



Common Grid Model

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Flow Based Stakeholder Group Meeting

Kastrup, 1 December 2016

Overview

- Common Grid Model
- Model establishment
- Individual Grid Models
- CGM applications
- Common Grid Model Exchange Standard
- Implementation (2016-18)
 - Development, Transition, Stability, Operation
- Potential Barriers

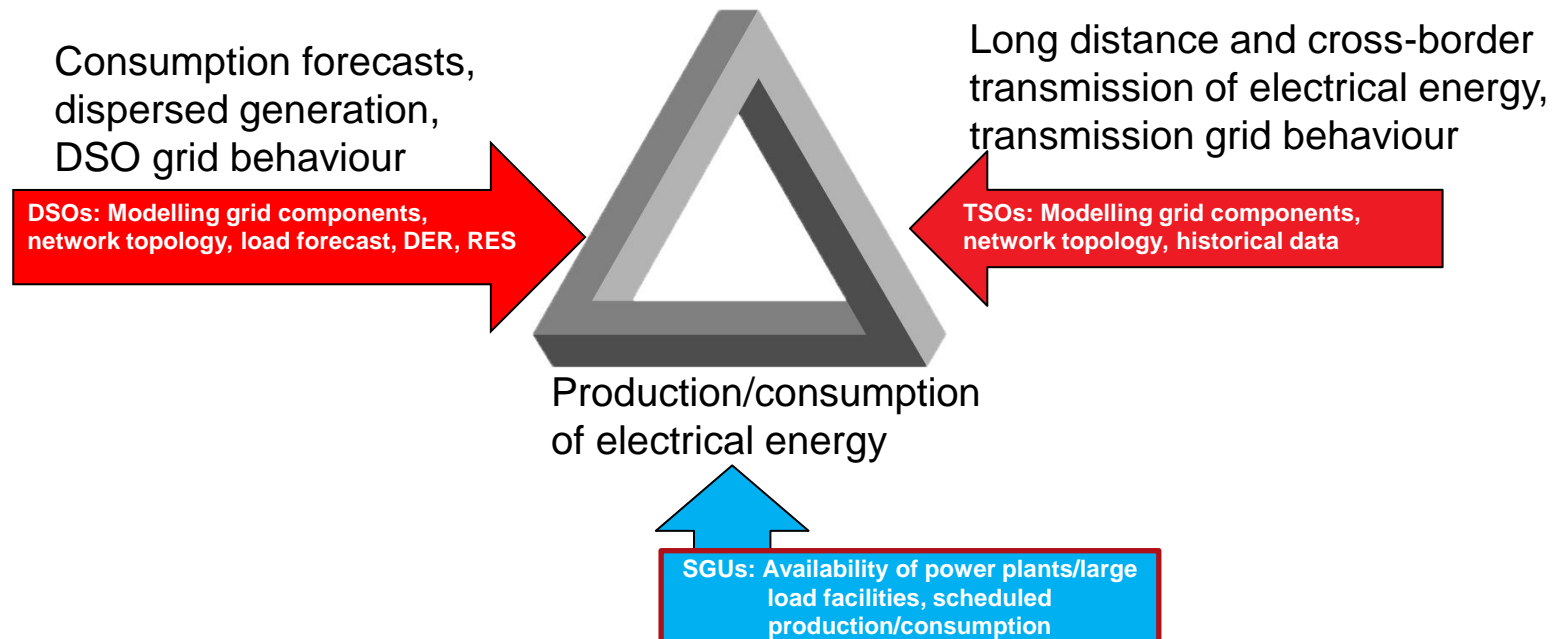
What is the Common Grid Model?

- Defined in GL CACM:
 - 'common grid model' means a Union-wide data set agreed between various TSOs describing the main characteristic of the power system (generation, loads and grid topology) and rules for changing these characteristics during the capacity calculation process
- The CGM is built up of the TSOs' Individual Grid Models:
 - 'individual grid model' means a data set describing power system characteristics (generation, load and grid topology) and related rules to change these characteristics during capacity calculation, prepared by the responsible TSOs, to be merged with other individual grid model components in order to create the common grid mo

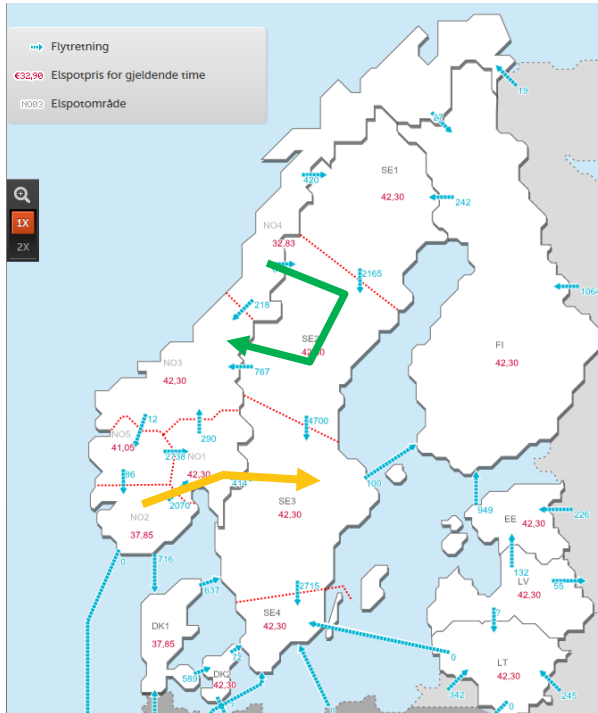
The Common Grid Model and Flow Based Capacity Allocation

- FB methodology is defined by the Power Transfer Distribution Factors (PTDF)
- Node-to-Line (CNE) PTDFs depend on grid reactances and topology
- Zone-to-Line (CNE) PTDFs also depend on Power Shift Keys (also called Generation Shift Keys)
- Steady state solution must be verified and possibly adjusted

Data from many sources



First after merging we can estimate the actual flows



Like:
Loop flows
Transit flows



Necessary tasks (RSC)

- Collect all the model parts (IGMs) and information about boundary connections
- Compensate for missing information (if applicable)
- Check the plausibility of the assumptions and check the format in which the data has been provided (so it can be processed correctly)
- Align the energy balance (what is produced, what is consumed and what is scheduled to be exchanged) for each IGM provided by each TSO
- Perform some model improvement (i.e. get rid of inconsistencies)
- Merge the models
- Calculate the system state for the whole grid and for each synchronous area

The expected system state depends on when you look at it



Grid Planning



Market & Operational Planning



Capacity



Operation

Grid extension
Outage planning

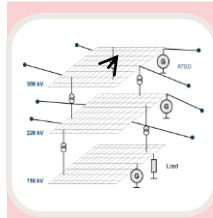
Maintenance & Capacity

Capacity

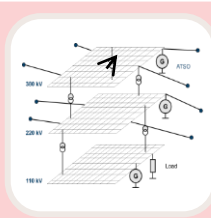
Security

Capacity & Security

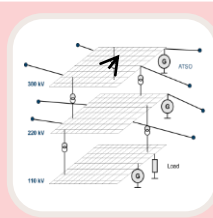
Execution



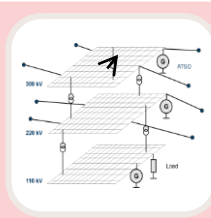
Year(s) ahead



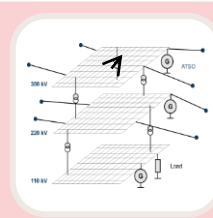
Month ahead



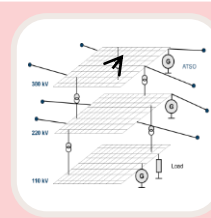
Week ahead



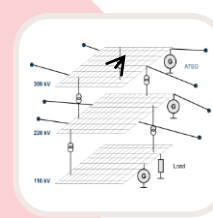
2-Days ahead



Day ahead



Intraday



Real-time

Confidence level

Business processes and time horizons

TSO's Individual Grid Models are expressed as CGMES (CIM) EQ models for a business day and SSH/TP instances for every reference point in time

Years ahead Individual Grid Models

Year ahead Individual Grid Models

Month ahead Individual Grid Models

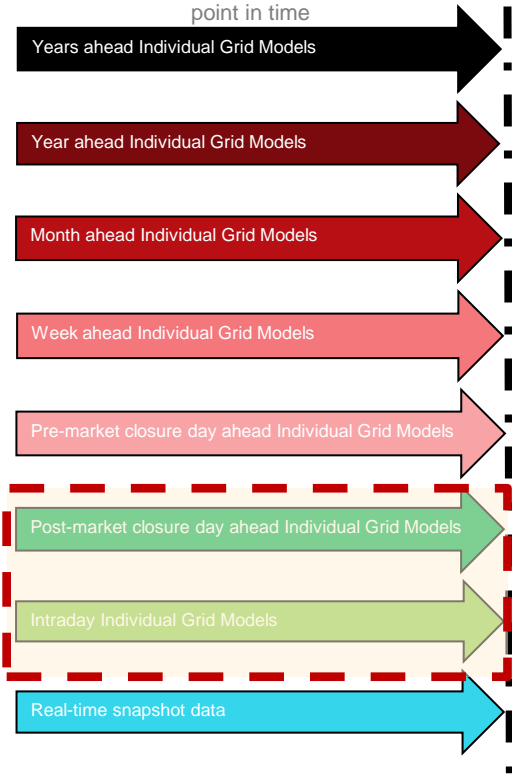
Week ahead Individual Grid Models

Pre-market closure day ahead Individual Grid Models

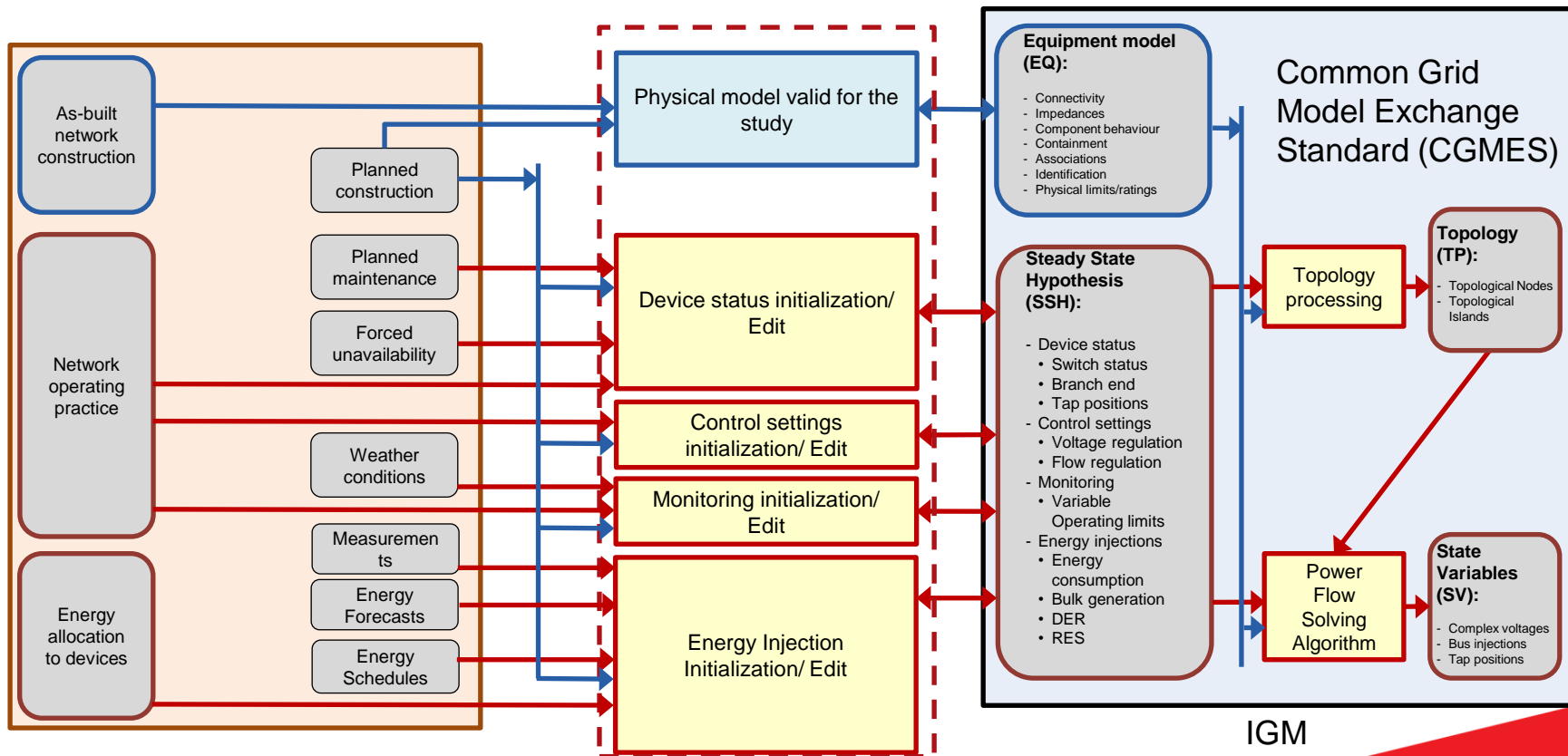
Post-market closure day ahead Individual Grid Models

Intraday Individual Grid Models

Real-time snapshot data

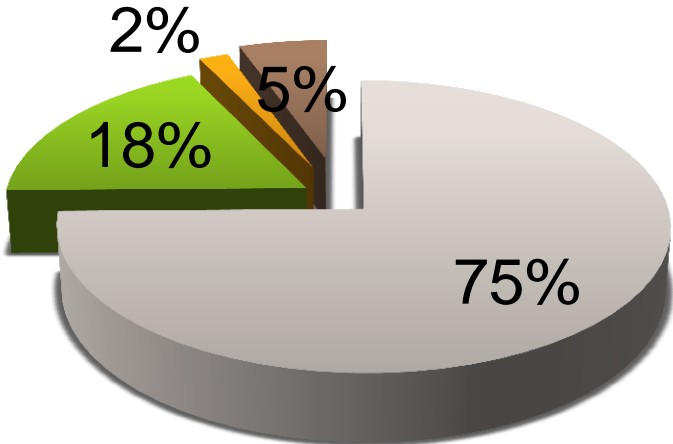


The DNA of an IGM



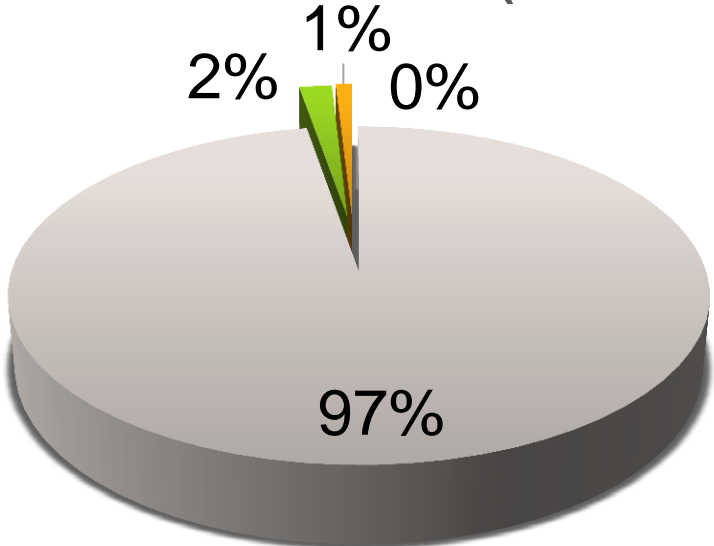
Common Grid Model Exchange Standard versions

CGMES 2.4 (CIM16)



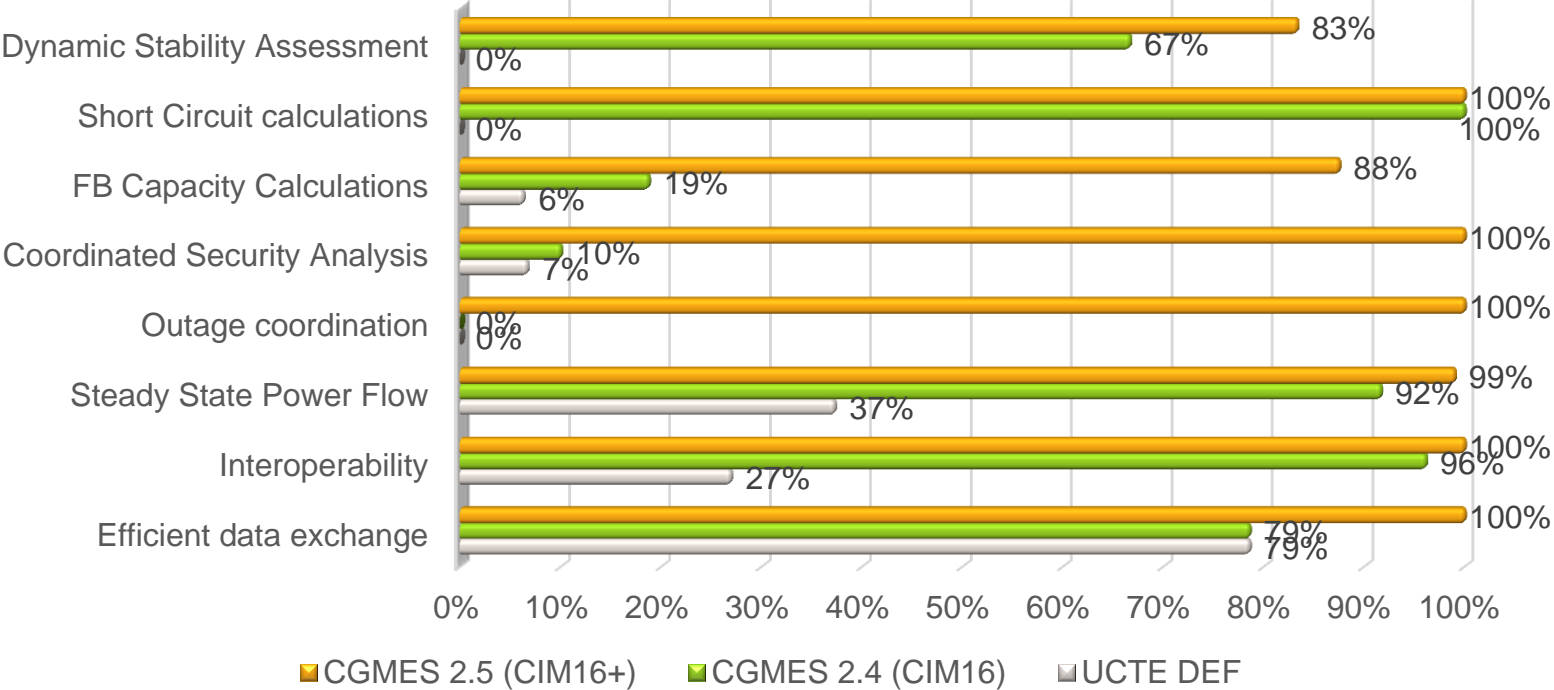
- Full
- Not
- Partial
- Work around

CGMES 2.5 (CIM 16+)

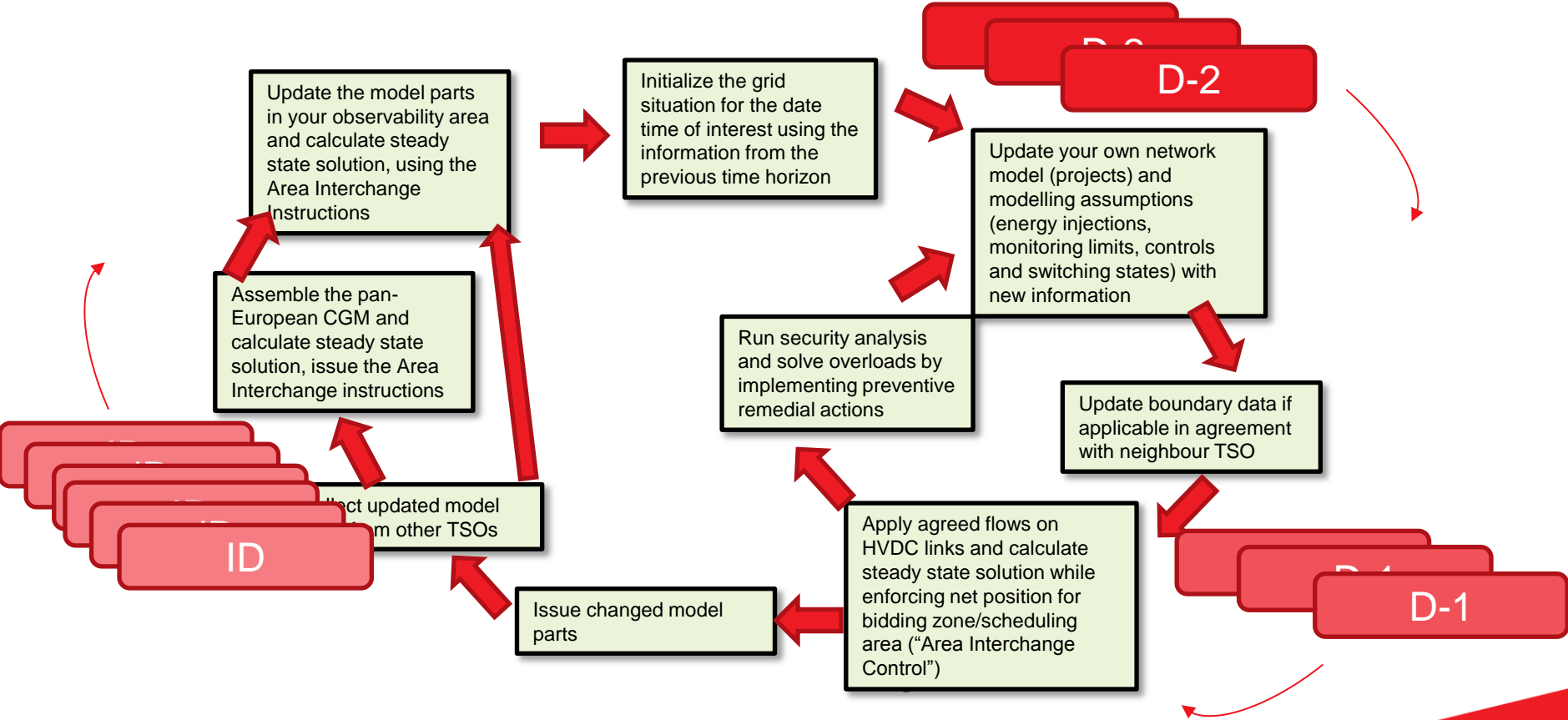


- Full
- Not
- Partial
- Work around

Use cases



Not a one-shot effort but a continuous process



Central Documents

- Guideline on Capacity Allocation and Congestion Management (**CACM**)
 - COMMISSION REGULATION (EU) 2015/1222 of 24 July 2015
- All TSOs' proposal for a common grid model methodology (**CGMM**) in accordance with Article 17 of [GL CACM]
- All TSOs' proposal for a generation and load data provision methodology (**GLDPM**) in accordance with Article 16 of [GL CACM]
- All TSOs' Common Grid Model Alignment Methodology (**CGMAM**) in accordance with Article 25(3)(c) of the (draft) Common Grid Model Methodology
- Documents required by CACM will be published on TSOs' or NRAs' web sites
- And several others:
 - Quality of CGMES Datasets and Calculations, European Merging Function Requirements Specification, Migration Process from UCTE DEF to CGMES, Pan European Verification Function etc.

Stepwise implementation: 4 phases

13 January 2017

13 July 2017

13 January 2018

**Development
Phase****Transition
Phase****Stability
Phase****Operational
Phase**

Develop software,
Services and
the ATOM network

All TSO's/RSC's
Implement CGMES

Set up of the
ATOM/OPDE
Minimum Viable
Solution [MVS]

TSO's/RSC's
Connect to OPDE/
ATOM

Test processes;
Optimize (individual)
connections/process

Hybrid merging
(RG CE only)

Parallel run of
UCTE + CGMES of
6 months (RGCE only)

CGMES provided for
operational purposes,
fall back to UCTE
possible

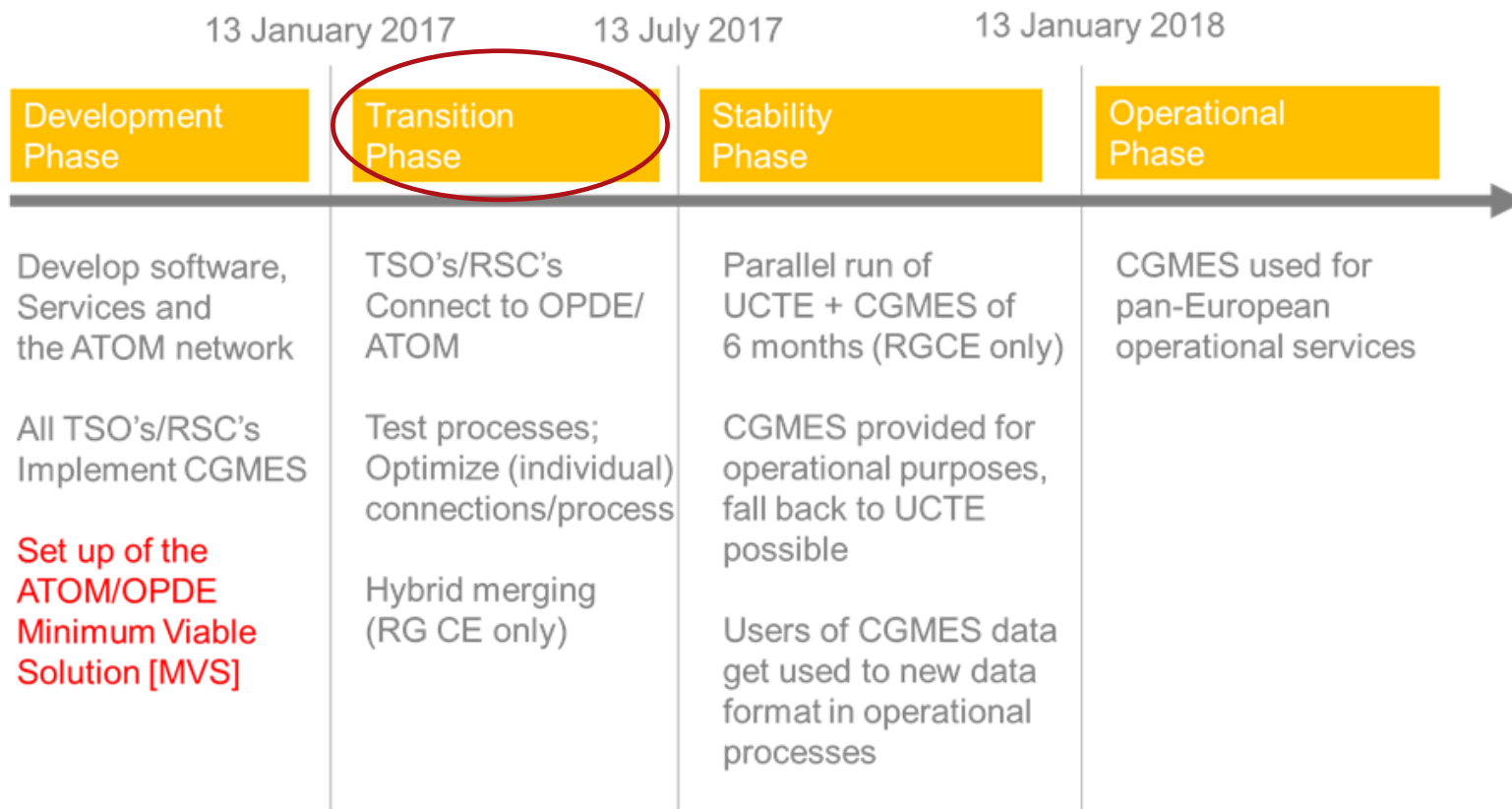
Users of CGMES data
get used to new data
format in operational
processes

CGMES used for
pan-European
operational services

Development phase

- Not all TSOs have implemented CGMES in their domestic environment
- Files are exchanged manually
- The main goals are to achieve CGMES conformity, interoperability and bug fixing
- Ends as soon as the OPDE/ATOM minimum viable solution has been installed (January 13th 2017)

Stepwise migration: 4 phases



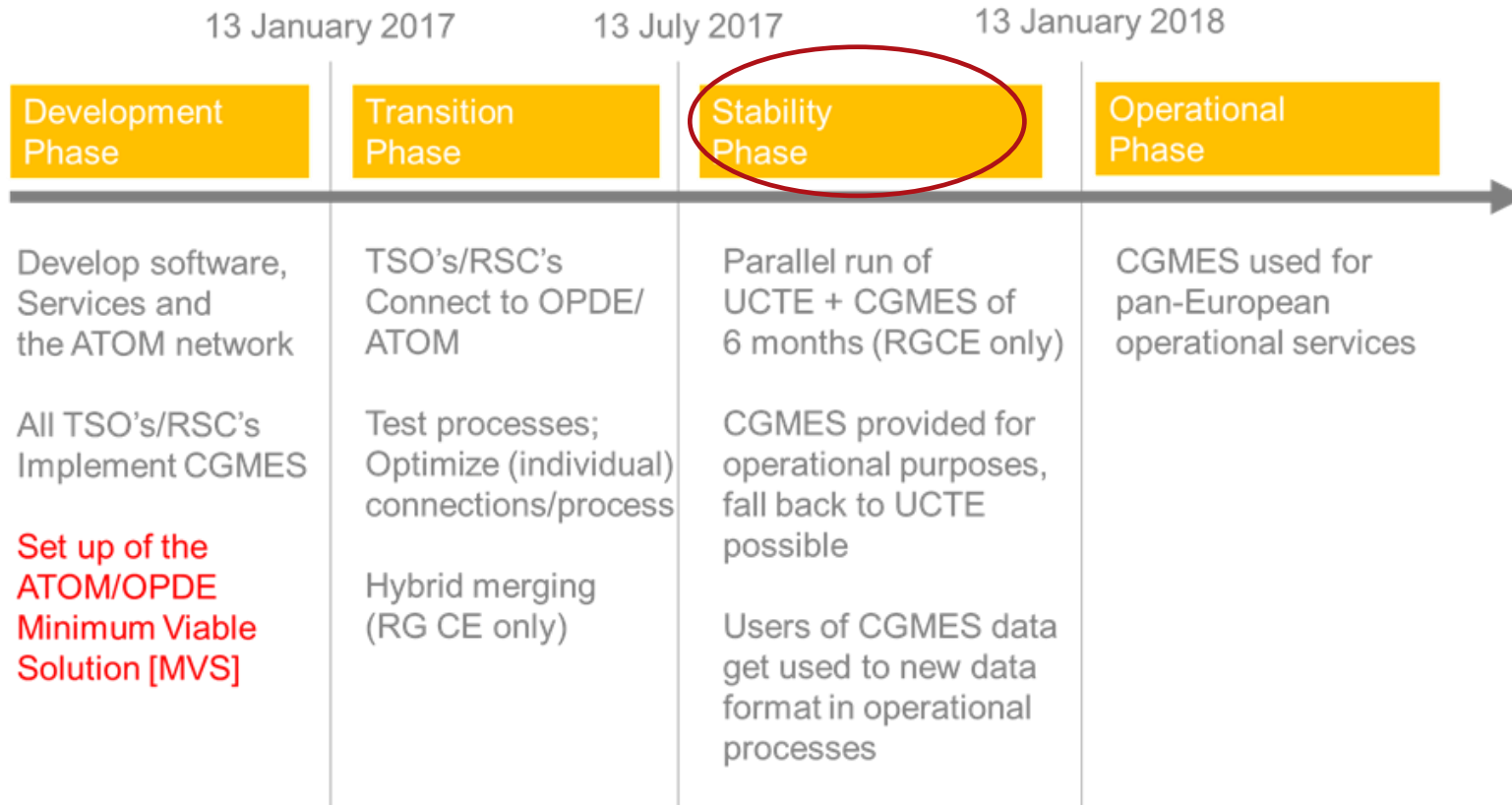
Transition phase

- Transition refers to the present process within RG CE
- An industrialized CGMES exchange cannot be achieved just yet for all TSOs
- OPDE Minimum Viable Solution is up and running
- OPDE software is in operation and infrastructure is ready to connect to TSOs & RSCs
- Central services are in operation (Quality Assessment Service, Boundary Management, Pan-European Verification Function)
- CGMA central service is not mandatory at this stage

Preconditions to enter the transition phase

- OPDE Minimum Viable Solution is up and running
- OPDE infrastructure is ready to connect to TSOs & RSCs
- OPDE software is in operation, it is synchronized with the respective FTP server(s) for UCTE data
- Central services are in operation (Quality Assessment Service, Boundary Management, Pan-European Verification Function)
- CGMA central service is not mandatory at this stage

Stepwise migration: 4 phases



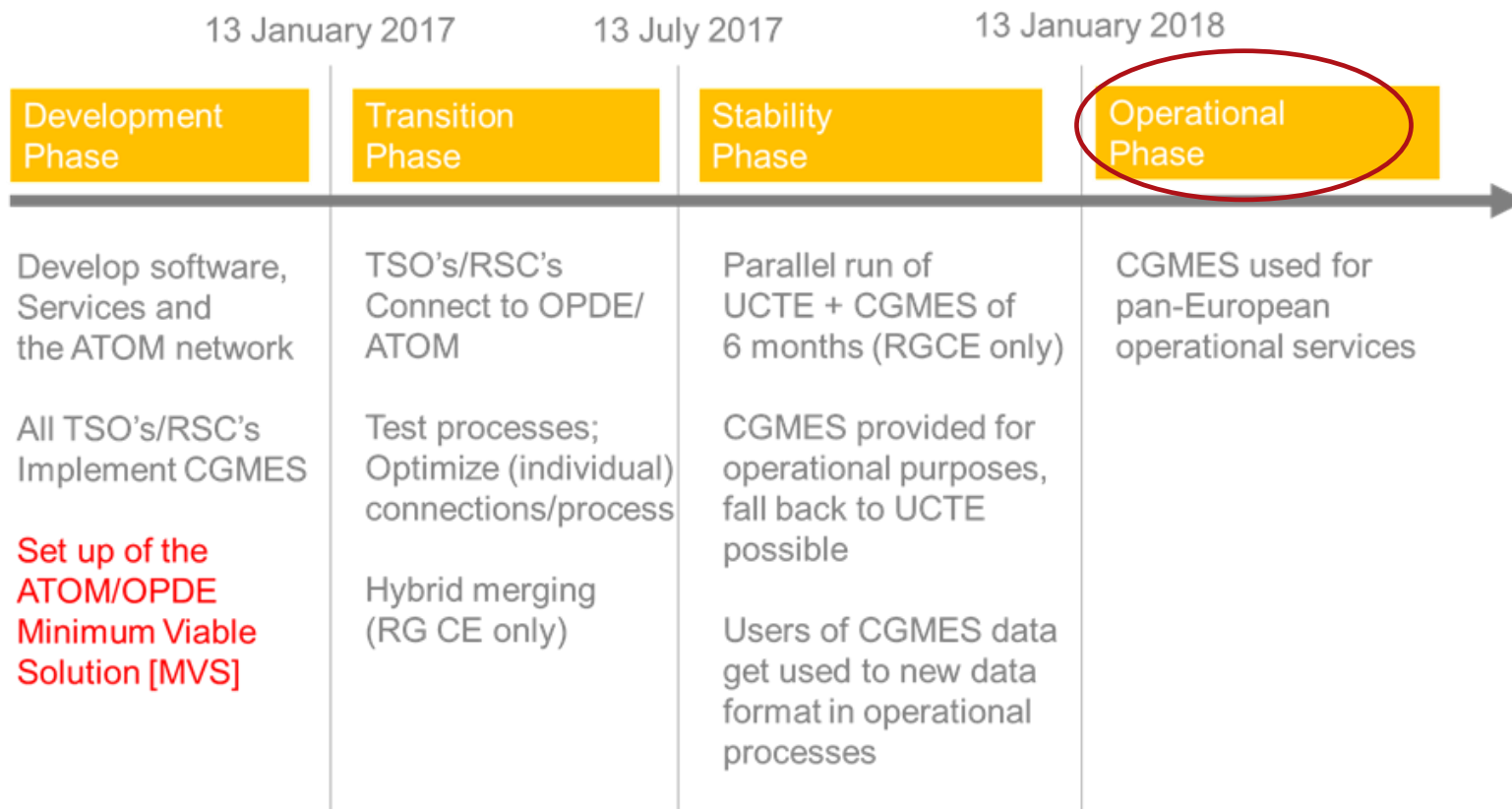
Preconditions to enter the stability phase (1)

- OPDE is fully operational
- CGMA service is operational
- Connections of all TSOs and RSCs to the OPDE in operation
- All CGMES IGMs are provided (at least for Continental Europe, and if possible with all other synchronous areas) before starting this phase
- Target Net Positions and target flows in HVDC interconnectors have to be available through the PEVF and CGMA

Preconditions to enter the stability phase (2)

- Boundary Platform is connected to OPDE and is fully operational
- Quality Assessment Service Portal is fully in operation to provide quality feedback to IGMs submitted by TSOs
- TSO operational tools that participate in the business processes for all relevant time horizons have passed CGMES conformity assessment
- Merging Tools have passed CGMES conformity assessment

Stepwise migration: 4 phases



Preconditions to enter the operations phase (quality)

- Individual and Global quality of IGMs & CGMs respect Minimum Requirements from “Quality of CGMES Datasets and Calculations” (No Fatal errors)
- TSOs and RSCs have to be confident in their CGMES models and results
- Capacity Calculation, and Security Analysis shall lead to reliable results

Preconditions to enter the operations phase (performance)

- IGM files are publically available on OPDE in accordance with CGMM gate closure timelines
- For any time horizon, the CGM (i.e. updates SSH files for each TSO and SV files for all synchronous areas and for the pan-European region) for all scenarios of a particular business day are publicly available on OPDE within 15 minutes after starting the merging process

Preconditions to enter the operations phase (robustness)

- Incomplete datasets shall not lead to abortion of the process (substitution process)

Potential barriers

- Availability of CGMES 2.5 and vendor tools
 - Power Transfer Corridors, System Integrity Protection Schemes ++
- Legal impediments for SvK and Statnett to send data to ENTSO-E platform
 - Work is ongoing to implement required measures and agreements

Impact on market participants

- Main impact is indirect
 - Change of capacity calculation method
 - Possibly Flow Based
- TSOs may ask for more data
 - Based on GLDPM
 - Possibly from new players (demand)
- Chang of deadlines, e.g. schedules
- More focus on data quality