using the formulas above for the analyzed case (the value of the cross-product netting recognition parameter U_{MP} =100%):

$$NW_{MP_{BASE_i}} = (|50| - |0|) * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP} = 50 * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP}$$

$$NW_{MP_{PEAK_i}} = (|-100| - |-50|) * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}$$
$$= 50 * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}$$

$$NW_{MP_{OFFPEAK_i}} = (|0| - |50|) * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}$$
$$= -50 * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}$$

Summary:

By applying the principal assumption of the cross-product netting mechanism, which is the equivalence of a BASE contract and the sum of PEAK5 and OFFPEAK contracts from the delivery point of view, 50 BASE purchase contracts for the analyzed delivery period were decomposed into 50 PEAK5 purchase contracts and 50 OFFPEAK purchase contracts, resulting in the synthetic position in BASE contracts equal to 0. When we apply the positions resulting from the decomposition of BASE contracts into PEAK5 and OFFPEAK contracts (50 purchase positions for both contracts) to the positions held in reality (-100 for PEAK5 and 0 for OFFPEAK), we net them, arriving at the synthetic net position in PEAK5 contracts for the delivery period in question equal to -50 and the synthetic net position in OFFPEAK contracts for the delivery period in question equal to 50.

Table 1 presents the change in the balance of positions held after cross-product netting:

Table 1.

Delivery period	Number of positions before netting	Number of positions after netting	Netting benefit*
BASE-Jan-21	50	0	50
PEAK-Jan-21	-100	-50	50
OFFPEAK-Jan-21	0	50	-50

*Number of positions eliminated by using cross-product netting. Negative values mean an increase in the number of positions.

Simulation of benefits from cross-product netting for the example presented above, using market data as at 1 July 2020

a) Value of the required initial margin for each delivery period <u>before</u> the cross-product netting mechanism is applied:

Delivery period	Net positions	Number of hours per delivery period (h)	Clearing price (Kr)	Risk parameter (P)	Initial margin (PLN)
BASE-Jan-21	50	744	242.95	4.5%	406,698.30
PEAK-Jan-21	-100	285	286.1	6.32%	515,323.32
OFFPEAK-Jan-21	0	459	210.5	8.48%	0.00
The value of the required initial margin (sum):					922,021.62

b) Value of the required initial margin for each delivery period <u>after</u> cross-product netting is applied:

Delivery period	Net positions	Number of hours per delivery period (h)	Clearing price (Kr)	Risk parameter (P)	Initial margin (PLN)
BASE-Jan-21	0	744	242.95	4.5%	0.00
PEAK-Jan-21	-50	285	286.1	6.32%	257,661.66
OFFPEAK-Jan-21	50	459	210.5	8.48%	409,666.68
The value of the required initial margin (sum):					667,328.34

<u>Profit resulting from the application of the cross-product netting mechanism:</u>

922,021.62 – 667,328.34 = **254,693.28 [PLN]**

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Example 2

We are considering the following portfolio of BASE, PEAK5 and OFFPEAK contracts for the following <u>delivery periods</u> *and* (net positions), in which long positions (purchases) are presented as positive, while short positions (sales) are presented as negative ones:

$$BASE - Jan - 21 = BASE_i = -50$$

$$OFFPEAK - Jan - 21 = OFFPEAK_i = 60$$

$$PEAK - Jan - 21 = PEAK5_i = 60$$

1. According to § 17a item 4 of the Detailed Clearing and Settlement Rules, a BASE contract is decomposed into synthetic positions in PEAK5 contracts and OFFPEAK contracts (in accordance with Formula A):

Formula A

$$PEAK5'_i = BASE_i + PEAK5_i$$

$$OFFPEAK5'_i = BASE_i + OFFPEAK_i$$

Calculated synthetic position in PEAK5 and OFFPEAK contracts during the corresponding delivery period:

$$PEAK5'_i = (-50) + 60 = 10$$

$$OFFPEAK'_i = (-50) + 60 = 10$$

2. Under § 17a item 6 of the Detailed Clearing and Settlement Rules, for delivery period *i*, the synthetic net position in a BASE contract is calculated (according to *Formula B*):

Formula B

$$BASE'_i = MIN(PEAK5'_i; OFFPEAK'_i) = 10$$

The above case is presented in scenario b) in § 17a item 6 of the Detailed Clearing and Settlement Rules, in which the synthetic positions in PEAK5 ($PEAK5'_i$) and OFFPEAK contracts ($OFFPEAK'_i$) are long.

3. Under § 17a item 7 of the Detailed Clearing and Settlement Rules, for each delivery period *i*, the quantity of contracts corresponding to the synthetic net positions in PEAK5 and OFFPEAK contracts during the respective delivery period *i* after netting is calculated (according to *Formula C*):

Formula C:

$$PEAK5''_i = PEAK5'_i - BASE'_i$$

$$OFFPEAK''_i = OFFPEAK'_i - BASE'_i$$

The quantity of contracts corresponding to the synthetic net positions in PEAK5 and OFFPEAK contracts, calculated in accordance with the above formula for the analyzed case

$$PEAK5_i'' = 10 - 10 = 0$$

$$OFFPEAK_i'' = 10 - 10 = 0$$

4. Under § 17a item 8 of the Detailed Clearing and Settlement Rules, for each delivery period *i*, the value of cross-product netting of the initial margin is calculated using the following formulas:

$$NW_{MP\,BASE_i} = (|BASE_i| - |BASE_i'|) * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP}$$

$$NW_{MP\,PEAK_i} = (|PEAK5_i| - |PEAK5_i''|) * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}$$

$$NW_{MP\,PEAK_i} = (|OFFPEAK_i| - |OFFPEAK_i''|) * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}$$

Cross-product netting values calculated using the formulas above for the analyzed case (the value of the cross-product netting recognition parameter U_{MP} =100%):

$$\mathbf{NW_{MP\,BASE_i}} = (|-50| - |10|) * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP} = \mathbf{40 * P_{BASE_i} * h_{BASE_i} * Kr_{BASE_i} * U_{MP}}$$

$$\mathbf{NW_{MP\,PEAK_i}} = (|60| - |0|) * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}$$
$$= \mathbf{60 * P_{PEAK5_i} * h_{PEAK5_i} * Kr_{PEAK5_i} * U_{MP}}$$

$$\mathbf{NW_{MP\,OFFPEAK_i}} = (|60| - |0|) * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}$$
$$= \mathbf{60 * P_{OFFPEAK_i} * h_{OFFPEAK_i} * Kr_{OFFPEAK_i} * U_{MP}}$$

Summary:

By applying the principal assumption of the cross-product netting mechanism, which is the equivalence of a BASE contract and the sum of PEAK5 and OFFPEAK contracts from the delivery point of view, 60 PEAK5 and OFFPEAK purchase contracts comprised in the analyzed delivery period were combined into 60 BASE purchase contracts, resulting in the synthetic position in PEAK5 and OFFPEAK contracts equal to 0. When we apply the positions resulting from the combination of PEAK5 and OFFPEAK contracts (60 purchase contracts) to the positions held in reality in BASE contracts (50 sale contracts), we net them, arriving at the synthetic net position in BASE contracts for the delivery period in question equal to 10.

Table 2 presents the change in the balance of positions held after cross-product netting:

Table 2.

Delivery period	Number of positions before netting	Number of positions after netting	Netting benefit*
BASE-Jan-21	-50	10	40
PEAK-Jan-21	60	0	60
OFFPEAK-Jan-21	60	0	60

*Number of positions eliminated by using cross-product netting. Negative values mean an increase in the number of positions.

Simulation of benefits from cross-product netting for the example presented above, using market data as at 1 July 2020

a) Value of the required initial margin for each delivery period <u>before</u> the cross-product netting mechanism is applied:

Delivery period	Net positions	Number of hours per delivery period (h)	Clearing price (Kr)	Risk parameter (P)	Initial margin (PLN)
BASE-Jan-21	-50	744	242.95	4.5%	406,698.30
PEAK-Jan-21	60	285	286.1	6.32%	309,193.99
OFFPEAK-Jan-21	60	459	210.5	8.48%	491,600.02
The value of the required initial margin (sum):					**1,207,492.31**

b) Value of the required initial margin for each delivery period <u>after</u> cross-product netting is applied:

Delivery period	Net positions	Number of hours per delivery period (h)	Clearing price (Kr)	Risk parameter (P)	Initial margin (PLN)
BASE-Jan-21	10	744	242.95	4.5%	81,339.66
PEAK-Jan-21	0	285	286.1	6.32%	0
OFFPEAK-Jan-21	0	459	210.5	8.48%	0
The value of the required initial margin (sum):					**81,339.66**

<u>Profit resulting from the application of the cross-product netting mechanism:</u>

1,207,492.31 – 81,339.66 = **1,126,152.65 [PLN]**