European Network of
Transmission System Operators
for Electricity

ENTSO-E
WEATHER PROCESS AND ENERGY PROGNOSIS IMPLEMENTATION GUIDE

2021-06-01

APPROVED DOCUMENT
VERSION 1.3

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NOTE CONCERNING WORDING USED IN THIS DOCUMENT

The force of the following words is modified by the requirement level of the document in which they are used.

- 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.
- MAY: This word, or the adjective “OPTIONAL”, means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option SHALL be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option SHALL be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.).

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Revision History

Version	Release	Date	Comments
0	0	2015-03-11	Initial release
0	Draft 2	2015-06-19	Review after Copenhagen meeting
0	Draft 3	2015-08-20	Review after Stuttgart meeting
0	Draft 4	2015-09-25	Review after conference call (incorporating WG-EDI proposals)
0	Draft 5	2016-01-15	Review after conference call following WG16 meeting
0	Draft 6	2016-03-16	Following WG-EDI meeting 2016-02-24 and Weather group conference call 2016-03-16
1	0	2016-04-21	Version for submission to Market Committee after WG EDI review.
1	1	2016-12-12	Add new business types: Global radiation, diffuse radiation, direct solar radiation. Add a new unit type: Kelvin.
1	2	2017-04-04	Delete Coordinatesystem.name (redundant with Coordinatesystem.mRID) Version for submission to Market Committee after WG EDI review.
1	3	2021-06-01	SvK reported that they are receiving data from weather stations that are point values. Those point values have no period, the resolution will be specified as PT0S = 0 seconds. Curve type Point and 0 seconds resolution are added to Weather document dependency table. Table showing the version of ESMP documents to be used is included. Schemas were removed from the IG and references to the document UML model and schema were added. Approved by MC.

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INTRODUCTION

This document was drafted based on IEC 62325 series. In particular, the IEC 62325-450 methodology was applied to develop the conceptual and assembly models.

1 Scope

An important information requirement in energy planning is the weather forecast and history. This is specifically important due to the growth of wind farms and photovoltaic generating units. It is also important in order to determine the potential generation and load on a given day. This document provides a harmonized mechanism for the transmission of weather information between all involved parties.

The objective of this implementation guide is to make it possible for software vendors to develop an IT application to enable the weather process as described in section 4 to be carried out between all interested parties.

The implementation guide is one of the building blocks for using UML (Unified Modelling Language) based techniques in defining processes and documents for interchange between the involved actors.

2 References

1. 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.

- IEC TS 61970-2, *Energy management system application program interface (EMS-API) –Part 2: Glossary*
- IEC 62325-301, *Framework for energy market communications – Part 301: Common information model (CIM) extensions for markets*
- IEC 62325-351, *Framework for energy market communications – Part 351: CIM European market model exchange profile*
- IEC 62325-450, *Framework for energy market communications – Part 450: Profile and context modelling rules*
- IEC 62325-451-1, *Framework for energy market communications – Part 451-1: Acknowledgement business process and contextual model for CIM European market*
- IEC 62325-451-5, *Framework for energy market communications – Part 451-5: Status request business process and contextual model for CIM European market*

2. Other references

- The Harmonised Electricity Market Role Model (HRM)
- Energy prognosis document UML model and schema.
- Weather document UML model and schema.
- Weather configuration document UML model and schema.
- Acknowledgement document UML model and schema.

3 Terms and definitions

3.1 Forecast

The provision of a prediction that is expected to happen

3.2 Prognosis

The provision of a prediction with different levels of uncertainty that is based on a weather forecast.

4 The weather document business process use

4.1 Overall business context

This implementation guide provides the means of transmitting weather forecast, production/load prognosis and historical weather data for the use within the electricity market between all interested parties.

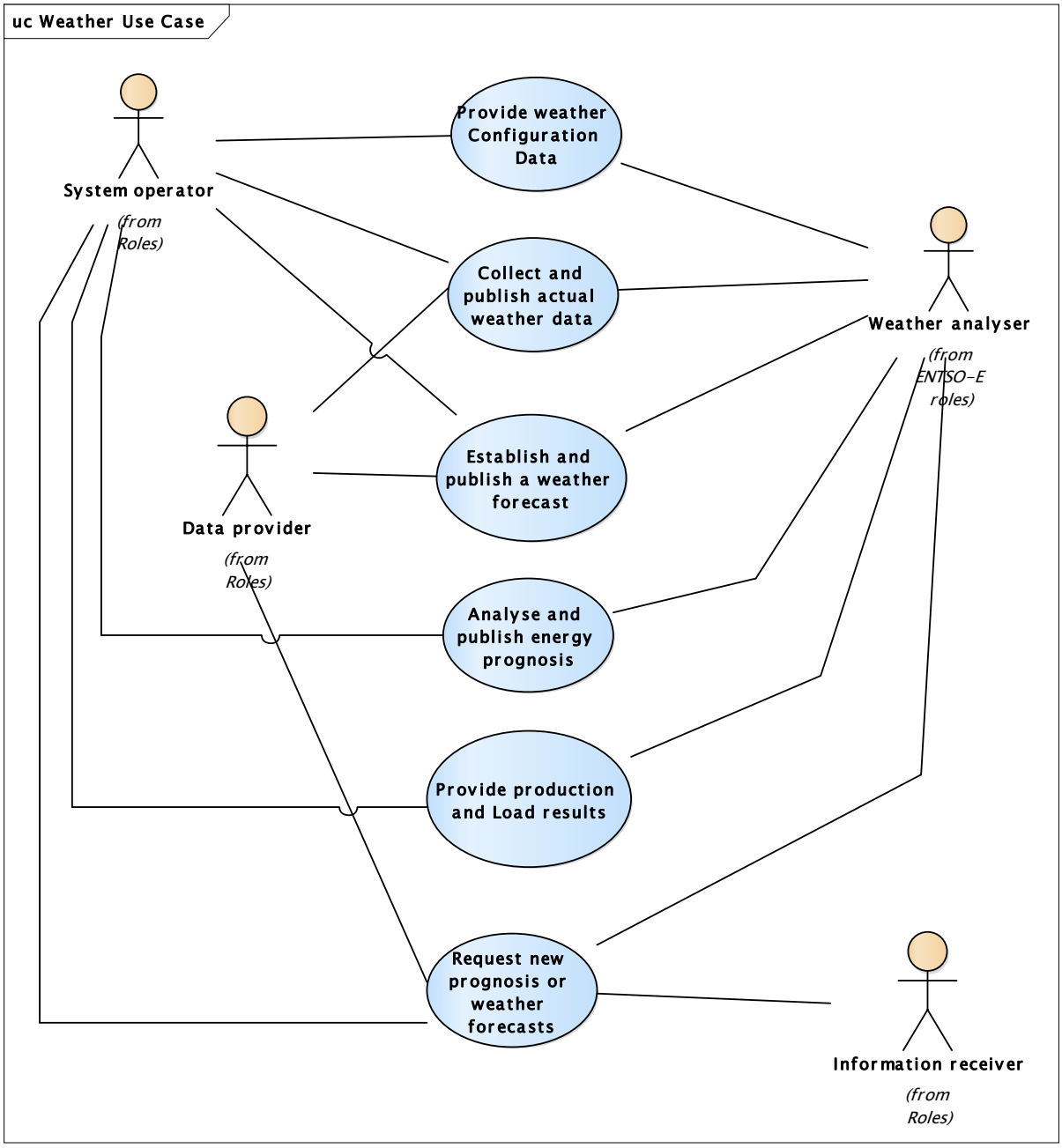

Figure 1: The ENTSO-E weather process use case

The ENTSO-E weather process describes how weather forecasts are used by weather analysers to provide production and load prognosis for use by system operators or other interested parties. It consists of 6 use cases that are described in the following paragraphs.

4.1.1 Provide weather configuration data

The use case covers the transmission by system operators to weather analysers of configuration information concerning essentially the renewable energy infrastructure.

4.1.2 Collect and publish actual weather data

The use case covers the collection and distribution of actual weather data from weather stations by weather data providers.

4.1.3 Establish and publish a weather forecast

The use case covers the determination and publication of weather forecasts by data providers based on the actual weather situation and the outlook of the weather system evolution. The weather forecast is provided based on the specified points in an area established by the system operator.

4.1.4 Analyse and publish energy prognosis

The use case covers the analysis by the weather analyser of the published weather information and its impact on the renewable energy environment in order to provide a prognosis of the likely impact in their production and load. The analysis is carried out based on the points specified by the system operator.

4.1.5 Provide production and load results

The use case covers the provision by the system operator of the actual production results of the renewable energy environment along with the total load results.

4.1.6 Request new prognosis or weather forecasts

The use case covers the possibility for interested parties to request revised weather forecasts or production / load prognosis from the weather data provider or weather analyser.

4.2 Weather process sequence diagram

The sequence diagram outlined in Figure 2 describes the basic interactions between the parties involved in the weather process.

The diagram describes the following actors:

- Data provider; the party that provides weather forecasts based on the actual weather situation and the evolution of the weather system.
- Weather analyser; the party that analyses the current and forecast weather situation and establishes a prognosis of its impact on the renewable energy environment as well as the overall load.
- System operator; the party that is the principal user of the information provided by the weather data provider and the weather analyser.
- Information receiver; the party that is interested in receiving weather information as well as production/load prognosis.

The identification of the weather stations are shown for information as a source of information but they are out of the scope of this process.

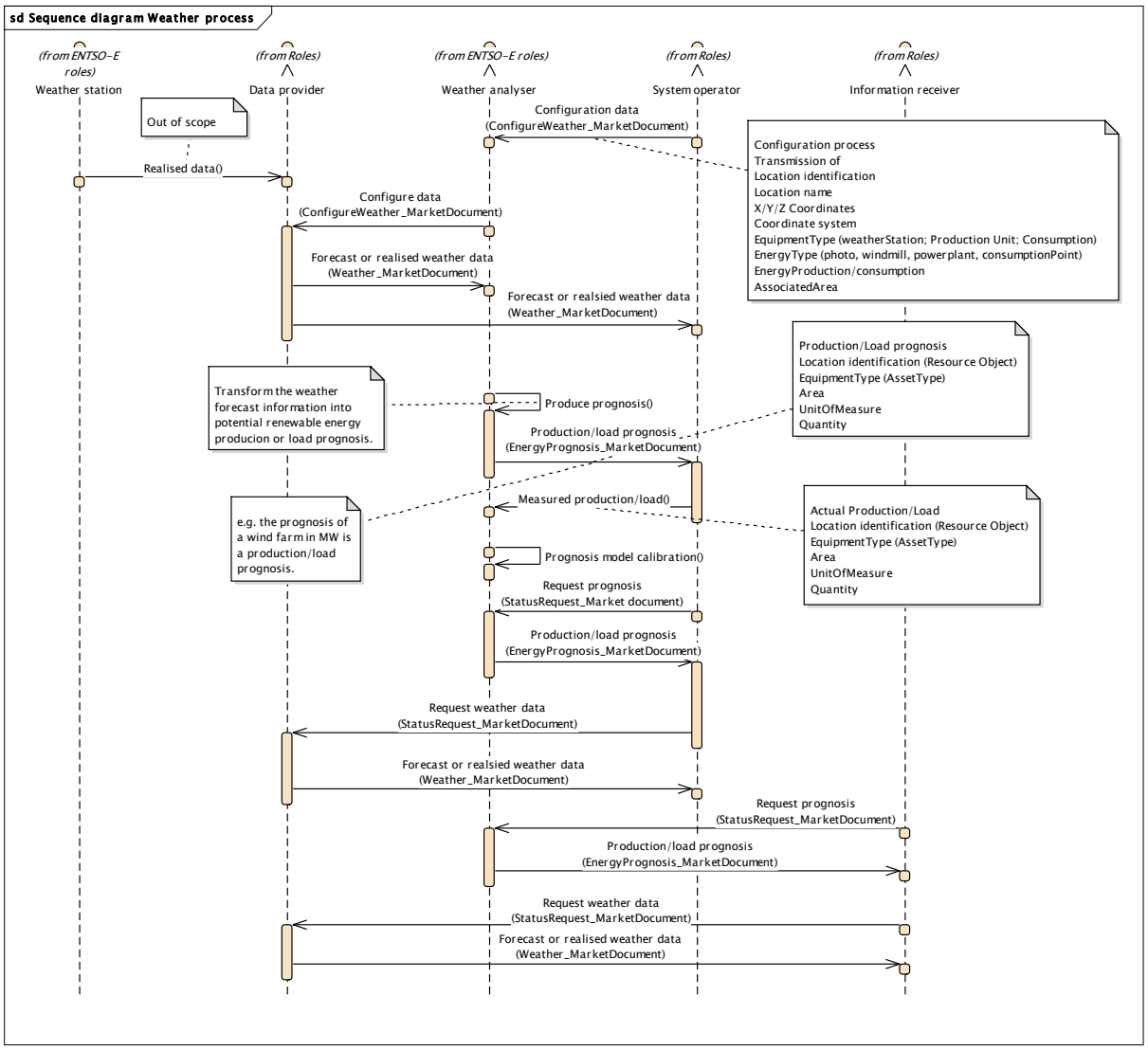

Figure 2: Weather process sequence diagram

The process is initiated by the provision by the system operator to the weather analyser of the information concerning the points (X/Y/Z coordinates) for which the weather forecasts and prognosis are to be provided. The weather analyser then transmits this information to the data providers. The configuration may be updated as necessary.

The data providers periodically take the actual weather situation from the designated weather stations and provide the information to the weather analyser.

In a similar timeframe the data providers provide to the weather analyser and system operator the weather forecasts for the designated points.

The weather analyser analysis of the information for the points designates by the system operator and provides a prognosis of the production and load that may occur with the renewable energy environment. The resulting prognosis is then sent to the system operator.

The system operator then provides the weather analyser with the actual results of the different renewable energy locations in order to enable the analysis model to be refined.

The system operator may request new weather forecasts or prognosis as required.

The end of the sequence diagram enables other interested parties to request weather forecasts.

4.3 Business rules

4.3.1 Applicable ESMP documents

This implementation guide assumes the use of the following ESMP documents and contextual and assembly models (also referred to as XSD or schema versions):

Table 1 - Applicable ESMP documents

ESMP document	version
Weather configuration document	urn:iec62325.351:tc57wg16:451-n:weatherconfigura-tiondocument:1:1)
Weather document	urn:iec62325.351:tc57wg16:451-n:weatherdocu-ment:1:1
Energy prognosis document	urn:iec62325.351:tc57wg16:451-n:energyprognosis-document:1:2
Acknowledgement document	urn:iec62325.351:tc57wg16:451-1:acknowledge-mentdocument:8:1

4.3.2 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 or rejecting it completely.

4.3.3 Dependencies governing the WeatherConfiguration_MarketDocument

The weather configuration document is used to provide all the information required for the creation of energy prognosis.

The information provided in a weather configuration document concerns the identification of the various points within an area where weather forecasts and prognosis are to be provided. This information also identifies the characteristics of the points in question.

The dependencies are listed in the following paragraphs.

Table 2 provides the dependencies for the weather configuration document.

Table 2 – Weather configuration document dependency table

Attribute	Value
WeatherConfiguration_MarketDocument	
Type	A95 = Configuration document
sender_MarketParticipant.marketRole.type	A04 = System operator
receiver_MarketParticipant.marketRole.type	A43 = Weather analyser
status	A14 = Creation A15 = Update Note: a document may be either a creation or an update.

Attribute	Value
Location	
mRID	The identification of the location being described.
coordinateSystem.mRID	A01 = ED50 A02 = OSGB36 A03 = WGS84 A04 = GTRF Refer to ENTSO-E code list for having more description about coordinate system.
start_DateAndOrTime.date Date	The date that the registered resource became operational
end_DateAndOrTime.date Date	The date that the registered resource was decommissioned.
positionPoints.xPosition	Latitude
positionPoints.yPosition	Longitude
positionPoints.zPosition	Altitude
registeredResource.mRID	The unique identification of a resource.
registeredResource.pSRType.psrType	Like: A04 = Generation A05 = Load B16 = Photovoltaic B18 = Wind offshore B19 = Wind onshore B15 = Other renewable B11 = Hydro run of river and poundage. Refer to ENTSO-E codelist for additional items.
environmentalMonitoringStation.mRID	Master resource identifier issued by a model authority.

4.3.4 Dependencies governing the Weather_MarketDocument

The weather document is used to provide all the information related to weather forecasts or historical information.

The information provided in a weather document concerns:

- A weather forecast;
- Weather actual information;

The dependencies are listed in the following paragraphs.

Table 3 provides the dependencies for the weather document.

Table 3 – Weather document dependency table

Attribute	Value
Weather_MarketDocument	
type	B13 = Weather Document
Process.processType	A14 = Forecast A16 = Realised
sender_MarketParticipant.marketRole.type	A39 = Data provider A04 = System operator

Attribute	Value
receiver_MarketParticipant.marketRole.type	A39 = Data provider A04 = System operator A43 = Weather analyser A33 = Information receiver
TimeSeries	
businessType	B46 = Wind speed B47 = Wind direction B48 = Solar irradiance B49 = Temperature B50 = Cloudiness B51 = Humidity B52 = Atmospheric pressure B53 = Precipitation B78 = Global radiation B79 = Diffuse radiation B80 = Direct solar radiation
Measurement_Unit.name	Wind speed MTS = [m/s] Wind direction DD = [0..360 ° Grad] Solar Irradiance D54 = [radiance ; W/m²] Temperature CEL = [Celsius] Cloudiness A59 = [Okta units] Humidity P1 = [% relative] Atmospheric pressure A97 = [hectopascal] Precipitation MMT = [mm] Kelvin KEL = K
curveType	A02 = Point A03 = Variable block
Series_Period	
resolution	PT1M = 1 minute PT0S = 0 seconds. Note: When resolution is 0 seconds, only one repetition of Point is expected per Series_Period, On top of that start and end time should be equal in timeInterval attribute of SeriesPeriod class when Resolution is o seconds.
Point	
quality	A01 = Adjusted A02 = not available A03 = Estimated A04 = as Provided

4.3.5 Dependencies governing the EnergyPrognosis_MarketDocument

The EnergyPrognosis_MarketDocument is used to provide all the information related to energy or power prognosis or historical information.

The information provided in an EnergyPrognosis_MarketDocument details the possible renewable energy production or the total load or the power generation for a given area.

The dependencies are listed in the following paragraphs.

Table 4 provides the dependencies for the EnergyPrognosis_MarketDocument.

225 **Table 4 - EnergyPrognosis_MarketDocument dependency table**

Attribute	Value
EnergyPrognosis_MarketDocument	
type	B14 = Energy prognosis document
sender_MarketParticipant.marketRole.type	A43 = Weather analyser
receiver_MarketParticipant.marketRole.type	A04 = System operator
Area_TimeSeries	
businessType	A04 = Consumption A01 = Production
mktPSRType.psrType	Like: B16 = Photovoltaic B18 = Wind offshore B19 = Wind onshore B15 = Other renewable B11 = Hydro run of river and poundage. A05 = Load Refer to ENTSO-E codelist for additional items.
Measurement_Unit.name	MAW = MW KWT = kW GWH = GWh MWH = MWh KWH = kWh
curveType	A03 = Variable block A04 = Overlapping breakpoint
Series_Period	
resolution	PT1M
Point	
quality	A01 = Adjusted A02 = not available A03 = Estimated A04 = as Provided

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