



Nordic Finer Time Resolution

February 16th, 2016





Agenda

- ❖ Requirements from the network code on Electricity Balancing (NC EB)
- ❖ Finer time resolution in a Nordic context
- ❖ Overview of the Nordic finer time resolution project
- ❖ Feasibility study and implementation concepts (ICs)
 - ✓ Evaluation methodology
 - ✓ Implementation concepts
- ❖ Input from stakeholders

ENTSO-E Network Code on Electricity Balancing (NCEB)

CONNECTION CODES

- › Requirements for Generators
- › Demand Connection Code
- › High Voltage Direct Current Connections

OPERATIONAL CODES

- › Operational Security
- › Operational Planning & Scheduling
- › Load Frequency Control & Reserves

MARKET CODES

- › Capacity Alloc. & Congestion Management
- › Forward Capacity Allocation
- › Electricity Balancing

The NC EB's objectives

- ❖ Balancing markets should ensure that demand and supply remain in continuous balance at the lowest possible cost to customers.
- ❖ Aim to move Europe from the current national focus on balancing to a situation where larger markets allow resources to be shared across Europe
- ❖ Promote greater integration, coordination and harmonization of electricity balancing rules in order to make it easier to trade resources.

Source: <http://networkcodes.entsoe.eu/market-codes/electricity-balancing/>

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MARKET CODES

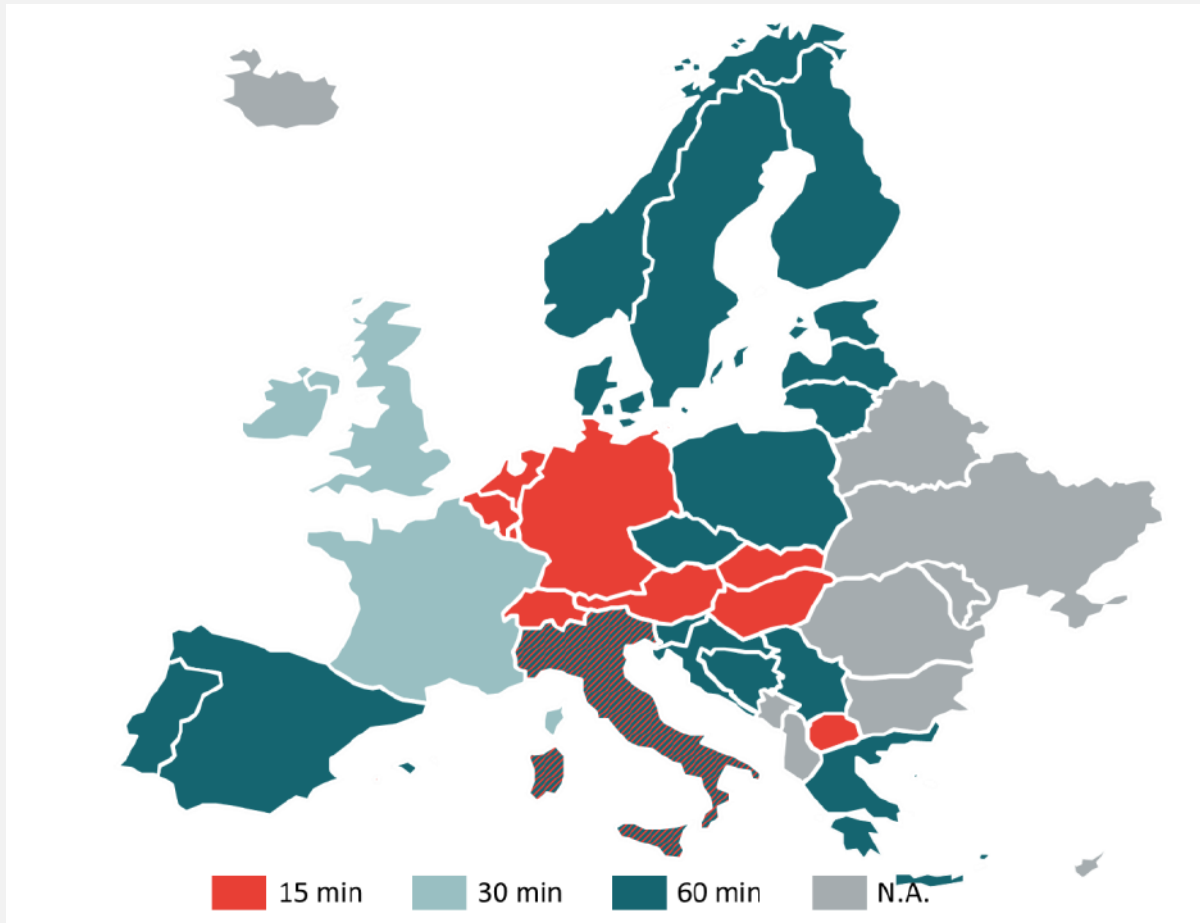
- > Capacity Alloc. & Congestion Management
- > Forward Capacity Allocation
- > Electricity Balancing

- ❖ The NC EB requires a harmonization of the imbalance settlement period (ISP) across Europe
- ❖ ACER has recommended to harmonize the ISP at 15 minutes
- ❖ ENTSO-e is performing a cost-benefit analysis (CBA) to assess ACERs recommendation
 - ✓ Preliminary results expected in March 2016

Source: <https://www.entsoe.eu/major-projects/network-code-implementation/cba-imbalance-settlement-period/Pages/default.aspx/>



Current Imbalance Settlement Periods (ISP) in Europe



Note: Harmonization on 60 min is not an option

Source: ENTSO-E WGAS, Survey on Ancillary services procurement, Balancing market design 2014, Jan 2015



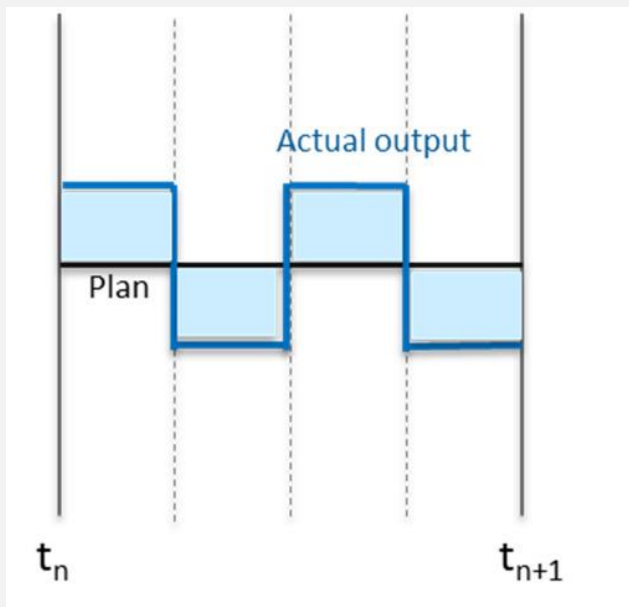
Finer time resolution in a Nordic context

- ❖ More intermittent, and less predictable, power infeed into the system
- ❖ More HVDC interconnections, leading to potential larger hourly changes in exchange volumes with other synchronous areas



Background - relationship between imbalances and market time resolution

- ❖ imbalances that occur because the BRPs do not follow their plans



Example of a production plan where the imbalances are "invisible" if hourly resolution in the settlement is applied



Background - relationship between imbalances and market time resolution

- ❖ So-called "planned intra hour imbalances". These imbalances are a result of the market design and happen even if all BRPs follow their plans

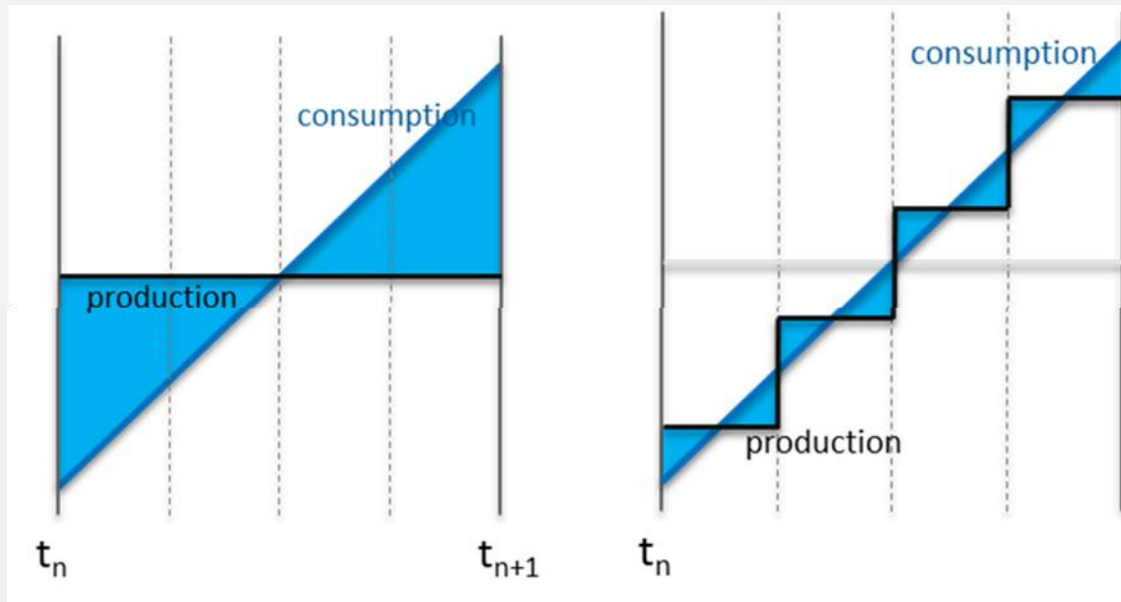


Illustration of how production changes in quarterly steps reduce the imbalances (blue area)



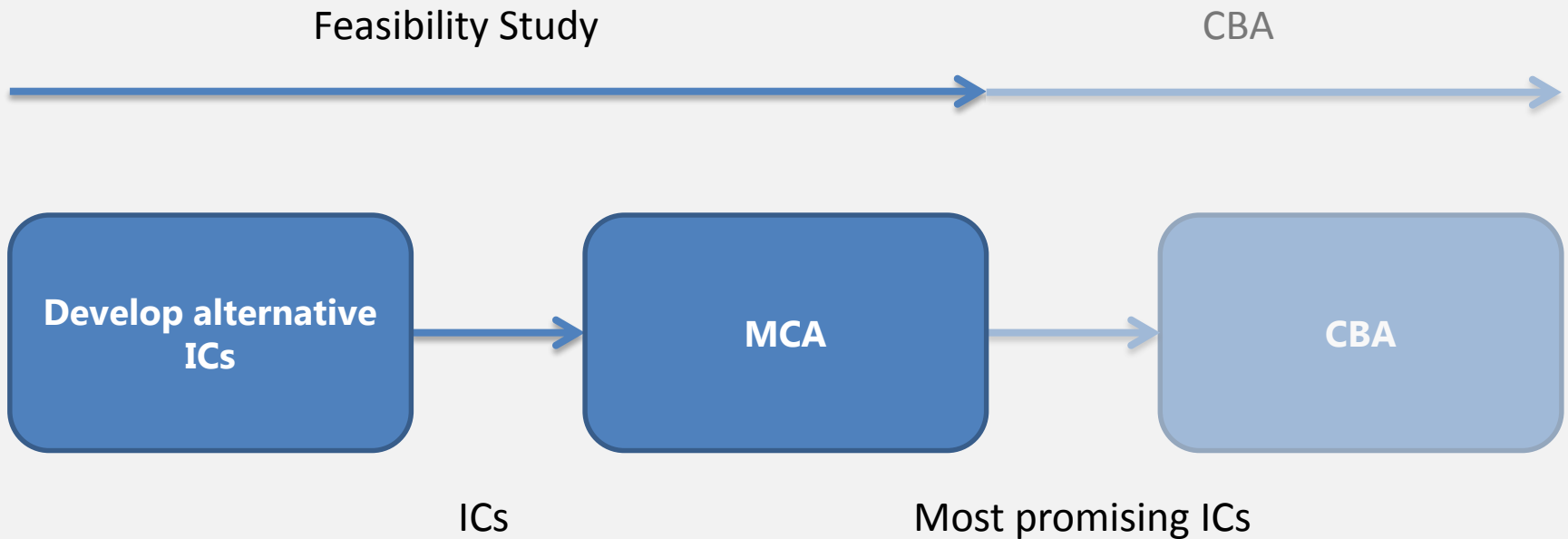
Nordic Finer Time Resolution Project

- ❖ Finer time resolution consist of:
 - ✓ 15 min time resolution in the imbalance settlement between **TSO** and **BRP**
 - ✓ 15 min settlement for both production and consumption
 - ✓ 15 min market time resolution (at least one option for market players to trade themselves into balance)

- ❖ Two dimensions, captured in a so-called Implementation Concept (IC):
 - ✓ Implemented solution, consisting of several conceptual building blocks
 - ✓ Implementation process, being the implementation timeline of the conceptual building blocks



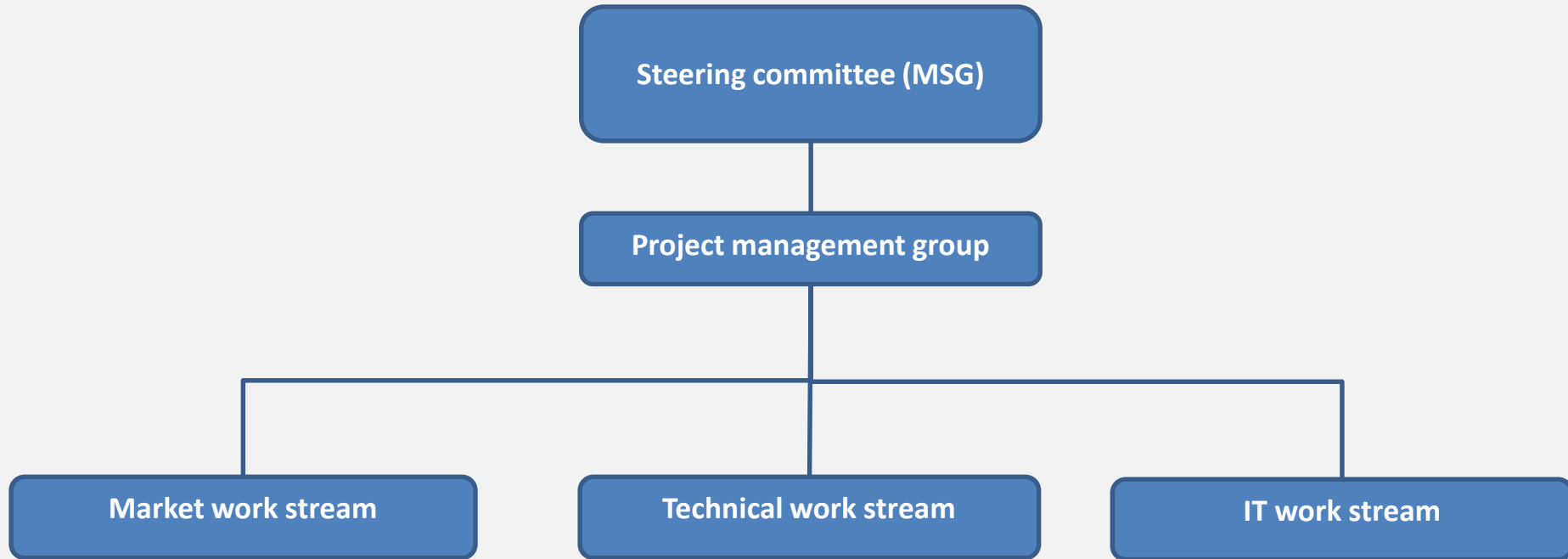
Approach



IC: Implementation Concept
MCA: Multi-Criteria Analysis
CBA: Cost-Benefit Analysis

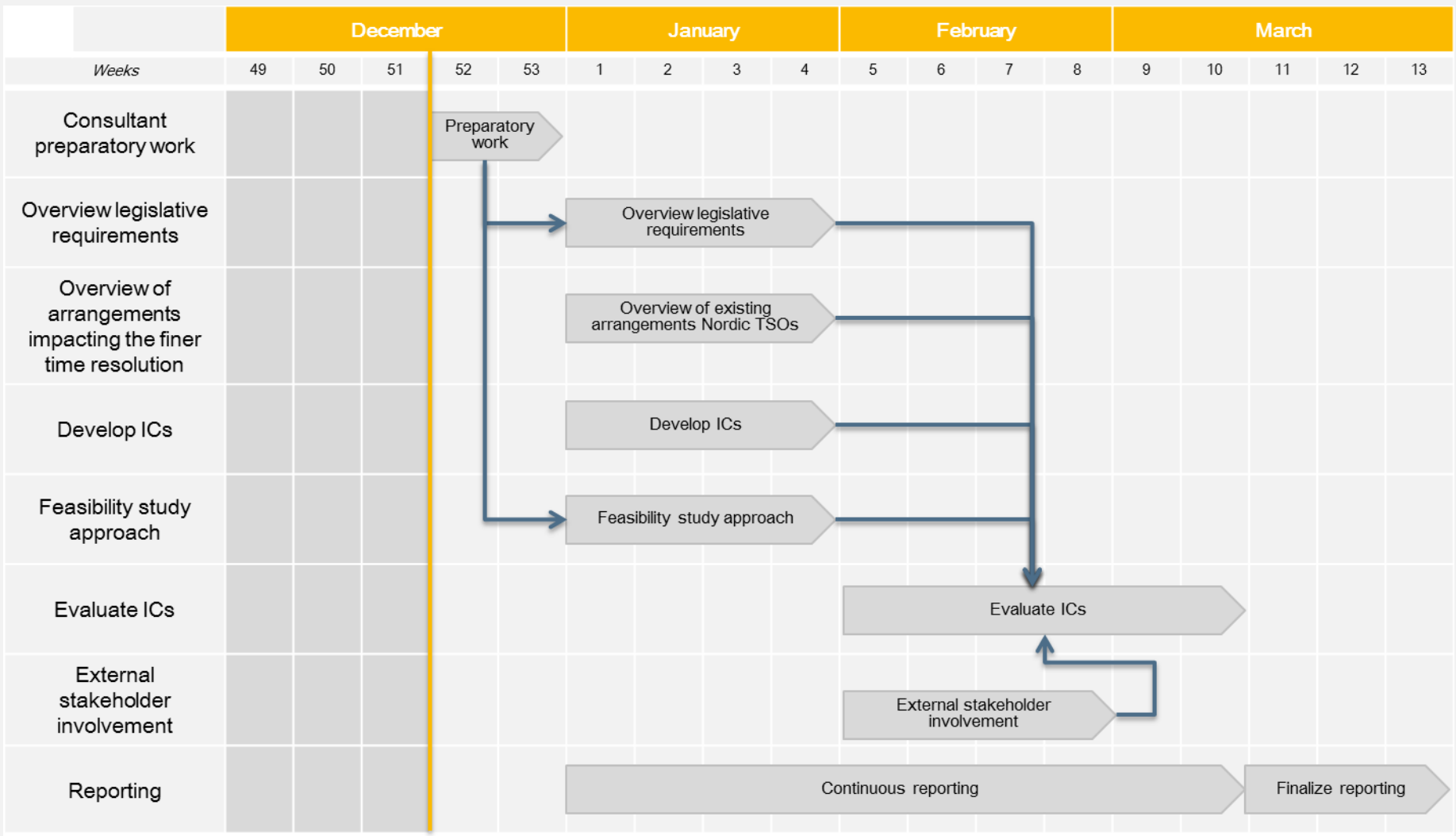


Project organisation





Planning





MCA: Multi-Criteria Analysis

Criterion	unit	Rating			
		IC1	IC2	IC3	...
One off costs	++/--	-	--	-/+	
Market liq.	++/--	++	+	--	
...	...				

Normalization of the ratings (0..1)



Criterion	Normalized rating			
	IC1	IC2	IC3	...
One off costs	0.5	0	1	
Market liq.	1	0.75	0	
...				

Different weighting factors can provide an indication of the sensitivity of the outcome

Criterion	Weighting Factor 1	Score 1			
		IC1	IC2	IC3	...
One off costs	10	5	0	10	
Market liq.	1	1	0.75	0	
...					

Criterion	Weighting Factor 2	Score 2			
		IC1	IC2	IC3	...
One off costs	1	0.5	0	1	
Market liq.	10	10	7.5	0	
...					



Multi-Criteria Analysis (MCA)

Criterion	Weighting Factor 1	Score 1			
		IC1	IC2	IC3	...
One off costs	10	5	0	10	
Market liq.	1	1	0.75	0	
...					



Explanation of the building blocks

- 15 minute ISP between TSO-TSO settlement
- 15 minute ISP between TSO-BRP settlement in both production and consumption

15 minute market time resolution in RPM (energy market only)

The existing ID

Hybrid ID

15-min DA Additional Market

15-minute DA

Higher resolution production plans (e.g. 5 mins)

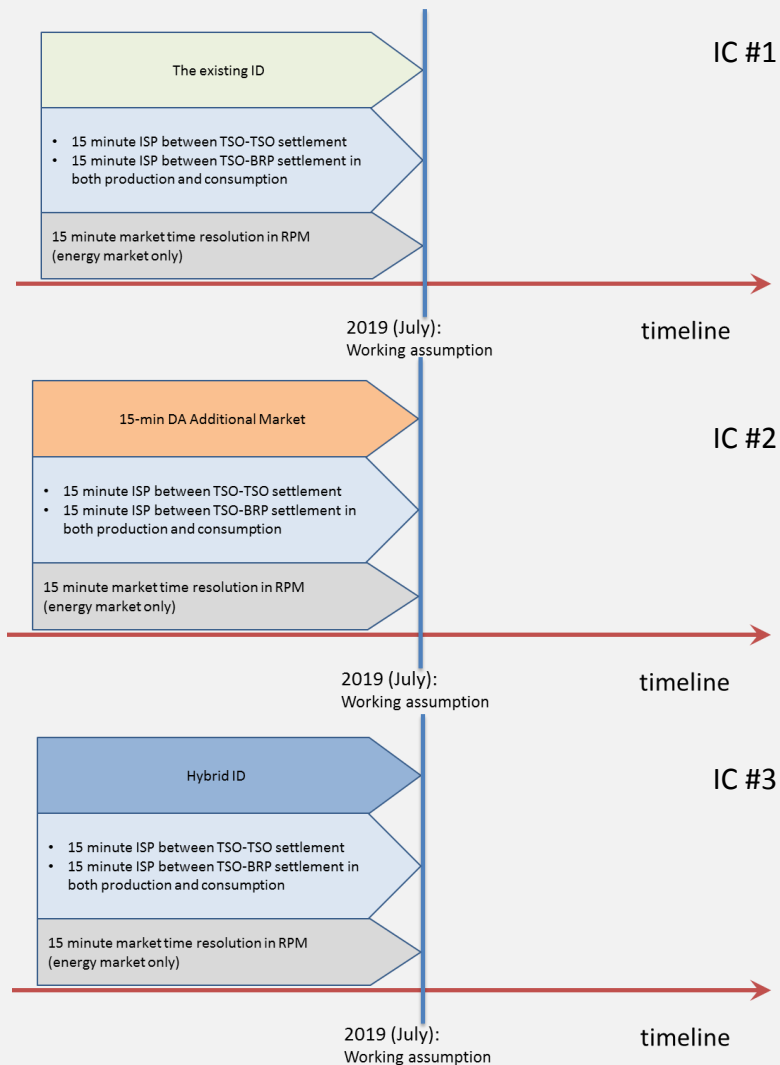
15-minute end-consumer metering

- ❖ Interpretation of NC EB compliance by introducing both 15-minute ISP between TSO-TSO settlement and 15-minute TSO-BRP settlement for both production and consumption.
- ❖ 15-minute RPM market on the energy trading, not on the capacity trading.
- ❖ The current ID market but with continuous trading of 15-minute products, using DA market spot price as reference for imbalance price settlement.
- ❖ The 'Hybrid ID' provides, next to the continuous trading, an auction mechanism (or other price-setting mechanism). The ID market price can be used for the imbalance settlement price.
- ❖ The '15-minute additional DA' block is based on the successful experience in Germany, and provides the possibility to set the imbalance price based on the 15-minute 'additional' DA price.
- ❖ The '15-minute DA' block is the current DA market with 15 min products and provides the possibility to set the imbalance price based on the 15-minute DA price.

- ❖ Both IC add-ons are functionalities that can be evaluated independently from the other ICs, and be combined with the ICs



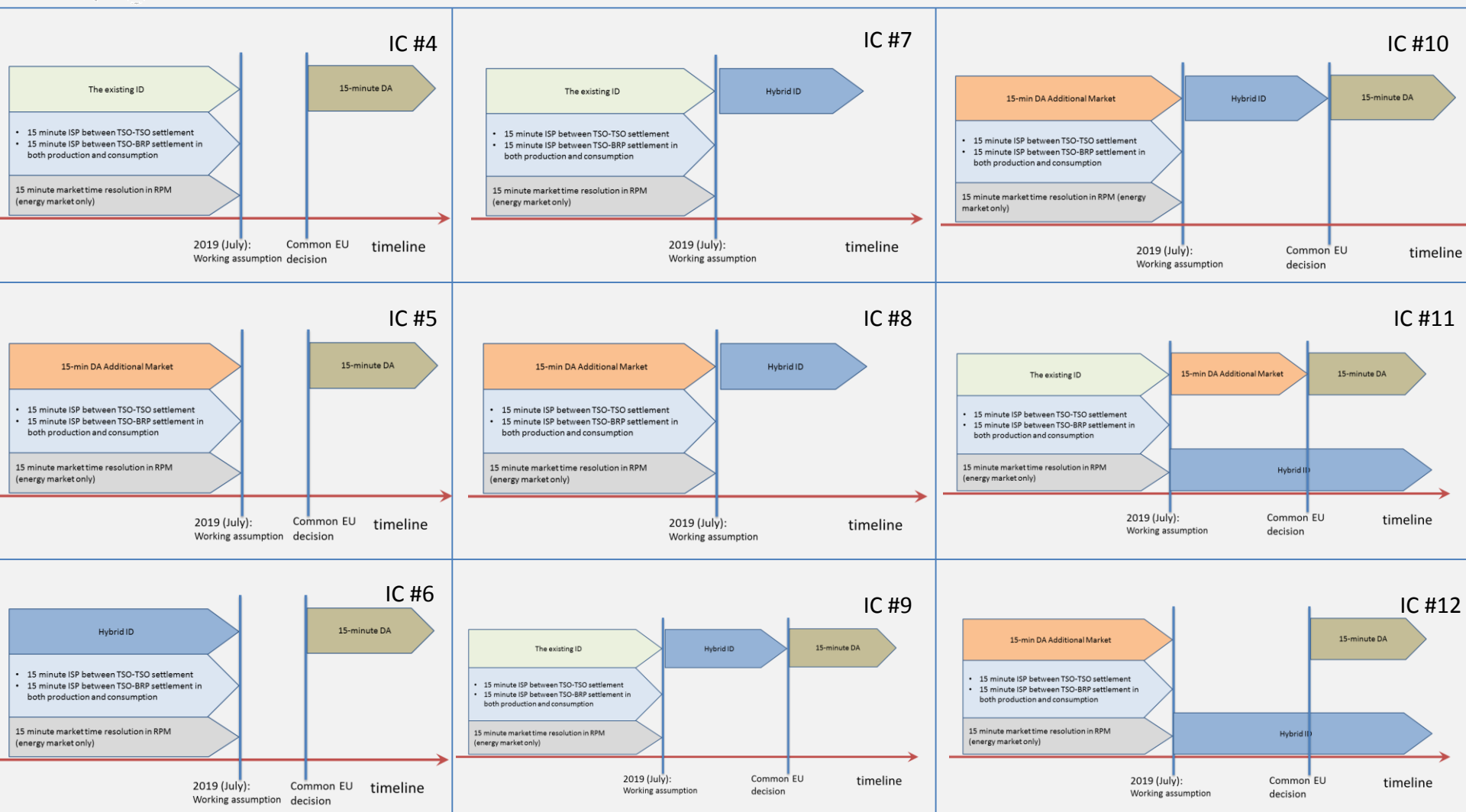
Minimum implementation ICs



- ❖ The light blue and grey blocks appear in each IC.
- ❖ Nevertheless, they are shown separately in order to indicate that the implementation timelines are independent from one another in the sense that an implementation delay of the grey block will not impact go-live of the light blue block.
- ❖ 'The existing ID', '15-min DA Additional Market' and 'Hybrid ID' blocks comply with the NC EB requirement that market participants must have minimum one option to trade themselves into balance.

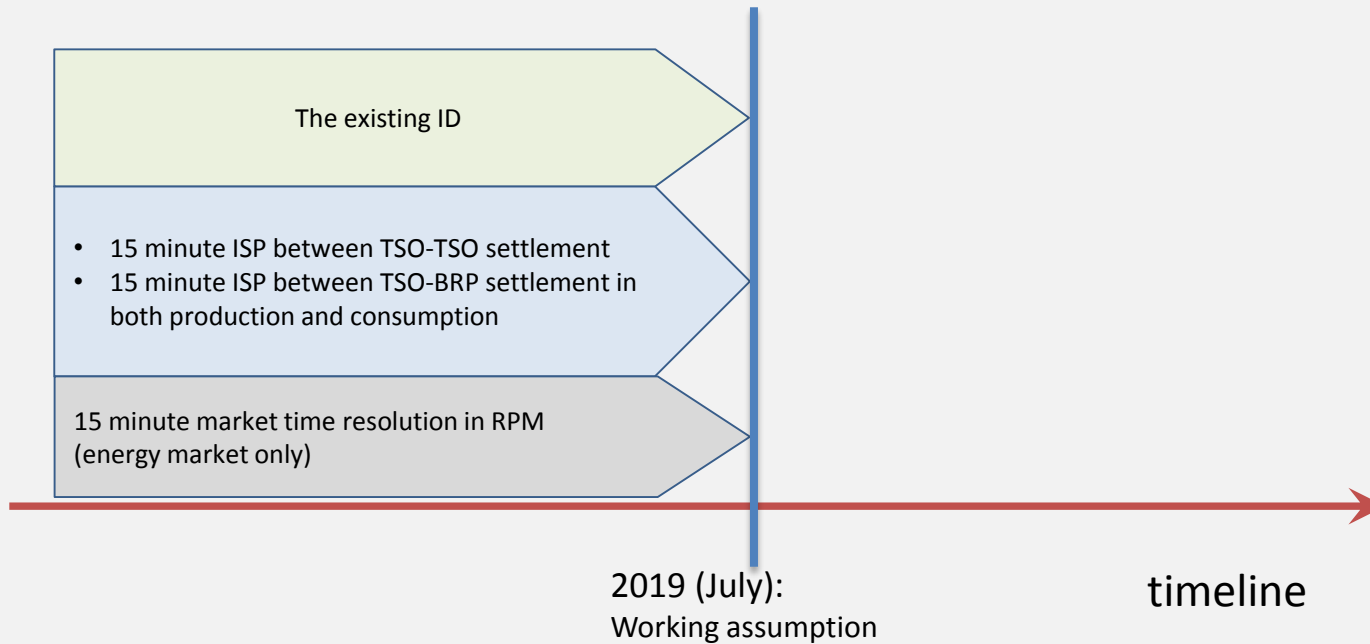


ICs with expanded functionality



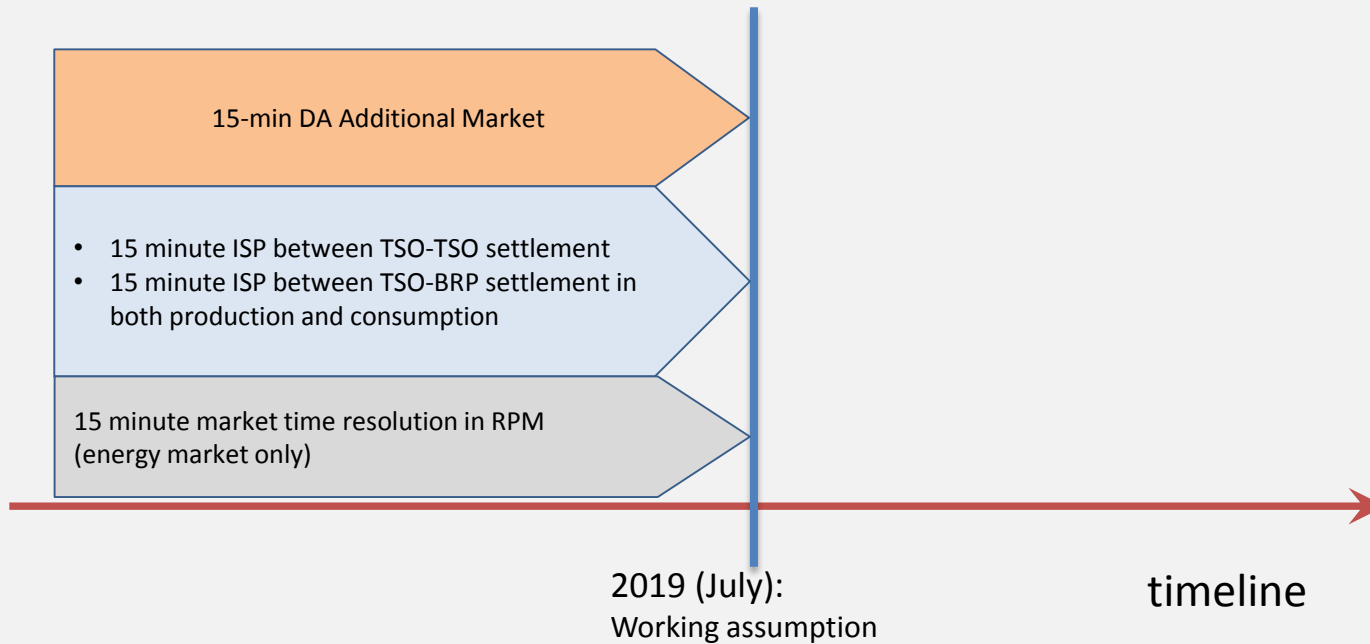


IC #1



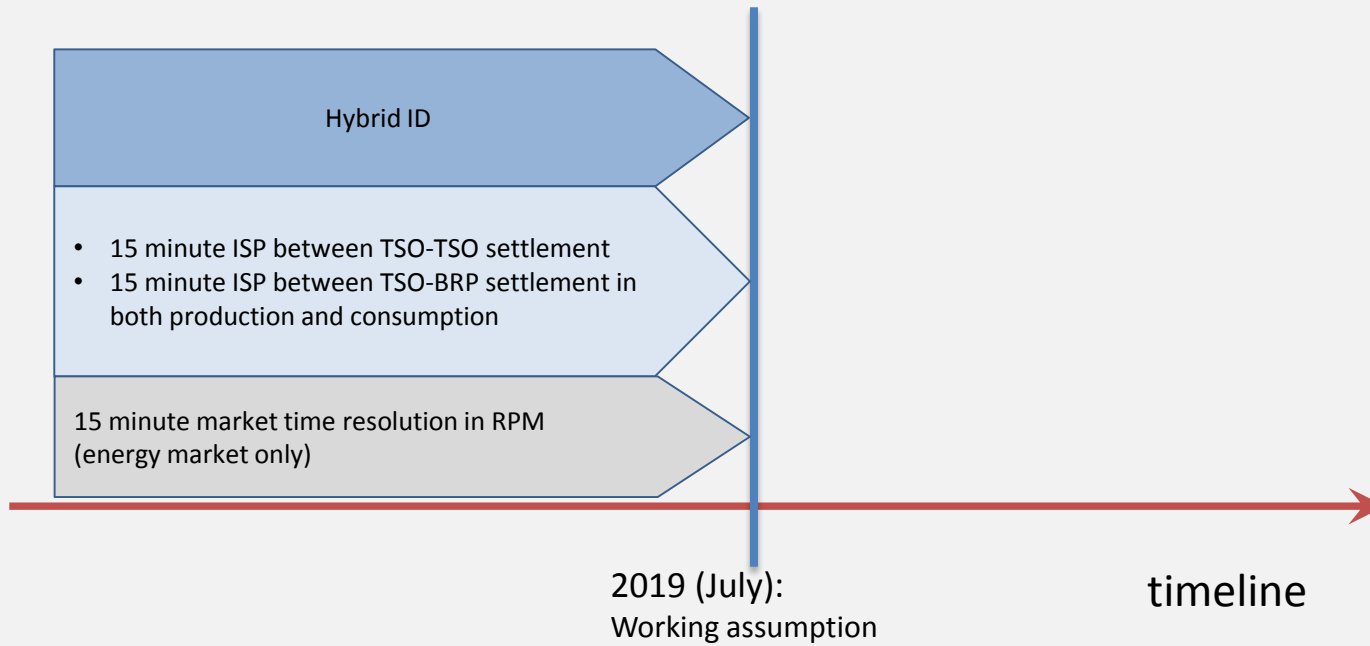


IC #2



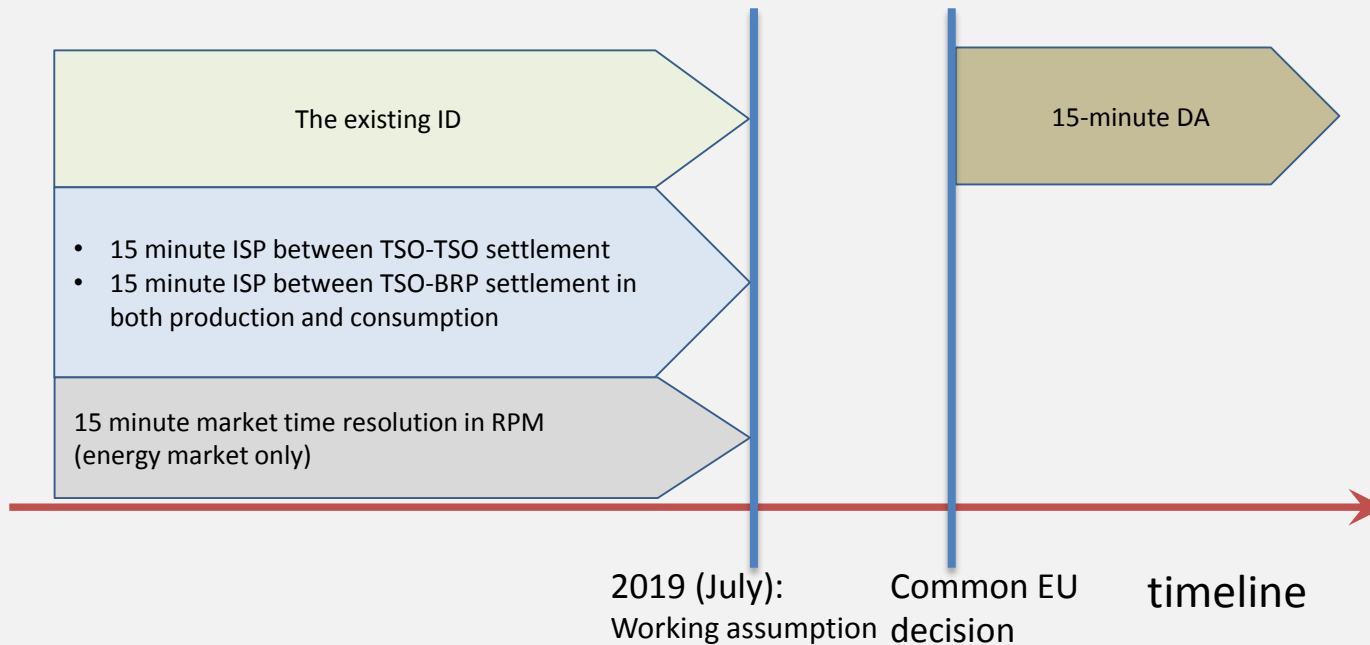


IC #3



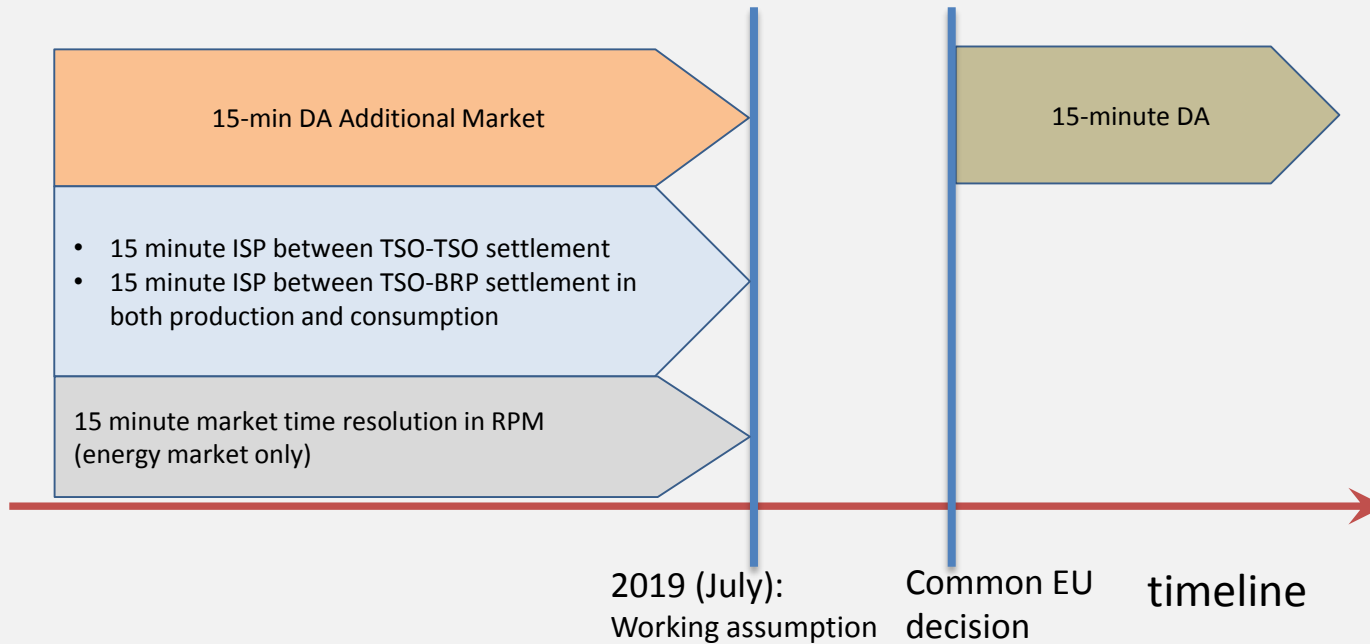


IC #4



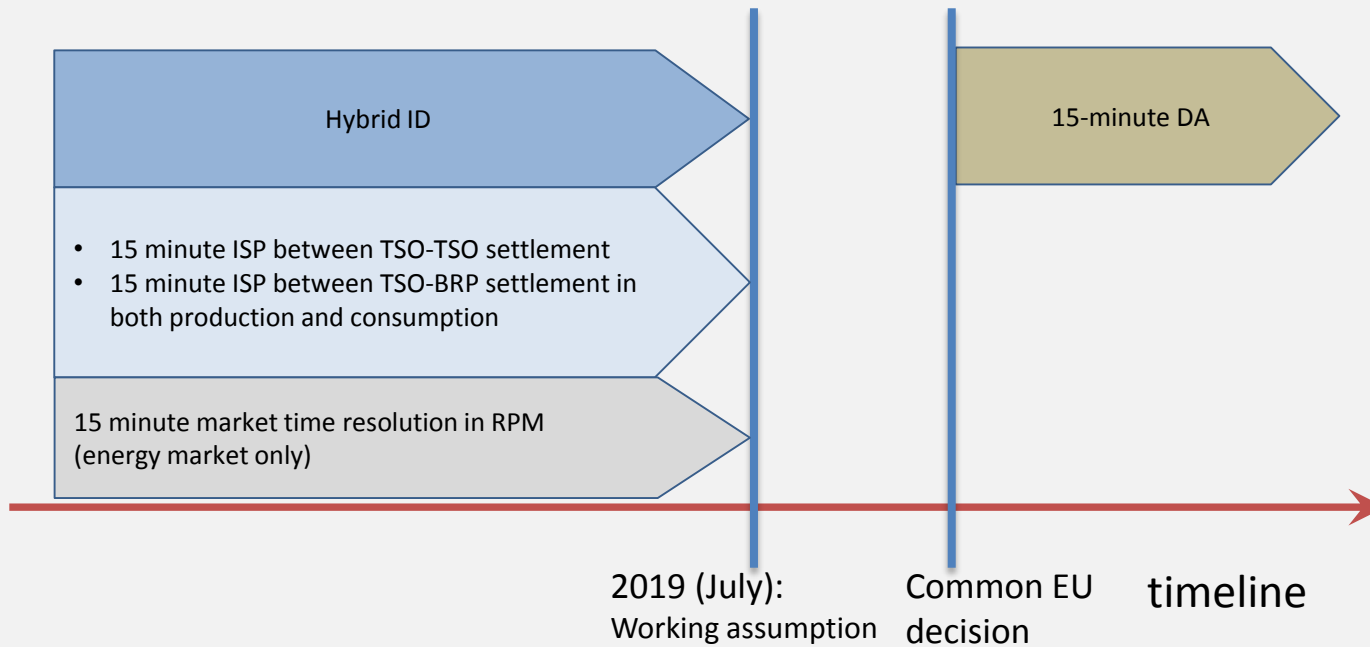


IC #5



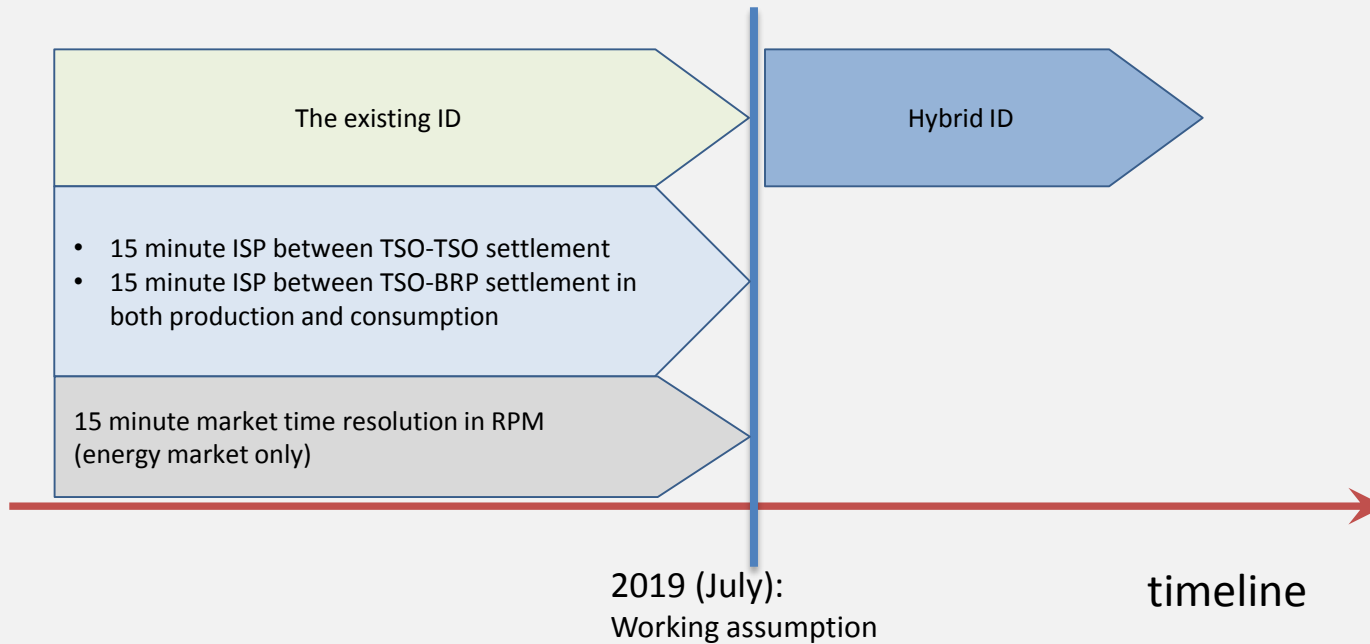


IC #6



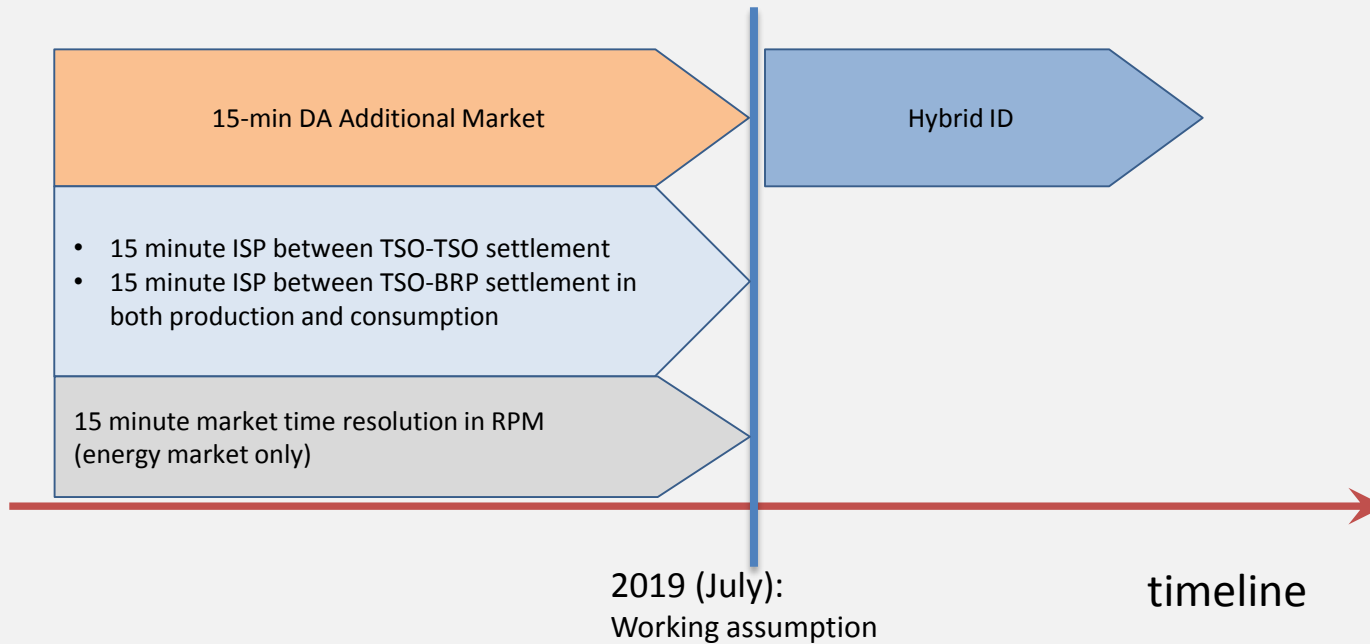


IC #7



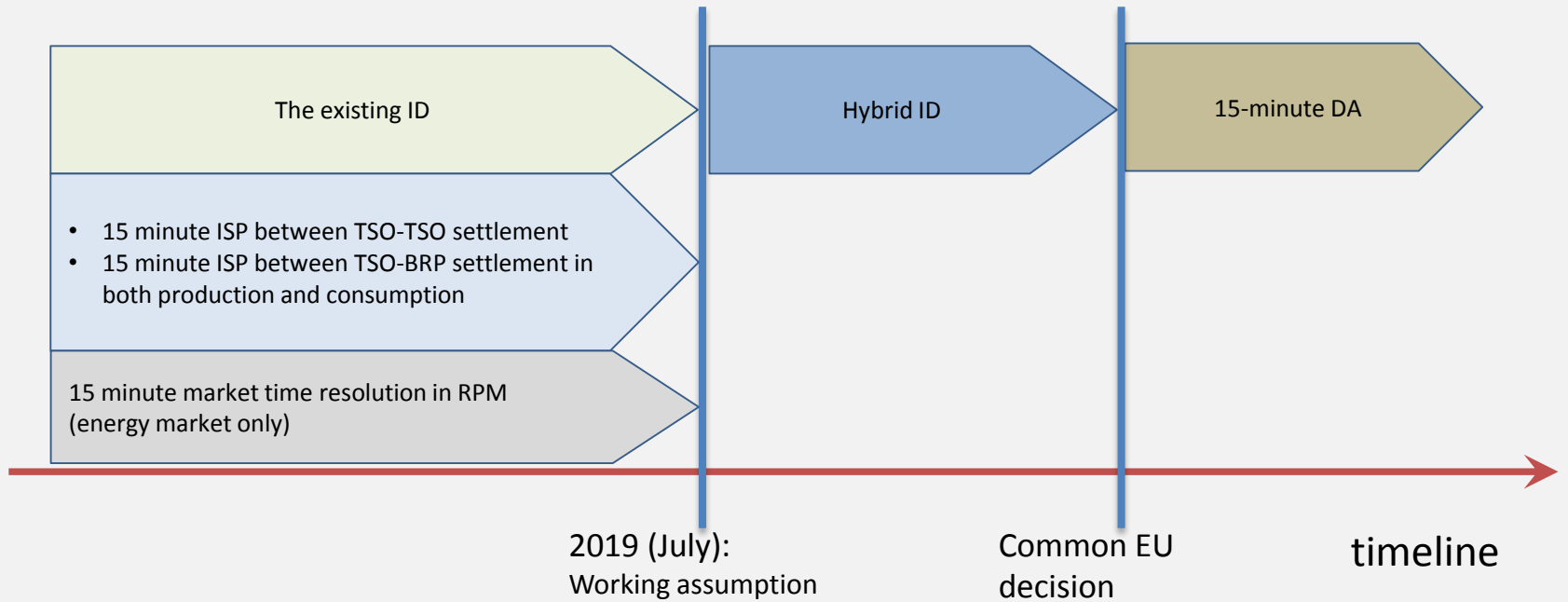


IC #8



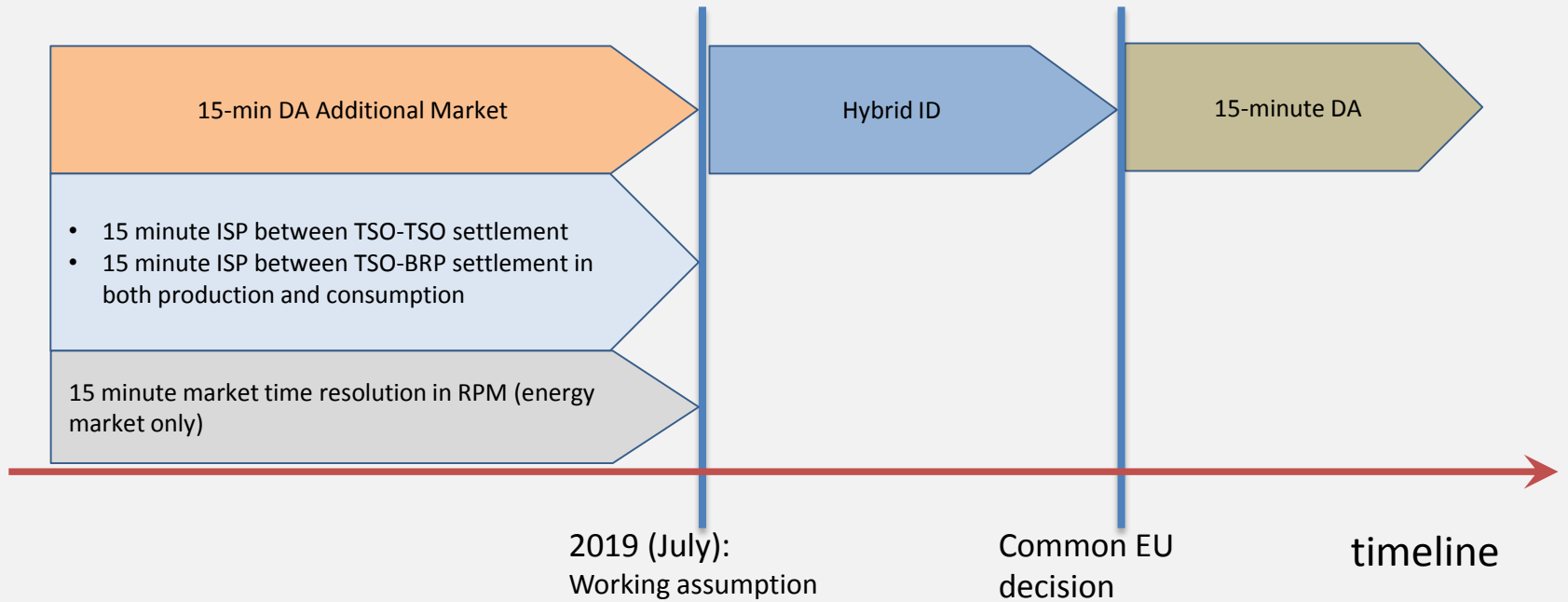


IC #9



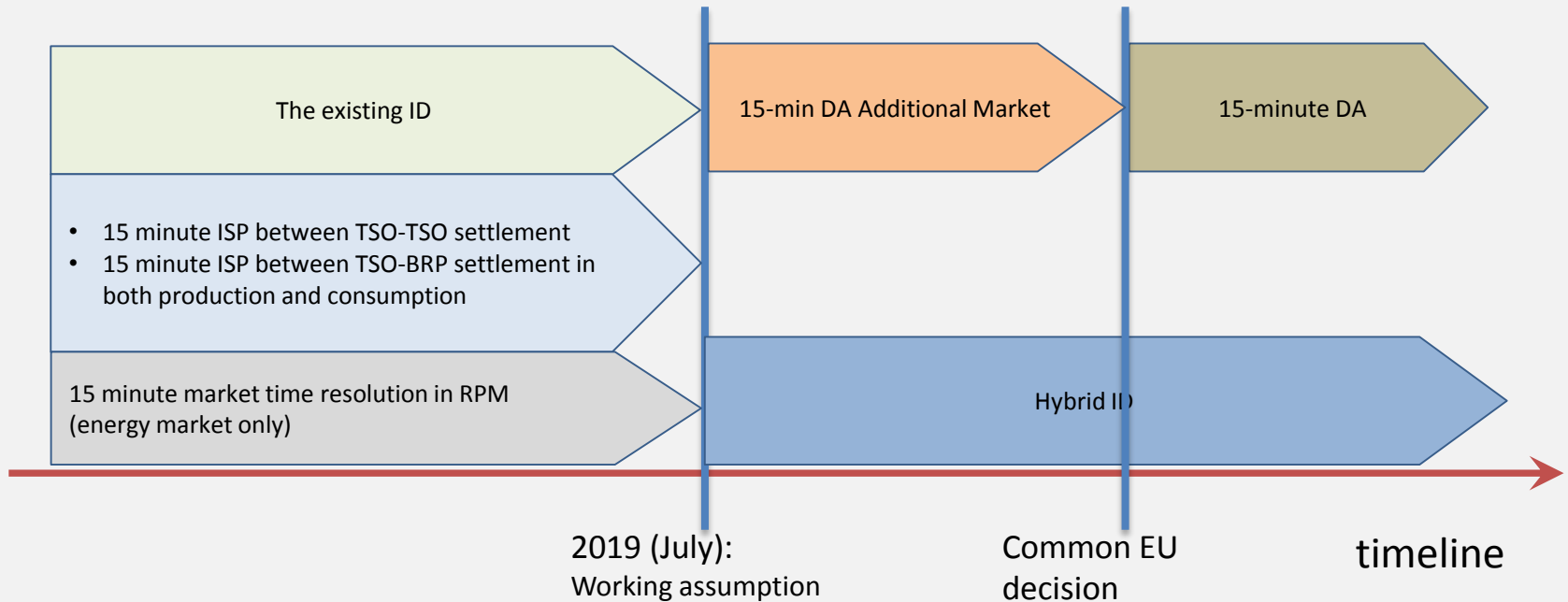


IC #10



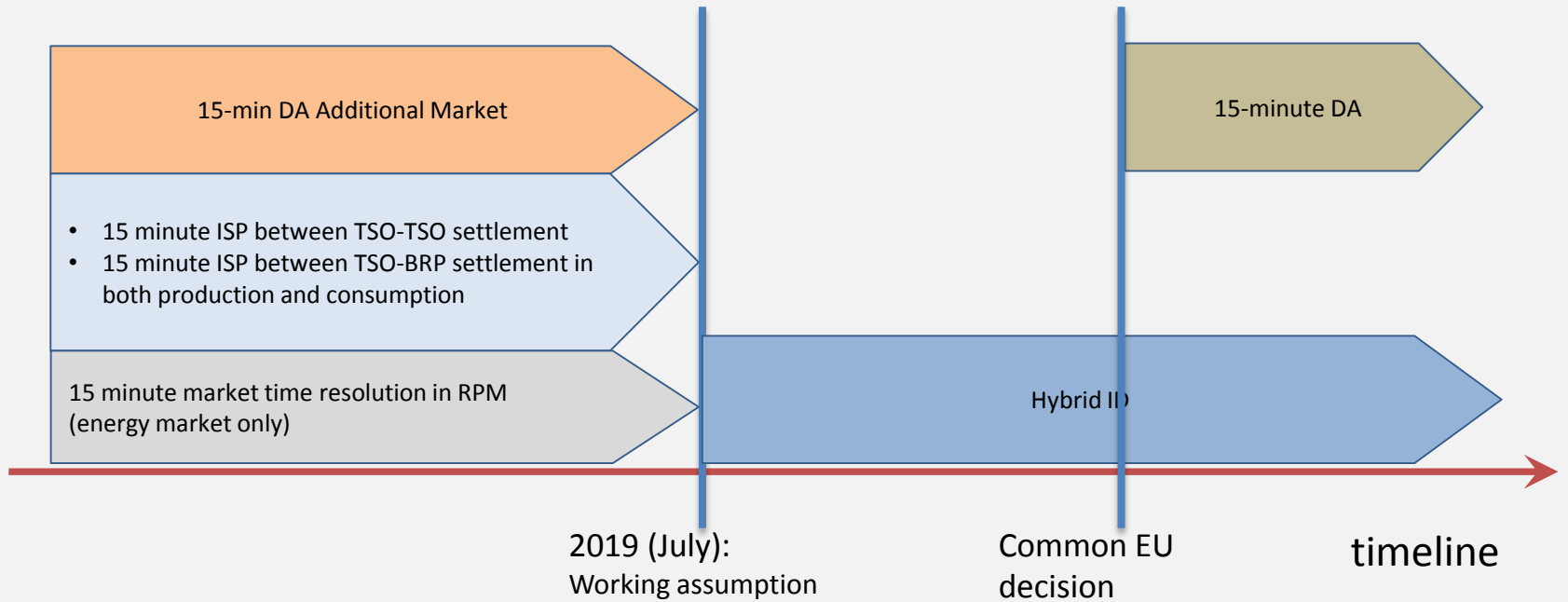


IC #11





IC #12





IC add-on 1

IC add-ons are functionalities that can be evaluated independently from the other ICs, and be combined with the ICs

15-minute end-consumer metering

'15-minute end-consumer metering' add-on

- 15 min end-consumer metering only comes into play when 15-minute metering has been rolled out in the Nordic countries
- As such, the implementation is rather far away on the timeline, which brings a lot of uncertainties, compared to other IC blocks



IC add-on 2

IC add-ons are functionalities that can be evaluated independently from the other ICs, and be combined with the ICs

Higher resolution production plans (e.g. 5 mins)

‘Higher resolution production plans’ add-on

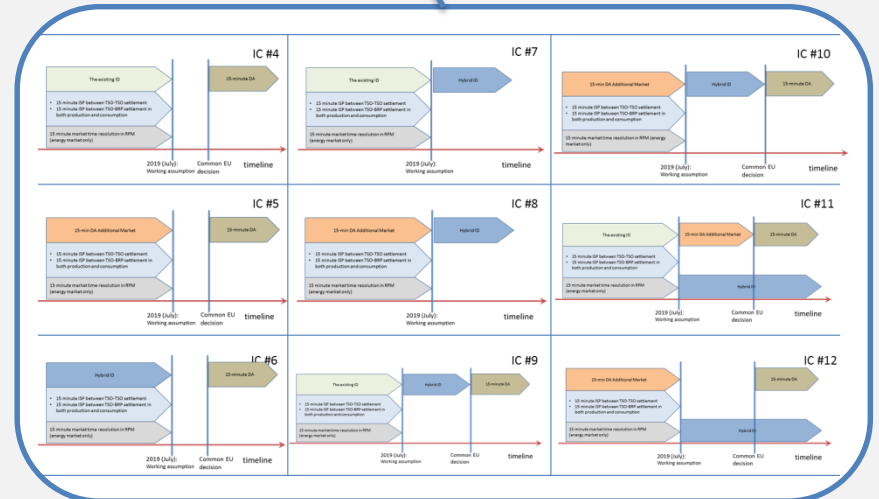
- The add-on brings pure operational benefits for TSOs at potential additional costs for the producers.
- The IC add-on can be evaluated individually, independent from other IC blocks.



Multi-Criteria Analysis (MCA)

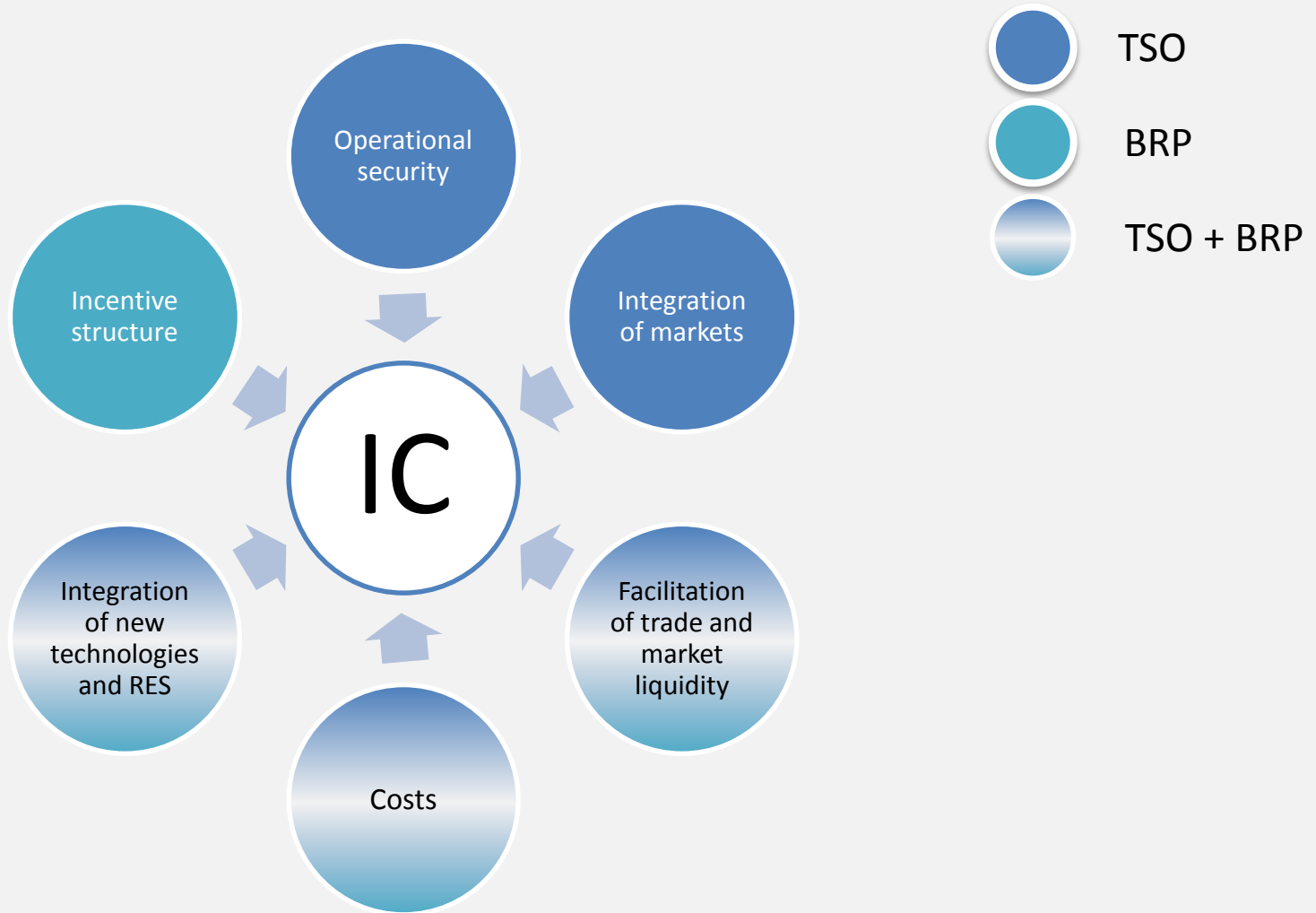
		Score 1			
Criterion	Weighting Factor 1	IC1	IC2	IC3	...
One off costs	10	5	0	10	
Market liquidity	1	1	0.75	0	
...					

ICs





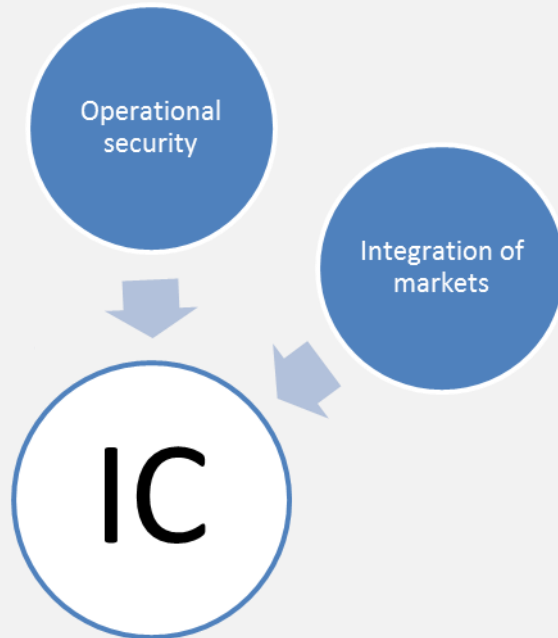
Criteria to evaluate the different ICs





TSO-only criteria

- Change in need of reserve volume
- Operation of new and existing HVDC links
- Impact on TSO processes
- Activation of FCR (frequency quality)
- Activation of FRR (aFRR and mFRR)
- Technical feasibility (in relation to the implementation time line)
- Facilitation of new RES infeed (Operation of new unregulated RES)

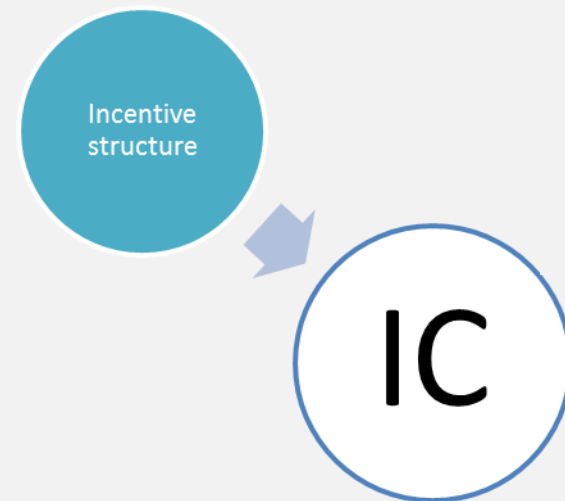


- Facilitation of cross-border trade e.g. DA and ID with Germany
- Possibility for CoBA-CoBA agreements outside Nordic area
- Increased use of interconnector capacity
 - Continuous ramping
 - Flipping of direction of HVDC links from quarter to quarter



BRP-only criteria

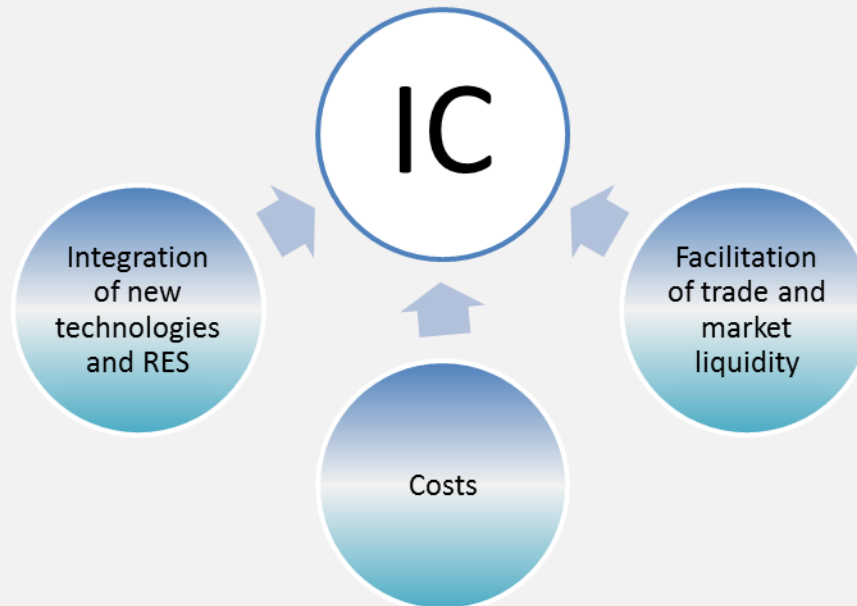
- Provision of correct price signals/incentives to be balanced (Incentives to trade on a quarterly basis)
- Risk of adverse pricing (i.e. higher ID price than anticipated balancing price)





TSO and BRP criteria

- Facilitation of new RES infeed
- Facilitation of more demand side response



- Possibility for market participants to balance their portfolio efficiently before the operational quarter
- Attractiveness of the new 15 min organized market trading opportunity
- Market liquidity: RPM, ID, DA, New market (Hybrid ID and additional DA auction)

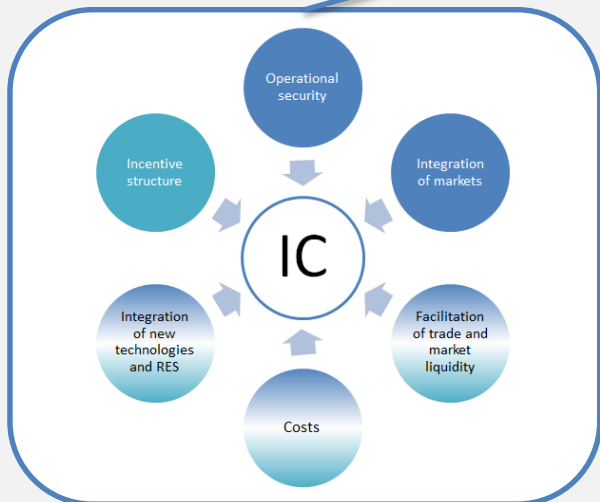
- One off costs (IT tools, measurement system, training staff, resources)
- Ongoing costs (daily operation)
- Implementation risk



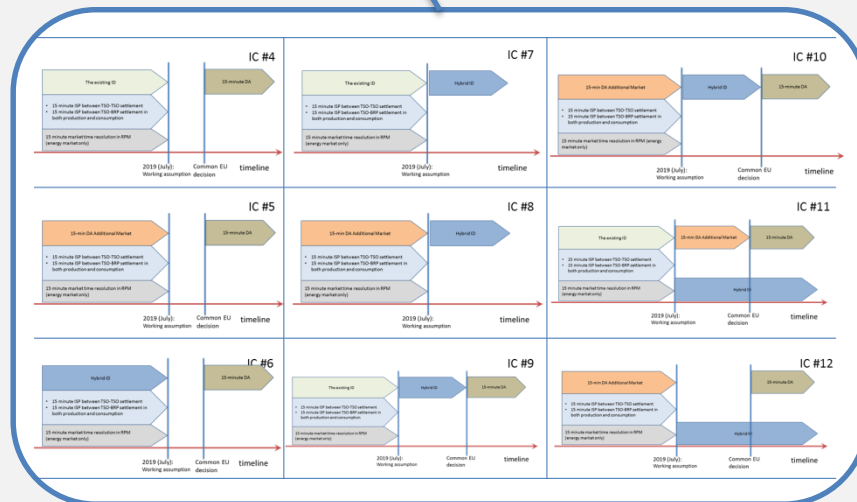
Multi-Criteria Analysis (MCA)

Criterion	Weighting Factor 1	Score 1			
		IC1	IC2	IC3	...
On off cost	10	+	-/+	++	
Market liquidity	1	++	+	-/+	
...					

Criteria and weighting factors

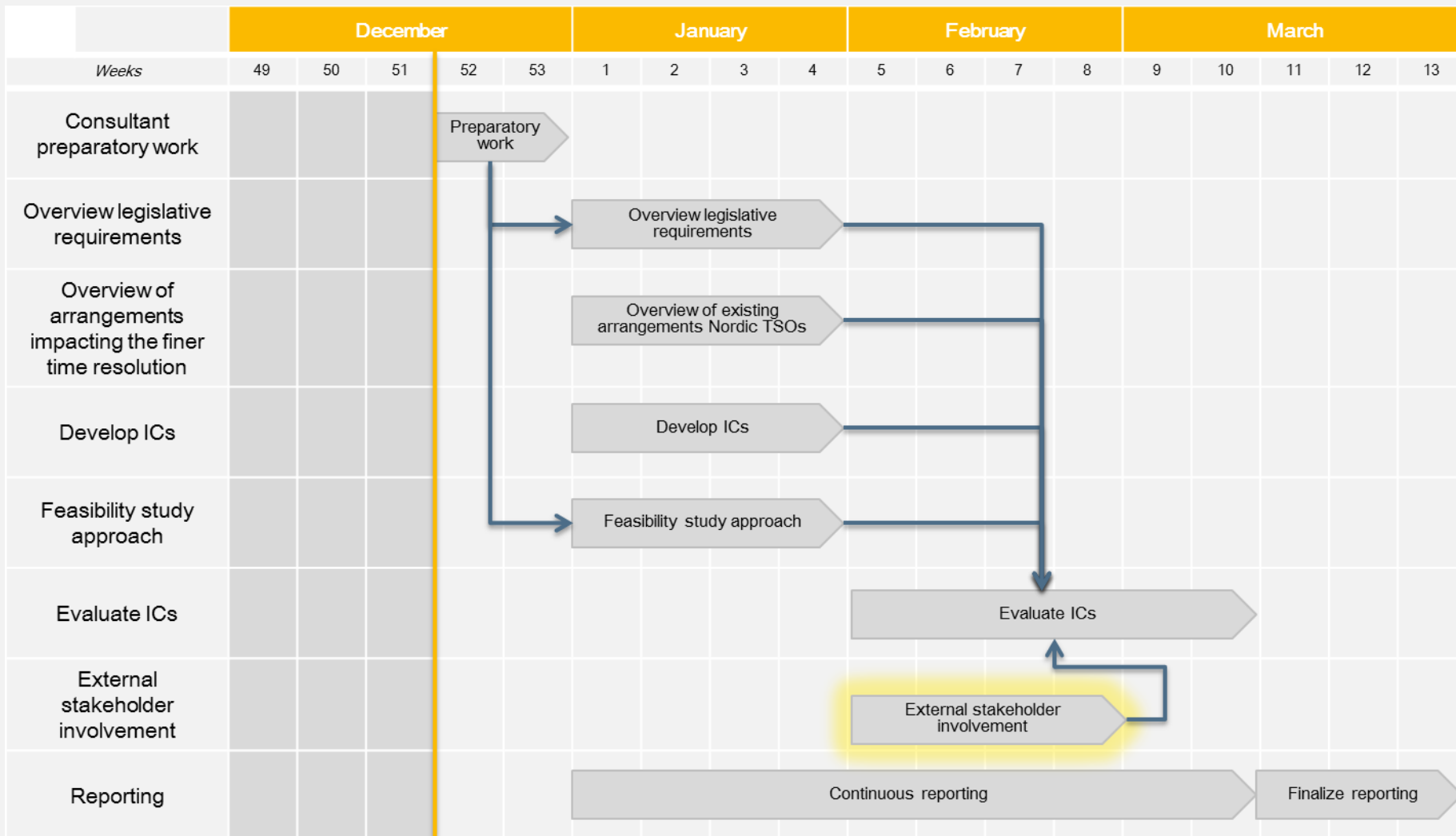


ICs





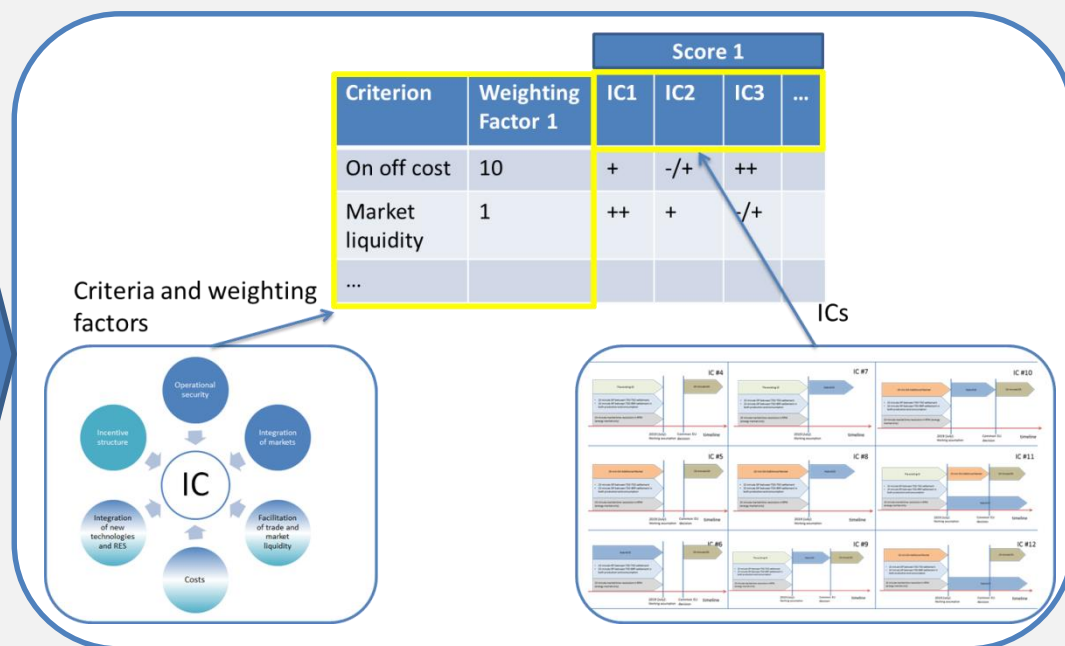
Stakeholder involvement





Stakeholder involvement

- ❖ We would like to take your view(s) into account
- ❖ Four national stakeholder meetings are organized by the Nordic TSOs in Feb 2016
- ❖ We developed a questionnaire to structure the feedback





Questionnaire

- ❖ We kindly ask you to provide your feedback before February 29th
- ❖ Please note that input received after that date cannot be taken into account
- ❖ The results of the questionnaire will be shared with you





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