Single Day-Ahead Market Coupling (SDAC) report on the partial decoupling incident of October 28th, 2023

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Executive summary

Summary of the partial decoupling incident

On Saturday, October 28th, 2023, an incident took place in the Single Day-Ahead Market Coupling process that led to a partial decoupling of HEnEx (Single NEMO in Greece), affecting the day-ahead trades with delivery day Sunday, October 29th, 2023, in the Single Day-Ahead Coupling (SDAC). The delivery day of the incident corresponds to the Long Clock Change Day (25 hours).

The partial decoupling of HEnEx from SDAC was the consequence of HEnEx not being able to provide its order book until the partial decoupling deadline (13:05). This resulted in decoupling the Greek bidding zone and the following two interconnectors: GR-BG and GR-IT.

The root cause was an incorrect implementation in the HEnEx Local Trading System impeding the validation of submitted orders concerning the Long Clock Change MTU (i.e., the additional hour). This prevented HEnEx from generating a correct order book, compliant with current regulatory requirements (i.e., validation of orders), on time. The problem was solved that very same day later in the afternoon by the implementation of a hotfix. This error in implementation, was not identified by HEnEx during the dedicated tests with SDAC and local tests with Participants.

Following the declaration of the partial decoupling and in line with the fallback procedures, shadow auctions results were published by JAO for the above-mentioned interconnectors and the results were sent to the market participants.

The SDAC parties in the bidding zones that remained coupled followed the normal procedures and the final SDAC results were published at 14:05.

The local auction was successfully completed by HEnEx around 16:05.

Lessons learnt and recommended follow up actions

HEnEx successfully performed local and coupling operations during the 2021 and 2022 Long Clock Change Day in SDAC production Such operational requirements also involve the execution of relevant dedicated tests, performed also for 2023, as done for every year. But even with the tests, the occurrence of this incident wasn't prevented.

The SDAC procedures in place to manage a partial decoupling, have been properly applied and have proven to be successful in retaining the coupling among the bidding zones not involved in the issue.

In addition, NEMOs and TSOs are continuing to work on the generic robustness of the operational processes and procedures at different levels (European, regional, and local) and their consistency for specific types of incidents. This generic investigation is not specifically related to this incident.

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List of abbreviations

CACM	EU Regulation establishing a guideline on capacity allocation and congestion management
CZC	Cross Zonal Capacities
EUPHEMIA	EU + Pan-European Hybrid Electricity Market Integration Algorithm
GCT	Gate Closure Time
GPC	Global Preliminary Confirmation
GFC	Global Final Confirmation
IC	Incident Committee
JAO	Joint Allocation Office
NEMO	Nominated Electricity Market Operator
PCR	Price Coupling of Regions
PMB	PCR Matcher Broker
SDAC	Single Day Ahead Coupling
TSO	Transmission System Operator

1 Introduction

On October 28th, 2023, an incident took place in the Day-Ahead Market Coupling process that led to a partial decoupling of HEnEx (Greek NEMO), affecting the day-ahead trades for delivery day October 29th, 2023. Only the Greek market was decoupled. The delivery day of the incident corresponds to the Long Clock Change Day (25 hours).

Since the Go-Live of the NWE Market Coupling on February 4th, 2014, after more than 3000 successfully completed market coupling sessions, this is the fifth incident that has led to a partial decoupling.

Although this did not lead to any grid security issues anywhere in Europe, the incident caused a disruption of the European Day-Ahead Market within the Single Day-Ahead Coupling and impacted processes on market parties' and TSOs' side. The common coupling system worked as expected and ensured the coupling of the remaining European market areas within SDAC.

This report is structured as follows. In Chapter 2, the Single Day-ahead Coupling (SDAC) is described. In Chapter 3, the normal operational process as covered in the operational procedures and the fallback measures in place are described together with their timings. In Chapter 4, a description of the incident, including the chronological course of events, and the root cause are presented. In Chapter 5, the actual handling of the incident is evaluated. Finally, in Chapter 6, the lessons learnt, and recommendations are presented.

2 Single Day-ahead Coupling

The aim of Single Day-ahead Coupling is to create a single pan European cross zonal day-ahead electricity market. An integrated day-ahead market increases the overall efficiency of trading by promoting effective competition, increasing liquidity, and enabling a more efficient utilisation of the generation resources across Europe.

SDAC allocates scarce cross-border transmission capacity in the most efficient way by coupling wholesale electricity markets from different regions through a common algorithm, simultaneously taking into account cross-border transmission constraints thereby maximising social welfare.

SDAC is an initiative between the Nominated Electricity Market Operators (NEMOs) and Transmission System Operators (TSOs) which – in the framework of CACM implementation – enables cross-border trading across Europe via implicit auctions for delivery of power for the following day.

Significant progress has been achieved in the establishment of a pan-European Single Day-Ahead Coupling in recent years, thanks to early implementation initiatives and pilot projects. SDAC relies on the Price Coupling of Regions (PCR) solution developed by a group of power exchanges.

See for more information the following websites:

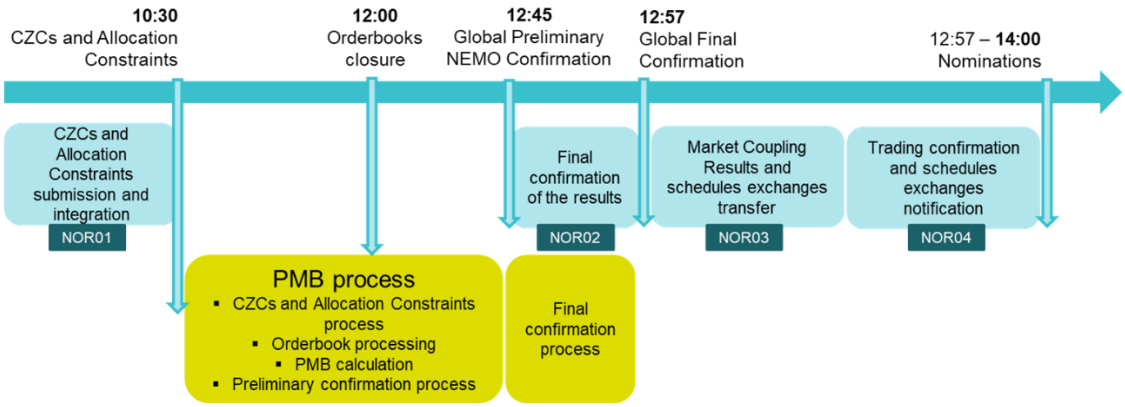
- ENTSO-E: https://www.entsoe.eu/network_codes/cacm/implementation/sdac/
- NEMO Committee: http://www.nemo-committee.eu/sdac

3 Operational process and timings as described in the operational procedures and fallback processes

To understand the effect of the issue that triggered the chain of events that finally led to a partial decoupling of HEnEx, in this chapter the normal process is briefly described together with the timings. Subsequently, the measures in place to handle a partial decoupling are described.

3.1 Normal process and timings

In the below figure, the regular operational process is visualized.



To start with, the TSOs provide cross border interconnector capacities to PCR through the NEMO(s) which forward them to the PMB while the Market Participants make bids for buying and selling to the Local Trading System of their NEMO(s).

At 12:00, the local order books are closed and submitted after internal validation to the PMB, which subsequently starts the calculation with EUPHEMIA. The results of this calculation are subsequently shared and validated. After that, the results are confirmed by the NEMOs and TSOs.

After the global final confirmation of the results, the market coupling results, and scheduled exchanges are transferred, and the trading confirmations and the scheduled exchanges notifications are submitted.

3.2 Fallback process and timings

To handle issues in operations, there are backup procedures. These provide workarounds for issues that do not lead to exceeding the critical deadlines for the different process steps. When these backup procedures do not suffice, there are fallback measures in place to limit the negative impact on the market.

In the below figure, the timings for the operational process are shown and the deadline for declaring a Partial or a Full Decoupling is shown.

3.2.1 Shadow auction process

When an order book is missing and a partial decoupling is declared or when a full decoupling is declared, shadow auctions are the most common fallback measures in place to handle a situation where the capacity of interconnectors cannot be allocated in the normal Market Coupling process. Market participants have the possibility to place default bids and provide (updates of) bids through dedicated platforms (e.g., JAO's website) to obtain capacity until 12:55 (in case of partial decoupling). The results of this auction are published as soon as possible after the partial decoupling has been declared (normally between 13:05 and 13:10) and represents the allocated capacity. Once this phase is completed, the market participants can adjust their power bids in the different markets normally between 13:10 and 13:25 taking in consideration the results of the shadow auctions.

Participants can nominate the capacity allocated through shadow auctions. These nominations done towards TSOs are then matched among the TSOs border by border.

3.2.2 Local auctions

When a NEMO is decoupled from the SDAC process, the NEMO(s) in the decoupled bidding zone(s) can then perform a local auction that enables trading within the individual zone(s) managed by the decoupled NEMO(s). Market Participants can also take in consideration the results of the shadow auctions on the borders affected by the decoupling. This process is done separately from the SDAC process where the remaining parties complete the SDAC process. When a full decoupling is declared, all NEMOs have this possibility of running the local auctions.

4 Description of the incident

On Saturday October 28th, 2023, the day of long clock change, HEnEx was not able to generate their order book within the allowed time and therefore they were decoupled. The root cause was an incorrect implementation in the Local Trading System of HEnEx, which resulted in a severe technical issue impeding the validation of submitted orders relevant to Long Clock Change MTU.

The chain of events can be divided into two parts: one concerning the decoupling incident and the subsequent processes on SDAC level (covered in Sections 4.1 until 4.4), the other concerning the local auctions (covered in Section 4.5). Finally, in Section 4.6, the solution for the issue that triggered the chain of events is presented.

4.1 Incident

The issue encountered by HEnEx was that they were not able to create a correct order book for the Long Clock Change Day. This prevented HEnEx from submitting the aggregated order book for the Greek market within the defined deadline to the central system that manages the SDAC market coupling process.

4.2 Timeline

In the below overview the timeline is shown.

Time	Event
11:45	HEnEx, as Coordinator, triggered an IC due to issues in collecting orders in their trading system. NEMOs decided to apply the procedure of postponing the closure of order books (12.00). Consequently, all NEMOs were allowed to close the order book in their Local Trading System at 12.20.
12:20	At the new order book gate closure time, HEnEx confirmed that the issue was not solved.
12:40	Message Risk of Partial Decoupling (ExC_03a) was sent out for the following Virtual Broker: HEnEx.
12:45	Message Delay in Market Coupling Results (ExC_02) was sent out.
13:05	Partial decoupling was declared and message (ExC_04a) was sent for the decoupling of HEnEx Virtual Broker. Partial decoupling procedure was thereafter followed. The order book reopening time (for the remaining coupled areas) was decided to be 13:10 – 13:25.
13:08	Shadow auctions for the following interconnectors were run: GR-IT and GR-BG
13:10	Reopening of the order books was done and procedure of partial decoupling of HEnEx was executed.
13:13	Publishing of the shadow auction results.
13:15	Shadow auction results received by TSOs (IPTO, ESO, Terna)
13:25	Closure of order book and all NEMOs uploaded the new version of their order books to PMB.
13:30	Calculation started.
13:49	Calculation finished.
13:50	Message Further Delay of the Market Coupling (ExC_03b) was sent out by OMIE as new PCR Coordinator (risk of full decoupling).

13:55	Global preliminary confirmation was distributed, and results were preliminarily confirmed and published.
14:05	Global final confirmation was distributed, and results were confirmed.

4.3 Communication to the market

As part of the SDAC process, the following joint communication towards the market was made:

Time	Event
12:40	Risk of partial decoupling (ExC_03a)
12:43	Shadow auction gate closure time at 12:50
12:50	Delay in Market Coupling Results (ExC_02)
13:05	Partial Decoupling - Reopening of the order books 13:10 – 13:25 (ExC_04a)
13:50	Further delay in market coupling results publication (ExC_03b)

Please note that these are the timings from the procedures. Depending on the recipient, this might vary a few minutes.

4.4 Impacted borders

The impacted borders concern the borders related to HEnEx.

For the impacted interconnectors,

- GR-BG
- GR-IT

Shadow auctions were triggered, in line with the fallback procedures.

In the below figure a visualization of the impacted borders is given.

4.5 Decoupled market Local auctions

Once this issue was fixed at HEnEx, local auction was run at 16:02 and the results were made available to Markets Participants and published at 16:05.

4.6 Solution for the issue that triggered the chain of events

During the incident, the IT support for the HEnEx Local Trading System identified that the root cause for the partial decoupling incident was an incorrect implementation affecting the order validation process for the Long Clock Change MTU.

Additionally, to any workarounds applied during the incident, on that same day, a fix was implemented in HEnEx Local Trading System. The fix was further tested and verified in consequent regional intraday auctions (CRIDA2 & CRIDA3 (in CRIDA1 HEnEx was decoupled)).

5 Handling of the incident – Evaluation

In this chapter, the way that the incident was handled is evaluated.

5.1 Detecting of the issue

The issue was detected as soon as HEnEx Local Trading System performed the scheduled automatic orders validation at 11:00, according to the applicable national regulatory framework.

5.2 Communication between the Market Coupling Coordinator, NEMOs, TSOs and third parties prior to declaring a partial decoupling

Overall, the management of the incident committee and the communication towards the operators of NEMOs, TSOs, and third parties went well. This is mainly due to the experiences and lessons learnt of the last decoupling incidents and due to the decoupling training sessions within SDAC (some of which were also joined by Market participants).

All messages to market participants were sent in line with the procedures.

5.3 Shadow auctions

	Shadow auction process		
Border / Interconnector	**Bid submission closed (auction ran)**	**Auction results sent**	**Results published on JAO website**
GR-IT	13:08	13:13	13:14
IT-GR	13:08	13:13	13:14
GR-BG	13:08	13:13	13:14
BG-GR	13:08	13:13	13:14

5.4 Update of bids based on shadow auction results

After declaration of the partial decoupling in the Incident Committee, there are 5 minutes for informing the market participants, 15 minutes for keeping the markets reopened, and 10 minutes for the preparation and sending of new files.

Few minutes after the reopening of the markets at 13:13, the shadow auction results were available.

The order books for the areas that remained coupled, reopened between 13:10 and 13:25.
See for an overview of the results of the shadow auctions per border and what was finally allocated in the table in Annex 1.

The shadow auction process and the subsequent update of the bids were executed accordingly.

5.5 Evaluation and estimate of monetary impact

The monetary impact for the affected TSOs consists of on the one hand of the compensation that TSOs provide towards the affected Market Participants. While on the other hand, congestion income is turned over for both the Long-Term Transmission Rights, as well as for the Shadow Auctions for that day.

An overview per border/interconnector and per direction is shown in the Table below.

	Congestion income and compensation to the Market Participants in EUR		
Border / Interconnector	**Long-Term Transmission Rights Congestion Income for 29/10/2023**	**Shadow Auction Congestion Income**	**Long-Term Transmission Rights Compensation to MP**
GR-IT	58,843.75	6,125.50	253,352.50
IT-GR	34,612.50	620.00	212,502.50
GR-BG	19,300.00	0.00	23,128.00
BG-GR	74,231.25	2,136.34	732,829.40
Sum	186,987.50	8,881.84	1,221,812.40

Note: The above data depicts the amount per each TSO per border direction. The data is based on CRDS, Shadow Auction Allocated Quantities, and SA prices provided by JAO.

6 Lessons learnt and recommended follow-up actions

Although the SDAC parties regret that this incident occurred, the issue was managed well. Procedures were followed correctly, and the communication was performed in line with those, using the agreed messages.

Moreover, the common coupling system worked as expected and ensured the coupling of the remaining European market areas within SDAC.

Due to the growing number of coupled parties, the very large number of involved systems and the increasing complexity of operations, the risk for incidents increases. Therefore, the SDAC parties are conducting rigorous tests prior to particular dates (like long clock and short clock dates) or when introducing changes in operations.

Also, in this case tests were positively run for the long clock day change (and it was not the first time that this day was run in SDAC) several days before the long clock day change happened.

However, this incident shows that a particular situation (25-hour day) and even if widely tested and already executed in the past years can also result into a decoupling.

NEMOs and TSOs are in any case and independently from this event always working on trying to improve the robustness of the process and procedures to reduce the risk for such kind of incident.

Annex 1: Overview of the results of the shadow auctions per border

Shadow auctions ran by JAO on 28/10/2023

BORDER	Bid submission closed (auctions were run at)	Auction results sent (TSOs, ENTSO-E and participants	Results published on JAO website
BG-GR	28/10/2023 13:08	28/10/2023 13:13	28/10/2023 13:14
GR-IT	28/10/2023 13:08	28/10/2023 13:13	28/10/2023 13:14

BORDER	Capacity requested		Capacity offered		Capacity allocated	
BG-GR	00:00-01:00	1432 MW	00:00-01:00	1057 MW	00:00-01:00	1057 MW
	03:00-24:00	1431 MW	01:00-03:00*	1058 MW	02:00-03:00*	1058 MW
			03:00*-04:00	1055 MW	03:00-04:00	1055 MW
			04:00-05:00	1050 MW	04:00-05:00	1050 MW
			05:00-06:00	1048 MW	05:00-06:00	1048 MW
			06:00-07:00	1050 MW	06:00-07:00	1050 MW
			07:00-08:00	1056 MW	07:00-08:00	1056 MW
			08:00-09:00	1061 MW	08:00-09:00	1061 MW
			09:00-10:00	1064 MW	09:00-10:00	1064 MW
			10:00-11:00	1066 MW	10:00-11:00	1066 MW
			11:00-12:00	1152 MW	11:00-12:00	1152 MW
			12:00-13:00	1127 MW	12:00-13:00	1127 MW
			13:00-14:00	1092 MW	13:00-14:00	1092 MW
			14:00-15:00	1088 MW	14:00-15:00	1088 MW
			15:00-16:00	1086 MW	15:00-16:00	1086 MW
			16:00-17:00	1064 MW	16:00-17:00	1064 MW
			17:00-18:00	1054 MW	17:00-18:00	1054 MW
			18:00-19:00	1060 MW	18:00-19:00	1060 MW
			19:00-20:00	1053 MW	19:00-20:00	1053 MW
			20:00-21:00	1046 MW	20:00-21:00	1046 MW
			21:00-22:00	1053 MW	21:00-22:00	1053 MW
			22:00-23:00	1081 MW	22:00-23:00	1081 MW
			23:00-24:00	1046 MW	23:00-24:00	1046 MW

BORDER	Capacity requested		Capacity offered		Capacity allocated	
GR-BG	00:00-01:00	840 MW	00:00-01:00	963 MW	00:00-01:00	840 MW
	01:00-02:00	839 MW	01:00-02:00	960 MW	01:00-02:00	839 MW

	02:00-03:00	834 MW	02:00-04:00	977 MW	02:00-03:00	834 MW
	02:00-03:00*	770 MW	04:00-05:00	997 MW	02:00-03:00*	770 MW
	03:00-06:00	834 MW	05:00-06:00	1002 MW	03:00-06:00	834 MW
	06:00-07:00	839 MW	06:00-11:00	910 MW	06:00-07:00	839 MW
	07:00-08:00	837 MW	11:00-12:00	901 MW	07:00-08:00	837 MW
	08:00-11:00	839 MW	12:00-18:00	910 MW	08:00-11:00	839 MW
	11:00-12:00	833 MW	18:00-19:00	1092 MW	11:00-12:00	833 MW
	12:00-15:00	836 MW	19:00-20:00	1093 MW	12:00-15:00	836 MW
	15:00-16:00	831 MW	20:00-21:00	1109 MW	15:00-16:00	831 MW
	16:00-21:00	827 MW	21:00-22:00	1123 MW	16:00-21:00	827 MW
	21:00-24:00	834 MW	22:00-23:00	1102 MW	21:00-24:00	834 MW
			23:00-24:00	1030 MW		

BORDER	Capacity requested		Capacity offered		Capacity allocated	
GR-IT	00:00-01:00	921 MW	00:00-24:00	500 MW	00:00-03:00	499 MW
	01:00-03:00	920 MW			02:00-03:00*	500 MW
	02:00-03:00*	775 MW			03:00-24:00	499 MW
	03:00-24:00	920 MW				

BORDER	Capacity requested		Capacity offered		Capacity allocated	
IT-GR	00:00-01:00	772 MW	00:00-24:00	500 MW	00:00-24:00	500 MW
	01:00-03:00	771 MW				
	02:00-03:00*	661 MW				
	03:00-24:00	771 MW				