

DIN EN 62325-351



ICS 27.010; 33.200; 35.240.50

Ersatz für
DIN EN 62325-351:2014-07
Siehe Anwendungsbeginn

**Kommunikation im Energiemarkt –
Teil 351: CIM-Profil für den europäischen Markt
(IEC 62325-351:2016);
Englische Fassung EN 62325-351:2016**

Framework for energy market communications –
Part 351: CIM European market model exchange profile
(IEC 62325-351:2016);
English version EN 62325-351:2016

Cadre pour les communications pour le marché de l'énergie –
Partie 351: Profil de modèle d'échange pour un système de gestion de marché de style
européen basé sur le CIM
(IEC 62325-351:2016);
Version anglaise EN 62325-351:2016

Gesamtumfang 76 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2016-07-20 angenommene Europäische Norm als DIN-Norm ist 2017-07-01.

Für DIN EN 62325-351:2014-07 besteht eine Übergangsfrist bis 2019-07-20.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62325-351:2016-01.

Für dieses Dokument ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Die enthaltene IEC-Publikation wurde vom TC 57 „Power systems management and associated information exchange“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (stability date) unverändert bleiben soll, das auf der IEC-Website unter „<http://webstore.iec.ch>“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

- bestätigt,
- zurückgezogen,
- durch eine Folgeausgabe ersetzt oder
- geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

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Der Zusammenhang der zitierten Dokumente mit den entsprechenden Deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Anwender der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 62325-351 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für einige der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Änderungen

Gegenüber DIN EN 62325-351:2014-07 wurden folgende Änderungen vorgenommen:

- a) Unterabschnitt 5.2 „Europäische Marktklassen“ (en: European Style Market Classes) wurde ergänzt um 5.2.4 Stämme (en: Primitives), 5.2.5 Datentypen (en: Datatypes) und 5.2.6 Nummerierungen (en: Enumerations);
- b) verschiedene Änderungen wie z. B. ein überarbeitetes Bild 9 - ESMPClasses;
- c) Überarbeitung der Tabelle 5 zu ESMPClasses-Attributen.
- d) Das Attribut „cancelledTS“ wird zu Klasse „TimeSeries“ hinzugefügt. Das Attribut wird in IEC 62325-301, Ausgabe 1 definiert und wurde in dem europäischen Marktprofiltyp nicht verwendet, wird nun aber für die Transparenzverordnung benötigt.
- e) Das Attribut „quality“ und außerdem der neue CIMDataType „QualityString“ wird zu der Klasse „Point“ hinzugefügt. Das Attribut wird in IEC 62325-301, Ausgabe 1 definiert und wurde in dem europäischen Marktprofiltyp nicht verwendet. Dieses Attribut ermöglicht das Entwickeln des Datenaustauschs bezogen auf den Abwicklungsgeschäftsprozess innerhalb eines synchronen Energietechniksystems für grenzüberschreitende Ströme.
- f) Zwischen der Klasse „Reason“ und der Klasse „Series_Period“ wird eine Assoziation hinzugefügt. Diese Assoziation ermöglicht das Melden von Fehlern auf der „Series_Period“.
- g) Die Klasse „MktGeneratingUnit“ aus IEC 62325-301 wird hinzugefügt. Diese Klasse wird benötigt, um nach der Transparenzverordnung Informationen zu Erzeugungsanlagen zu veröffentlichen.
- h) Eine Klasse „VoltageLevel“ aus IEC 61970-301 wird hinzugefügt. Diese Klasse wird benötigt, um nach der Transparenzverordnung Informationen zu veröffentlichen.
- i) Eine Klasse „Location“ aus IEC 61968-11 wird hinzugefügt. Diese Klasse wird benötigt, um nach der Transparenzverordnung Informationen zu veröffentlichen.
- j) Bei der Klasse „MarketParticipant“ wird die Kardinalität des Attributs „mRID“ zu [0..1] geändert, und das Attribut „name“ aus IEC 62325-301 wird als [0..1] hinzugefügt.
- k) Bei der Klasse „Price“ wird die Kardinalität des Attributs „amount“ von [1] zu [0..1] geändert, und es wird eine Assoziation zu der Klasse „TimeSeries“ als [0..*] zu [0..*] hinzugefügt.
- l) Eine Klasse „ConstraintDuration“ aus IEC 62325-301 wird hinzugefügt, die für die Aktivierungsbeschränkungen auf dem Regelungsmarkt erforderlich ist.
- m) Die Beschränkungen für Datentypen werden hinzugefügt.

Frühere Ausgaben

DIN EN 62325-351: 2014-07

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung^{N1)}

1 Anwendungsbereich

Dieser Teil der IEC 62325 ist anwendbar auf europäische Elektrizitätsmarkttypen.

Dieser Teil der IEC 62325 legt ein UML-Paket fest, das eine logische Betrachtungsweise der funktionalen Aspekte des europäischen Marktmanagementtyps innerhalb eines Elektrizitätsmarkts bereitstellt.

Dieses Paket basiert auf dem allgemeinen Informationsmodell (CIM) (en: common information model). Die Verwendung des CIM geht deutlich über dessen Anwendung in einem Marktmanagementsystem hinaus.

Aufgrund der Größe des vollständigen CIM werden die in dem CIM enthaltenen Objektklassen in eine Reihe logischer Pakete gruppiert, von denen jedes einzelne einen bestimmten Teil des modellierten Gesamt-Energietechniksystems darstellt. Anhäufungen solcher Pakete werden als einzelne Internationale Normen umgesetzt.

Ausgehend von den CIM-Paketen werden regionale kontextbezogene Modelle erstellt, um die Anforderungen an den Austausch von Marktinformationen für eine bestimmte Region, d. h. den Geschäftskontext, abzudecken. Bei einer Region kann es sich um einen Kontinent handeln, auf dem gemeinsame Elektrizitätsmarktgestaltungen für den Informationsaustausch verwendet werden (Europa, Nordamerika, Asien etc.) Ebenso kann es sich um ein bestimmtes Land oder eine Organisation handeln, die besondere Bedürfnisse hat und sich das CIM zunutze machen möchte.

Diese neue Ausgabe der IEC 62325-351 enthält neue Klassen und Assoziationen, die erforderlich sind, um der neuen Geschäftsentwicklung für den europäischen Markttyp und insbesondere der Umsetzung der Europäischen Verordnungen (Nr. 1227/2011 und Nr. 543/2013) zu genügen.

3 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC TS 61970-2 und die folgenden Begriffe.

3.1

aggregierte Geschäfts-Informationseinheit

ABIE (en: aggregate business information entity)

für ein bestimmtes Geschäftsfeld wiederverwendete aggregierte Kernkomponente (ACC)

3.2

aggregierte Kernkomponente

ACC (en: aggregate core component)

Anhäufung zusammengehöriger Geschäftsinformationsteile, die unabhängig von einem bestimmten Geschäftskontext zusammen eine gesonderte Bedeutung für das Geschäft haben

Anmerkung 1 zum Begriff: Als Terme bei der Modellierung stellen diese unabhängig von einem bestimmten Geschäftskontext eine Objektklasse dar.

[QUELLE: ISO/TS 15000-5:2005, Abschnitt 9]

^{N1)} Nationale Fußnote: Die Nummerierung aus IEC 62325-351:2016-06 wurde beibehalten.

3.3**basiert auf**

(en: based on; IsBasedOn)

Verwendung eines Artefakts, das Einschränkungen hat, die nach den Anforderungen eines bestimmten Geschäftskontextes vorgenommen wurden

[QUELLE IEC 62325-450:2013, 3.4]

3.4**Geschäftskontext**

(en: business context)

formale Beschreibung einer speziellen Geschäftssituation, die aus den Werten einer Gruppe von Kontextkategorien bestimmt wurde und es ermöglicht, unterschiedliche Geschäftssituationen eindeutig voneinander zu trennen

[QUELLE: ISO/TS 15000-5:2005, 4.6.2]

3.5**Informationsmodell**

(en: information model)

Darstellung von Konzeptionen, Beziehungen, Beschränkungen, Regeln und Operationen zur Festlegung von Datensemantiken für eine ausgewählte Diskursdomäne

Anmerkung 1 zum Begriff: Es kann gemeinsam anwendbare, feste und geordnete Datenstrukturanforderungen an den Domänenkontext enthalten.

3.6**interner europäischer Markt****IEM** (en: internal european market)

Markt für Waren, Dienste etc. innerhalb der Europäischen Gemeinschaft

Anmerkung 1 zum Begriff: Insbesondere bestimmen Europäische Richtlinien und Verordnungen den Energie-IEM.

Anmerkung 2 zum Begriff: Diese Softwaresysteme für einen Elektrizitätsmarkt können Unterstützung bei der Kapazitätsaufteilung, der Energieplanung, bei Hilfs- oder anderen Diensten, Echtzeit-Abläufen und Abrechnungen einschließen.

3.7**Profil**

(en: profile)

grundlegender Strukturrahmen aller Informationen die erforderlich sind, um für eine spezielle Umgebung geeignet zu sein

– Leerseite –

English Version

**Framework for energy market communications –
Part 351: CIM European market model exchange profile
(IEC 62325-351:2016)**

Cadre pour les communications pour le marché de l'énergie –
Partie 351: Profil de modèle d'échange pour un système de
gestion de marché de style européen basé sur le CIM
(IEC 62325-351:2016)

Kommunikation im Energiemarkt –
Teil 351: CIM-Profil für den europäischen Markt
(IEC 62325-351:2016)

This European Standard was approved by CENELEC on 2016-07-20. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 57/1618/CDV, future edition 2 of IEC 62325-351, prepared by IEC/TC 57 „Power systems management and associated information exchange“ was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62325-351:2016.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-04-20
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-07-20

This document supersedes EN 62325-351:2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 62325-351:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61968-11	NOTE	Harmonized as EN 61968-11.
IEC 61970-301	NOTE	Harmonized as EN 61970-301.
IEC 61970-452	NOTE	Harmonized as EN 61970-452.
IEC 61970-552	NOTE	Harmonized as EN 61970-552.
IEC 62325-301	NOTE	Harmonized as EN 62325-301.

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INTRODUCTION

This part of IEC 62325 is one of the IEC 62325 series for deregulated energy market communications.

The principal objective of the IEC 62325 series is to produce standards which facilitate the integration of market application software developed independently by different vendors into a market management system, between market management systems and market participant systems. This is accomplished by defining message exchanges to allow these applications or systems access to public data and exchange information independent of how such information is represented internally.

The common information model (CIM), i.e. IEC 62325-301, IEC 61970-301 and IEC 61968-11, specifies the basis for the semantics for message exchange.

The European style market profile is based on different parts of the CIM IEC standards and specifies the business processes and the content of the messages exchanged.

This part of IEC 62325 provides the European style market profile specifications that support the European style design electricity markets. These electricity markets are based on the European regulations, and on the concepts of third party access and zonal markets. This part of IEC 62325 was originally based upon the work of the European Transmission System Operators (ETSO) and then on the work of the European Network of Transmission System Operators (ENTSO-E) on electronic data interchange.

FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS –

Part 351: CIM European market model exchange profile

1 Scope

This part of IEC 62325 is applicable to European style electricity markets.

This part of IEC 62325 specifies a UML package which provides a logical view of the functional aspects of European style market management within an electricity markets.

This package is based on the common information model (CIM). The use of the CIM goes far beyond its application in a market management system.

Due to the size of the complete CIM, the object classes contained in the CIM are grouped into a number of logical packages, each of which represents a certain part of the overall power system being modelled. Collections of these packages are progressed as separate International Standards.

From the CIM packages, regional contextual models are built to cover the market information interchange requirements for a given region, i.e. the business context. A region may be a continent where common electricity market designs are used for the exchange of information (Europe, North America, Asia, etc.). It may also be a specific country or an organization that has particular needs and wishes to benefit from the CIM.

This new edition of IEC 62325-351 contains new classes and associations required to comply with new business development for European style market, and in particular the implementation of the European regulations (No. 1227/2011 and No. 543/2013).

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.

IEC TS 61970-2:2004, *Energy management system application program interface (EMS-API) – Part 2: Glossary*

IEC 62325-450:2013, *Framework for energy market communications – Part 450: Profile and context modelling rules*

IEC 62361-100, *Power systems management and associated information exchange – Interoperability in the long term – Part 100: Naming and design rules for CIM profiles to XML schema mapping*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61970-2, as well as the following apply.

3.1

aggregate business information entity

ABIE

re-use of an aggregate core component (ACC) in a specified business

3.2

aggregate core component

ACC

collection of related pieces of business information that together convey a distinct business meaning, independent of any specific business context

Note 1 to entry: Expressed in modelling terms, this is the representation of an object class, independent of any specific business context.

[SOURCE: ISO/TS 15000-5:2005, Clause 9]

3.3

based on

IsBasedOn

use of an artefact that has been restricted according to the requirements of a specific business context

[SOURCE IEC 62325-450:2013, 3.4]

3.4

business context

specific business circumstance as identified by the values of a set of context categories, allowing different business circumstances to be uniquely distinguished

[SOURCE: ISO/TS 15000-5:2005, 4.6.2]

3.5

information model

information model is a representation of concepts, relationships, constraints, rules, and operations to specify data semantics for a chosen domain of discourse

Note 1 to entry: It can provide shareable, stable, and organized structure of information requirements for the domain context.

3.6

internal European market

IEM

market of any commodity, service, etc. within the European Community

Note 1 to entry: In particular, European Directives and Regulation are defining the energy IEM.

Note 2 to entry: These software systems in an electricity market may include support for capacity allocation, scheduling energy, ancillary or other services, real-time operations and settlements.

3.7

profile

basic outline of all the information that is required to satisfy a specific environment

4 European style market concepts

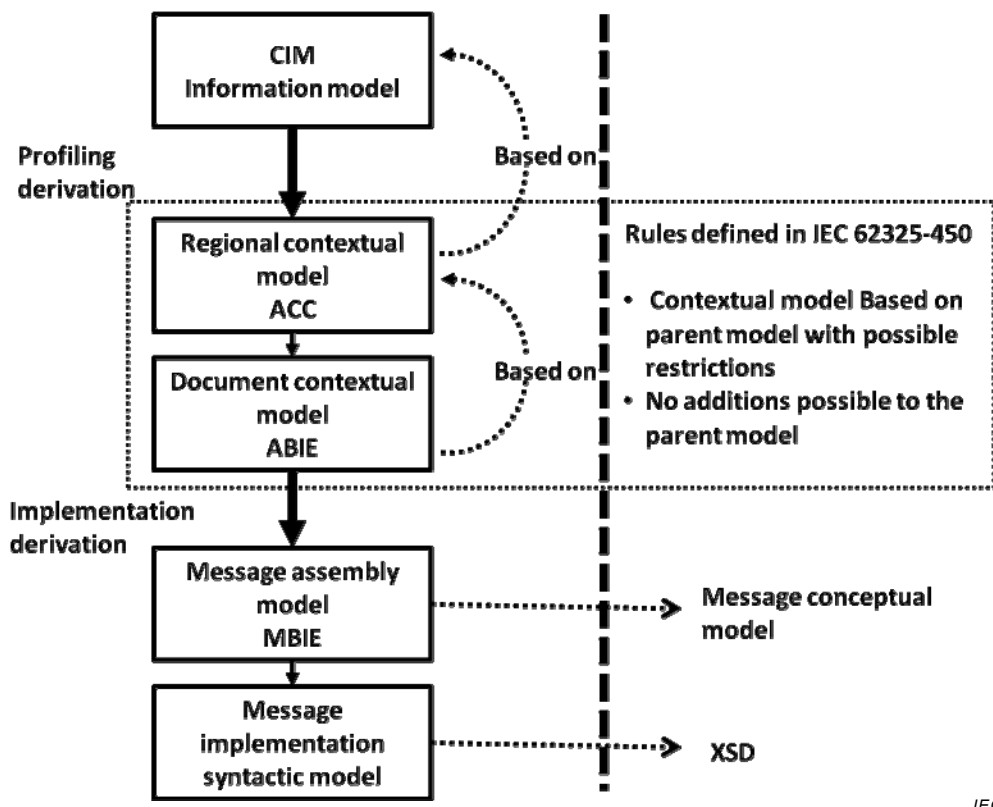
4.1 From the CIM information model to the European style market profile

4.1.1 General

The European style market profile is a regional contextual model as defined in IEC 62325-450. IEC 62325-450 provides the contextual derivation rules to be applied from the abstract CIM core concepts to generate the regional contextual model.

The common information model (CIM) is an abstract model. A CIM-compliant implementation does not need to include all classes, attributes, or associations in the CIM standard. Profiles are defined to specify which elements shall be included, i.e. mandatory elements, in a particular use of the CIM, as well as which elements are optional.

As stated in IEC 62325-450 and outlined in Figure 1, the definition of CIM profiles follows a layered modelling framework from the CIM information model down to the specification of messages based on CIM concepts through the definition of different regional contextual models and their subsequent contextualized documents for information exchange.



IEC

Figure 1 – IEC 62325-450 modelling framework

From the CIM which provides the overall semantic model for the electricity industry, regional contextual models are built to cover the electricity market information interchange requirements for a given region, i.e. the business context, in compliance with IEC 62325-450 rules.

The European style market profile (ESMP) is a regional contextual model based on the CIM artefacts where some particular artefacts are refined respecting a set of defined rules to cater for specific European style market requirements. These artefacts are based on the CIM artefacts on which they are built.

The European style market profile is the cornerstone to derive contextualized documents catering for specific information interchange functional requirements. These document contextual models are defined in other standards of the IEC 62325 series; and a dedicated IEC 62325-451-x¹ (x going from 1 to n) per main business process describes the related information interchange requirements. Additional constraints are thus introduced on the European style market profile on which they are built.

¹ IEC 62325-451-1, IEC 62325-451-2, IEC 62325-451-3, IEC 62325-451-4, IEC 62325-451-5 and IEC 62325-451-6 are published; others are to be published.

The final modelling step applies standardized message assembly rules in order to provide an information structure for information interchange. All syntactic specific electronic documents are built from the message assembly models. This last level is covered by IEC 62361-100.

4.1.2 Applying the framework to the European style electricity market

Within Europe a target has been defined for the implementation of the energy internal European market (IEM) and in particular the electricity market. The harmonization of business processes has been carried out in particular for the data interchange between market participants such as transmission system operators (TSO), distribution system operators (DSO), balance responsible parties, etc. These business processes address a number of energy market activities such as congestion management, scheduling, reserve resource management, explicit auction for transmission capacity, settlement, reconciliation, etc.

The result of this harmonization work has been taken into account to define the European style market profile based on the CIM UML model. The European style market profile is thus a regional contextual model as defined in IEC 62325-450.

The European style market profile is a first level of contextual model that covers generically all the required information conveyed in the different exchanged messages gathered by the defined business processes.

The European style market profile is therefore the smallest sub-set of the CIM information model, derived by restrictions, from which all the exchanges of information are derived for all the European market business processes.

4.1.3 Examples for building a European style market profile

Each UML artefact can be potentially restricted in order to refine and define the business requirements applied to the current European style market profile.

The example in Figure 2 illustrates how the CIM information model is restricted into a profile for the European style market.

- a) Classes: it is possible to restrict each class of the CIM by selecting a subset of its attribute list since all CIM attributes are optional (i.e. their multiplicity is 0..1). For example, the CIM MarketDocument class is restricted into the profile class with only two attributes, mRID and type.
- b) Attributes: it is possible to restrict each attribute in the profile by applying restrictions to its related datatypes (see Datatypes below) and its multiplicity. The new multiplicity shall be included in the multiplicity from the parent BasedOn class. For example, in the European style market profile, the attribute mRID from MarketParticipant is mandatory (i.e. multiplicity = 1..1) while in the parent BasedOn class from the CIM, the attribute is optional (i.e. multiplicity = 0..1).
- c) Relationships: it is possible to restrict each relationship between CIM Classes at the profile level. The kinds of restriction uniquely concern the multiplicity and qualification of the end role.
- a) Datatypes: it is possible to restrict the CIM Datatypes by defining facets on the value space of the datatype. For example, the CIM attribute type of MarketDocument is a CIM String while in the profile it is restricted by an enumeration (i.e. MessageTypeList) to indicate the list of valid types for a MarketDocument.

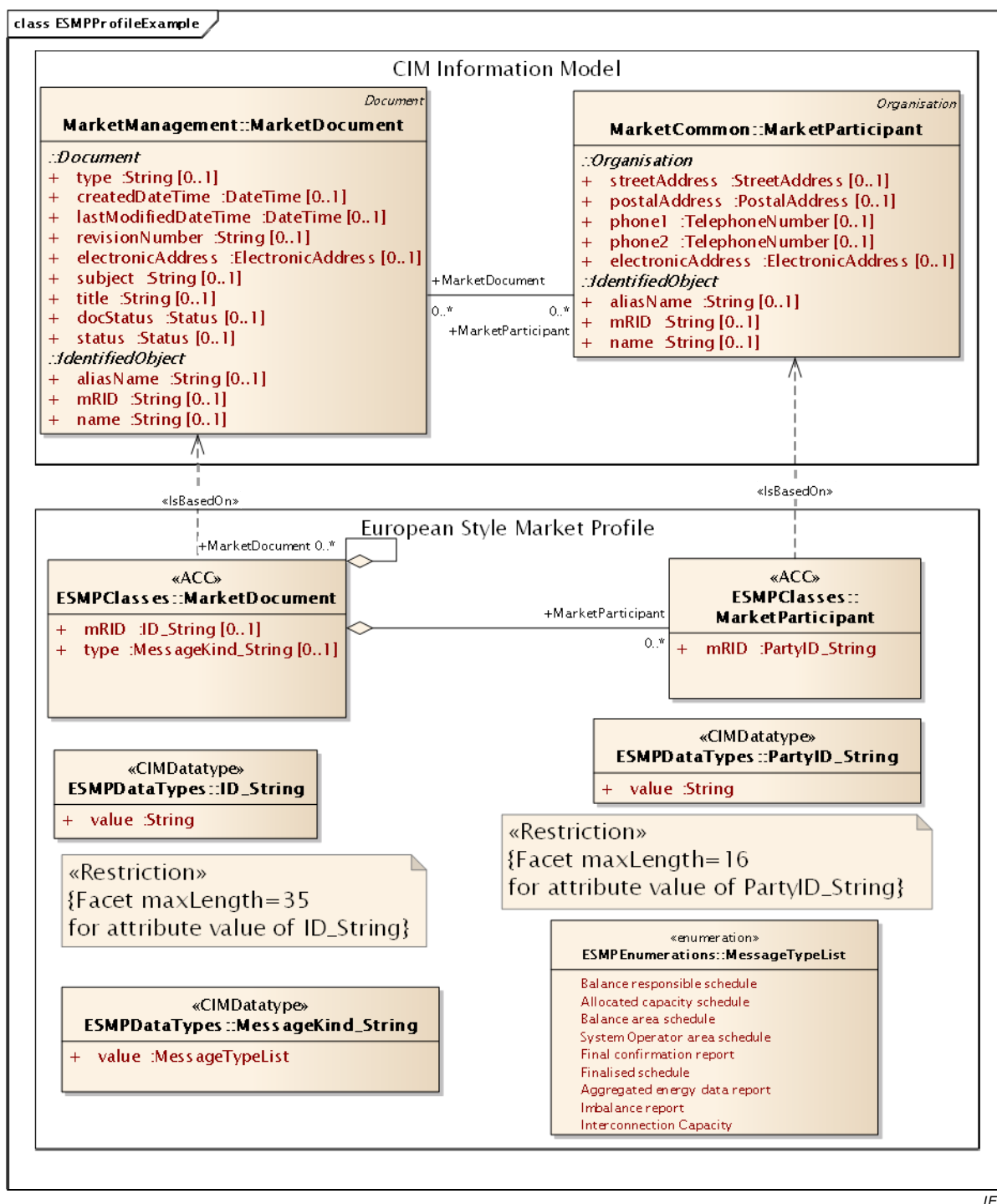


Figure 2 – Example of restrictions applied to CIM for a profile

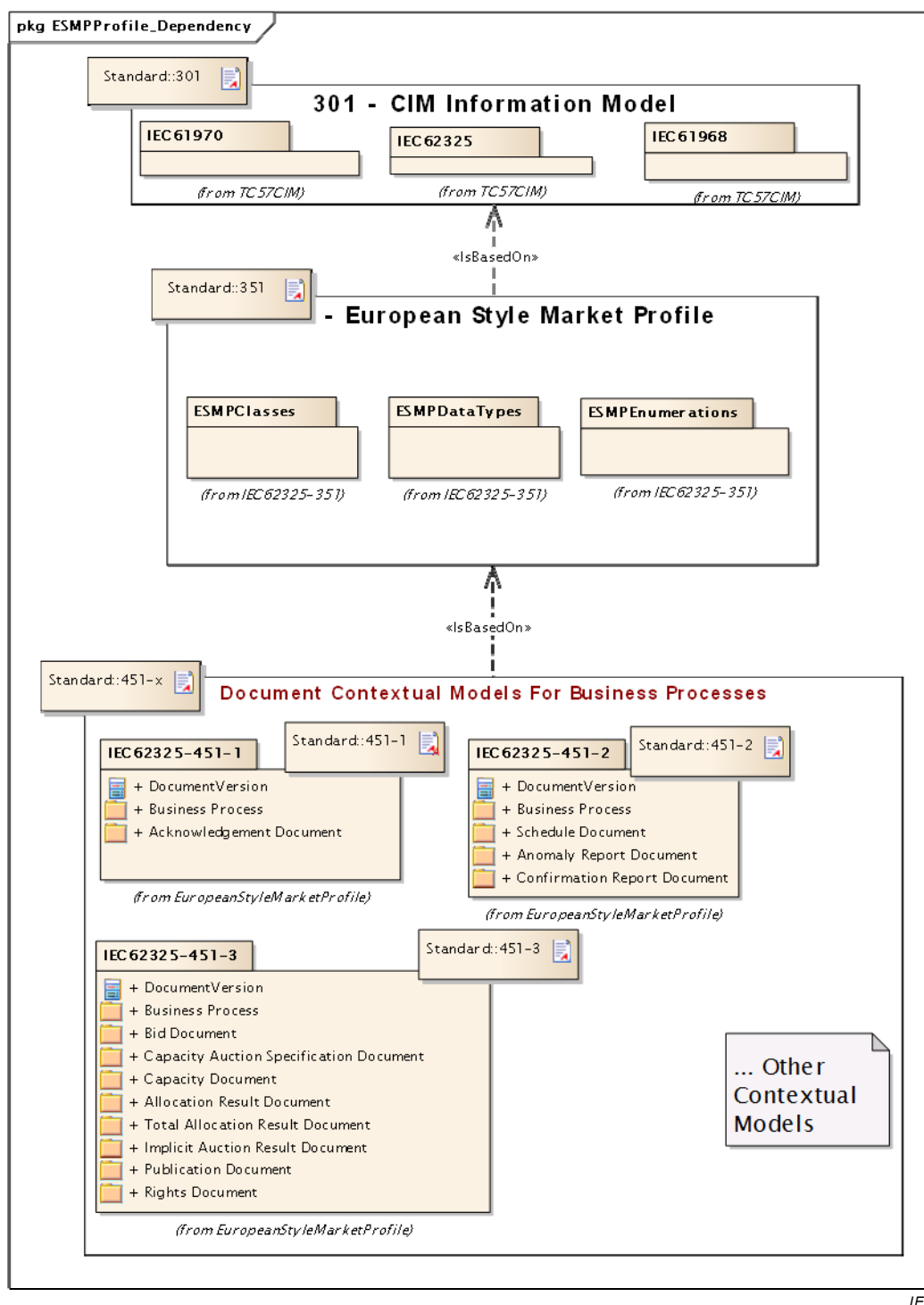
NOTE In the examples, the list of attributes and enumerated literals are not complete. They are just given as examples.

4.2 European style market package structure

Figure 3 shows the main package structure of this profile that is composed of:

- **ESMPClasses:** Defining all the contextual classes of the European style market profile (ESMP) derived by restriction from the CIM information model.
- **ESMPDataTypes:** Defining all the core datatypes used within the ESMP classes.

- ESMPEnumerations: Defining the name of all the allowed enumerations for the value space of some of the ESMP datatypes.



IEC

Figure 3 – Overview of European style market profile dependency

The European style market is use case oriented and is based on business processes along with their document exchanges. Each document is a sub-contextual model derived by restriction from the European style market profile.

All the core datatypes used in every document are merged, harmonized and centralized in the European style market profile. Therefore each exchanged document is indicating the reuse of core datatypes that have been defined only once in the European style market profile.

4.3 The European electricity market concepts

Europe has promoted the development of an energy IEM. This energy IEM, which has been progressively implemented since 1999, aims to deliver a real choice to all consumers in order to achieve efficiency gains, competitive prices and higher standards of service, and to contribute to security of supply and sustainability.

The development of the energy IEM was based on the “historical” area of each transmission system operator (TSO). Thus, the concept of a zonal model appeared to be quite natural as:

- Each TSO has developed its transmission network in order to reduce the congestion within its area.
- The development of interconnections was mainly made for security and synchronization reasons.

In a zonal model, transactions are commercially and physically cleared regardless of the location within a market or a bidding area. A reference energy price for a market area or a bidding area is defined usually by a power exchange or a market operator. Bilateral trade may however co-exist with exchange trading.

It should be pointed out that there are different implementations of the zonal model:

- A number of countries have a single price on their hub.
- Some countries have created “bidding areas” within their market area, each bidding area could have a different price.
- Market splitting: Some countries have grouped their market areas managed through a single power exchange. It is only when congestion appears that the market area is split into bidding areas with different prices.
- Market coupling: Some countries have grouped their market areas into a single area, but keeping a power exchange per area. It is only when congestion appears that the market area is split into bidding areas with different prices.

Network congestion within a bidding area is mainly managed by the system operator (SO) through redispatching. Congestion between bidding areas is managed by the system operator (s) and/or the market operator (s) and/or the power exchange (s) either through transmission capacity auctions or through market coupling or market splitting.

In particular, all network studies or network security assessments are carried out by the transmission system operators. Dedicated processes are defined between the transmission system operators in order to ensure a proper and transparent operation of the market. These processes are not intended to be described within this standard as they are related to a specific profile, i.e. IEC 61970-452, and the associated IEC 61970-552. It should be underlined that the results of these studies and assessment are taken into account as “external” constraints by the electricity market.

The energy prices are usually based on the transaction prices between the market participants in a market area or bidding area and are based on the transmission constraints between the bidding areas where market splitting or market coupling is implemented. The role of the market operator is generally carried out by a power exchange (PX).

The European electricity market is based on the concept of regulated third party access (rTPA). In order to permit effective competition the transmission system operators have to allow any electricity supplier non-discriminatory access to the transmission network to supply customers. The conditions of access to the transmission network are regulated by the national regulatory authority. In particular, the energy price on the wholesale market is independent of the price for grid access. The

energy price is dependent upon the contract signed by the parties. The grid access price is regulated and is not dependent upon a km-stamp, i.e. the price paid by a party connected to the grid is mainly based on the type of end-user (consumer or producer), but not on the location (electrical path) within the bidding area or market area.

The business concepts, zonal model (single “hub” price) and regulated third party access on which the European style market is based, are thus very different from the nodal model. In the nodal model, a locational marginal price has to be defined for each electrical node used by the security constrained economic dispatch function.

Consequently, the following information is not of interest within the European style market for “exclusively market” operations (network modelling is used to assess the security of the power system and is the sole responsibility of the system operators):

- Detailed network modelling, and in particular data for the security constrained economic dispatch. In Europe, this process is carried out through the balancing process, i.e. activation of the least expensive bids for a reserve resource.
- Detailed generation modelling and all the technical constraints data in order to compute a set point value for a generator. In Europe, this process is carried out through the balancing process, i.e. activation of the least expensive bids for a reserve resource.
- Detailed information on location. In Europe the location information is limited to the hub connection, i.e. the bidding zone where the resource is located.

Within the European style market, the following processes have been harmonized:

- The acknowledgement process, IEC 62325-451-1: This process deals with the technical and functional acknowledgment of electronic documents to be carried out within any European style market process.
- The scheduling system process (ESS), IEC 62325-451-2: This process deals mainly with the validation of the bilateral trades between market participants and the assessment of the balance of each market participant (how much energy its resources will generate, how much energy its clients will consume, as well as the import and export of energy).
- The transmission capacity allocation and nomination process (ECAN), IEC 62325-451-3: This process describes the explicit and implicit auctions of capacity for cross border trades. The secondary market of capacity rights is also described, i.e. once a capacity trader has acquired capacity in an auction, it could be resold in a bilateral transaction or on another auction.
- The settlement and reconciliation process (ESP), IEC 62325-451-4: This process describes how to exchange the information necessary to settle the electricity market, i.e. the comparison of the scheduled energy and the actual meters.
- The reserve resource planning process (ERRP): This describes how the resources are planned scheduled and especially how the system operator can activate the tertiary reserve for balancing purpose. The ERRP cross border redispatch process: This describes the process of redispatching between TSOs when a congestion constraint occurs. Currently, a network code is being drafted for the “balancing process” and standardization work will be initiated when this network code will be available.

These existing processes as well as new processes as they become available are the object of the IEC 62325-451-x standards.

4.4 Business process modelling

The European Union is making significant progress towards a level playing field providing transparent non-discriminatory access to the energy markets across Europe irrespective of national and regional boundaries. Unbundling of previously integrated national or regional energy utilities and third party access to transmission networks are key themes of EU Directive 1228/2003. Since the issue of this Directive several policy papers and further Directives have been issued that strengthen

the principles upon which the internal energy market is being built; a market where energy is traded as a commodity and grids are managed along market oriented lines.

To operate an electricity market, large volumes of operational and commercial data are to be exchanged between the different market participants. The main target of this harmonization work is to standardise the way the information is exchanged between market participants for a dedicated business process.

In the IEC 62325-451-x standards, the business processes are described using “Use Cases” and “Activity diagrams”.

As an example, the following is a brief description of the scheduling system business process.

The scheduling system process allows automated processing of energy schedules which are traded bilaterally or through the participation of a power exchange.

The schedules are submitted by the traders to the transmission system operator before the gate closure time. The schedules contain a set of time series for the amount of energy being traded between the party in question and other parties on the market.

The business processes include acknowledgement of the receipt of the schedules, matching of the schedules and confirmation or rejection of the schedules.

Schedule, acknowledgement, anomaly and confirmation report electronic documents are the four documents that support the complete scheduling process.

The scheduling system process is generic and accommodates all models of European style markets being practised in Europe.

- At one end of the spectrum the scheduling system process is used to implement typical scheduling mechanisms from traders to transmission system operators in any of the market areas.
- On the other end of the spectrum, the scheduling system process, in matching international energy exchanges between the hierarchical levels of the ENTSO-E regional group Continental Europe pyramid.

The scheduling system process allows the handling any specific time frame, from annual, day ahead through to intraday periods.

4.5 Business rules for the European style market profile

4.5.1 General

Within the European style market profile, the following generic business rules are applied to each electronic document. Additional business rules depending on specific processes may also be applied and are described in the IEC 62325-451-x series of standards.

4.5.2 Identification of an ESMP electronic document

Within the European style market profile, electronic documents are generally identified by three characteristics:

- The identification of the electronic document.
- The version of the electronic document.
- The identification of the emitter of the electronic document.

The following business rules are to be applied:

- Each MarketDocument shall be identified by the sender in a unique manner.
- For a MarketDocument, the revisionNumber (version) value shall be a positive integer and leading zeros shall be suppressed.
- For the first version of a MarketDocument, the revisionNumber value shall be equal to 1. If the MarketDocument identification is sufficient to identify a specific instance of another MarketDocument, a revisionNumber is not required.
- For the succeeding versions of a MarketDocument, the revisionNumber value shall be superior to the previous revisionNumber.

4.5.3 Time

The following business rules are to be applied:

- All the dates and times within the MarketDocument shall be expressed in coordinated universal time (UTC) in compliance with ISO 8601.
- The datatype ESMP_DateTime defined as YYYY-MM-DDThh:mm:ssZ is a restriction of the datatype DateTime.
- For all time intervals, the start date and time is included in the scope of the interval whereas the end date and time is excluded from the scope of the interval, i.e. [start date and time, end date and time).
- For all time intervals, the start date and time as well as the end date and time are expressed in coordinated universal time (UTC) in compliance with ISO 8601 but without the seconds, i.e. as YYYY-MM-DDThh:mmZ.

4.5.4 Coding scheme identification

The following business rule is to be applied:

- Whenever a coded value within a MarketDocument is associated with a coding scheme, the coding scheme shall always be identified. The coding scheme is an independent facet of an attribute with a size of three alphanumeric characters.

4.5.5 Direction of flow within TimeSeries

Within the electricity market, it is important to identify the direction of an energy flow.

Usually, one speaks of “import” or “export”, but within an electronic data interchange these concepts can be confusing, i.e. the “import” value for one trader is the “export” value for the other, etc. In the current language, there is frequently confusion between the origin or destination of a flow and its direction.

A single set of rules has been defined for all the involved business processes in order to avoid misinterpretation, i.e. from schedules within an area and between areas all the way down to settlement.

The following business rules are to be used within the European style market profile:

- Generation, as source of energy, puts the energy into an area.
- Consumption takes the energy out of an area.
- In the case of trades between parties within an area the “out_Domain” will always be the same as the “in_Domain”. The direction of the energy flow therefore can be determined as going from the “out_MarketParticipant” (seller) to the “in_MarketParticipant” (buyer).
- In the case of trades between parties in different areas the “out_Domain” shall always be different to the “in_Domain”. The energy flow shall always go from the “out_Domain” to the “in_Domain” and from the “out_MarketParticipant” (seller) in the “out_Domain” to the “in_MarketParticipant” (buyer) in the “in_Domain”.