European Network of
Transmission System Operators
for Electricity

PAN EUROPEAN VERIFICATION FUNCTION

IMPLEMENTATION GUIDE

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- SHALL: This word, or the terms “REQUIRED” or “MUST”, means that the definition is an absolute requirement of the specification.
- SHALL NOT: This phrase, or the phrase “MUST NOT”, means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective “RECOMMENDED”, means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications shall be understood and carefully weighed before choosing a different course.
- SHOULD NOT: This phrase, or the phrase “NOT RECOMMENDED”, means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
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INTRODUCTION

1 Scope

The Pan-European Verification function (PEVF) provides necessary input data for the creation of coherent Common Grid Models for both the Day Ahead and Intraday processes. The function shall receive scheduled exchanges at the relevant time instances per scheduling area or per scheduling area border and per HVDC system linking scheduling areas for each synchronous area and its interconnectors. These scheduling information shall be provided to the ENTSO-E Operational Planning Data Environment (OPDE), so as to form a common view on the expected grid situation for a particular point in time.

This implementation guide focuses on providing all reporting process sequences to and from the PEVF as well as the business rules of the scheduling reporting process. The Pan-European Verification function business context, the Acknowledgement and the Status Request business processes, as well as the UML model and schema of each document, which is used in this implementation guide, are described in separate Documents, which are explicitly stated under the following chapter.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- Acknowledgement business process:

IEC 62325-451-1, Framework for energy market communications – Part 451-1: Acknowledgement business process and contextual model for CIM European market

- Status request business process:

IEC 62325-451-5, Framework for energy market communications – Part 451-5: Status request business process and contextual model for CIM European market

- UML model and schema:

The ENTSO-E RG CE Schedule Reporting Process – Implementation Guide, Version 2.0

The ENTSO-E Reporting Information Document UML Model and Schema, Version 1.0

- Pan-European Verification function business context:

The Pan European Verification Function for system operations – Requirements Specification”

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3 Terms and definitions

All definitions included in this document reflect the definitions from ENTSO-E– Metadata Repository and latest versions of Network Codes as they were available at the time of creation of this document. After finalisation of Network Codes and adaptation of ENTSO-E– Metadata Repository/Glossary these Definitions will be removed.

3.1
Aggregated netted external schedule
A schedule representing the netted aggregation of all external TSO schedules and external commercial trade schedules between two scheduling areas or between a scheduling area and a regional group of other scheduling areas.

3.2
Aggregated netted external market schedule
A schedule representing the netted aggregation of all external commercial trade schedules between two scheduling areas or between a scheduling area and a regional group of other scheduling areas; (replaces “summarized market schedules”).

3.3
Aggregated netted external TSO schedule
A schedule representing the netted aggregation of all external TSO schedules between two scheduling areas or between a scheduling area and a regional group of other scheduling areas; (replaces “timeframe independent schedules”).

3.4
Domain
A delimited area that is uniquely identified for a specific purpose and where energy consumption, production or trade may be determined.

3.5
External commercial trade schedule
A schedule representing the commercial exchange of electricity between Market Participants in different scheduling areas. (replaces “market based cross border exchange schedules”)

3.6
External TSO schedule
A schedule representing the exchange of electricity of TSOs between different scheduling areas.

3.7
HVDC line
High Voltage Direct Current line

3.8
Net position
The netted sum of electricity exports and imports for each market time period for a given geographical area (for example, the result of a market coupling process).

3.9
Netted area AC position
The netted aggregation of all AC external schedules of an area. (replaces ”control program”).

3.10
OPDE
Operational Planning Data Environment

3.11
PEVF
Pan-European Verification function

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3.12
Schedule
A reference set of values representing the generation, consumption or exchange of electricity between actors for a given time period.

3.13
Scheduling area
An area within which the TSOs obligations regarding scheduling apply due to operational or organizational needs.

3.14
Synchronous area
An area covered by interconnected TSOs with a common system frequency in a steady-state such as the synchronous areas continental Europe (CE), Great Britain (GB), Ireland (IE) and Northern Europe (NE).

4 The PEVF schedule reporting business process

4.1 Schedule reporting process sequence

The following diagrams outline the data as well as the respective format, in which they shall be delivered to and from the PEVF:

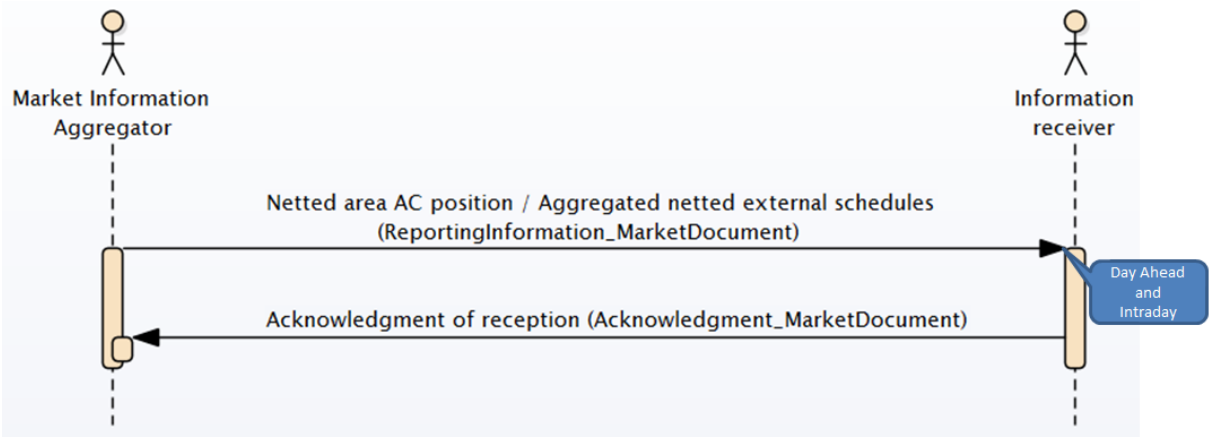

Figure 1 – Schedule reporting process sequence diagram A

According to Figure 1, all regional scheduling coordination functions/systems shall send a single Reporting Information Market Document per synchronous area and timeframe (Day Ahead and Intraday) to the PEVF. This document shall contain pre-verified synchronous area internal scheduling data and more precisely:

- The netted area AC positions for all scheduling areas within the synchronous area unless the synchronous area consists only of a single scheduling area.
- The aggregated netted external schedule for each boundary point of a HVDC link within the synchronous area.

Additionally, the aggregated netted external schedules for each boundary point of a HVDC link, which connect the “sending” synchronous area with other synchronous areas and do not need to be verified by the PEVF shall also be included in the Reporting Information Market Document. (e.g.: A HVDC synchronous area interconnector does not need to be verified by the PEVF, when both scheduling areas in the two synchronous areas are operated by a single TSO).

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Furthermore, each regional scheduling coordination function/system may include in the Reporting Information Market Document the aggregated netted external schedules per scheduling area border within the synchronous area.

Figure 2 - Schedule reporting process sequence diagram B

According to Figure 2, all regional scheduling coordination functions/systems shall send to the PEVF a Reporting Market Document for each boundary point of a synchronous area interconnector (HVDC link) that needs to be verified by the PEVF. One time series provides the input to the area and the other provides the output from the area. The PEVF will accept single sided nominated schedules for synchronous area interconnectors (HVDC link), where bilaterally agreed by the involved parties.

For each reporting market and reporting information market document sent, the PEVF shall issue an acknowledgement document either accepting the whole document received or rejecting it completely.

Figure 3 – Schedule reporting process sequence diagram C

Once the PEVF is in possession of all the aforementioned data, it performs the required verifications and provides OPDE with the relevant information. According to Figure 3, the PEVF shall send for each timestamp of an energy delivery day for both Day Ahead and Intraday processes in a Reporting Information Market Document the netted area AC position for each Scheduling Area as well as the aggregated netted external schedule for each boundary point of each HVDC link to OPDE. An acknowledgement document either accepting or rejecting the whole document received is issued.

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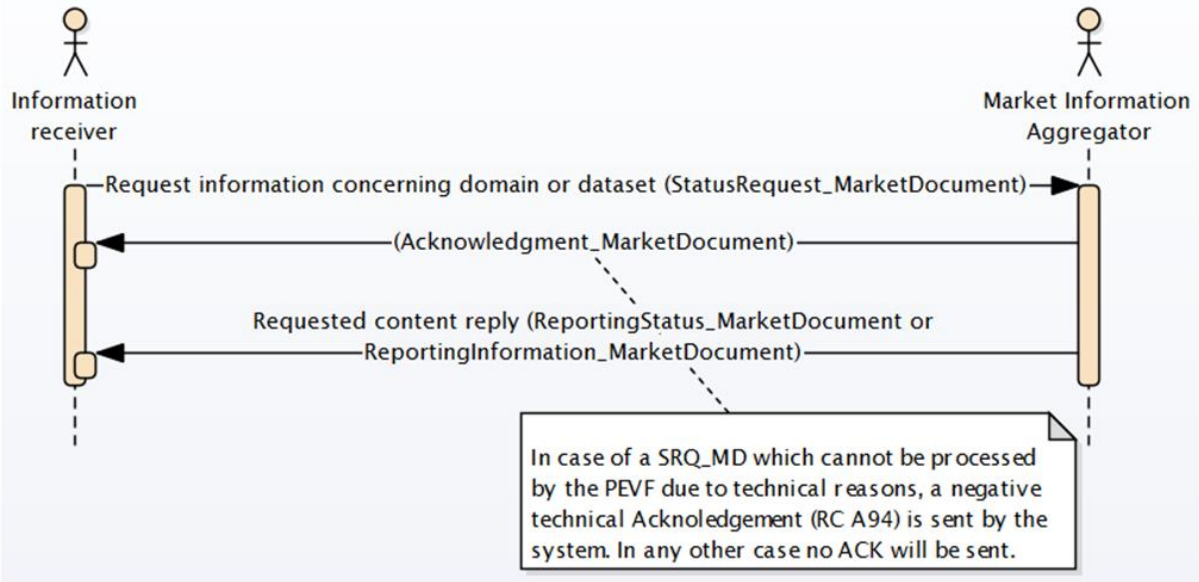

Figure 4 - Schedule reporting process sequence diagram D

The fourth sequence diagram (Figure 4) deals with the request for scheduling information concerning a domain or a pre-defined dataset and the reply from the PEVF. Such a request shall be provided by the use of a Status Request Market Document.

An information receiver can be:

- a regional scheduling coordination function/system
- OPDE

A status request may identify for a given time interval and process type:

- A domain and optionally a referenced date/time and business type.
- A dataset and optionally a referenced date/time, .

The PEVF shall provide the information relative to the domain or dataset for the designated time interval as available at the referenced date/time, if available. The requests will always be satisfied by the PEVF with the provision of a reporting status market document or a reporting information market document depending on the requested Document type, containing one or all of the following:

- Aggregated netted external schedules.
- Netted area AC position.

The requested time interval must always be a single whole calendar day in the CET/CEST time zone.

4.2 Scheduling approach of HVDC links

From a network modelling perspective, there are three types of modelling for the HVDC interconnectors:

1. Simplified HVDC model
2. Explicit detailed HVDC model
3. Embedded detailed HVDC model

The detailed description of these models can be found in the latest version of the document: “Implementation Guide for CGM network modelling and CGMES exchanges”. However, from a

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scheduling point of view, the two following cases can be distinguished. In neither of these cases the losses of the HVDC link are scheduled separately.

The HVDC link is represented in the “Simplified HVDC model” and in the “Explicit detailed HVDC model” as a scheduling area. Such a scheduling area does not belong to a synchronous area and need to be configured separately in the PEVF. The losses in these two modelling approaches are considered in the scheduling process, but not separately. Precisely, the aggregated netted external schedules for each boundary point of an HVDC link, sending and receiving end are nominated with a granularity of boundary points. The full amount of energy shall be reported in the exchange from the “sending” scheduling area to the scheduling area representing the HVDC link, while the amount of energy taking into account the losses shall be reported in the exchange from the scheduling area representing the HVDC link to the “receiving” scheduling area. Verification of the schedules from the PEVF can be performed if both TSOs and the scheduling agent of the HVDC operator provide schedules for both the sending and receiving end or one TSO is responsible for providing schedules for the cross border exchanges of the three scheduling areas. Schedules can be provided by one TSO on behalf of the related TSOs, in case this mandate has been made explicitly.

For those HVDC links, which are modelled based on the third modelling approach (“Embedded detailed HVDC model”), the HVDC link is treated as an AC link from a scheduling point of view. Losses are not considered at all in the scheduling process and consequently no additional scheduling area is necessary. Verification of the schedules can be performed by the PEVF either if both TSOs send the schedules for the cross border exchange by the HVDC interconnector or if one TSO provides the schedules on behalf of both TSOs. This mandate in the latter case has to be made explicitly.

The details of the modelling arrangements for each HVDC link in the various synchronous areas can be found in the latest version of the document: “Implementation Guide for CGM network modelling and CGMES exchanges”.

4.3 Business rules for the PEVF schedule reporting process

4.3.1 General rules

For each electronic data interchange defined in this document, an acknowledgement document, as defined in IEC 62325-451-1, should be generated either accepting the whole received document (with the exception of the status request market document that does not require it, since the reply is made with the document containing the requested content) or rejecting it completely.

The reporting market document shall contain 2 time series per scheduling area border. DC-links will be reported using additional “path”-information. One time series provides the input to the area and the other provides the output from the area.

The reporting status market document shall contain 4 time series per scheduling area border. Two time series assigned to the first of the involved TSOs and two additional time series assigned to the second involved TSO. DC-links and controllable AC-links will be reported separately using additional “path”-information.

The reporting information market document shall contain 2 time series per domain. DC-links and controllable AC-links will be reported separately using additional “path”-information.

Duplicated documents shall be answered with the same acknowledgement market document as their originals. If the documents differ but have the same mRID and version, a technical acknowledgement market document (ReasonCode A94) shall be sent.

4.3.2 Dependencies governing the Reporting_MarketDocument

The reporting market document is used by the regional scheduling coordination functions/systems to provide to PEVF the aggregated netted external schedules for the

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290 synchronous area interconnectors (HVDC links).The dependencies are listed in the following
291 paragraphs.

292 **Table 1 – Aggregated netted external schedule dependency table**

	Day ahead	Intraday
Reporting_MarketDocument		
type	B26 = Aggregated netted external schedule document	
process.processType	A01 = Day ahead	A18 = Total intraday
sender_MarketParticipant.marketRole.type	A32 = Market Information Aggregator	
receiver_MarketParticipant.marketRole.type	A33 = Information receiver	
domain.mRID / codingScheme	A scheduling area border identified with an EIC Y code. codingScheme = A01	
subject_Domain.mRID / codingScheme	A scheduling area of the originator of the market schedule identified with an EIC Y code. This identification shall be found in either the in_Domain.mRID or the out_Domain.mRID of the time series. codingScheme = A01	
TimeSeries		
businessType	B63 Aggregated netted external schedule	
product	8716867000016 = Active Power.	
in_Domain.mRID / codingScheme	A scheduling area where the product is being delivered identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
out_Domain.mRID / codingScheme	A scheduling area where the product is being extracted identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
connectingLine_RegisteredResource.mRID	codingScheme = A01 (EIC-T)	
quantity_Measure_Unit.name	MAW	
curveType	A01 or A03 = Variable block	
Series_Period		
resolution	PT1H, PT60M, PT15M or PT1M	

293

294 Table 1 provides the dependencies for the aggregated netted external schedules.

295 There shall be a reporting market document for each boundary point of a synchronous area
296 interconnector (HVDC link) per process (Day Ahead and Intraday). The document shall always
297 contain all HVDC links, which connect the “sending” synchronous area with other synchronous
298 areas. The scheduling area border is identified in the domain.mRID attribute. The scheduling
299 area that is the subject of the document is defined in the subject_Domain.mRID attribute.

300 Reporting market documents providing schedules for HVDC links, which are modelled
301 according the first and second modelling approaches (simplified and explicit detailed models)
302 shall provide a single reporting market document containing all scheduling area borders of the
303 scheduling area representing the HVDC link. This scheduling area is identified in the
304 domain.mRID attribute and the subject_Domain.mRID attribute.

305 Two reporting market documents will be provided per sender per scheduling day:

306 • One document containing the day ahead values (required in order to provide the day
307 ahead situation for the scheduling day). This shall have a unique document

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identification and a process type of “Day ahead” (A01). Any evolutions to this schedule shall be carried out through the creation of a new version. The new version will replace the previous version. A day ahead document is required for every border even if there are no market nominations for this border.

- One document containing the Intraday values. This will have a unique document identification and shall have a process type of «Intraday Total» (A18). This shall include the updated values of the values already provided in the Day ahead document. The Time_Period.timeInterval and the timeInterval_DateTimeInteval shall always cover the complete period. Any evolutions to this schedule shall be carried out through the creation of a new version. The new version will replace the previous version.

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4.3.3 Dependencies governing the Reporting Information Market Document

The reporting information market document is used to provide pre-verified scheduling data to and from the PEVF. The dependencies are listed in the following paragraphs.

Table 2 – Reporting information market document dependency table

	Day Ahead	Intraday
ReportingInformation_MarketDocument		
type	B19 = Reporting information market document	
process.processType	A01 = Day ahead	A18 = Total intraday
sender_MarketParticipant.marketRole.type	A32 = Market Information Aggregator	
receiver_MarketParticipant.marketRole.type	A33 = Information receiver	
domain.mRID	A scheduling area representing the regional group identified with an EIC Y code. codingScheme = A01.	
time_Period.timeInterval	This information provides the start and end date and time of the period covered by the document.	
Doc_Status	The identification of the condition or position of the document with regard to its standing. A document may be intermediate or final. A01 = Intermediate A02 = Final	
TimeSeries		
businessType	B63 = Aggregated netted external schedule B64 = Netted area AC position	
product	8716867000016 = Active Power.	
in_Domain.mRID / codingScheme	An area where the product is being delivered. Identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
out_Domain.mRID / codingScheme	An area where the product is being extracted. Identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
connectingLine_RegisteredResource.mRID	Required if DC link or controllable AC link codingScheme = A01 (EIC-T)	
quantity_Measure_Unit.name	MAW = Mega watts	
curveType	A01 or A03 = Variable block	
Series_Period		
resolution	PT1H, PT60M, PT15M or PT1M	
Reason		
code	This information may be provided at three levels. At the header level to indicate if no information to a status request is available. The following code shall be used: B08 = Data not yet available. At the Time series level to provide the following information: B30 = Data unverified B31 = Data verified A26 = Default Time Series applied A30 = Imposed Time Series from nominated party's Time Series A54 = Global position not in balance	

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The regional coordination functions shall provide to PEVF a single reporting information market document per synchronous area per process. The synchronous area is identified in the domain.mRID attribute. The quality flags of this document are ignored by the PEVF. In case a regional coordination function/system cannot compile a consistent set of scheduling data for the region, no data is sent to the PEVF.

For each synchronous area the set of schedules shall be published on the OPDE, using a Reporting Information Market Document per timeframe. This document consists both the netted area AC positions and /or aggregated netted external schedules per scheduling area border for each scheduling area in the synchronous area as well as all the aggregated netted external schedules for each boundary point of each HVDC interconnector and all quality flags. In any case PEVF shall always deliver a full data set to the OPDE system. Missing or not validated scheduling data is flagged with the respective reason codes.

Two reporting information market documents will be provided per sender per scheduling day:

- One document containing the day ahead values (required in order to provide the day ahead situation for the scheduling day). This shall have a unique document identification and a process type of “Day ahead” (A01). Any evolutions to this schedule shall be carried out through the creation of a new version. The new version will replace the previous version.
- One document containing the Intraday values. This will have a unique document identification and shall have a process type of «Intraday Total» (A18). This shall include the updated values of the values already provided in the Day ahead document. The Time_Period.timeInterval and the timeInterval_DateTimeInteval shall always cover the complete period. Any evolutions to this schedule shall be carried out through the creation of a new version. The new version will replace the previous version.

The detailed description of the reason codes is provided below:

- Data unverified: Missing or not validated data.
- Data verified: Schedules nominated from the related parties of a synchronous area HVDC interconnector are compared. If the values are the same the corresponding Reason Code will be set to “Verified”. In addition, a checksum is performed for the netted area AC positions of Continental Europe and the Nordic area for all market time units. If the values do add up to zero, the Reason Code is set to “Verified” for all values of the corresponding Market Time Unit. Finally, the Reason Code is also set to “Verified” for the netted area AC positions of the Baltic Area, for the aggregated netted external schedules within Continental Europe and the Nordic area and for the single nominated aggregated netted external schedules for all values of the corresponding Market Time Unit.
- Default Time Series applied: If the Time Series received from the related parties of a synchronous area HVDC interconnector do not correspond, the lower value (per direction) of the two will be applied to both and the Reason Code will be set to “Default Time Series applied” for the updated Time Series. In case of opposite directions, both values will be set to zero and the Reason Code will be set to “Default Time Series applied” for both Time Series.
- Imposed Time series from nominated party's time series: The PEVF applies substitution for missing data by default where possible. On the PEVF level this is only meaningful for the HVDC links between the synchronous area. Within the synchronous area the substitution shall be done on the synchronous level. For the Day Ahead time horizon, this means that in case of a bilateral set of schedules and data from one side is missing, it shall be substituted with scheduling data from the other scheduling area (counterpart schedule). In case of Intraday, the last valid schedule is used.
- Global position not in balance: For the netted area AC positions of the Synchronous Areas of Continental Europe and Nordic, it will be verified that the checksum is zero

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for all timestamps. If this is not the case the Reason Code will be set to “Global position not in balance” for all individual scheduling areas within the affected synchronous area.

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4.3.4 Dependencies governing the Reporting Status Market Document

Table 3 – Reporting status market document dependency table

	Day Ahead	Intraday
ReportingStatus_MarketDocument		
type	B18 = Reporting status market document	
process.processType	A01 = Day ahead	A18 = Total intraday
sender_MarketParticipant.marketRole.type	A32 = Market Information Aggregator	
receiver_MarketParticipant.marketRole.type	A33 = Information receiver	
domain.mRID	A scheduling area representing the regional group identified with an EIC Y code. codingScheme = A01.	
time_Period.timeInterval	This information provides the start and end date and time of the period covered by the document.	
TimeSeries		
businessType	B63 = Aggregated netted external schedule	
product	8716867000016 = Active Power.	
in_Domain.mRID / codingScheme	An area where the product is being delivered. Identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
out_Domain.mRID / codingScheme	An area where the product is being extracted. Identified with an EIC Y code. Either the in_Domain.mRID or the out_Domain.mRID must match the subject_Domain.mRID. codingScheme = A01.	
connectingLine_RegisteredResource.mRID	Required if DC link or controllable AC link codingScheme = A01 (EIC-T)	
quantity_Measure_Unit.name	MAW = Mega watts	
curveType	A01 or A03 = Variable block	
Series_Period		
resolution	PT1H, PT60M, PT15M or PT1M	
Reason		
code	This information may be provided at three levels. At the header level to indicate if no information to a status request is available. The following code shall be used: B08 = Data not yet available. At the Time series level to provide the following information: A28 = Counterpart time series missing A29 = Counterpart time series quantity differences B30 = Data unverified B31 = Data verified At the Point level to provide information on a given quantity. The following codes shall be used: A43 = Quantity increased A44 = Quantity decreased Other reason codes according to ENTSO-E code list	

4.3.5 Generic rules and dependencies for the Status Request Market Document

The Status Request Market Document is specified in IEC 62325 – 451-5. In this specification the attributes described in Table 4 are mandatory.

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384 **Table 4 – Mandatory attributes of Status request market document**

Attribute name / Attribute type	Description
mRID	The unique identification of the document being exchanged within a business process flow.
type	The coded type of a document. The document type describes the principal characteristic of the document. A59 = status request for a status within a process (status request for a reporting status market document) B20 = status request for reporting information market document
sender_MarketParticipant.mRID	The identification of a party in the energy market. --- Document owner.
sender_MarketParticipant.marketRole.type	The identification of the role played by a market player. --- Document owner. --- The role associated with a MarketParticipant.
receiver_MarketParticipant.mRID	The identification of a party in the energy market. --- Document recipient.
receiver_MarketParticipant.marketRole.type	The identification of the role played by a market player. --- Document recipient. --- The role associated with a MarketParticipant.
createdDateTime	The date and time of the creation of the document.

385

386 Table 5 provides the dependencies for the status request market document relevant for the
387 reporting process.

388 The attribute instance component defines the nature of the request through the use of two
389 attributes:

390 • "attribute" that contains a keyword identifying the name of an attribute that is used to
391 identify what is being specified. In the context of the reporting process the following
392 attributes shall be used: "type", "domain.mRID", "processType", "dataset.mRID",
393 "referenced.dateTime" and/or "businessType".

394 • "attributeValue" that provides the content of the specified attribute. It is a string value
395 that represents a copy of the element tag of the electronic document for which the
396 status is being requested.

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397 **Table 5 – Status request market document dependency table**

	Document type	Domain status request	Requested time interval	Dataset status request	referenced date	ProcessType	BusinessType
	AttributeInstanceComponent						
attribute	The attribute value shall equal “type”	The attribute value shall equal “domain.mRID”	The attribute value shall equal “requested_Period.timeInterval	The attribute value shall equal “dataset.mRID”	The attribute value shall equal “referenced.dateTime”	The attribute value shall equal “ProcessType”	The attribute value shall equal “BusinessType
attributeValue	*The identification of the type that is covered in the reporting information market document. It shall correspond to one of the following:* *A59 = status information* *B20 = Reporting information* *The status information shall provide information about the result of the verification process on a scheduling area border.(4 time series per domain).* *The reporting information shall provide information about the scheduling data based on “positively verified” schedules.(2 time series per domain)*	*The identification of the domain that is covered in the status request document. Depending on the reporting context it will correspond to one of the following:* • *A Scheduling area;* • *A Scheduling area border;* • *A Synchronous area.* *The identification shall be an EIC Y code.* *This name shall not be provided if a dataset identification is present.* *This name shall be provided if a dataset identification is not present.*	*The identification of the period that is to be covered in the reply, for example a given schedule day.* *The time interval is mandatory.* *The requested Time interval must always be a single whole calendar day in the CET/CEST time zone. The time interval shall conform to the following pattern:* *YYYY-MM-DDThh:mmZ/ YYYY-MM-DDThh:mmZ*	*The identification of an individually predefined data set in a data base system.* *The identification shall be up to 35 alphanumeric characters.* *This name shall not be provided if a domain is present.* *This name shall be provided if a domain is not present*	*The point of time for which the data is requested from the data base system.* *The date and time shall conform to the following pattern:* *YYYY-MM-DDThh:mm:ssZ* *This name shall only be provided if required.*	*A01 = Provide Day ahead values only.* *A18 = Provide latest available verified data based on day ahead and intraday*	*Not present if a dataset identification is present.* *Mandatory if an identification of a domain is present* *B63 = Aggregated netted external schedule* *B64 = Netted area AC position*

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