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Entwurf

**Kommunikation im Energiemarkt –
Teil 451-2: Planungs-Geschäftsprozess und kontextbezogene
CIM-Modelle für den europäischen Markt
(IEC 57/1313/CD:2012), Text in Englisch**

Framework for energy market communications –
Part 451-2: Scheduling business process and contextual model for CIM European market
(IEC 57/1313/CD:2012), Text in English

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2013-08-05 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter www.entwuerfe.din.de bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an dke@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (Hausanschrift: Stresemannallee 15, 60596 Frankfurt am Main).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 115 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Die englische Originalfassung des internationalen Dokuments IEC 57/1313/CD:2012 „Framework for energy market communications – Part 451-2: Scheduling business process and contextual model for CIM European market“ (CD, en: Committee Draft) ist unverändert in diesen Norm-Entwurf übernommen worden.

Das internationale Dokument wurde vom TC 57 „Power systems management and associated information exchange“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet und den nationalen Komitees zur Stellungnahme vorgelegt.

Die IEC und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Da der Abstimmungszeitraum für einen FDIS bzw. Schluss-Entwurf prEN nur 2 Monate beträgt, und dann keine sachlichen Stellungnahmen mehr abgegeben werden können, sondern nur noch eine „JA/NEIN“-Entscheidung möglich ist, wobei eine „NEIN“-Entscheidung fundiert begründet werden muss, wird bereits der CD als DIN-Norm-Entwurf veröffentlicht, um die Stellungnahmen aus der Öffentlichkeit frühzeitig berücksichtigen zu können.

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

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

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen 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 vorliegenden Normentwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der IEC 62325-451-2 veröffentlicht. Zu deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Nationaler Anhang NA (informativ)

3 Begriffe

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

Anmerkung 1 zum Begriff: Siehe Internationales Elektrotechnisches Wörterbuch, IEC 60050, für allgemeine Glossardefinitionen.

3.1

aggregierte Geschäfts-Informationseinheit

ABIE

(en: **aggregate business information entity**)

Wiederverwendung einer aggregierten Kernkomponente (ACC) in einem festgelegten Geschäftsbereich

[QUELLE: ISO 15000-5]

3.2

aggregierte Kernkomponente

ACC

(en: **aggregate core component**)

Sammlung aufeinander bezogener Stücke von Geschäftsinformationen, welche zusammen eine bestimmte Geschäftsbedeutung tragen, unabhängig von einem bestimmten Geschäftskontext

Anmerkung 1 zum Begriff: Ausgedrückt durch Modellierungsbegriffe, ist dies die Darstellung einer Objektklasse, unabhängig von einem bestimmten Geschäftskontext.

[QUELLE: ISO 15000-5]

3.3

Anwendungsprogramm-Schnittstelle

API

(en: **application program interface**)

die Menge öffentlicher Funktionen, welche von einer ausführbaren Anwendungskomponente für die Verwendung durch andere ausführbare Anwendungskomponenten bereitgestellt wird

3.4

Einbindungsmodell

(en: **assembly model**)

Modell, welches Informationen in einem Geschäftskontext für das Einbinden in elektronische Dokumente für den Datenaustausch aufbereitet

3.5

basierend auf oder IsBasedOn

(en: **based on or IsBasedOn**)

Verwendung eines Artefakts, welches entsprechend der Anforderungen eines spezifischen Geschäftskontexts eingeschränkt ist

3.6

Geschäftskontext

(en: **business context**)

spezifischer Geschäftszusammenhang, welcher durch die Werte einer Menge von Kontextkategorien festgelegt ist, und es ermöglicht, unterschiedliche Geschäftszusammenhänge eindeutig voneinander zu unterscheiden (UN/CEFACT)

3.7**europäischer Marktprofiltyp
ESMP****(en: European style market profile)**

der europäische Marktprofiltyp, das Ziel der vorliegenden Internationalen Norm

3.8**Informationsmodell****(en: information model)**

Repräsentation 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 Informationsstrukturanforderungen für den Domänenkontext bereitstellen.

3.9**Marktmanagementsystem****MMS****(en: market management system)**

aus einer Softwareplattform bestehendes Computersystem, welches grundlegende unterstützende Dienste und eine Reihe von Anwendungen bereitstellt, welche die für ein effektives Management des Elektrizitätsmarktes erforderliche Funktionalität bereitstellen

Anmerkung 1 zum Begriff: Diese Softwaresysteme in einem Elektrizitätsmarkt dürfen Unterstützung für die Kapazitätsvergabe, Energiezeitplanung, zusätzliche und andere Dienste, Echtzeit-Operationen und Abrechnungen einschließen.

3.10**Nachricht-Geschäfts-Informationseinheit****MBIE****(en: message business information entity)**

repräsentiert die Aggregation einer Menge von ABIE, welche eine definierte Reihe von Einbindungsregeln berücksichtigt

3.11**Profil****(en: profile)**

grundlegender Rahmen für alle Informationen, welche erforderlich sind, um einer spezifischen Umgebung zu genügen

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Framework for energy market communications –
Part 451-2: Scheduling business process and contextual model for CIM
European market

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 Power systems management and associated information exchange.

The text of this standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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The National Committees are requested to note that for this publication the stability date is

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371

INTRODUCTION

372 This International Standard is one of the IEC 62325 part 451-n series for deregulated energy
373 market data exchanges based on the European style market profile. This standard, IEC
374 62325-451-2, defines the document contextual models, the message assembly models as well
375 as the XML schemas to be used for the time based scheduling process.

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

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

384 This European style market profile is based on different parts of the CIM IEC standard and
385 specifies the content of the messages exchanged.

386 This document provides for the European style market profile the time based scheduling
387 process. These market processes are based on the European regulations, and on the
388 concepts of third party access and zonal market. This standard was originally based upon the
389 work of the European Transmission System Operators (ETSO) Task Force EDI (Electronic
390 Data Interchange) and then on the work of the European Network of Transmission System
391 Operators (ENTSO-E) Working Group EDI.

392 ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-
393 line data bases of patents relevant to their standards. Users are encouraged to consult the
394 data bases for the most up to date information concerning patents.

Framework for energy market communications – **Part 451-2: Scheduling business process and contextual model for CIM** **European market**

1 Scope

This International Standard is one of the IEC 62325 part 451-n series for deregulated energy market data exchanges and is applicable to European style electricity markets.

Based on the European style market contextual model (IEC 62325 part 351), this particular International Standard specifies a UML package for the scheduling business process and its associated document contextual models, assembly models and XML schemas for use within the European style electricity markets.

The relevant aggregate core components (ACCs) defined in IEC 62325 part 351 have been contextualised into aggregated business information entities (ABIEs) to satisfy the requirements of the European style market acknowledgment business process.

The contextualised ABIEs have been assembled into the schedule document, contextual model, the anomaly report contextual model and the confirmation report contextual model.

Related assembly models and XML schema for the exchange of scheduling information between market participants is automatically generated from the Assembled document contextual models.

2 Normative references

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

IEC 62325-301, *Framework for energy market communications, Common information model (CIM) extensions for markets*.

IEC 62325-351, *Framework for energy market communications, CIM European market model exchange profile*.

IEC 62325-450, *Framework for energy market communications, Profile and context modeling rules*.

IEC 62325-451-1, *Framework for energy market communications; Acknowledgement business process and contextual model for CIM European market*.

IEC 62361-100, *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 of IEC 61970-2 apply, as well as the following.

NOTE Refer to International Electrotechnical Vocabulary, IEC 60050, for general glossary definitions.

3.1

aggregate business information entity

ABIE

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

[SOURCE: ISO 15000-5]

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.

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

442 [SOURCE: ISO 15000-5]

443 **3.3** 444 **application program interface** 445 **API**

446 the set of public functions provided by an executable application component for use by other
 447 executable application components.

448 **3.4** 449 **assembly model**

450 model that prepares information in a business context for assembly into electronic documents
 451 for data interchange.

452 **3.5** 453 **based on or IsBasedOn**

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

456 **3.6** 457 **business context**

458 specific business circumstance as identified by the values of a set of context categories,
 459 allowing different business circumstances to be uniquely distinguished (UN/Cefact).

460 **3.7** 461 **European style market profile** 462 **ESMP**

463 the European style market profile, the object of this International Standard.

464 **3.8** 465 **information model**

466 representation of concepts, relationships, constraints, rules, and operations to specify data
 467 semantics for a chosen domain of discourse.

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

470 **3.9** 471 **market management system** 472 **MMS**

473 computer system comprised of a software platform providing basic support services and a set
 474 of applications providing the functionality needed for the effective management of the
 475 electricity market.

476 Note 1 to entry: These software systems in an electricity market may include support for capacity allocation,
 477 scheduling energy, ancillary or other services, real-time operations and settlements.

478 **3.10** 479 **message business information entity** 480 **MBIE**

481 represents the aggregation of a set of ABIEs that respects a define set of assembly rules.

482 **3.11** 483 **profile**

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

485 **4 Document contextual model and message assembly model basic concepts**

486 **4.1 Overview**

487 IEC 62325-450 defines a set of CIM profiles that follows a layered modelling framework as
 488 outlined in Figure 1 going from the common information model (CIM), to different regional
 489 contextual models and their subsequent contextualized documents for information exchange,
 490 the final step being the message specifications for information interchange.

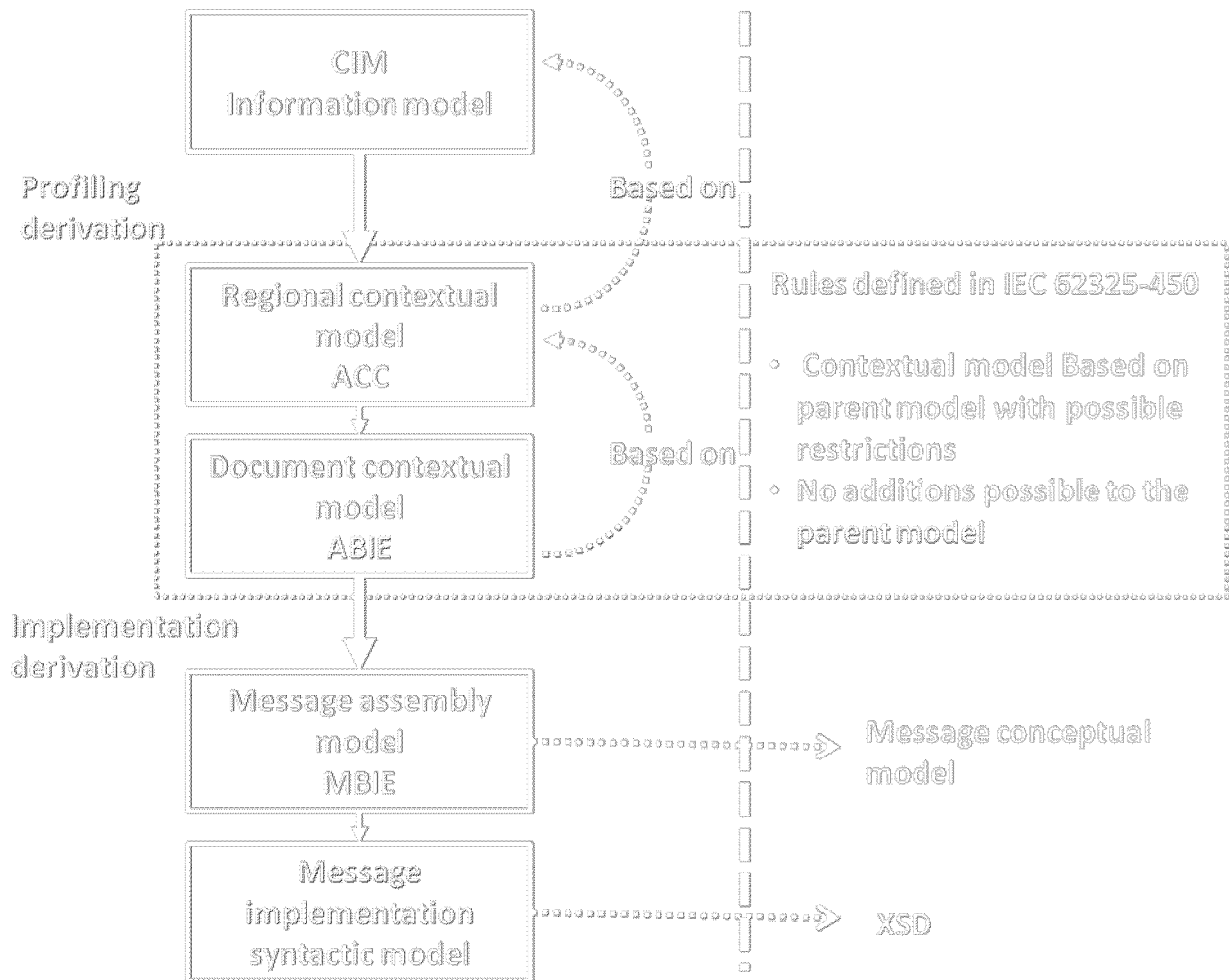


Figure 1 - IEC 62325-450 modelling framework

The regional contextual models are the basic components that are necessary to build electronic documents for information interchange. The European style market contextual model (IEC 62325 part 351) is, as an example, a regional contextual model. The components are also termed aggregate core components (ACCs).

A document contextual model is based upon a specific business requirements specification and is constructed from the contextualisation of the ACCs that can be found in the European style market contextual model. The contextualised ACCs at this stage are termed aggregate business Information entities (ABIEs). These ABIEs are the constructs that are assembled together into a specific electronic document to satisfy the information requirements outlined in the business requirements specification. The transformation from an ACC to an ABIE must respect the rules defined in IEC 62325 part 450, "Profile and context modeling rules".

Once a document contextual model has been built that satisfactorily meets the business requirements, a message assembly model can be automatically generated from it. The automatic generation respects the rules defined in IEC 62361 part 100, "Naming and design rules for CIM profiles to XML schema mapping".

XML schema then may be automatically generated from the message assembly model. If necessary specific mapping can take place at this stage to transform the CIM class and attribute names into more market resilient names.

4.2 European style market package structure

The main package structure of the European style market profile is described in Figure 2.

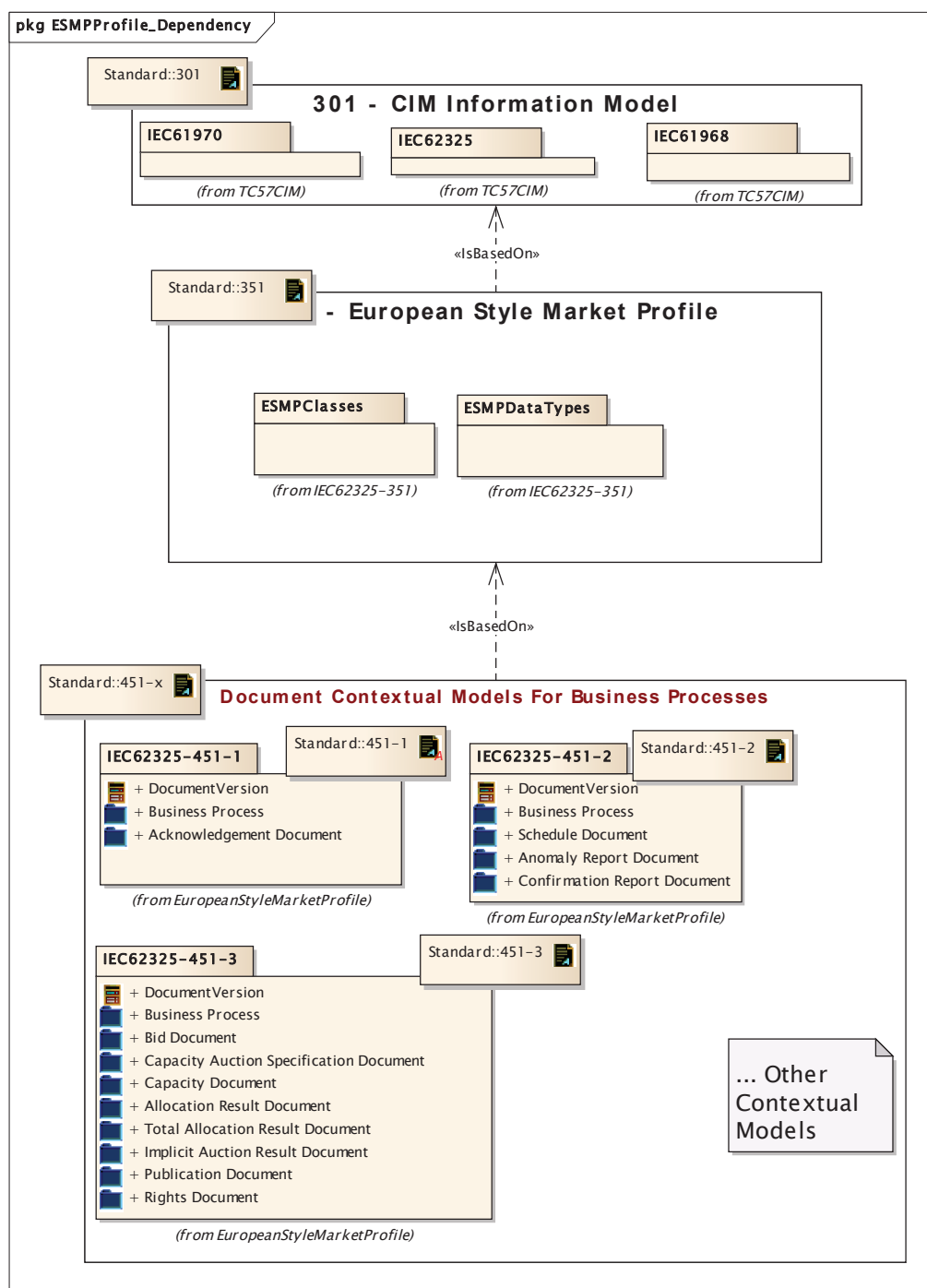


Figure 2 - Overview of European style market profile dependency

For each business process, a business process package is described in an IEC 62325 part 451-n (n from 1 to i) standard.

A business process package contains:

- The document contextual model (ABIE) and the automatically generated **message assembly model (MBIE)** for each electronic document required to enable the completion of the business process. Each document is a sub contextual model derived by restriction from the European style market profile.
- The XML schema of the business document that is automatically generated from the message assembly model.

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The European style market profile (ESMP), as defined in the IEC 62325 part 351, provides the core components permitted for use in an IEC 62325 part 451-n standard. All ABIEs must be “based on” the IEC 62325 part 351 core components:

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

All the core components that are used in every electronic document structure have been harmonized and centralized in the European style market profile.

4.3 From the European style market profile to the document contextual model

The document contextual model for a given business process is constructed by an information analyst who identifies all the information requirements necessary to satisfy the business process.

Once the information requirements have been identified, the information analyst identifies the related ACCs that are available in the European style market profile and contextualises them to meet the information requirements. This contextualisation step creates a set of aggregate business Information entities (ABIEs).

In a final step the information analyst assembles together into a specific document contextual model package the ABIEs to form a document model satisfying the business requirements.

All document contextual models share the same core components and core datatypes. These are defined in the European style market profile (IEC 62325-351) and are contextualised and refined in all document contextual models (IEC 62325-451-x series) respecting the rules as described in IEC 62325-450.

4.4 From the document contextual model to the message assembly model

Once the document contextual model has been finalised, the message assembly model may be automatically generated.

All document contextual models share the same core components and core datatypes. These are defined in the European style market profile (IEC 62325-351) and are contextualised and refined in all document contextual models (IEC 62325-451-n series) respecting the rules as described in IEC 62325-450.

To enable this automatic generation a series of principles have been elaborated based on the underlying structures defined in the European style market profile.

The message assembly model is generated into a separate package and respects the following basic criteria:

- 1) There shall be one class that is not dependent through a relationship on another class. This class shall be deemed the Root class
- 2) When there is a dependant class, that has a [0..1] or [1..1] multiplicity in all the dependent class association ends, then if it is a leaf class, the leaf class attributes shall be integrated into the parent class.
- 3) The multiplicity of the integrated attributes shall correspond to the multiplicity of the association end related to the dependent class. However, if an attribute has a multiplicity of [0..1] then this multiplicity shall become the multiplicity of the integrated attribute. For example, in Figure 3, the MarketParticipant class has a [1..1] relationship with the parent Schedule_MarketDocument and its “mRID” has a [1..1] multiplicity, thus the resulting combination is a [1..1] multiplicity. Consequently the “mRID” attribute is moved to the parent class for each relation respecting the [1..1] multiplicity.

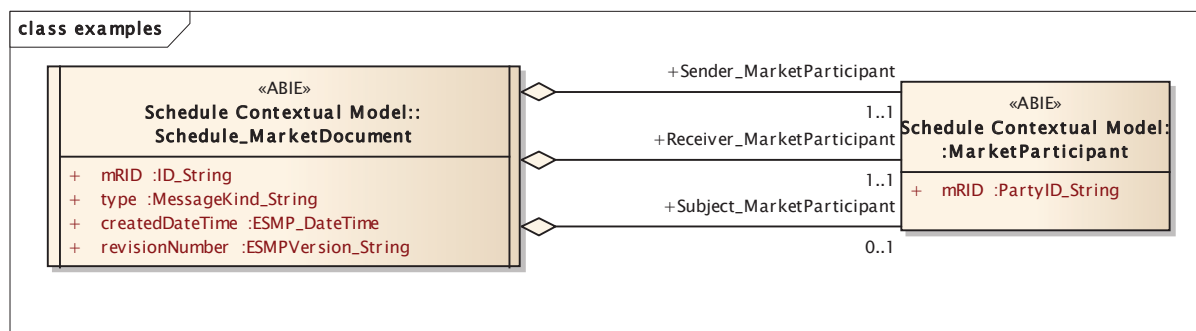


Figure 3 - Message assembly criteria

Note in the above example the dependent class «MarketParticipant» is associated twice to the parent class Schedule_MarketDocument all with a multiplicity of [1..1]. Its attributes shall be integrated into the parent class differentiated by the association rolename.

4) The name of the integrated attribute in the integrating class shall be the concatenation of the association end role name and the name of the attribute of the original class. For example, in Figure 3, there are two specific end role names, “Sender_MarketParticipant” and “Receiver_MarketParticipant”. Consequently the “mRID” attribute to be integrated into the parent class shall be “Sender_MarketParticipant.mRID” and “Receiver_MarketParticipant.mRID”.

5) The attributes that are integrated into a class shall maintain the same datatypes as defined in the dependant class.

6) The parent class could have associations with more than one leaf class. The integration rule is applied for each leaf class that fulfil the association requirement of 0..1 or 1..1

7) In the case where there is a hierarchy of dependant classes, the integration process is iterative starting from the leaf classes

8) Attributes and Associations are ordered.

The resulting message assembly model shall be the model used for the creation of technological implementations such as XML schema.

4.5 From the assembly model to the XML schema

The final modelling step applies a standardized set of criteria in order to generate a uniform XML schema from the assembly model. This transformation process respects the rules defined in IEC 62361 part 100, “Naming and design rules for CIM profiles to XML schema mapping”.

5 The time based scheduling business process (Informative)

5.1 General

The scenarios described below reflect the basic scenarios within the European electricity market. They are however not exhaustive and several extensions or variants are possible.

5.2 Business process definition

In the European electricity market, trading of energy is processed in two distinct phases:

- An initial phase for the trading of the commodity itself, i.e. when traders, Power Exchanges, etc. are involved in commodity trading exchanging information on quantities of energy and prices;
- A second phase where the physical aspects of the trade are provided to the transmission system operator.

This document deals specifically with the second phase that essentially addresses how much energy has been bought or sold or would be generated or consumed by each market participant. The energy amount is mainly expressed in MegaWatts (MW) for a given time period (hourly, half hourly or quarter of an hour). These specific energy declarations are termed “nominations”. The scheduling declaration process is used during this second phase.

— Entwurf —

The European electricity market is based on the concept of regulated third party access where all the market participants must provide their position for a given period that should generally be balanced depending on local market rules. The fundamental basis underlying these energy schedules is that, for a given market participant, the input quantities, i.e. the energy that is generated by its power stations or that is bought on the energy market (over the counter or power exchange), should be equal to the output quantities, i.e. the energy that is consumed by its consumers or that is sold on the energy market.

There are three main ways to trade electricity energy as a commodity:

- Through a power exchange or an “organised” electricity market where a trader may purchase or sell standardized energy products in an “anonymous way” (i.e. without knowing its counterpart). Offers within a bidding area managed by a Power Exchange can either be matched in a standalone way or in coordination with offers from other bidding areas but taking into account the transmission capacity constraints between the areas.

This last form of market is known as “market coupling” (when there are different power exchanges managing the “coupled” bidding areas) or “market splitting” (when a single power exchange manages the “coupled” bidding areas). The trader is not aware either of the origin or of the destination of the energy purchased or sold. There are two forms of organised markets: (i) auction markets in which trades are matched altogether once the gate closure occurs and (ii) continuous markets in which trades are matched continuously until the gate closure.

The financial operations related to the trades are carried out between the central counter party linked to the power exchanges and the trader. Once the trades are cleared, the commercial schedules (or market hub nominations) consisting of the aggregated trades that have occurred are forwarded by the power exchange or the central counter party to the concerned transmission system operator in a day-ahead or intraday process.

Examples of standardized products are: minimum volume increment (such as 1 MW), minimum price increment in Euros per Megawatt hour (such as 0.01 Euros per MWh) and a time interval (such as the next day with closure at noon on day ahead). Generally the blocks of energy could be sold on a peak, off peak or a given number of hours.

- Through over the counter (OTC or bilateral) trades where two traders are involved in a trade within a bidding area managed by a single transmission system operator. In such a case, the traders are free to trade as they wish, i.e. they are free to establish any pattern of the energy transaction. However once the trade has been finalised they have to declare their position to the concerned transmission system operator for the gate prior to operation. Usually, nominations are delivered for the day-ahead process (one gate for D-1) or intraday process (up to one per hour).
- Through International over the counter (OTC) trades where two traders are involved in a trade within bidding areas managed by different transmission system operators. In such a case, the transmission system operators on the borders of each bidding area have to match the nomination of each trader either in long term process, day-ahead process or intraday process. This process is also linked to the transmission capacity allocation process, i.e. auctions on transmission capacity rights.

In addition, to assess the balance of each market participant, other nominations have to be provided such as:

- Generation and consumption forecast schedules (where the market participants have to declare the aggregated generation or consumption forecast of their power stations and consumers to the local transmission system operator) for the day ahead process and intraday process, etc.
- Supply of a block of energy to an end-consumer (where a supplier delivers energy to a consumer contractually linked to a different balance responsible party);
- etc.

Thus four basic use cases have to be handled for the processing of these nominations depending upon their typology:

- Transmission of the nomination only;
- Transmission of the nomination and acknowledgment process (IEC 62325 part 451-1);
- Transmission of the nomination, acknowledgement process and confirmation report;
- Transmission of the nomination, acknowledgement process, eventually an anomaly report and a confirmation report.

Each of the above market situations can be reflected in different business scenarios as defined in the following paragraph.

5.3 Scheduling business process definition

The scheduling business process can be divided into 4 different scenarios as outlined in the use case in Figure 4.

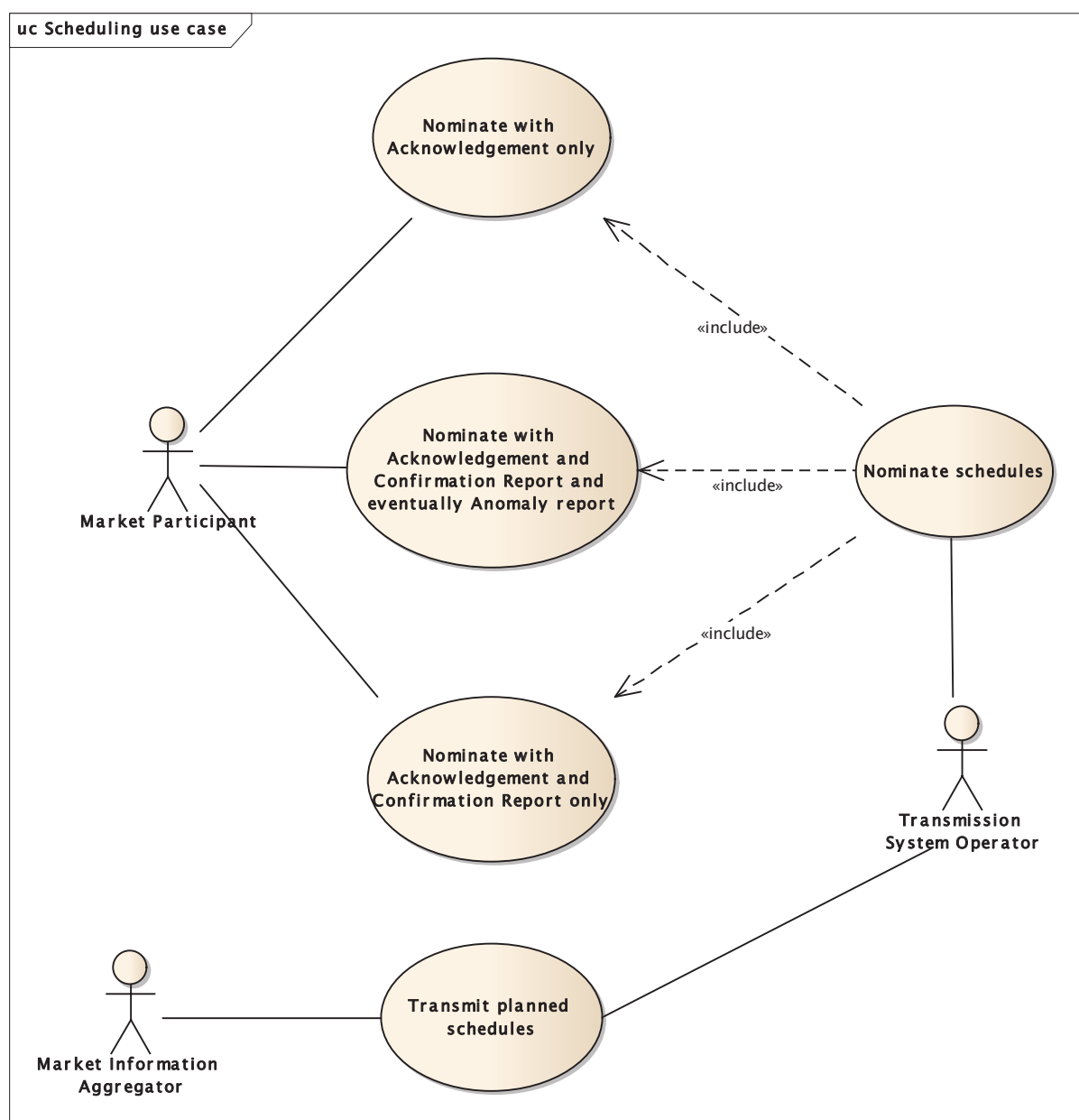


Figure 4 - Scheduling business scenarios

The first three scenarios are linked to the way the energy is traded as a commodity.

679 The last scenario consists of the transmission of the nominations for information purposes to
680 a third party. This use case is not described in this process

681 **5.3.1 Nominate Schedules for commodity trades**

682 The transmission system operator has to be informed of the commodity trades made by the
683 market participant, either through a third party, such as market operator (power exchange) or
684 a nomination validator (coordinated international OTC trade), or with another market
685 participant. Consequently it is necessary to nominate the schedule to enable its verification
686 before acceptance.

687 Three forms of nomination are covered in this process.

688 **5.3.1.1 Nominate with acknowledgement only**

689 This is the simplest form of nomination and could be used where a market operator or a
690 nomination validator provide nomination information to the transmission system operator. In
691 such a case, the transmission system operator does not need to match the nominations of
692 each counterpart as they have been validated by an external trusted third party.

693 **5.3.1.2 Nominate with acknowledgement, confirmation and anomaly**

694 This is the case for OTC trades, where market participants individually submit their
695 nominations to the transmission system operator who carries out the following steps:

- 696 • Verifies that the schedule is coherent independently from the counter nomination. At
697 the end of the verification process an acknowledgement document is transmitted
698 informing the market participant of the results of the initial verification.
- 699 • On reception of the nomination from the counter party the nominations are matched
700 and if any mismatches are identified an anomaly report is submitted to both parties. A
701 time driven event may be provided in order to verify that nominations from one party
702 without a nomination from a counter party are taken into consideration and the
703 appropriate anomaly report can be generated.
- 704 • Just prior to the closure of a given period an intermediate confirmation report may be
705 transmitted to the market participants informing them of the situation of their
706 nominations and eventually what will happen to nominations where there are
707 outstanding anomalies.
- 708 • At the closure of a given period a final confirmation report is transmitted to the market
709 participants informing them of what will be effectively scheduled from their
710 nominations.

711 **5.3.1.3 Nominate with acknowledgement and confirmation**

712 The third case can be used where the transmission system operator does not provide
713 anomaly information and consequently it reflects the second case without the anomaly report
714 step.

715 It is also more generally used in the transmission system operator to transmission system
716 operator allocation of interconnection capacity in the case of international trades. This
717 process is carried out to ensure that the nominations on each side of the transmission system
718 operator areas are coherent and respect the agreed cross border rules. Such exchanges may
719 employ a single matching principle where one transmission system operator acts as the
720 matching transmission system operator who carries out the schedule matching and informs
721 the participating transmission system operator of the results in a confirmation report. Any
722 mismatches may be resolved by applying an agreed set of rules and integrated into the
723 confirmation report.

724 **5.3.2 Transmit planned schedules**

725 This use case is to enable transmission system operators to inform interested parties and in
726 particular market information aggregators of the schedules, in aggregated form, that have
727 been approved for a given period.

728 5.4 Schedule business process workflow

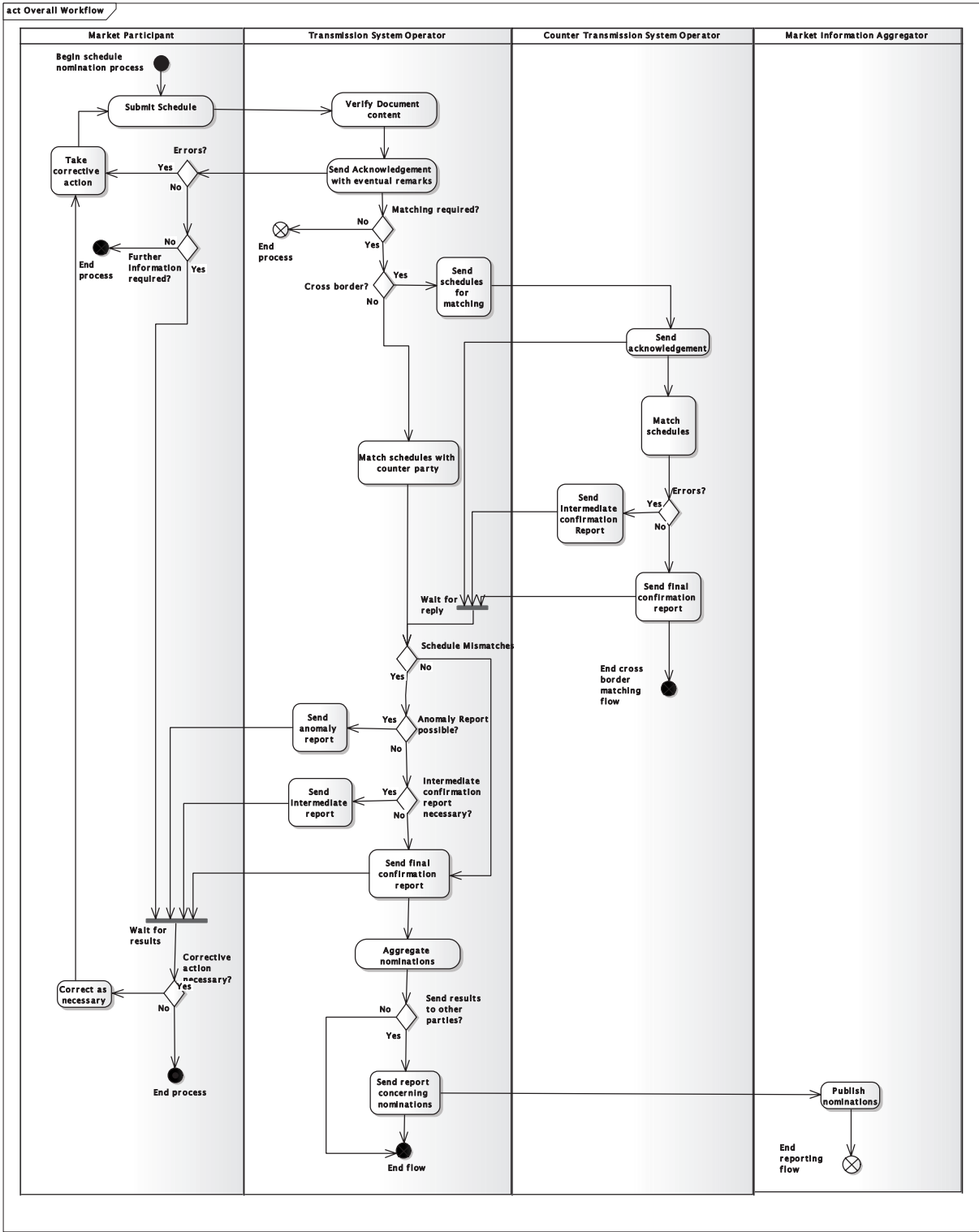


Figure 5 - Scheduling process workflow

The four scenarios described above can be represented in the workflow diagram outlined in Figure 5. As can be seen from the workflow the schedule process can be looked upon as an integrated process that can also be broken down into four specific scenarios.

The complete schedule process that begins with a nomination being submitted by a market participant to the system operator managing a market balance area and ends with the list of the schedules being transmitted to a market information aggregator for posting to a website corresponds to the complete workflow diagram.

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However, it is possible to use parts of the overall process individually to cover specific business requirements.

These individual scenarios have been outlined in the use case diagram in Figure 4.

5.4.1 Scenario 1 workflow

Scenario 1, see Figure 6, may be used when a party (market participant or system operator) wishes to transmit scheduling information to another party and requires that an acknowledgement is sent in reply.

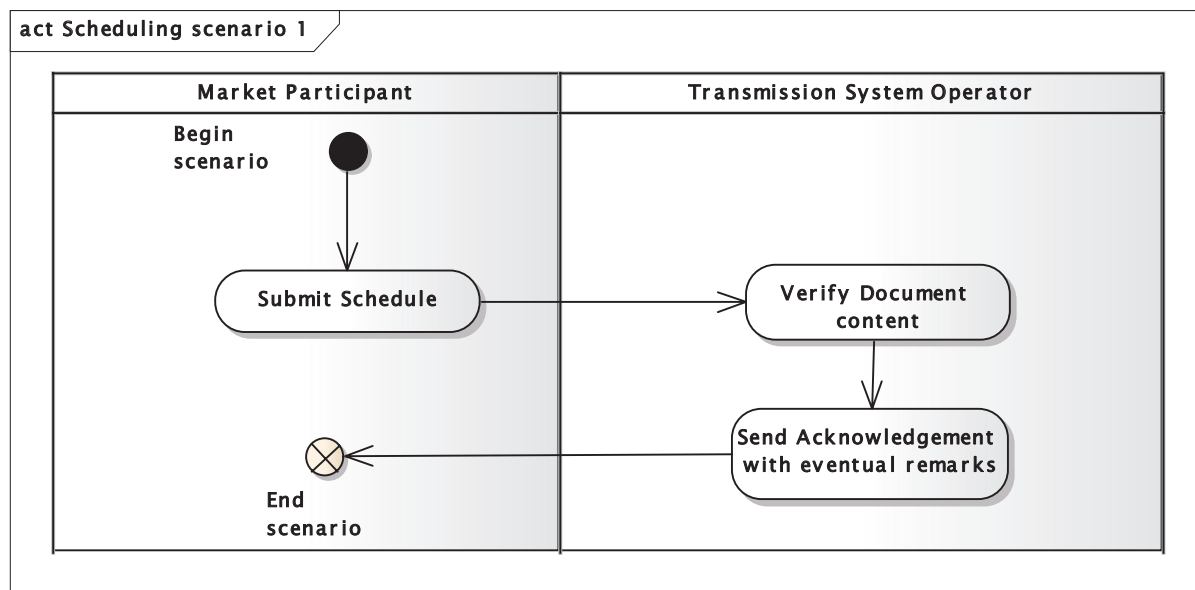


Figure 6 - Scheduling scenario 1 workflow

Scenario 1 may be used when a party (market participant or system operator) wishes to transmit scheduling information to another party and requires that an acknowledgement is sent in reply.

The schedule document in this case may contain detailed time series information or time series that have aggregated to a given level (area, agreement identification or metering point).

Should a negative acknowledgement occur then the schedule document is retransmitted after the necessary corrections have been made.

5.4.2 Scenario 2 workflow

Scenario 2, see Figure 7, corresponds to the general day ahead or intraday scheduling process where the schedules are matched. It is a three step process:

- The market participant nominates the schedule to the transmission system operator who after verification of its contents in isolation replies with an acknowledgement document.
- The market participant's time series in the schedule document are matched with the time series of the counterpart.
- The schedule document content is confirmed for application for the period requested.

Error situations can be identified in the documents submitted in which case corrective action has to be taken by the market participant or the counterpart.

A particular error situation may occur whenever there is a mismatch between two time series or whenever there is no counterpart time series to match. In this situation it is possible to transmit an anomaly report containing the information of the mismatched time series. It should be noted that this information is sent to both parties for information.

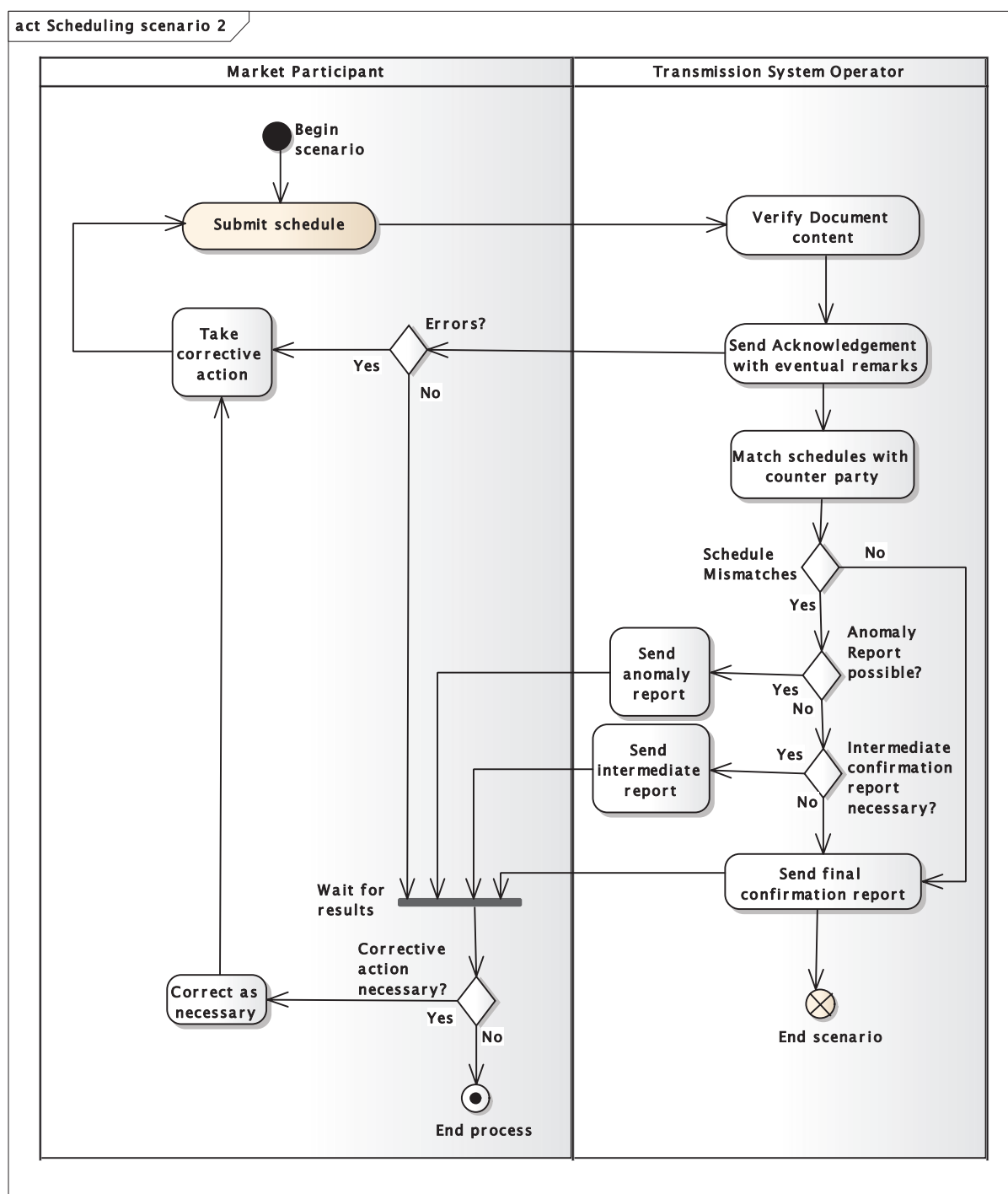


Figure 7 - Scheduling scenario 2 workflow

It is also possible to transmit an intermediate confirmation report that contains all the schedule information provided by the market participant and indicates what will be accepted for processing at cut off. For example it can provide a time series that mismatches where the quantities have been reduced in respect of local market rules. This value will be the final value if the market participant takes no corrective action.

The final confirmation report terminates the transaction and provides all the time series that have been accepted, with eventually any corrections due to local market rules. In some circumstances it may also include an imposed time series that does not figure in the market participant's schedule but has been imposed by the transmission system operator in order to complete some contractual obligations.

5.4.3 Scenario 3 workflow

Scenario 3, see Figure 8, is typical of a system operator to system operator matching situation where single sided matching is carried out. It may also be used with market participants if local market rules dictate its use.

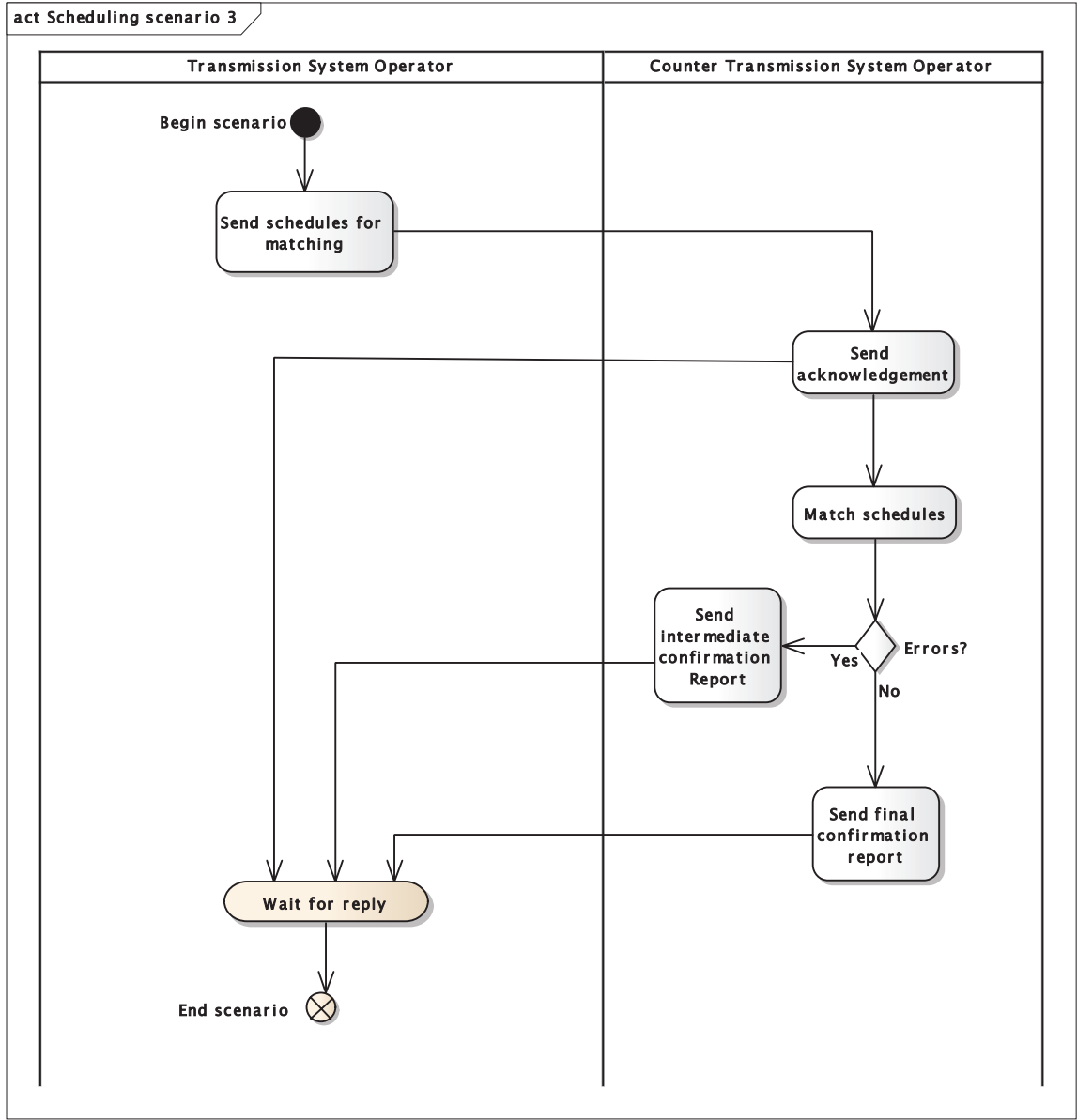


Figure 8 - Scheduling scenario 3 workflow

One party sends the schedule nominations that have already been validated to the matching party. For security reasons the matching party may also transmit the area schedules but basically this is making use of scenario 2.

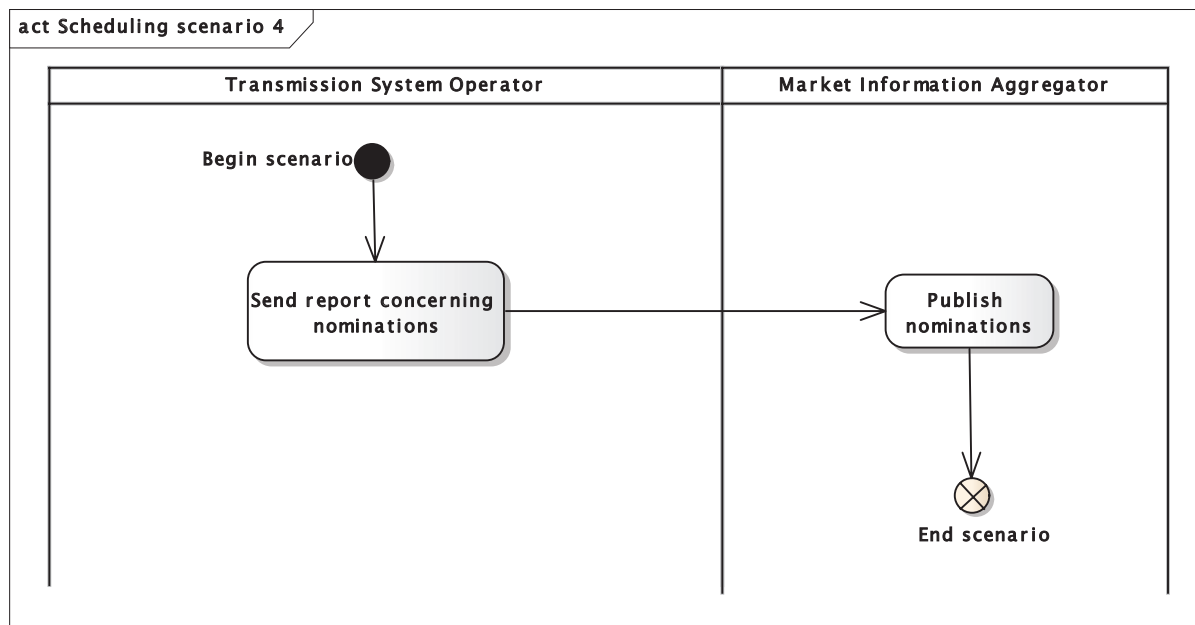
The matching party acknowledges reception of the schedules and then proceeds to carry out matching with the local counter schedules. If there are any differences the matching party applies agreed rules in order to resolve all outstanding issues.

In the case where rules have been applied to resolve matching issues an intermediate confirmation report is transmitted to the participating party. It may be necessary to retransmit the schedules in order to finalise any outstanding issues.

If there are no issues a final confirmation report is transmitted which concludes the scenario.

798 5.4.4 Scenario 4 workflow

799 Scenario 4, see Figure 9, consists of the transmission of the scheduled nominations for
800 information purposes to a third party. There is no response expected in this scenario.



802 **Figure 9 - Scheduling scenario 4 workflow**

803 The transmitting party may be any party who has schedule information of interest to another
804 party. For example a nomination validator may send the information to a transmission system
805 operator, or an auction office handling implicit auctions may carry out a similar transmission to
806 a transmission system operator. The information that is transmitted in this scenario may be in
807 detailed or aggregated form depending on its destination.

808 The workflow depicts a typical case where it is used by the transmission system operator to
809 inform a market information aggregator of the nominations. The market information
810 aggregator may then publish these on a website as required.

811 5.5 Position of the market participant

812 Nominations are provided at different gate closures, such as long term, day-ahead, intraday.
813 Different possibilities exist on the way nominations are submitted:

- 814 • At a given gate, only the nominations for the time period for this gate are provided;
- 815 • At a given gate, only the total nomination is provided (including all the previous
816 nominations)
- 817 • etc.

818 Table 1 outlines the characteristics that apply to day-ahead and intra-day trading

819 **Table 1 - Characteristics of day ahead and intra-day trading**

Process Type	Document identifications	Information (values)	Schedule TimeInterval	Matching Period
Day-Ahead	1	Current position	Whole day	Whole day
Intraday incremental	N (1 per gate)	Incremental values	Remaining hours	Remaining hours
Schedule Day	1	Current position	Whole day	Remaining hours

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Process Type	Document identifications	Information (values)	Schedule TimeInterval	Matching Period
Intraday total	N (1 per gate)	Current position	Whole day	Remaining hours
Intraday accumulated	N (1 per gate)	Incremental values	Whole day	Remaining hours

820 Depending on the way the intraday process is implemented in a market, there are different
821 ways to calculate the “current position” for a party at a given point in time:

- 822 ▪ Intraday incremental: Current position is the aggregation of the confirmed schedules,
823 especially within day-ahead (Pa) and intraday (Pb) processes
 - 824 ○ $CP = Pa + Pb$ (1st intraday) + Pb (2nd intraday) + Pb (...) + ...
- 825 ▪ Schedule day: Current position is given by the last confirmed document
 - 826 ○ $CP =$ Last confirmed document.
- 827 ▪ Intraday total: Current position is given by the last confirmed document
 - 828 ○ $CP = Pa$, and at a latter point in time replaced by the Intraday Total document
- 829 ▪ Intraday accumulated: Current Position is the aggregation of the confirmed schedules
830 from the day-Ahead (Pa) schedule document and the schedules from the last
831 confirmed intraday accumulated document
 - 832 ○ $CP = Pa +$ Intraday accumulated document

833 5.6 Generic business rules for document

834 5.6.1 General

835 The following business rules apply to the documents defined in this Standard.

836 5.6.2 Process Type for distinguishing between day ahead and intraday trading

837 The day ahead and intra-day document respect exactly the same rules.

838 The fundamental difference between the two is that intra-day scheduling can only take place
839 within the scope of the hours already scheduled but not executed.

840 5.6.3 Use of the In_Domain and Out_Domain

841 Basically the In_Domain and the Out_Domain is always required excepting two
842 circumstances:

- 843 • Where the BusinessType identifies a production time series then only the In_Domain is
844 to be used.
- 845 • Where the BusinessType identifies a consumption time series then only the
846 Out_Domain is to be used.

847 5.6.4 Use of the In_MarketParticipant and Out_MarketParticipant

- 848 • Where the BusinessType identifies a production time series then only the
849 In_MarketParticipant is to be used.
- 850 • Where the BusinessType identifies a consumption time series then only the
851 Out_MarketParticipant is to be used.

852 However if the information provided is of an aggregated nature (i.e. the ObjectAggregation
853 indicates an aggregation at area or agreement level) then the In_MarketParticipant and
854 Out_MarketParticipant shall not be used.

855 5.6.5 Use of the MarketAgreement

856 The MarketAgreement shall only be used in the case where the BusinessType indicates an
857 external trade with explicit capacity.

858 **5.6.6** Acknowledgement of a schedule market document

859 Upon reception of a schedule market documents, an acknowledgement document as defined
860 in IEC 62325-451-1 is to be sent either for acceptance, rejection or errors indication.

861 An acknowledged version of a schedule market document replaces the previous version of the
862 document in question.

863 **5.6.7** Acceptance and rejection criteria of a schedule market document

864 The conditions described in Table 2 provide the error conditions as well as the action to be
865 carried out.

866 **Table 2 – Error condition and action**

Error	Secondary condition	Action
A Schedule_MarketDocument error.		The complete document is rejected.
A TimeSeries identification level error.	If it is the initial transmission of a document, or if it concerns the addition of a new time series.	The complete time series in question is rejected.
A TimeSeries identification level error.	If it is the retransmission of a document with a new version number then if it concerns an error at the time series level or if the time series is missing.	The complete document is rejected.
A Series_Period level error.	An error concerning the time interval or the resolution.	The complete document is rejected.
A Point error.	If it is an error with the quantity.	The complete document is rejected.
A Point error.	If the position doesn't exist.	The complete document is rejected.
A Point error.	If the position is missing.	The complete document is rejected.

867 **5.6.8** Document without any TimeSeries instances

868 A document that contains no time series instances shall be considered to be a valid
869 transmission from a market participant indicating that there is no time series information
870 forthcoming. This is dependent on market rules that in some circumstances require the
871 systematic transmission of a document from a market participant.

872 The market participant may at a later time transmit a new version of the document in question
873 with time series information.

874 **5.6.9** Business rules for confirmation report market document

875 The confirmation market document is used to inform all interested parties of the situation in
876 respect to their schedule.

877 A confirmation market document is generated once a cutoff time has been reached for the
878 schedule time interval in question. At that point in time the total schedule is balanced and all
879 outstanding discrepancies are noted.

880 Depending on market rules, apart from a final confirmation market document that is produced
881 after cutoff, intermediate confirmation market documents may be generated. The cutoff time
882 refers to daily, intra daily and also the different markets that cover imbalance adjustments,
883 reserve allocation, etc. (ancillary services markets).

884 The confirmation market document provides all the time series that have been provided in the
885 schedule market document for the schedule time interval in question. It may also include one
886 or several time series that a system operator has imposed on the market participant in
887 compliance with market rules.

888 Their schedule can either be globally confirmed, or in the case of discrepancies, they will be
889 informed of what aspects of their time series have been finally accepted.

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890 A confirmation market document may be sent to a market participant who has not sent
891 beforehand a schedule market document. This may occur for example whenever a time series
892 has to be imposed on a market participant in order to confirm obligations that have been
893 previously agreed and for which the market participant has not complied.

894 All the time series that have been sent in a schedule market document by the concerned party
895 are identified in the confirmation market document. If there are discrepancies these are
896 identified with a reason code and eventual text. A time series if being rejected in the
897 confirmation market document shall not contain any period information.

898 A time series may be imposed by the system operator on the market participant in respect to
899 specific market rules. For example, if market rules indicated that in case of mismatch one of
900 the parties time series would automatically be taken and imposed on the other party. Such a
901 condition could occur if a market participant had a document that was rejected due to syntax
902 errors and the document was never retransmit prior to cutoff. An imposed time series cannot
903 be provided if an equivalent time series has already been accepted.

904 The Series_Period class Time Interval and Resolution attributes must be the same as those in
905 the original schedule market document and must be sent in the confirmation market document
906 for all time series that have been accepted or accepted with modification. In the case of
907 imposed time series the resolution must be the same as the one for the market participant's
908 time series.

6 Contextual and assembly models (Normative)

6.1 Schedule Contextual Model

6.1.1 Overview of the model

Figure 10 shows the model.

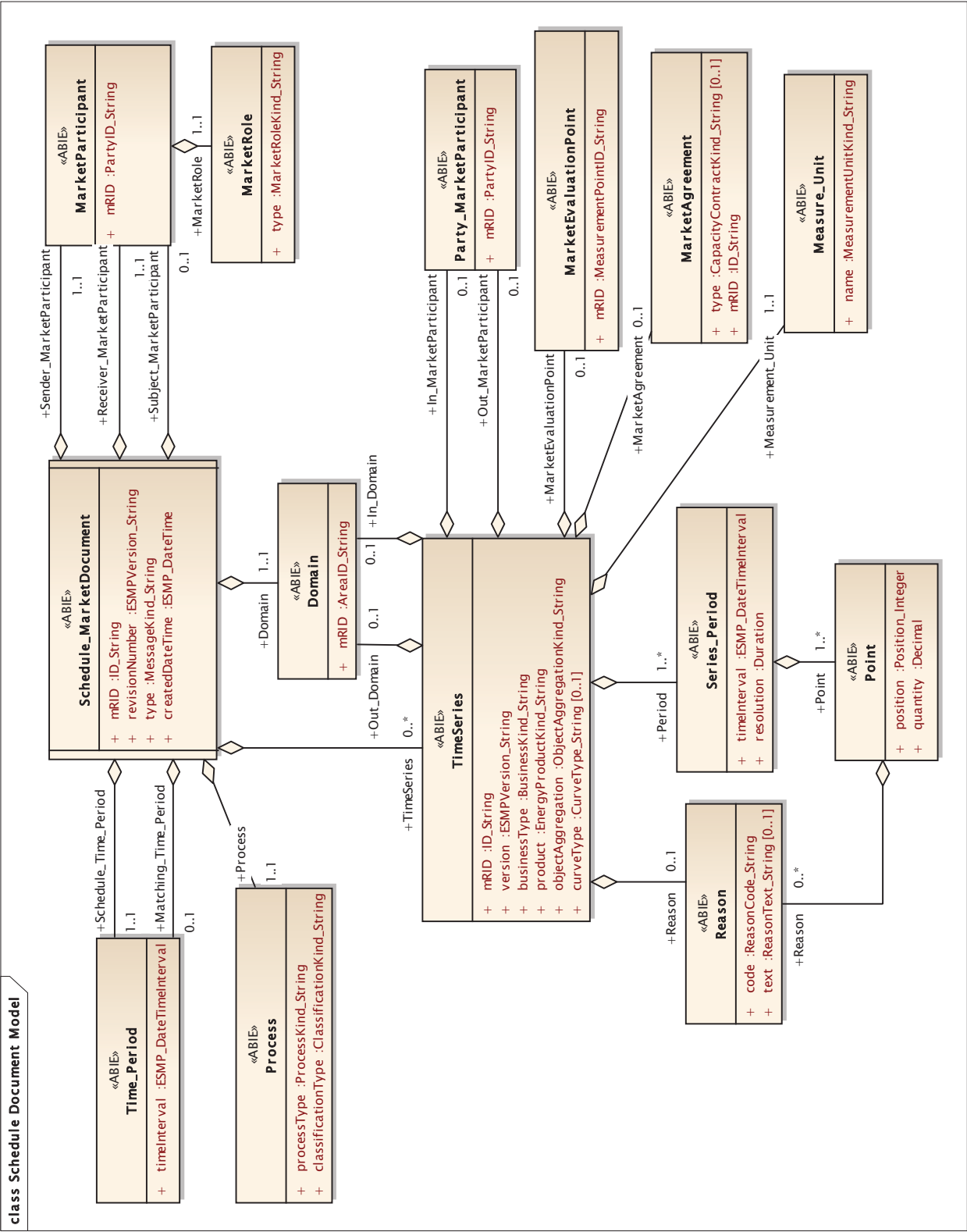


Figure 10 - Schedule Contextual Model

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6.1.2 IsBasedOn relationships from the European style market profile

Table 3 shows the traceability dependency of the classes used in this package towards the upper level.

Table 3 - IsBasedOn dependency

Name	Is BasedOn Class	Complete IsBasedOn Path
Domain	ESMPClasses::Domain	62325\ESMPClasses
MarketAgreement	ESMPClasses::MarketAgreement	62325\ESMPClasses
MarketEvaluationPoint	ESMPClasses::MarketEvaluationPoint	62325\ESMPClasses
MarketParticipant	ESMPClasses::MarketParticipant	62325\ESMPClasses
MarketRole	ESMPClasses::MarketRole	62325\ESMPClasses
Measure_Unit	ESMPClasses::Measure_Unit	62325\ESMPClasses
Party_MarketParticipant	ESMPClasses::MarketParticipant	62325\ESMPClasses
Point	ESMPClasses::Point	62325\ESMPClasses
Process	ESMPClasses::Process	62325\ESMPClasses
Reason	ESMPClasses::Reason	62325\ESMPClasses
Schedule_MarketDocument	ESMPClasses::MarketDocument	62325\ESMPClasses
Series_Period	ESMPClasses::Series_Period	62325\ESMPClasses
Time_Period	ESMPClasses::Time_Period	62325\ESMPClasses
TimeSeries	ESMPClasses::TimeSeries	62325\ESMPClasses

6.1.3 Detailed Schedule Contextual Model**6.1.3.1 Schedule_MarketDocument root class**

This document is to be used to exchange information related to transactions as defined in IEC 62325-451-2.

A schedule document provides the position of a party or a domain related to some market information; it includes a set of time series.

An electronic document containing the information necessary to satisfy the requirements of a given business process.

IsBasedOn: ESMPClasses::MarketDocument

Table 4 shows all attributes of Schedule_MarketDocument.

Table 4 - Attributes of Schedule Contextual Model::Schedule_MarketDocument.

mult.	Attribute name	Attribute type	Description
[1..1]	createdDateTime	ESMP_DateTime	The date and time of the creation of the document.
[1..1]	mRID	ID_String	The unique identification of the document being exchanged within a business process flow.
[1..1]	revisionNumber	ESMPVersion_String	The identification of the version that distinguishes one evolution of a document from another.
[1..1]	type	MessageKind_String	The coded type of a document. The document type describes the principal characteristic of the document.

Table 5 shows all association ends of Schedule_MarketDocument with other classes.

931 **Table 5 - Association ends of Schedule Contextual Model::Schedule_MarketDocument**
 932 **with other classes.**

mult.	Role	Class type name	Description
[1..1]	Domain	Domain	The identification of the domain that is covered in the schedule document. It is in general the market balance area that is the subject of the schedule plan. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::Domain.Domain[0..1]
[0..1]	Matching_Time_Period	Time_Period	This information provides the start and end date and time of the period to be matched. The matching period start date and time must begin at the start of the schedule time interval or be within the bounds of the schedule time interval. The matching period end date and time must be the same as that of the schedule time interval. It is this period that is being presented for matching. The period prior to the matching period is generally considered to be historical data and should correspond to the information received in previous transmissions. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::Time_Period.Period[0..*]
[1..1]	Process	Process	The process dealt with in the document. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::Process.Process[0..*]
[1..1]	Schedule_Time_Period	Time_Period	This information provides the start and end date and time of the schedule time interval. All time intervals for the time series in the document must be within the total time interval for the schedule. The receiver will discard any time intervals outside the schedule period. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::Time_Period.Period[0..*]
[0..1]	Subject_MarketParticipant	MarketParticipant	The party that is the subject of the documents time series. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
[1..1]	Sender_MarketParticipant	MarketParticipant	Document owner. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
[1..1]	Receiver_MarketParticipant	MarketParticipant	Document recipient. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::MarketParticipant.MarketParticipant[0..*]
[0..*]	TimeSeries	TimeSeries	The time series that is associated with an electronic document. Association Based On : ESMPClasses::MarketDocument.[] ----- ESMPClasses::TimeSeries.TimeSeries[0..*]

933 **6.1.3.2 Domain**

934 A domain covering a number of related objects, such as market balance area, grid area
 935 borders etc.

936 IsBasedOn: ESMPClasses::Domain

Table 6 shows all attributes of Domain.

Table 6 - Attributes of Schedule Contextual Model::Domain.

mult.	Attribute name	Attribute type	Description
[1..1]	mRID	AreaID_String	The unique identification of the domain.

6.1.3.3 MarketAgreement

A formal agreement between two parties defining the terms and conditions for a set of services. The specifics of the services are, in turn, defined via one or more service agreements.

IsBasedOn: ESMPClasses::MarketAgreement

Table 7 shows all attributes of MarketAgreement.

Table 7 - Attributes of Schedule Contextual Model::MarketAgreement.

mult.	Attribute name	Attribute type	Description
[1..1]	mRID	ID_String	The unique identification of the agreement.
[0..1]	type	CapacityContractKind_String	The specification of the kind of the contract, e.g. long term, daily contract.

6.1.3.4 MarketEvaluationPoint

The location where one or more products are measured. This may be a physical or virtual location.

IsBasedOn: ESMPClasses::MarketEvaluationPoint

Table 8 shows all attributes of MarketEvaluationPoint.

Table 8 - Attributes of Schedule Contextual Model::MarketEvaluationPoint.

mult.	Attribute name	Attribute type	Description
[1..1]	mRID	MeasurementPointID_String	A unique identification of the measurement point.

6.1.3.5 MarketParticipant

The identification of the party participating in energy market business processes.

IsBasedOn: ESMPClasses::MarketParticipant

Table 9 shows all attributes of MarketParticipant.

Table 9 - Attributes of Schedule Contextual Model::MarketParticipant.

mult.	Attribute name	Attribute type	Description
[1..1]	mRID	PartyID_String	The identification of a party in the energy market.

Table 10 shows all association ends of MarketParticipant with other classes.