SEMOPX

SCALABLE COMPLEX ORDERS

CLOSURE REPORT

Version: 1.0

Table of Contents

1 Executive Summary

The SEM day-ahead and intraday markets use the EUPHEMIA pricing algorithm as part of the pan-European Single Day Ahead Coupling (SDAC). SDAC has been researching changes to EUPHEMIA that will improve the scalability of the algorithm . A change from the Complex Orders (COs) product to Scalable Complex Orders (SCOs) product has been identified as significant way to improve the overall EUPHEMIA solve times. SDAC have requested markets that use COs, which includes the SEM, to transition to the SCOs product by the end of 2022.

SEMOpx in collaboration with exchange members initiated a project to allow members to understand the nature and attributes of the SCOs product, to build and test the necessary member and market system changes, and to trial the SCOs product under as realistic as possible market conditions. SEMOpx would like to note the high levels of participation in the project and thank all those who participated for their beneficial input into its success.

Over the last 12 months the project has completed analysis, system change, training and trial activities. This included a 2-month trial period to allow members to gain experience with using the SCOs product for commercial offer submission.

Based on the outcomes of the project activities and feedback from members, SEMOpx has concluded that the trial was successful in its objectives and, subject to approvals, the go-live of the SCOs product should occur with a targeted date of the 16th November 2022.

2 Purpose

The purpose of this SCOs Project Closure Report is to provide a summary to SEMOpx members, and particularly the SEMOpx Exchange Committee, of the activities and outcomes of the SCOs Project. It is envisaged this document will provide an input to the decision-making process in the October 2022 Exchange Committee meeting which will look at approving the modification for the implementation of SCOs in the SEM day-ahead and intraday markets.

3 Background

The EUPHEMIA pricing algorithm allows for several different formats of bids and offers, collectively referred to as orders, each of which has related characteristics and limitations.

Research and development of EUPHEMIA is an ongoing SDAC initiative with the focus on potential ways to optimize the performance of the algorithm and reduce solver constraints. This is to alleviate potential performance and solve time issues due to the increasing number of jurisdictions joining SDAC and new features (e.g. flow-based coupling, 15 min Market Time Units).

SDAC started research into scalability improvements in 2019 and this identified, among other items, that a change from Complex Orders (COs) to Scalable Complex Orders (SCOs) will relax the constraints and reduce the overall EUPHEMIA solve times. As a result, the SDAC Committee requested those regions using COs to transition to SCOs by the end of 2022, in order to facilitate an increase in efficiency of the EUPHEMIA algorithm and to cater for the future demands of SDAC.

Given the SEM uses unit-based imbalance settlement the COs product is utilised for a high proportion of the volume of electricity sold in the ex-ante markets. This meant that a project was required to complete the transition to SCOs in the SEM with a key goal of the project to ensure SEMOpx members achieved familiarity of the SCOs product as well as ensuring the change would have no significant adverse impacts on SEM trading.

4 Project Goals

There were four key goals identified for the SCOs Project. These goals are described below.

4.1 Member Familiarity with the SCOs Product

This goal was to ensure that SEMOpx members achieved familiarity with the SCOs product and its different attributes, as well as how the application of these different attributes in SCOs submissions could impact on how the algorithm interprets and applies the SCOs in the auctions.

4.2 Market System and Member System Technical Changes

This goal was to ensure that both the market systems and members systems were technically ready for the transition from COs to SCOs.

Transition to the SCOs product required both SEMOpx market systems and member systems to be modified to manage the submission and processing of the SCOs products.

4.3 Member Trialling of SCOs

This goal was to ensuring members were comfortable with how to submit the SCOs in order to correctly represent their desired commercial offer data.

Members requested that enough time was allocated to the trialling of the new SCOs product.

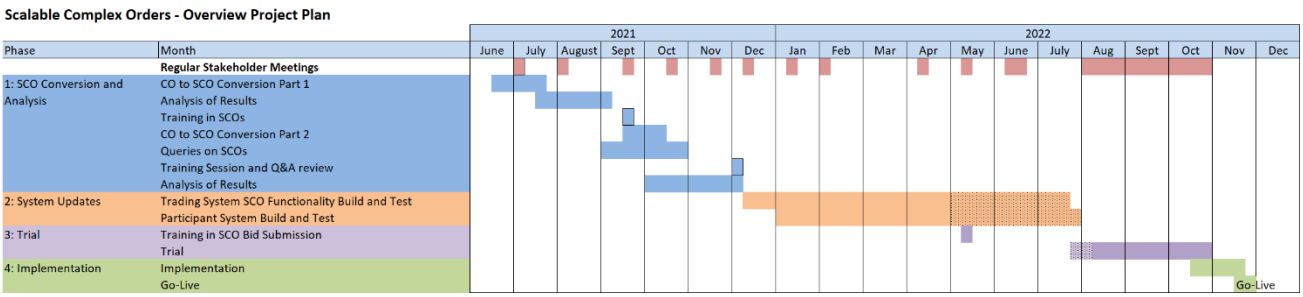
4.4 Member and Market Go-Live Readiness

The final goal was to ensure that both members and SEMOpx were ready for the final go-live of the new SCOs product.

5 Project Plan

The SCOs project plan was developed in consultation with SEMOpx, SEMOpx's service providers, algorithm experts and SEMOpx members who were part of the SCOs member test working group.

An overview of the project plan is provided below.



The project involved four phases:

Phase 1: SCOs Conversion and Analysis

This phase focused on the achieving the goal of member familiarity with the SCOs product.

COs to SCOs conversions and analysis were performed by N-Side, a research and development company with extensive expertise in the EUPHEMIA algorithm.

Phase 2: System Updates

This phase focused on achieving the goal of both the market systems and members systems being technically ready for the transition from COs to SCOs.

Technical documentation on the changes required to implement SCOs in the system was published and both SEMOpx and members developed their technical system solutions.

Phase 3: Trial

This phase focused on achieving the goal of providing enough time for members to trial and become comfortable with representation of their desired commercial offer data using SCOs.

This phase included training session for members and opportunities to run trials using the SCOs and compare the results to the baseline runs which used COs.

Phase 4: Implementation

This phase is focused on the final cutover to the new SCOs products and is still underway.

It involves:

- Final approval of the SCOs project by the Exchange Committee.
- Publication and implementation of the ETS and API releases which will incorporate the SCOs product and remove the COs product.
  Final go-live communications and activities.

6 Outcomes

The following section provides a summary of the activities and the outcomes of each phase of the project.

6.1 Phase 1: SCOs Conversion and Analysis

This phase focused on the achieving the goal of member familiarity with the SCOs product.

It consisted of workshops with the algorithm research and development team (N-Side) to allow members to understand the components of the SCOs and how they could be used to achieve desired offer submissions and trading outcomes.

Two conversions were planned. However, due to member feedback, after the presentation of Conversion 1 results, SEMOpx was able to facilitate a second set of conversions with different applications of the Minimum Acceptance Volume and Fixed Term conditions. Resulting in a total of 6 conversions being completed and analysed.

These results and analysis were shared with members through the regular SCOs project meetings.

Further details on the conversion analysis are available in the following links:

Conversion 1 Results Analysis
Conversion 2 Results Analysis

The results concluded that even with relatively simple conversion methodologies for COs to SCOs that the SCOs could be used as a comparable substitute for COs and that similar market outcomes could be achieved using the SCOs.

The outcome of the Conversion and Analysis stage allowed a better understanding of the SCOs product with members and a desire to then trial the SCOs product to gain familiarity with its operation.

6.2 Phase 2: System Updates

This phase focused on achieving the goal of both the market systems and members systems being technically ready for the transition from COs to SCOs.

To achieve this SEMOpx provided members with technical system documentation and supported development queries from members as they modified their test systems to accommodate SCOs.

Detailed information on the technical specifications is available here.

This phase also involved SEMOpx working with its service provider to build and test the trading system functionality to be used for SCOs.

The intention was to have the system changes available for the subsequent Trial phase.

The outcome of the System Updates phase was the successful building and testing of the SCOs functionality in the market systems and having members technically ready for the subsequent trail phase.

6.3 Phase 3: Trial

6.3.1 Overview

The inclusion of an 2-month trial phase in the project provided members with the ability to simulate the formation as well as submission of SCOs products and see the market outcomes of these

decisions in the day-ahead and intraday auctions. The trial allowed members to expand on the learnings of the conversion and analysis phase, increase their understanding of the implications of different formations of SCOs commercial offer data, and test the trading system functionality of both their own and the market systems.

This phase included training for members on the SCOs product in terms of the ETS trading system and APIs. This training was provided in the SCOs project meeting held on the 4th February 2022. The training materials are available from the SEMOpx website.

However, the main focus of this phase was the trials. The trial plan was shared with members in the SCOs project meeting on the 4th February 2022, with the final trial plan confirmed in the SCOs project meeting on the 8th April 2022.

Four scenarios were agreed and provided a combination of different demand and wind scenarios.

Runs were completed using the COs offers actually used for each of the trade dates selected for the trial. These were used as the baseline for comparing differences between the existing COs and the use of SCOs.

The table below details the trial timeline, the dates for each trial and the scenarios selected.

Trial Week	Trial Week Start Dates	Trade Date Simulated	Scenario
Weeks 1 & 2	8 Aug – 19 Aug	06/01/2021	High Demand & Low Wind
Weeks 3 & 4	20 Aug – 2 Sep	18/07/2021	Low Demand & Low Wind
Weeks 5 & 6	3 Sep – 16 Sep	30/09/2021	Low Demand & High Wind
Weeks 7 & 8	17 Sep – 30 Sep	11/02/2021	High Demand & High Wind

October was kept as a contingency period should there be a need for further trials. Based on the outcome of the trialling in August and September, most of this contingency was not needed.

Members requested one further scenario of a high demand during a trade date with higher order prices i.e. closer to current market prices. This is being facilitated on the 18th and 20th October using trade date 16/03/2022. This report will be updated with the results of these trials when available. However, based on the trials to date SEMOpx does not foresee any issues arising from these additional trials. However, they provide another opportunity for members to further test submissions head of the go-live.

6.3.2 Trial Queries or Issues

There were a limited number of issues or queries highlighted to SEMOpx as a result of the trials. All of which were able to be rectified or satisfactorily explained.

6.3.2.1 Delay in start of the Trial

The trial was planned to begin in June 2022, but issues were identified with the build of the trial environment and the installation of the new trading system release. The trial was postponed by one month to allow the issues to be rectified. However, this had limited impact on the overall timelines of the project as contingency periods were available and used.

6.3.2.2 Incorrect Exchange Rate

The main issue identified during the trial was the incorrect application of exchange rates for the DAM and IDA3 auctions for the first two scenarios. To rectify this and mitigate any impact that

exchange rates may have had on the trials, SEMOpx organised the re-run of the DAM auctions for the impacted trial dates. Subsequent analysis indicated the incorrect exchange rates had minimal impact on the overall market results.

The trial reruns were scheduled within later trial weeks, and so did not impact on the contingency period.

6.3.2.3 Member Queries and Feedback

SEMOpx received 72 queries over the duration of the trial. A significant number of these queries were basic administrative issues dealing with access to the trial system.

Any queries that were raised regarding data or market outcomes where able to be adequately resolved and explained.

SEMOpx requested feedback of the members views on the outcomes of the trial. No negative feedback was received regarding the use of SCOs.

6.3.3 Trial Analysis

SEMOpx provided summaries of the SCOs submissions, cleared SCOs, and market prices and volumes from each trial run compared to the baseline for each scenario. Details of this are available from the SEMOpx website here.

SEMOpx also performed high level analysis for each trial. A summary of this analysis for each run is also available from the SEMOpx website here.

The analysis showed that when participation levels and submitted order data was similar in baseline and SCOs trial the market cleared price and volumes were similar.

Where there was a significant difference of participation or where participants submitted different order data, the market cleared prices and volumes were different as expected. However, the variances were justifiable and deemed to be satisfactory market outcome when considering participation levels and submitted order data.

During the trial SEMOpx and participating members were able to validate that all technical conditions of the product behaved as expected. Price and Quantity Pairs, Fixed Term, Scheduled Stop and Minimum Acceptance Volume conditions when submitted, all behaved in line with the technical description of the product. No examples of any of these conditions breaching the technical condition were noted during the trial.

6.4 Phase 4: Implementation

Based on the successful outcomes of the first 3 phases, the SCOs project is now entering the last phase to obtain final approval of the SCOs project by the Exchange Committee and to confirm the target release date for the SCOs product planned for first use in the IDA2 auction to be held at 8am on 16th November 2022.

7 Conclusion

The SCOs project had the following goals:

a) Member Familiarity with the SCOs Product
b) Market System and Member System Technical Changes
c) Member Trialling of SCOs
d) Member and Market Go-Live Readiness

Based on the outcomes from the project phases and feedback through the SCOs project working group these goals have been achieved.

There were high levels of participation from across the industry throughout the project, which contributed greatly to its success.

There is widespread familiarity and acceptance of the SCOs product as a replacement for the existing COs. There are no known issues that would warrant a delay in implementing the SCOs product in the SEM day-ahead and intraday auctions.

SEMOpx would therefore recommend that the implementation of SCOs to the SEM day-ahead and intraday markets is completed as intended on the 16th November 2022.