

EBSG | Co-optimisation

12 May 2022



Outline

1. N-SIDE developments
 - a) Price formation and cost-minimisation
 - b) High-level overview of the first experience of the run of the prototype
 - c) Overview of the latest planning
2. Next steps

1.a) N-SIDE developments: issue of Price formation and cost-minimisation for BC

- TSOs would like to remind about the complexity of including the (legal) requirements of EB Regulation into the co-optimised allocation process (prototypes)
- The objective function of the CPOF is different from EUPHEMIA (cost minimisation versus welfare maximisation) which adds complexity to the EUPHEMIA algorithm
 - Currently, TSOs identify a regulatory conflict between EB Regulation and the current performance of the prototype
- From discussions with N-SIDE it is shown that the current prototype cannot (yet?) completely respect all requirements for price formation of balancing capacity markets

1.a) N-SIDE developments: issue of Price formation and cost-minimisation for BC

Regulatory requirements:

CZCAOF – welfare maximisation (EB Regulation Art. 40.1)

- Splitting CZC across markets
- Selection of cross-product bids between DAM and BCM (linking)

SDAC EUPHEMIA – welfare maximisation

- DAM bid selection
- DAM price formation
- Distributing the available CZC (PTDFs) for DAM per bidding zone border

CPOF – cost minimisation (EB Regulation Art. 58(3)(a))

- BSP bid selection
- Satisfying TSO BC demand
- BCM price formation
- Bid selection per BCM (BSP linking between BCMs)

1.a) N-SIDE developments: Price formation and cost-minimisation

Background: Requirements for BC market clearing:

- Balancing capacity bid selection to be based on cost minimisation (EB Regulation Art. 58(3)(a))
- Marginal pricing is the foreseen pricing scheme: TSOs pay BSPs the marginal price times the offered volume of accepted bids
- TSOs asked N-SIDE also to consider inelastic TSO demand and price caps for BC procurement

Current N-SIDE algorithm assumes price formation based on a "primal-dual approach" (as implemented in EUPHEMIA for SDAC):

- Price formation in the N-SIDE algorithm is not based on cost minimisation and marginal pricing as requested by TSOs
- algorithm does not necessarily provide solutions which respect the cost minimisation requirement
- Accordingly, N-SIDE approach is not (yet) fully compliant with EB Regulation Art. 58(3)(a).

Required adjustment of expected deliverables from the N-SIDE assignment:

The Co-optimisation project team asked N-SIDE to elaborate in their final report on the following:

1. Description of the differences between the N-SIDE algorithm and current balancing capacity market requirements
2. Indication of the circumstances when the N-SIDE algorithm outcomes deviate from/ are identical with outcomes of an algorithm which meets BC market clearing requirements
3. Qualitative analysis to see how EUPHEMIA can be adapted to meet BC market clearing requirements
4. Qualitative analysis to identify alternatives for co-optimizing the BCM and DAM to fully meet the BC market clearing requirements.

1.b) N-SIDE developments: High-level overview of the first experience of the run of the 1-step prototype

- N-SIDE has run 2 simulations with the 1-step co-optimisation prototype:
 - ❖ Simulation 1: multilateral linking,
 - ❖ Simulation 2: unilateral linking.
- Different CZC split outcomes are identified and N-SIDE will now prepare a proper depiction of the results.

Next step: preparation of the 2-step co-optimisation prototype

N-SIDE shall apply 2 different techniques for the simplified EUPHEMIA in the 2-step co-optimisation:

- ❖ Option 1: Relax all binary conditions (declare indivisible bids as “divisible”, etc)
- ❖ Option 2: Drop price conditions such as “no paradoxically accepted orders”

Option 1 is a bigger simplification compared to Option 2 (may lead to even more discrepancies compared to the 1-step multilateral benchmark (and 1-step unilateral))

1.b) N-SIDE developments: High-level overview of the first experience of the run of the 1-step prototype

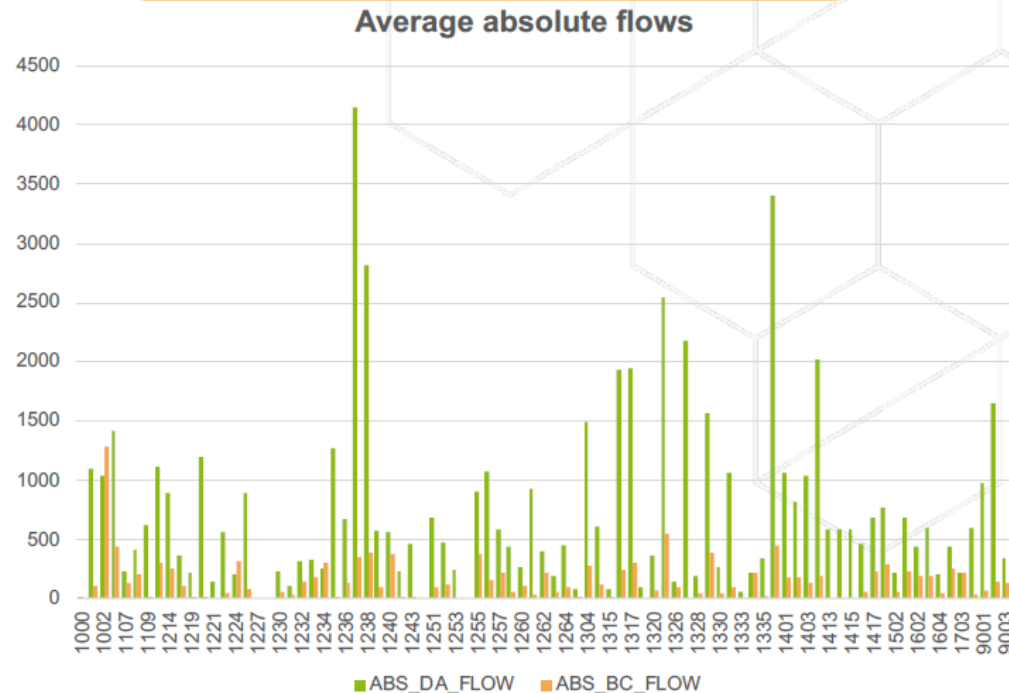
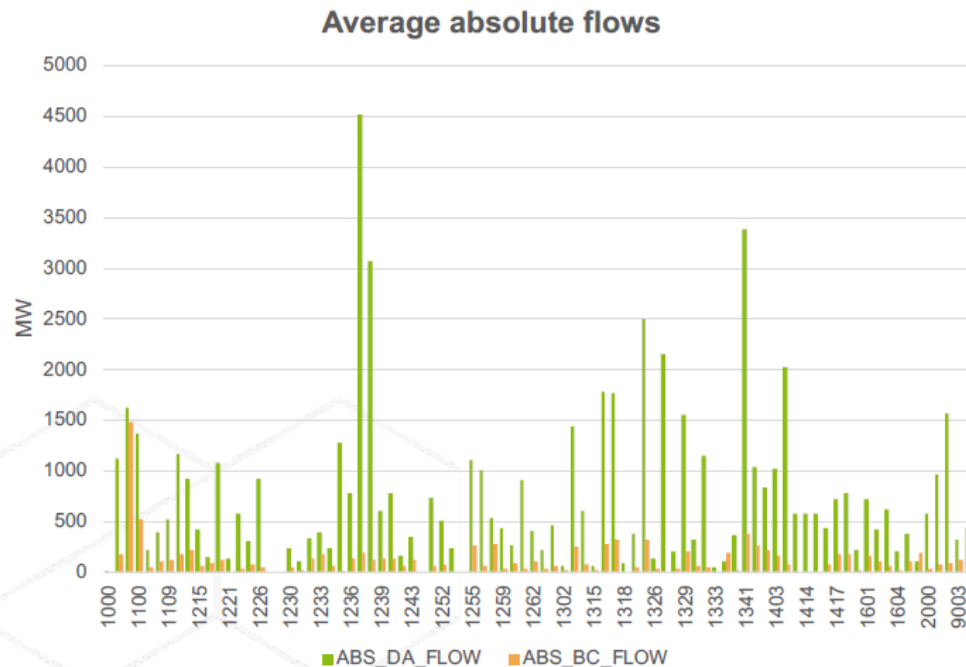
Simulation results for the 1-step multilateral vs unilateral scenarios



Average absolute flows **DAM** & **BC**

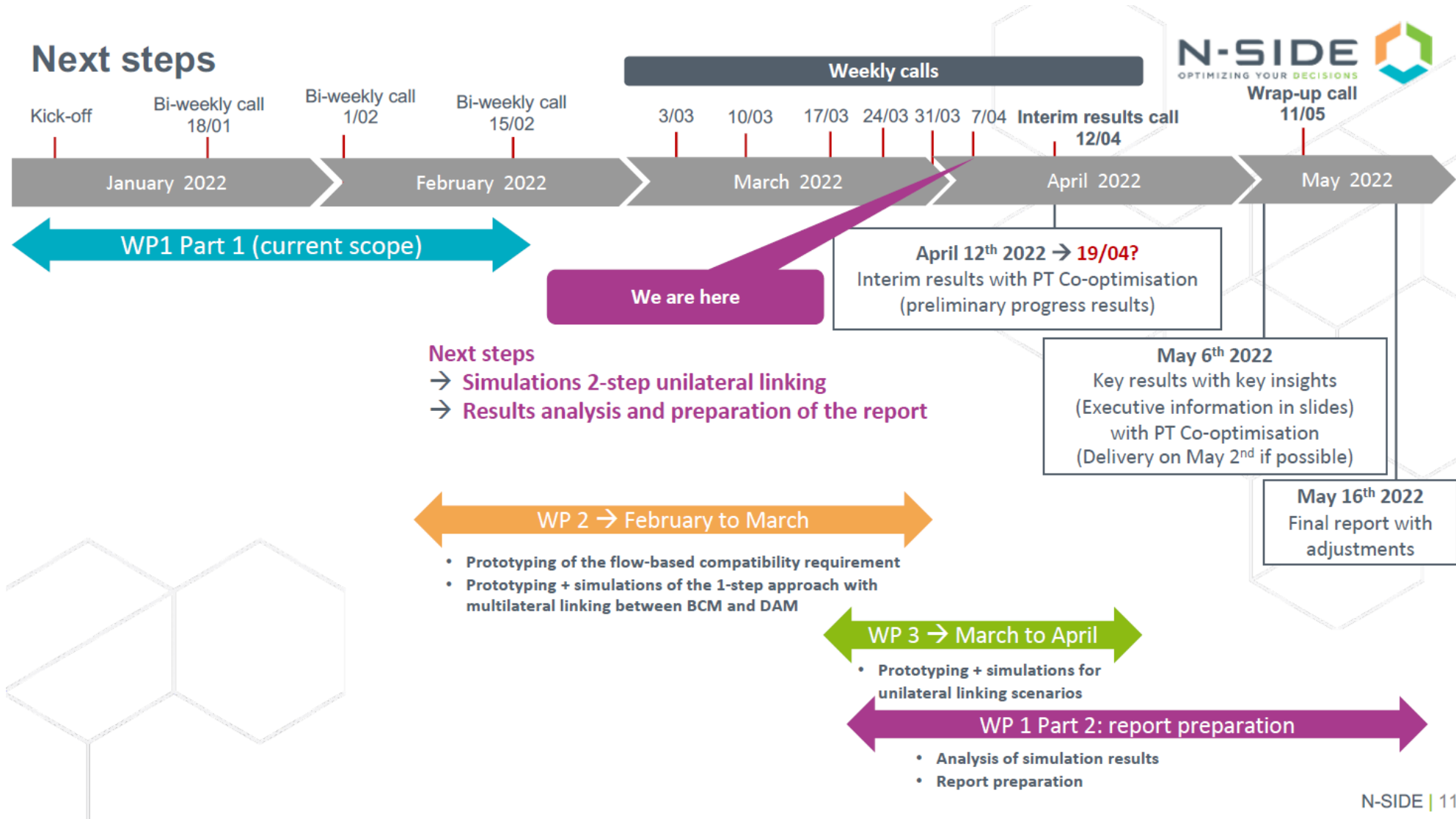
1-step multilateral linking

1-step unilateral linking



A CZC split does take place in both scenarios.

1.c) N-SIDE developments: Overview of the latest planning



2. Next Steps

Date	Activity/Milestone
Late April - Early May	<ul style="list-style-type: none">N-SIDE interim results (expected)
May - June	<ul style="list-style-type: none">Internal ENTSO-E reviews
Late May	<ul style="list-style-type: none">N-SIDE final results
Late May - early June	<ul style="list-style-type: none">Internal ENTSO-E approvals
17 June	<ul style="list-style-type: none">Submission to NEMOs

Appendix

1.a) N-SIDE developments: Price formation and cost-minimisation

Reminder: CPOF legal requirements

EB Regulation Art. 58(3)(a)

TSOs exchanging BC shall develop algorithms to be operated by the capacity procurement optimisation functions. Those algorithms shall:

- (a) *minimise the overall procurement costs of all jointly procured balancing capacity;*
- (b) if applicable, take into account the availability of cross-zonal capacity including possible costs for its provision.

Minimising the overall procurement is conducted by:

- price formation based on BSP price, not based on mid price or another price
- Substitution of reserves, meaning shifting TSO demand from one product to another (also CEP requirement)