

Minutes of Meeting Task Force MOG II 24/06/2022

List of participants

Name	First name	Company/association
Breton-Godo	Raphaël	TotalEnergies Renewables
Bronckart	Olivier	Elia
Buedts	Nico	Jan De Nul
Carnière	Hugo	Belgian Offshore Plateform
Chaouchi	Aymen	Elia
Claes	Jan	Siemens Gamesa
De Vos	Kristof	Elia
Debacker	Béatrice	Engie
Desmaré	Francois	Luminus
Dewinter	Christophe	Otary
D'hulster	Aislinn	Cabinet Van der Straeten
Gabriels	Senne	SPF Economie
Genêt	Benjamin	Elia
Gommeren	Ward	GE Renewable Energy
Gunnar	Watthé	Deme group
Hahati	Bilal	Elia
Hendrix	Stijn	Parkwind
Juhani Koivisto	Matti	DTU
Kormoss	Aymeric	Virya Energy
Laleman	Ruben	Engie
Matthys-Donnadieu	James	Elia
Meuer	Stefan	BASF Renewable Energy
Moerman	Diederik	SPF Economie
Mortier	Jo	RWE
Pieck	An	CREG
Reichling	Alain	GE Renewable Energy
Rietjens	Damien	Elia
Robbelein	Jo	SPF Economie
Schывens	Tim	Elia
Steensels	Marc	Otary
Suykens	Cathy	Parkwind/Vyria
Trappeniers	Tom	Elia
Van Bossuyt	Michael	Febeliec

Van Campenhout	Steve	Elia
Van Cauwenbergh	Gert	Elia
Van den Bogaert	Tanguy	Elia
Van der Biest	Piet	Siemens Energy
Van Nuffel	Margot	Otary
Van Thielen	Elmo	Elia
Vandekerkhove	Wouter	Ocean Winds
Vanvuchelen	Frank	SPF Economie
Vergote	Viktor	Luminus
Verrydt	Eric	BASF Antwerpen
Verwilghen	Davy	Elia
Villella	Fortunato	Elia
Vissers	Maurice	Eneco
Vosse	Bertrand	Elia
Waignier	Jean-François	Febeg
Zenner	David	Elia

Agenda of the Task Force MOG 2

Session 1: 10:00 – 12:30 (chaired by David Zenner)

- 1. Connection requirements:** overview of technical specifications/interface
- 2. Dynamic & Harmonic:** presentation of system impact and need for studies as preparation for 1st OWF tendering

Session 2: 13:30 – 15:00 (chaired by James Matthys-Donnadieu)

- 3. Balancing:** Update of MOG 2 system integration study

The meeting was chaired by David Zenner for the first session in the morning and James Matthys-Donnadieu for the second session in the afternoon. All agenda items were supported by presentations prepared by Elia. The slides serve as background for these minutes and can be found on the Elia website under <https://www.elia.be/en/users-group/workshop/20220624-workshop>

Minutes of Meeting

David Zenner welcomes all physical and virtual participants to this second Task Force MOG II. He introduces the agenda and the main objective of today.

Connection requirement

Elia gives an overview of the project schedule, introduces the design of the energy island, the grid design, the foreseen interfaces and protection concept.

Context & island concept (presented by Tom Trappeniers)

BOP asks if the island will be also used to connect Triton Link. Tom Trappeniers answers that additional interconnectors will be as much as possible connected to the island, the exact number of interconnectors is not yet defined.

Grid design (presented by Tom Trappeniers)

BASF Renewable Energy asks if the array cable will be located on the island. Tom Trappeniers confirms it.

BOP asks where additional interconnectors will be connected on the island. Tom Trappeniers answers that the DC convertors included in the current design of the island will be used for this purpose.

BOP asks if Elia already studied the possibility to pull in all the 66kV cables in the landing point of the island. Tom Trappeniers answers that design is still ongoing, but no issue is foreseen at this stage given the larger space available on the island in comparison with a classical platform.

BOP asks if the 132kV solution can be considered for the other concessions coming after the commissioning of the first concession. Tom Trappeniers answers that 66kV design will be applied for all the concessions. The large turbines (14-18 MW), possibly connected in 132kV, is expected to be commercialized from 2027 to 2030, e.g. after the starting of the tendering process of MOG 2.

Interface point (presented by Damien Rietjens)

No specific questions or comments.

Protection philosophy (presented by Davy Verwilghen)

Otary asks if the installation of cables on the island is a construction responsibility for the Grid Users or for Elia. Tom Trappeniers answers that the infrastructure assets and also the export cables will be built by Elia, but the array cable will be installed by the Grid User. Elia complements that larger space and larger buffer zone will be available for pulling the cable on the island (in comparison to a platform) and to perform maintenance on the assets thanks to the island design.

Otary asks if it will possible to consider loop string with the proposed design. Damien Rietjens confirms that loop string will be possible but only for auxiliary services.

Otary comments that the position of the circuit breaker, the interlocking process and the communication with Elia will require complex interface for operation. Otary also notices that a good communication with the right technology will be required between the first wind turbine and the other wind farms for ancillary services. The information shared via 4...20mA will be not sufficiently accurate and fast to deliver ancillary services.

Otary comments the needs for cooperation to discuss on the details regarding the communication between the different wind farms to optimize the technical solution and the economical aspect of such communication aspect. Tom Trappenniers answers that this is an open question for which feedback from the market is welcome and further discussions will be foreseen on this topic.

Otary asks if a dedicated fiber cable will be provided per Grid User or Elia will ensure an interface for communication including redundancy. Tom Trapenniers answers that the fiber cable will be installed per wind farm including a redundancy.

David Zenner complements that the questions and remarks related to communication interface cubicle were noted and will be discussed in the future. *Note post Task Force: An ad-hoc technical workshop is organized on 16/09/2022 to further develop and discuss the open points and questions.*

Elia calls for feedback regarding on the open questions presented during the Task Force as highlighted in the support used during the presentation. *Note post Task Force: The feedback can be communicated to Damien.Rietjens@elia.be for the 15/08/2022 at the latest.*

Dynamic & Harmonic

Generalities (presented by Olivier Bronckart)

Oliver Bronckart presents an introduction to dynamic & harmonic phenomena and the generalities around power system stability. This presentation includes also a focus on MOG II with the challenges foreseen on the integration of around 7 GW of power electronics at the Belgian coast. Solutions for these challenges shall be found to maintain the stability and the security of the grid and avoid consequences for the Belgian and Central European grid. Additional presentations will be provided in the framework of this Task Force to highlight the challenges and the clarification that will be defined in the technical requirement for the tendering of MOG 2.

MOG 2 case (presented by Olivier Bronckart)

Luminus asks which part of the challenges presented by Elia is linked to the connection of massive offshore wind parks connected with a potential HVDC cable. Olivier Bronckart answers that the allocation of the phenomena cannot be dedicated to a specific asset/device. An exception is the forced oscillation phenomenon which is specific to offshore wind farm.

Luminus asks how the responsibility will be managed if the HVDC solution leads to technical requirements impacting the offshore wind farms. Olivier Bronckart answers that it is impossible to define specifications with a decomposition per device/asset. The specification is defined by considering the combination of all assets/devices and by identifying the best technico-economical solution from a societal perspective that will lead to meet the technical needs. Further investigation and discussion on the coordination phase for the assessment will be needed to determine the role and responsibilities of each party.

Forced oscillations (presented by Fortunato Villella)

Otary asks if Elia investigates potential solutions at grid level to mitigate the effect of forced oscillation phenomena. Fortunato Villella answers that forced oscillations when detected in other countries have always been solved at the source by removing the forced oscillation (mostly by controller tuning). No solution at grid level is currently available. The consequence of having oscillations in the system might be that disconnection of production units would be needed, leading to important costs for the system as probably (international) redispatch will be needed.

SPF Economie asks if the forced oscillation phenomenon is linked to AC and/or HVDC connection. Fortunato Villella clarifies that the nature of the connection does not have any impact, the same phenomenon is observed in AC or HVDC configuration due to the active power nature of these oscillations as HVDC systems have very limited capability to store energy.

It was asked if more information on gained experience with forced oscillations in ENTSO-E could be shared. Fortunato Villella answers that no publication exists today on the existing experience of forced oscillation due to confidentiality issues, but some reports are available on inter-area oscillations. *Note post Task Force - Link to the available reports regarding inter-area oscillations:*

- https://eepublicdownloads.entsoe.eu/clean-documents/SOC_documents/Regional_Groups_Continental_Europe/2017/CE_inter-area_oscillations_Dec_1st_2016_PUBLIC_V7.pdf
- https://eepublicdownloads.entsoe.eu/clean-documents/pre2015/publications/entsoe/RG_SOC_CE/Top7_110913_CE_inter-area-oscil_feb_19th_24th_final.pdf
- https://eepublicdownloads.entsoe.eu/clean-documents/SOC_documents/Regional_Groups_Continental_Europe/OSCILLATION_REPORT_SPD.pdf

SPF Economie asks if other sources were identified for forced oscillation phenomena. Fortunato Villella answers that no other sources were observed so far. Maybe some forced oscillations at much lower time frame due to the wind dynamics, but no regular oscillations were observed up to now. Luminus asks if the source of forced oscillation is always mechanical. Fortunato Villella confirms, following a joint assessment with existing wind parks, that the source of forced oscillation is purely mechanical and is translated into electrical oscillation.

Virya Energy asks why it is not possible to absorb these forced oscillations with current system services (FCR, aFRR). Fortunato Villella answers that the system services does not solve the problem as they are not fast enough, and that they are not dimensioned for this purpose.

BASF asks if any grid asset (reactor, capacitor) would be existing to filter forced oscillation effect. Elia investigated this option, but forced oscillation are purely acting on active power at the moment. The system is very strong and voltage magnitude is impacted in a limited way. Using an active voltage compensator to reduce these oscillations, such as a STATCOM would require a very high value of MVAR to impact voltage and would translate a risk that is related to active power and interarea oscillations into a local voltage oscillation problem.

BASF asks what is the countermeasures used today. Fortunato Villella answers that the only countermeasure is to cut completely the production of the wind farm as forced oscillations are also present at lower wind speed and when a curtailment is applied.

James Matthys-Donnadieu introduces the second session and presented the agenda for the afternoon focused on the balancing topic.

Balancing and system integration

Elia gives an overview of the status and planning of the update of the study on system integration and balancing, following a presentation by DTU on the results of the first deliverable on the projections of offshore generation profiles. After this presentation, Elia presents shortly the method and the next steps. All presentations were supported by slides available on the website.

General status of the study and planning (presented by Kristof De Vos)

No specific questions or comments.

Projections of the offshore generation profiles (presented by DTU - Matti Koivisto)

Luminus asks why it was chosen to not update the power curves knowing that new models wind turbine is reaching generation up to 30 m/s. DTU confirms that the power curves were not updated. For the curve up to 20 m/s, it was assumed that the specific power (W/m^2) remains the same. For the part of storm shutdown, one of technologies assumed (referred to as HWS Deep in the presentation) is producing up to 31 meters per second and was assumed to remain the same based on discussions with stakeholders.

Otary asks why DTU uses the same way of modelling than 3E study. DTU clarifies the model used was developed in-house and is not the same than 3E study. DTU clarifies that a comparison was done with other studies as requested by stakeholders in previous discussions. Following this analysis, it shows that the modelling was similar or better than other studies. Yet it has to be kept in mind the purpose of each study, as the modelisation will be tuned taking it into account. A simple comparison of the results is not necessarily appropriate.

It was asked why the future French wind farms were not included in the study. DTU answers that it was assumed the impact of these wind farms was limited due to the long distance compared to the area location analyzed in this study. Only nearby Dutch wind farms closed to the study perimeter were included in the analysis

BASF asks a clarification on the difference between the assumption of the turbine size considered in the 3 main different areas (17 MW for area 1 and 2 representing 2.1 GW and 20 MW for area 3 representing 1.4 GW) and the assumptions defined in the previous discussions assuming 17 MW turbine size for offshore wind farm before 2030 and 20 MW for offshore wind farm after 2030. Kristof De Vos clarifies the assumptions used for the study as described in the minutes of the last Task MOG 2 considering 3 GW of offshore capacity in 2028, 4.4 GW in 2029 and 5.8 GW in 2030. For the offshore wind park commissioned in 2030, it was assumed that 20 MW turbine size could have been built for this target year only.

BOP asks if the measured data used in this exercise is based on measured data at the connection point of Elia. Elia will clarify this in the MoM. *Note post Task Force: Elia confirms that data used in the study is collected at the access point level. The access point stands for the Elia substation and the voltage level where the Wind Park is connected to the grid. The wind park can have multiple connections (connections points) on one access point. In any case, the total capacity is the sum of the metering data of each connection point. Also note that DTU only models wake losses, and not unavailability or electric losses which are less relevant in the scope of the study (i.e. on generation variations rather than on generation output). This unavailability also explains the deviations between the modelled and observed results when discussing the model validation (slide 67 – 80)].*

BOP asks if DTU investigated the differences between the wind speed from the meteorological database and the measurement. DTU confirmed that during the analyses they have compared the measured wind speeds to the simulated ones, and the fit is found to be good. For the final report, DTU will include such comparison for very high wind speeds (related to storms). Elia also clarified that input data for wind speed was provided from every turbine on the corner of the parks.

Febeliec asks what is the frequency of sizable curtailment in addition of the figures on number of hours with complete shut-down (5.8 GW) during storm condition. Elia (Kristof De Vos) refers to the table with 1h ramp results (slide 89) for additional insights on this point. Elia (James Matthys-Donnadieu) complements that the balancing implication for the Belgium system is foreseen in the next steps and results will be provided in the next months.

Febeliec asks clarification on the non-symmetrical pattern of the cut-in and cut-off profile of offshore wind farm. DTU refers to the results and tables with the upward and downward ramps during wind speeds larger than 20 m/sec (slide 88 and 89) and answers that this will serve as an input for the system simulations and mitigation measures proposed by Elia. DTU clarifies that it does not model the return from a storm for any storm shutdown technology: the different technologies return at slightly different wind speeds, but just as fast and this causes high up-ramps for all the shutdown technologies. The same approach was followed in the 2020 report.

Luminus asks if the atmospheric effect (high concentration of wind farm has impact very far in the area) was considered in the study. DTU answers that while the farm-to-farm wake impacts were considered to the extent available in standard software (PyWake in DTU's case), the so-called mesoscale losses (atmospheric effect) were not considered. These effects are still being studied in research projects, and not available in software applicable in the timeframe of this project; however, they could cause additional losses in the highest installed capacity scenarios (especially 5.8 GW). DTU notes that the wake modeling is similar to the 3E study discussed earlier, also considering this point.

James Matthys-Donnadieu (Elia) thanks Matti Koivisto (DTU) for the presentation.

Methodology for the impact assessment on balancing and system integration during normal conditions : impact on reserve capacity needs (presented by Kristof De Vos)

No specific questions or comments.

Methodology for the impact assessment on balancing and system integration during Exceptional conditions : impact of storms and ramps on system operation (presented by Aymen Chaouachi)

Febeliec asks if Elia foresees improvements regarding the coverage of BRP on residual load. Elia (James Matthys-Donnadieu) answers that different scenarios will be analyzed regarding the coverage of the prediction errors by BRP and the TSO. Elia will clarify the assumptions and the methodology regarding market parties behavior in the next presentations.

Febeliec asks clarification on which market parties will balance the offshore bidding zone in the North. Elia (James Matthys-Donnadieu) answers a need to reach first a common understanding with the stakeholders on the challenges and the opportunities around offshore bidding zones before to go further in the discussion.

James Matthys-Donnadieu (Elia) closed the Task Force and invited the stakeholders to the workshop following different questions received from the stakeholders to further discuss the implications of the Offshore Bidding Zone.