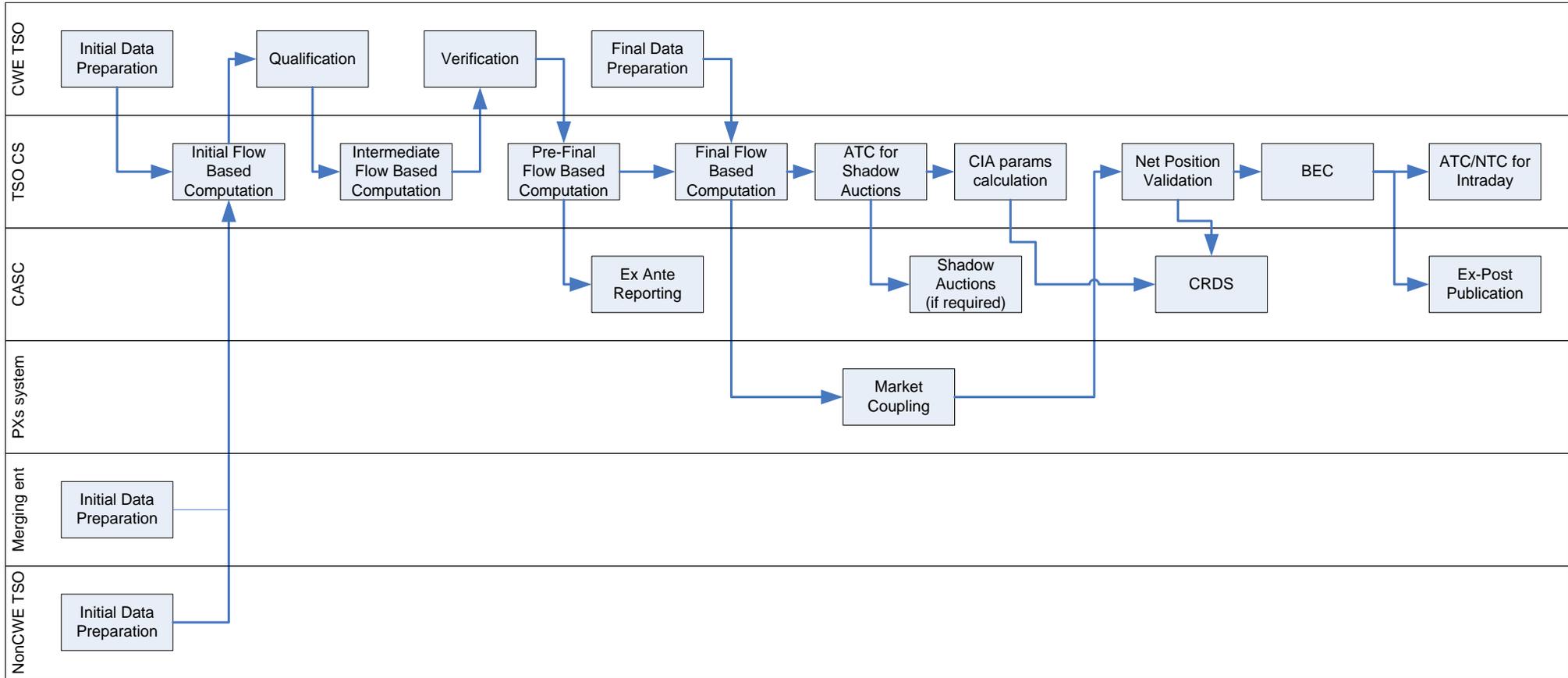


***Documentation of the CWE FB MC solution as basis for the formal approval-request***  
(Brussels, 9<sup>th</sup> May 2014)

**Annex 16.3 High level business process FB capacity calculation**

# 1. High level process

## FB High Level Business Process



### Process introduction

This document describes detailed process description and procedures to be followed during the Flow Based market coupling. The FB process is assembled by following main processes: pre-coupling, post-coupling and marketcoupling.

The pre-coupling process represents the coordinated preparation of grid constraints, provided to the market coupling and covers sub-processes such as Initial Data Gathering, Initial FB Computation, Intermediate FB Computation, Final Data Gathering, Final FB Computation, FB parameters for CIA and ATC Calculation for Shadow Auction.

The Market coupling itself is covered by the MC system (not part of TSO CS). An external PMB system receives anonymized and (only) presolved final flow based parameters and calculates the market outcome within the FB constraints. The output of the Market Coupling is sent back to the CS as the next inputs

The post-coupling process represents the evaluation of market coupling results and covers sub-processes: Net Positions Validation, Bilateral Exchange Computation and Intraday ATC Calculation.

Data Archiving is an integral part of the pre-coupling and post-coupling processes. Compared to the current ATC Based Common System the Flow Based Common System will perform the archiving immediately after each calculation, because of necessity of instant reporting over the computed data. All the input and output data is archived together with the configuration settings. In case of repeated calculation (e.g. restarted initial or intermediate computation) all the previous version of the archived data is kept as well.

The Flow Based Common System covers following main functionalities:

- Receiving Processes
- Data Gathering (all data flowing through the platform), data processing and storage
- Interface for Flow Based parameters computation (initial, intermediate, final, CIA)
- Net Position Validation (NPV)
- Bilateral Exchange Computation (BEC)
- Intraday ATC computation
- ATC for shadow auction computation

The main goal of the flow-based method is enabling a transparent management of the network to be as close as possible to the real time. Following data is needed for FB calculation: Common Grid Model (CGM), Refprog and List of critical branches which are described below. In addition, entities provide GSKs, external constraints, long-term nominations, reference NTCs, LTAs.

CGM network is clear-cut defined by:

- List of all the nodes (buses) and links (lines, transformers, phase shifters etc.)
- List of the different areas and their composition
- Nodal topology (i.e. which line is connected to which node?)
- Nodal voltages
- Node injection and consumption
- Impedance of the lines (lines, transformers, phase shifters etc.)
- The transformer ratios
- The maximal and minimal angles for the phase shifter and their number of plots
- Slack node

The CGM network information is obtained via D-2CF files. CGM is a grid model used to determine the available capacity for cross-border exchanges. The CGM is strongly linked to the best anticipation of the situation in network on maturity date. For deriving the commercial exchanges that are implicitly part of the D2CF the Refprog is provided, which is sent together with D-2CF files.

List of critical branches – for a capacity study the only constraints considered are the flow constraints, since the commercial exchanges cannot compromise the network security. For Critical branch see Definition.

Physical margin is defined for each critical branch. It measures the acceptable flow variation in a critical branch. The physical margin is equal to the difference between the maximal flow and the reference flow. Reference flows are obtained from the load flow calculation. Maximal flows may be obtained from the CB file or the D2CF file.

For simulating the grid flows due to foreign exchanges flows a modeling of the nodal injection is needed. Thus the TSOs need to know which generators will be implied. Such partition of the generation is defined by constant coefficients – Generation Shift Keys (GSK). Each TSO will assess the GSK for the participating nodes where the injection varies significantly during a variation of the zonal balance.

The outcome of the load flow analysis are the FB parameters (RAM=remaining available margin per CB, PTDF matrix) which define the constraint for the MC algorithm. The nodal PTDF matrix encompasses the influence of the injections, the influence on a critical branch of every additional MW injected to the node. Due to the Direct Current approximation the PTDFs only depend on the characteristics of the branches and the network topology.

Once the nodal PTDFs are calculated, the Zonal PTDF, which represents a production shift due to the exchanges, can be calculated by using the GSK matrix.

Finally the Remaining Available Margin (RAM) is calculated giving the margin which is available on all CB for Market Coupling.

### Time schedule overview

Process	Day	Target start time	Normal duration	Target end time	Critical deadline	Sub-process	Non CWE TSO's	CWE TSO's	CC*	Central entity	CASC	Merging entity	MC system
4.1	D-2	14:00	6 h	20:00	02:00	Initial Data preparation	X	X	X		X	X	
	D-2	14:00	1h	15:00	18:00	Prepare reference		X	X	(X)			
	D-2	15:00	4h	19:00	01:00	Send in individual TSO data (CB, D2CF,...)	X	X			X		
	D-2	19:00	1h	20:00	02:00	D2CF Merging						X	
4.2	D-2	20:00	a few sec	20:00	02:00	Initial Data Gathering				X			
4.3	D-2	20:00	10'	20:10	02:20	Initial FB computation				X			
4.4	D-1	23:00	5 h	04:00	07:20	Qualification		X	X				
	D-2	20:10	1h30	00:30	03:50	Local Qualification (local RA)		X					
	D-1	00:30		02:00	05:20	Pre-qualification (optional)		X	X				
	D-1	00:30	1h30	02:00	05:20	Prepare and send in RA coordination request		X	X	(X)			
	D-1	02:00	2h	04:00	07:20	RA coordination check		X	X	(X)			

4.5	D-1	04:00	10'	04:10	07:30	Intermediate FB computation				X			
4.6	D-1	04:10	3 h 30'	07:45	10:15	Verification		X	X				
4.7	D-1	07:45	10'	07:55	10:25	Pre-Final FB computation				X			
4.8	D-1	07:55	5'	08:00	10:30	Ex-ante reporting				X			
4.9	D-1	08:00	1h30	09:30	11:25	Final data preparation		X					
4.10	D-1	09:30	a few sec	09:30	11:25	Final data gathering				X			
4.11	D-1	09:30	10'	09:40	11:35	Final FB computation				X			
4.12	D-1	09:40	10'	09:50	11:45	ATC for Shadow Auctions computation				X			
4.13	D-1	09:50	10'	10:00	15:50	CIA for FB computation				X			
4.14	D-1	12:00	42'	12:42	13:37	Market Coupling							X
4.15	D-1	12:42	13'	12:55	13:50	Net Position Validation				X			X
4.16	D-1	12:55	10'	13:05	16:10	Bilateral Exchange Computation				X			X
4.17	D-1	13:05	10'	13:15	17:20	Intraday ATC Computation				X			
4.18	D-1	15:00	10'	15:10	20:00	CRDS					X		
4.19	D-1	15:00	10'	15:10	20:00	Ex-post reporting				X			

\*CC: Coordination Center