



Co-funded by
the European Union



EDDIE

EUROPEAN DISTRIBUTED
DATA INFRASTRUCTURE
FOR ENERGY

D2.2

Information Schema Defined

This work has been co-funded by the European Union's Horizon Innovation
Actions under grant agreement No. 101069510



DOCUMENT INFORMATION

WP number and title	WP2 – EDDIE Framework API for data-based services
Deliverable number	D2.2
Version Number	1.0
Document Reference	10.5281/zenodo.11565603
Lead Beneficiary	FH OOE
Deliverable type	Report
Planned deliverable date	30/06/2024
Date of Issue	05/02/2024
Dissemination level	PU
Author(s)	AIT, D4G, FHO, EAS
Contributor(s)	AIT, FHO, D4G, EAS, ENT
Keywords	Data management, Data summary, Data standardization, Implementing regulation, Interoperability

Legal Disclaimer: This work has been co-funded by the European Union’s Horizon Innovation Actions under grant agreement No. 101069510. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the granting authority European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them. The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The below referenced consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law. © 2023–2025 by the EDDIE Consortium.

Disclosure Statement: The information contained in this document is the property of the EDDIE Consortium and it shall not be reproduced, disclosed, modified or communicated to any third parties without the prior written consent of the below-mentioned entities.

CONSORTIUM PARTNERS

The EDDIE Consortium consists of the following partners:

Participant No	Participant organisation name	Short Name	Country
1	University of Applied Sciences Upper Austria – Campus Hagenberg – Research and Development	FHO	AT
2	Copenhagen School of Energy Infrastructure, Department of Economics, Copenhagen Business School	CBS	DK
3	European University Institute	EUI	IT
4	University of Vienna, Faculty of Computer Science, Cooperative Systems Research Group	VIE	AT
5	Austrian Institute of Technology, Center for Digital Safety & Security, Competence Unit Cooperative Digital Technologies	AIT	AT
6	The Lisbon Council for Economic Competitiveness and Social Renewal asbl	LIC	BE
7	PONTON GmbH	PON	DE
8	Asociación de Empresas de Energía Eléctrica (aelec)	AEL	ES
9	DEDA – Public Gas Distribution Networks – Single Member S.A.	DED	GR
10	EDA Energiewirtschaftlicher Datenaustausch GmbH	EDA	AT
11	Südtiroler Energieverband	SEV	IT
12	FlexiDAO	FLE	ES
13	Digital4Grids	D4G	FR
14	EASEE Gas	EAS	FR
15	Entarc.eu	ENT	AT
16	ETA+ GmbH	ETP	DE



DOCUMENT HISTORY

Version	Date	Status	Author(s), Reviewer	Description
V0.1	01/04/2024	Draft	Wout van Voornveld	Initiated
V0.2	23/04/2024	For first review	Laurent Schmitt, Shievam Kashyap, Wout van Voornveld	Draft ready
V0.3	15/06/2024	Review comments processed	Vasileios Karagiannis, Margit Kranner, Agnes Jodkowski	Review
V0.9	14/06/2024	Finalised	Wout van Voornveld, Shievam Kashyap	Comments incorporated
V1.0	20/06/2024	Rectified formatting issues	Wout van Voornveld, Stefan Grünberger, Shievam Kashyap	Based on the comments from Project Coordinator, finalized some formatting issues

AUTHOR AND REVIEWER ACKNOWLEDGMENTS

Authors

Author names	Partner	Email address
Wout van Voornveld	EAS	w.van.voornveld@gasunie.nl
Shievam Kashyap	FHO	shievam.kashyap@fh-hagenberg.at
Marc Kurz	FHO	marc.kurz@fh-hagenberg.at
Laurent Schmitt	D4G	laurent.schmitt@digital4grids.com
Florian Weingartshofer	FHO	florian.weingartshofer@fh-hagenberg.at
Fabian Haas	FHO	fabian.haas@fh-hagenberg.at
Stefan Grünberger	FHO	stefan.gruenberger@fh-hagenberg.at
Rainer Danner	FHO	rainer.danner@fh-hagenberg.at

Reviewers

Reviewer names	Partner	Email address
Christoph Schaffer	FHO	Christoph.Schaffer@fh-hagenberg.at
Vasileios Karagiannis	AIT	Vasileios.Karagiannis@ait.ac.at
Margit Kranner	AIT	Margit.Kranner@ait.ac.at
Agnes Jodkowski	AIT	Agnes.Jodkowski@ait.ac.at
Oliver Hödl	FHO	Oliver.Hoedl@fh-hagenberg.at

Acknowledgements

We are deeply grateful to all those who have contributed to the success of this deliverable, and without whose valuable input, it would not have been possible. Special thanks to Bhagyashree Wahie (ENTSO-E) and Jan Owe (Svenska Kraftnät) for clarifying the procedures concerning the maintenance requests for CIM changes, Vasileios Karagiannis, Margit Kranner and Agnes Jodkowski for their valuable reviewing efforts.



DEFINITIONS, ACRONYMS AND ABBREVIATIONS

Acronyms/ Abbreviations	Description
BESS	Battery Energy Storage System
BPMN	Business Process Modelling and Notation
CIM	Common Information Model
CP	Charge Points
DMD	Dedicated Management Device
ESMP	European Style Market Profile
JWG	Joint Working Group
OCA	Open Charge Alliance
OCPP	Open Charge Point Protocol
SAREF	Smart Applications REference
WP	Work package

EXECUTIVE SUMMARY

The EDDIE (European Distributed Data Infrastructure for Energy) project focuses on defining and implementing a framework for data exchange within the European energy sector. This deliverable, D2.2, titled "Information Schema Defined," outlines the progress made in developing a standardized information schema to facilitate data interoperability across various energy systems and stakeholders.

The primary objective of this document is to define the information exchanges necessary for the EDDIE project. This involves aligning with existing and emerging regulations, addressing regional interoperability challenges, and meeting the specific needs of EDDIE demonstrators. The deliverable also aims to harmonize the use of existing standards such as the Common Information Model (CIM) and Smart Applications REFERENCE (SAREF).

The document begins with an analysis of the requirements based on current and forthcoming European regulations, specifically EU 2023/1162 and demand response regulations. It also examines regional interoperability issues in countries like Austria, France, and Denmark, and considers the needs of various demonstrators, including hydrogen networks and residential energy management systems.

EDDIE is committed to using existing standards wherever possible. The document provides a summary of relevant standards such as CIM, SAREF, and Open Charge Point Protocol (OCPP). It highlights the limitations within these standards and describes efforts made to address these gaps, often through maintenance requests to enhance the standards.

Detailed definitions are provided for different types of data exchanges, including permission data, validated historical data, near real-time data, and master data. The document outlines the process of fitting the requirements and standards into these proposed definitions. Additionally, a comprehensive overview of the change management process for the CIM standard is included, detailing how changes are proposed, reviewed, and implemented. The document discusses the implementation environment, synchronizing activities across various tasks (T2.2 to T2.4). It describes how the proposed standards are transformed into working software and provides notes on the deployment and documentation of the EDDIE framework.

This deliverable marks a significant step towards establishing a robust and interoperable data exchange framework for the European energy sector. By harmonizing existing standards and addressing regional and regulatory requirements, the EDDIE project aims to enhance data interoperability, contributing to the overall efficiency and sustainability of energy systems across Europe. This summary provides an overview of the critical aspects and achievements outlined in the EDDIE D2.2 deliverable, setting the stage for subsequent implementation phases and further development within the project.

TABLE OF CONTENT

1	Introduction	12
1.1	Purpose of the Document	12
1.2	Scope and Intended Audience	12
1.3	Structure of the Document.....	12
2	Requirements Analysed	14
2.1	Implementing regulation (EU) 2023/1162	14
2.2	New Implementation Regulations in progress (demand response)	19
2.3	Regional connector interoperability	20
2.3.1	Austria	21
2.3.2	France.....	21
2.3.3	Denmark.....	22
2.4	Demonstrators demands.....	24
2.4.1	General.....	24
2.4.2	Hydrogen network and sector coupling	24
2.4.3	Residential Energy Management and Prosumer participation into markets (A step towards net zero homes).....	27
2.5	Market standards available	28
2.5.1	CIM.....	28
2.5.2	SAREF	29
2.5.3	OCPP	31
2.6	Permission data	34
2.7	Validated Historical Metering Data.....	39
2.8	Near real-time measurement data (CIM-based format).....	41
2.9	Near real-time measurement data (internal format)	41
2.10	Master data.....	42
2.10.1	Accounting point master data	42
3	Towards a better standard	45



3.1	The IEC CIM change process	47
3.2	Project EDDIE way of working concerning IEC CIM changes.....	51
4	Synchronising with tasks T2.2-T2.4.....	52
4.1	Synchronising with T2.2.....	52
4.1.1	Consent Market Document.....	52
4.1.2	Consumption Records	54
4.1.3	raw-data-on- proprietary -format.....	55
4.1.4	status-messages	55
4.1.5	terminations	55
4.2	Synchronising with T2.3.....	56
4.3	Framework Deployment & Documentation.....	56
4.3.1	Introduction.....	56
4.3.2	Continuous Integration & Delivery	57
4.3.3	Established CI/CD Tools and Practices in Project EDDIE.....	59
4.3.4	Integrating Tools in CI/CD Pipeline	61
4.3.5	EDDIE Framework operation manual.....	62
4.3.6	Exemplary Release Notes.....	70
	References	72
	Annex – 1 Overview CIM Maintenance Process	74

LIST OF FIGURES

Figure 1: Access to validated historical consumption data by an eligible party.....	16
Figure 2: Revocation of an active consent.....	18
Figure 3: Read near real-time data from smart meter.....	19
Figure 4: Impression of the scope of the Demand Response draft Implementing Regulation.....	20
Figure 5: iec62325-451-10 definition of MarketEvaluationPoint.....	22
Figure 6: iec62325-451-10 definition of MeasurementPointID_String.....	22
Figure 7: The Danish translation of the iec62325-451-10 MarketEvaluationPoint.....	23
Figure 8: The Danish translation of the iec62325-451-10 MeasurementPointID_String....	23
Figure 9: Hydrogen Village overview.....	25
Figure 10: Validated Historical Gas Data (METRED - Edigas 6.1).....	26
Figure 11: Schematic overview of net zero homes with PV heat pump and EV storage.....	27
Figure 12: CIM and the smart grid plane.....	29
Figure 13: SAREF base ontology description.....	30
Figure 14: SAREF DeviceTypes.....	30
Figure 15: Smart grid plane.....	33
Figure 16: Permission data initial.....	35
Figure 17: StatusTypeList addition proposal.....	36
Figure 18: EDDIE Validated Historical Data.....	40
Figure 19: EDDIE near real-time measurements data.....	41
Figure 20: EDDIE Accountingpoint Master Data.....	43
Figure 21: CIM maintenance procedure organogram.....	46
Figure 22: Maintenance Request - CIM for Retail Market.....	48
Figure 23: Maintenance Request - CIM ESMP Subgroup.....	48
Figure 24: Maintenance Request - ICTC.....	49

Figure 25: Maintenance Request – UCA.	50
Figure 26: CIM Maintenance Request procedure overview.	50
Figure 27: EDDIE Consent Market document.....	54
Figure 28: Exemplary Pull Request in the GitHub Repository.....	58
Figure 29: Integration of PR-information into Slack.....	58
Figure 30: Exemplary SonarCloud analysis runs of the EDDIE Framework.	59
Figure 31: Information regarding a released Docker container.....	60
Figure 32: Overview of GitHub Action workflows.....	61

LIST OF TABLES

Table 1: Project EDDIE Scope concerning the (EU) 2023/1162 use cases.	15
Table 2: ENTSO-E Code List change request for StatusType enumeration.....	39
Table 3: Parties involved in maintenance Request procedure.....	45
Table 4: Summary of the IEC/TC57 Working Groups.....	47
Table 5: Attributes of the EDDIE button element.	64
Table 6: Environment variables for EDDIE Core configuration.....	65
Table 7: Configuration parameters for CIM.....	66
Table 8: Configuration of data needs.	66
Table 9: Common fields of data needs.	67
Table 10: Additional fields for data needs, on the example of Validated Historical Consumption Data.	68
Table 11: Parameters to configure the Kafka Connector.	69

1 Introduction

1.1 Purpose of the Document

The primary purpose of this document, "Information Schema Defined," is to provide a comprehensive framework for data exchange within the EDDIE project. It aims to establish standardized information schemas to ensure interoperability among various energy systems and stakeholders across Europe. This document outlines the requirements derived from European regulations, regional interoperability challenges, and the specific needs of EDDIE demonstrators. Additionally, it harmonizes existing standards such as the Common Information Model (CIM) and Smart Applications REFERENCE (SAREF) to facilitate seamless data exchanges. By defining these schemas, the document aims to support the integration and efficient operation of the European energy market, enhancing data accessibility, accuracy, and reliability.

1.2 Scope and Intended Audience

This document defines the scope of the information schemas necessary for the EDDIE project, focusing on standardizing data exchange protocols to ensure interoperability across diverse energy systems in Europe. It is tailored to address the needs of various stakeholders, including energy providers, regulatory bodies, and technology developers. By outlining the schemas based on both existing and forthcoming European regulations, this document aims to guide the integration of energy data systems, facilitate compliance with regional interoperability requirements, and support the implementation of demonstrators within EDDIE. The intended audience includes technical experts involved in data management, regulatory compliance officers, and project managers overseeing the deployment of energy data solutions in Europe and beyond.

1.3 Structure of the Document

Data exchange is a vital part of any European data space for energy. The process of specifying the definitions of these data exchanges is a trade-off between several requirements. This document is meant as giving an insight into the process of the construction of the information exchanges within Project EDDIE. In chapter two we look into the requirements from the point of view of the Implementing Regulations (existing and future), the EDDIE region connectors and EDDIE demonstrator demands. As EDDIE is



committed to use existing standards, a summary of relevant ones is given (CIM, SAREF and OCCP).

In chapter three we fit the requirements and the standards into the proposed definitions for permission data, validated historical data, near real-time data and master data. We touch upon limitation within the current standard and describe how EDDIE dealt with shortcomings, often resulting in maintenance request to enhance the existing standard. The whole process of the change process for the CIM standard is specified in chapter 4.

In chapter 5 we delve into the implementation environment with the synchronising activities to tasks T2.2 until T2.4. Here we see how the proposed standards are processed into working software. This document ends with some notes on the EDDIE framework deployment and documentation.

2 Requirements Analysed

The scope of project EDDIE is not strictly limited to the legal aspects as laid down by the implementing regulations. Important as it is, and giving direction for the project, in order to reach a successful European dataspace for energy, more requirements are to be taken into consideration. In this chapter we also look forward to the current work on a new set of implementing regulations (demand response and supplier switching). Furthermore, practical obstacles at the regional level, pop up during the project which need proper addressing. Some of the EDDIE demonstrators extend the scope of the previous requirements and thus form an extra challenge in terms of information schema definitions. Lastly, we take a look at the available market standards in order to prevent EDDIE from inventing the wheel.

2.1 Implementing regulation (EU) 2023/1162

One of the input requirements for Project EDDIE is the Implementing Regulation on interoperability requirements and non-discriminatory and transparent procedures for access to metering and consumption data issued on the 6th of June 2023¹. This regulation finds its origin in the Electricity Directive from 2019, which states in article 24.1.

“The Commission shall adopt, by means of implementing acts, interoperability requirements and non-discriminatory and transparent procedures for access to data referred to in Article 23(1)” [1].

Further article 20 of [1] states, “the smart metering systems shall accurately measure actual electricity consumption and shall be capable of providing to final customers information on actual time of use. Validated historical consumption data shall be made easily and securely available and visualised to final customers on request and at no additional cost. Non-validated near real-time consumption data shall also be made easily and securely available to final customers at no additional cost, through a standardised interface or through remote

¹The official link to this regulation is:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1162>

however, the draft version with the same content was known under the reference of C(2023)3477 and is still, confusingly, online available at: https://energy.ec.europa.eu/publications/implementing-regulation-interoperability-requirements-and-non-discriminatory-and-transparent_en

access, in order to support automated energy efficiency programmes, demand response and other services;”.

The main objective is to encourage customer participation and creating energy awareness in a non-discriminatory way at no extra cost through all the Member States. The EDDIE proposal for the HORIZON-CL5-2021-D3-01-01 tender, states:

“EDDIE creates a de-centralised, distributed, open-source Data Space, aligned with directions of the work on the Implementing Acts on Interoperability and other European activities.”

The regulation consists of six use cases, four for access to historic validated data and two for near real-time data. In the following Table 1 the use cases relevant for Project EDDIE are marked:

Use case	Scope of EDDIE
1. Access validated historical consumption data by the customer	No
2. Access to validated historical consumption data by an eligible party	Yes
3. Eligible party terminates the service	Yes
4. Revocation of an active consent	Yes
5. Activate near real-time data flow from smart meter	No
6. Read near real-time data from smart meter	Yes

Table 1: Project EDDIE Scope concerning the (EU) 2023/1162 use cases.

In use case 1: Access validated historical consumption data by the customer is out of scope for EDDIE as the customer’s energy supplier already fulfils the role of Data Access Provider.

In use case 2: Access to validated historical consumption data by an eligible party, Project EDDIE performs a facilitating role to the Permission Administrator, an intermediate in the data

exchange process. Some process steps rely on other actors but are triggered by Project EDDIE. Those are marked with a grey colour in Figure 1.

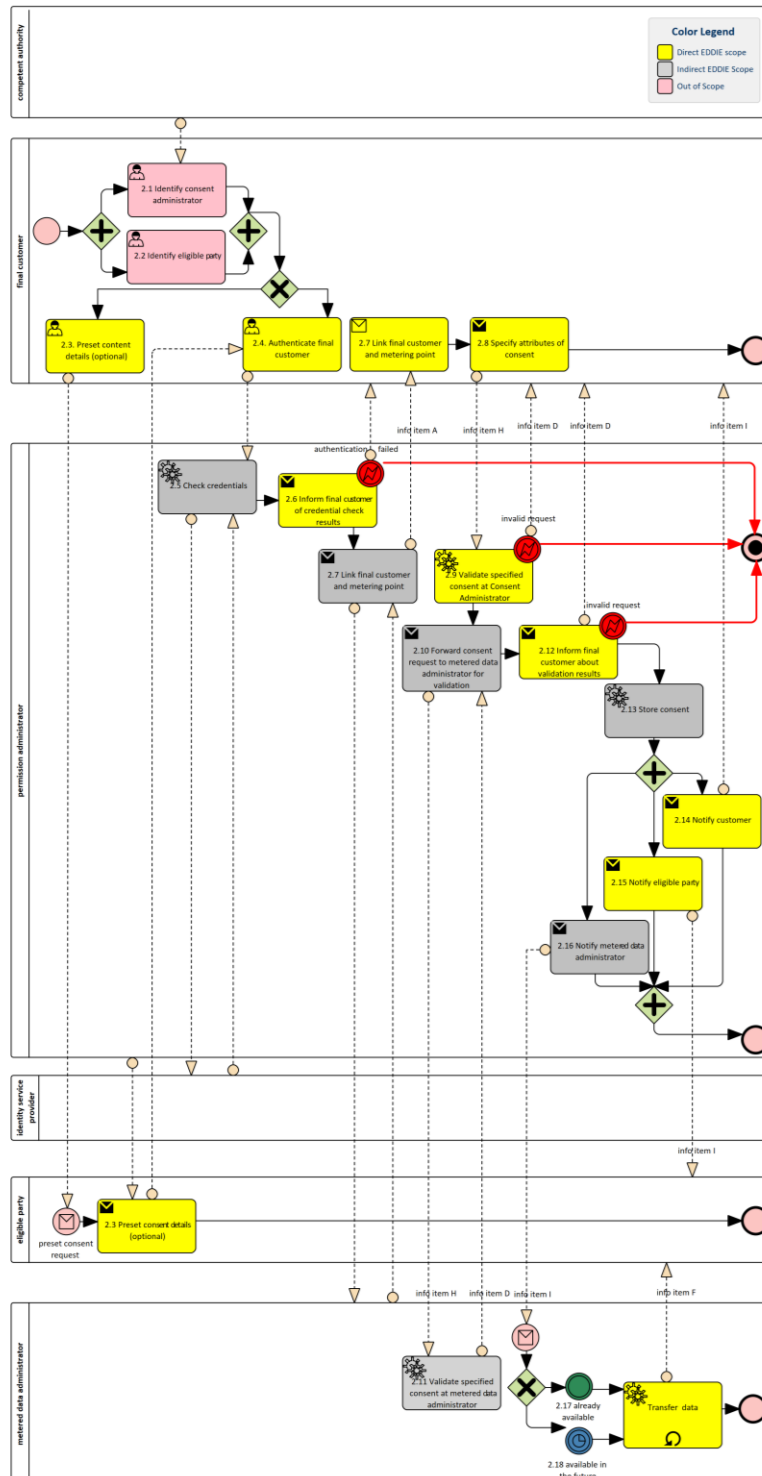


Figure 1: Access to validated historical consumption data by an eligible party.

The diagram above uses the BPMN (Business Process Modelling and Notation) open standard to model the processes [2]. BPMN has three basic symbols: events, activities and gateways (decision). A reading guide is available in annex 4 of [3].

In use case 3: Eligible party terminates the service is out of scope for EDDIE as this a contractual process and not a primary data exchange process.

In use case 4: Revocation of an active consent, Project EDDIE performs the role of Consent Administrator, an intermediate in the data exchange process. Some process steps rely on other actors but are triggered by Project EDDIE. Those are marked with a grey colour in the diagram below.

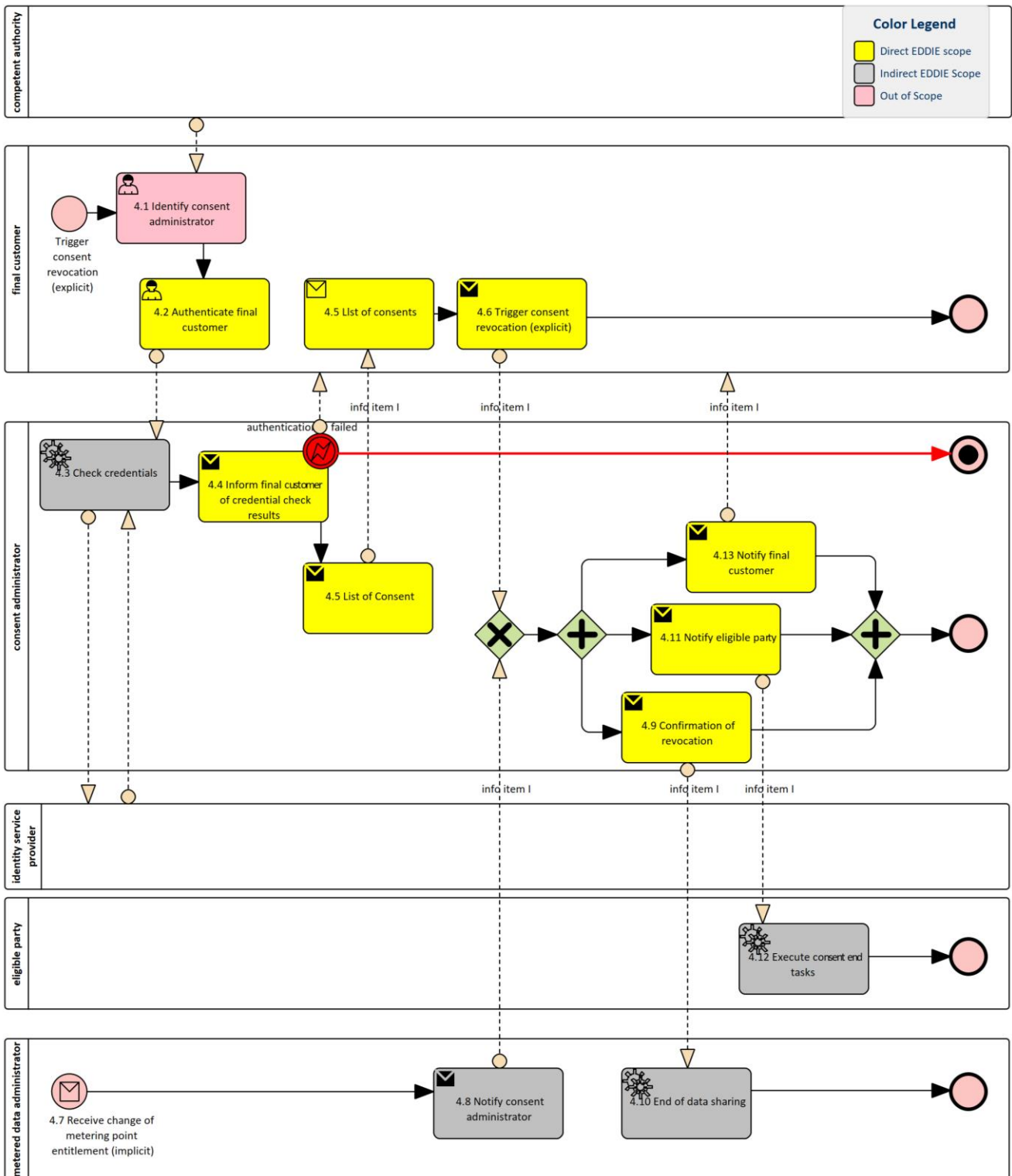


Figure 2: Revocation of an active consent.

In use case 5. Activate near real-time data flow from smart meter is out of scope for EDDIE as this a technical process between the final customer and the meter operator.

In use case 6. Read near real-time data from smart meter, Project EDDIE performs the role of Consent Administrator, an intermediate in the data exchange process. Some process steps rely on other actors but are triggered by Project EDDIE. Those are marked with a grey colour in the diagram below.

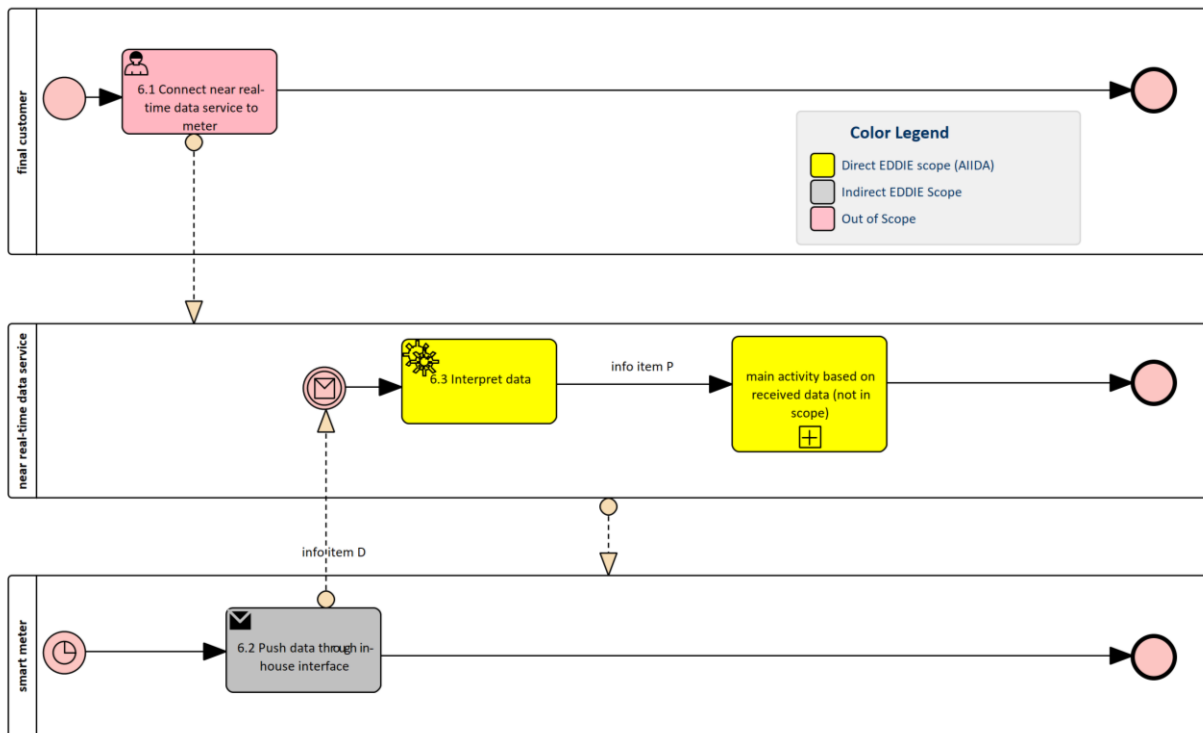


Figure 3: Read near real-time data from smart meter.

2.2 New Implementation Regulations in progress (demand response)

The Smart Grid Taskforce Expert group 1 on smart grid standard and operability (see report section of accomplished works of [4]) started working on the new Implementing Regulations on Customer Switching and Demand Response in 2023, which activities merged in 2024 into the Joint Working Group (JWG) [5] chaired by the ENTSO-E and EU-DSO Entity. These new Implementing Regulations were already announced in the Electricity directive of 2019 (see report section of accomplished works of [4]). As especially the Demand Response

regulation is complex, it's future impact on a European data space is relevant to consider as otherwise EDDIE could be short-lived as only being able to support access to metering and consumption data (the currently published Implementing Regulation) and not being usable for demand response scenarios.

Customer switching is relatively simple regulation consisting of just two business processes. Demand response however, currently has 16 business processes (and counting). EDDIE has several linking pins to the JWG's taskforce and stakeholder panel in the person of Georg Hartner, Laurent Schmitt and Wout van Voornveld. The developments in the JWG are closely followed and the potential impact on the data interoperability is evaluated and taken into the design work for the information schema.

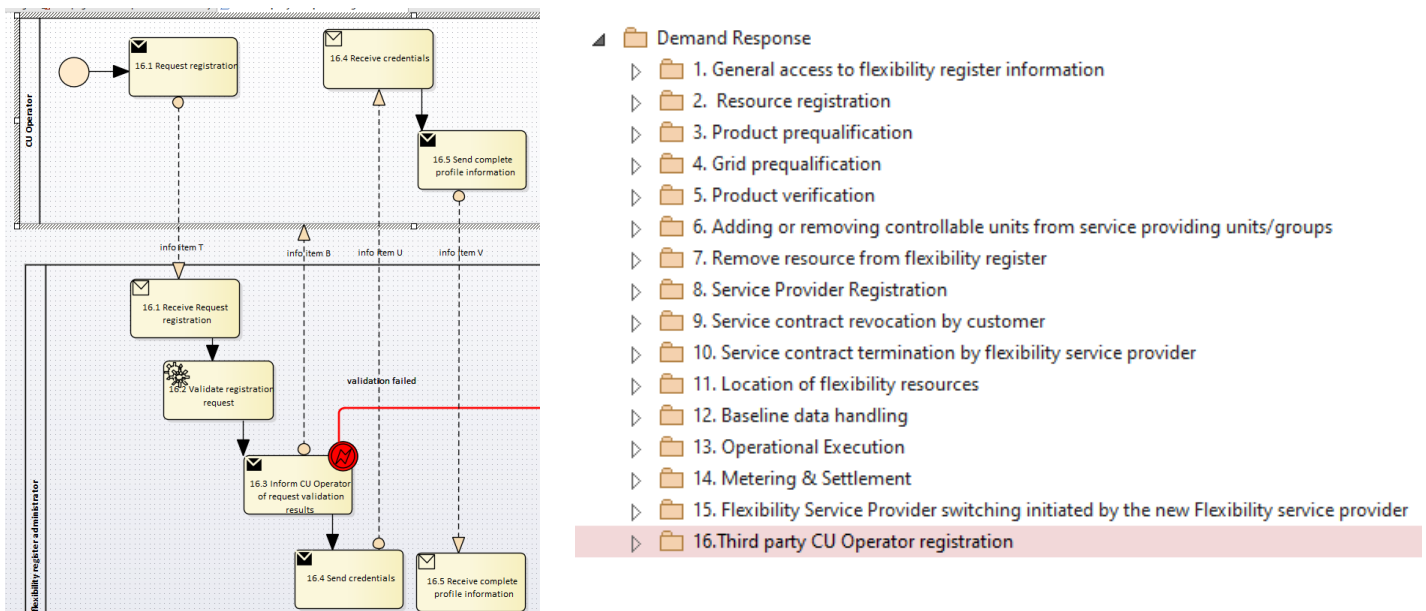


Figure 4: Impression of the scope of the Demand Response draft Implementing Regulation.

2.3 Regional connector interoperability

EDDIE is a decentralised data space. This implies that we take the regional used data exchange formats as it is and do not prescribe data to be presented in a certain way. Internally EDDIE uses a format to translate each regional connector to. However, for each regional connector in Europe, EDDIE needs to make a customised adapter in order to process

the data into our internal format. In this way we already connected Austria, France, Spain, Denmark with others under construction.

In working with region connectors, the lack of standardisation is obvious. A few examples are given here to indicate the work done by EDDIE to connect each region. The intent is to make clear what practical issues, often unforeseen at a higher level, you have to overcome to make things eventually work. Practicalities sometimes make the difference between success and failure.

2.3.1 Austria

For Austria, initially, we were not able to identify the flowdirection of the energy: what is consumption, what is production? It turned out that it was part of an attribute in the messagecode attribute that had a specific coding value, according to which the distinction could be made.

Issue:

embedded (hidden) data.

Details

The flowdirection of the energy is encoded in the messagecode attribute.

if the 5th character of MessageCode=1 then consumption is meant.

if the 5th character of MessageCode=2 then production is meant.

Requirement:

EDDIE had to apply business logic to fill the internal attribute flowdirection:

flowdirection=DOWN if 5th character of MessageCode=1

flowdirection= UP if 5th character of Messagecode=2

2.3.2 France

For France we were unpleasantly surprised that the region connector (ENEDIS) were not standardised on the energy unit kilo Watt hour (kWh), but were using Watts (without the time element).

Issue:

Use of non-standard energy unit

Details:

ENEDIS In France uses the unit W (Watt) instead of kWh ~ (kilo Watt per hour)

Requirement:

Internally EDDIE is standardised on energy in kWh. For France, ERDDIE now calculates kWh base on the supplied amount in Watt for the provided time interval available elsewhere in the message.

2.3.3 Denmark

The data format for energy data exchange in Denmark looked promising: they used an IEC CIM standard for their data exchange, which should not need much conversion to the internal format used by EDDIE. However, in the process Denmark allowed some flexibility that still needed action to overcome.

Issue: when a standard is not so standard.

Details:

The Danish region connector [6] has based itself on the IEC 62325-451-10 standard MyEnergyData [7].

As an example, take the MeteringEvaluationPoint definition (see Figure 5) and its referenced

```

- <xs:complexType name="MarketEvaluationPoint" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim17#MarketEvaluationPoint">
- <xs:sequence>
  <xs:element name="mRID" type="MeasurementPointID_String" minOccurs="1" maxOccurs="1"
    sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim17#IdentifiedObject.mRID" />
  <xs:element name="connectionCategory" type="xs:string" minOccurs="0" maxOccurs="1"
    sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim17#UsagePoint.connectionCategory" />
  <xs:element name="usagePointLocation.geoInfoReference" type="xs:string" minOccurs="0" maxOccurs="1"
    sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim17#Location.geoInfoReference" />
</xs:sequence>
</xs:complexType>

```

Figure 5: iec62325-451-10 definition of MarketEvaluationPoint.

MeasurementPointID_String (see Figure 6).

```

- <xs:complexType name="MeasurementPointID_String" sawsdl:modelReference="http://iec.ch/TC57/2013/CIM-schema-cim17#String">
- <xs:simpleContent>
  - <xs:extension base="MeasurementPointID_String-base">
    <xs:attribute name="codingScheme" type="ecl:CodingSchemeTypeList" use="required" />
  </xs:extension>
</xs:simpleContent>
</xs:complexType>

```

Figure 6: iec62325-451-10 definition of MeasurementPointID_String.

Now in the Danish version it becomes (see Figure 7 and Figure 8):

```
<!-- Definition for MarketEvaluationPoint -->
- <xsd:complexType name="MarketEvaluationPoint">
- <xsd:sequence>
  <xsd:element name="mRID" type="MarketEvaluationMeteringPoint" />
</xsd:sequence>
</xsd:complexType>
```

Figure 7: The Danish translation of the iec62325-451-10 MarketEvaluationPoint.

```
<!-- Definition for MarketEvaluationMeteringPoint -->
- <xsd:complexType name="MarketEvaluationMeteringPoint">
- <xsd:sequence>
  <xsd:element name="codingScheme" type="xsd:string" minOccurs="0" />
  <xsd:element name="name" type="xsd:string" minOccurs="0" />
</xsd:sequence>
</xsd:complexType>
```

Figure 8: The Danish translation of the iec62325-451-10 MeasurementPointID_String.

Some observations:

- In the Danish version the reference to the central CIM library (<http://iec.ch/TC57/2013/CIM-schemacim17>) is left out, which would otherwise have guarantees uniformity with the CIM standard.
- Naming changes:
MeasurementPointID_String becomes MarketEvaluationMeteringPoint
- Both, mRID element of MarketEvaluationPoint are mandatory, however, in the Danish version this mRID is of type MeasurementPointID_String, which is defined by two optional elements, thus making the mRID optional as well.
- The coding schema element has become a string-typed free format value, whereas it is meant to be selectable from the predefined code list library.

Requirement:

Provide for EDDIE default values in case of missing values.

2.4 Demonstrators demands

2.4.1 General

Project EDDIE will work on pre-defined demonstrators to proof the working of the dataspace concept. As two of them propose a challenge to the information exchange, we will handle them in detail²:

- Hydrogen network and sector coupling
- Residential Energy Management and Prosumer participation into markets (A step towards net zero homes)

2.4.2 Hydrogen network and sector coupling

Hydrogen Village is a community in the North of Greece that is based on electrolyzers to produce hydrogen using renewable energy resources (solar and wind). This green hydrogen fuels the citizen's hydrogen boiler through a dedicated hydrogen pipeline. A central electrolyser makes sure that electricity is available in the evening and in wintertime.

One of the main challenges was, that the hydrogen boilers and fuel cells could not be modelled using the CIM standard IEC62325-351 Ed.3 [8]. For this EDDIE did a maintenance request to ENTSO-E to add hydrogen as a FuelType entry. The request was honoured in autumn 2023 and became part of the code list distribution 0.91 of 21 December 2023 [9].

² The others are: EDDIE Online, Moving towards 24x7 Carbon-free Energy, Wholesale Trading and Flexibility Generation

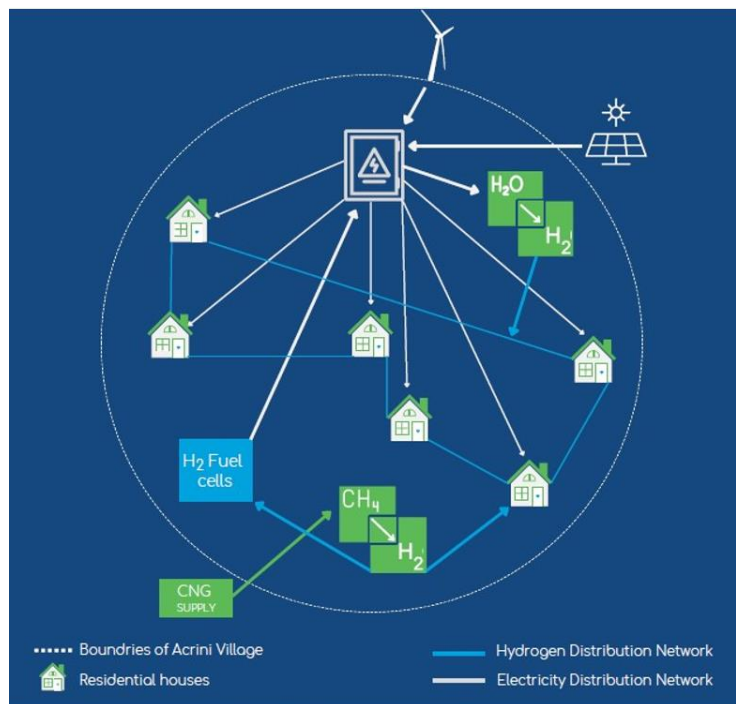


Figure 9: Hydrogen Village overview.

Another challenge in this demonstrator is the existing difference between the gas and electricity market information exchange format. Electricity follows the IEC CIM standard whereas gas has the EDIG@S message format [10] maintained by the EASEE-organisation [11]. Although both formats are based on the UMM standard [12], differences exist. To facilitate future interoperability, EDDIE gave a presentation 'EASEE-Gas beyond EDIGAS' to the EASEE-Gas board to address this issue and to plead for harmonisation of the models. This presentation was repeated to the EASEE-Gas harmonising gas role model working group (HGRM), who already worked with ENTSO-E on harmonising the gas and electricity role models. As a result, a topic was put on the agenda of the CIM TC57 working group (#18: Gas data model harmonisation) on the 5th of April where the chair of the HGRM working group gave a short introduction. A follow-up meeting is scheduled in June.

To give an impression of the gas equivalent of the validated Historical data, here follows a representation of the METRED document in EDIG@S 6.1 format (see paragraph 3.2 for the CIM version).

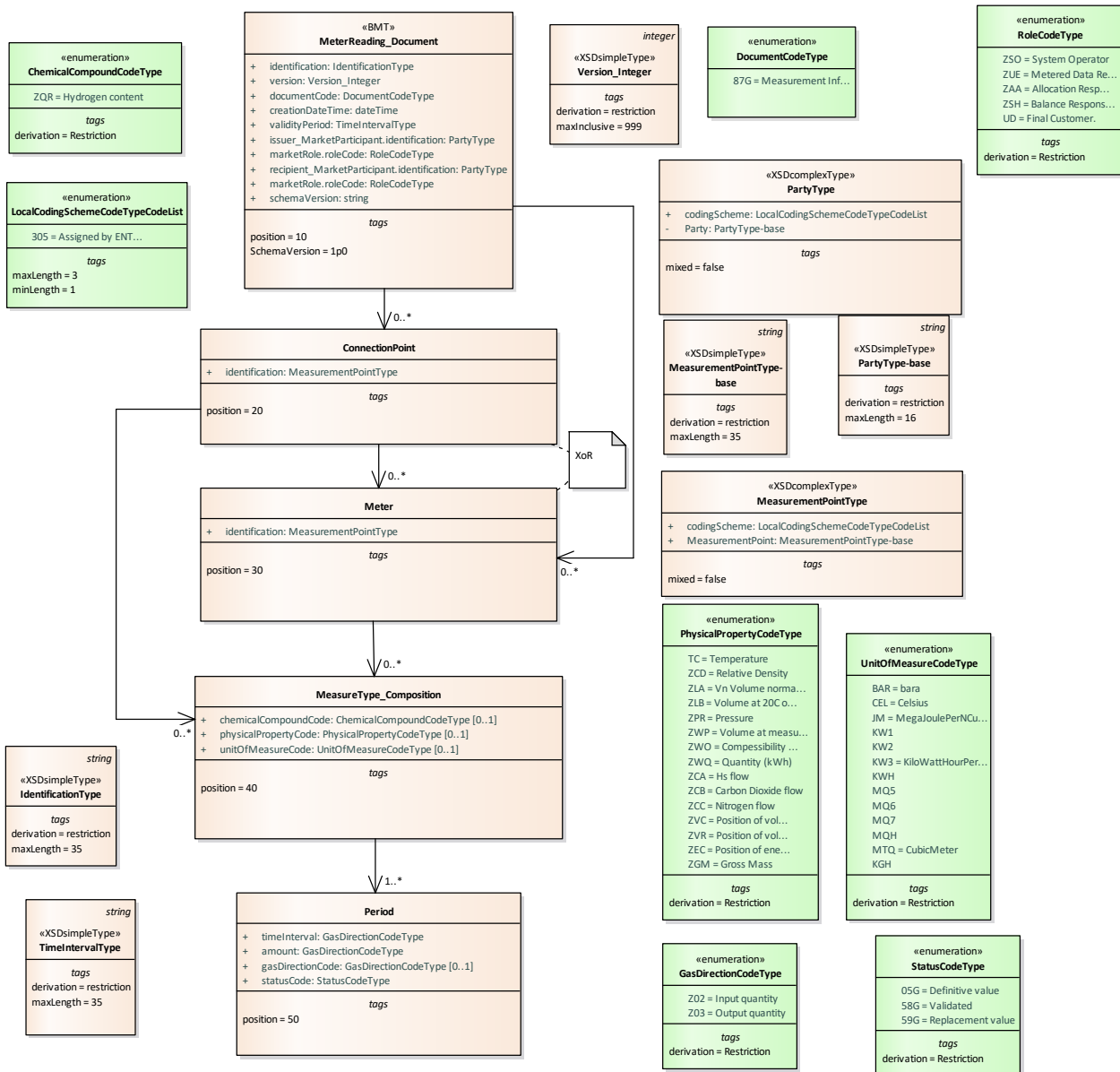


Figure 10: Validated Historical Gas Data (METRED - Edigas 6.1).

Communalities are found in the following aspects:

- Relations between entities (all one to many, starting at the document level and ending at the period level)
- Each entity having an identifying attribute.
- Naming convention (camel casing).
- Some terminology (marketParty).

Differences are found in details:

- Most terminology at the attributer level (identification vs mrID)
- Code list entries

2.4.3 Residential Energy Management and Prosumer participation into markets (A step towards net zero homes)

The first challenge the Net Zero homes impose, is the disclosure of data from behind-the-meter devices like Electric Vehicles (EV), Heat pumps, rooftop PhotoVoltaic (PV) systems and Battery Energy Storage Systems (BESS). These devices will need a communication facility not derived from the primary smart meter but separately through any other accessible submeters or Dedicated Measurement Devices (DMD). They should be made available at near real-time (with a maximum frequency/refresh rate of 15 minutes) to be able to participate in demand response flexibility scenarios.

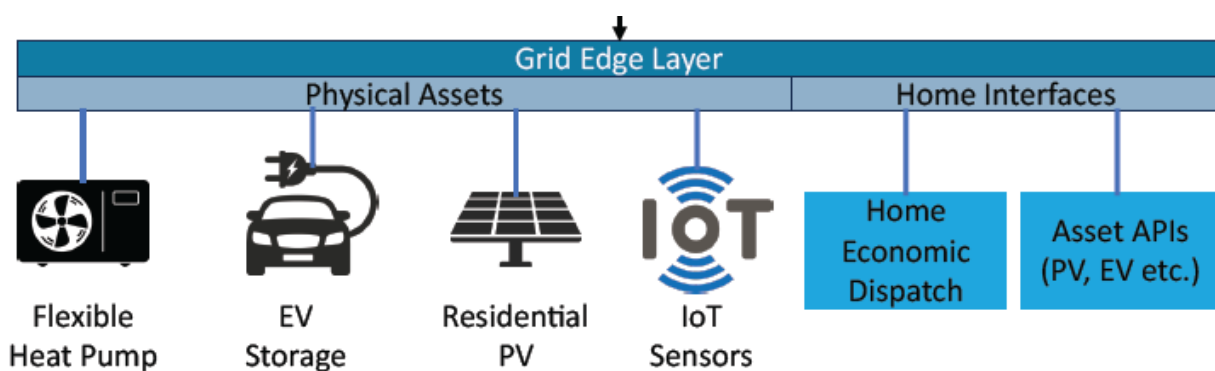


Figure 11: Schematic overview of net zero homes with PV heat pump and EV storage.

Another challenge is the distribution requirements of abovementioned devices. For retrieval of the residential data from the local devices to a data distributable environment, performance is of primary concern. For sharing this data, uniformity through a standardised interface is of utmost importance. These two primarily conflicting requirements need to be consolidated. In the chapter three we will deal with this issue when we come to speak of the internal version of the near real-time data.

Further points to be addressed:

- Do we combine the measurements from the local devices in one message thus reducing the number of messages exchanged, at the price of the size of these messages.
- Do we foresee a regular and predictable heartbeat of message (let's say every 5 minutes), or do we opt for event-based messaging, when values have changed. For instance, PV energy generation will be zero at night, so sending zero value message is not very efficient.

2.5 Market standards available

2.5.1 CIM

The Common Information Model (CIM) was developed by the International Electrotechnical Commission (IEC). While there are many standards already available, CIM seems to be the first choice for many users in Europe. The CIM is an industry-standard model that provides a common language for the exchange of information between Transmission System Operators (TSOs) and market participants in the electricity market. This model has been specifically designed to facilitate the exchange of data and transfer of information necessary for both regional and pan-European grid development studies, as well as future processes related to network codes.

To align with European practices and conventions the European Style Market Profile (ESMP) was introduced. Historically, the main focus of CIM was on TSO and Distribution System Operator (DSO) communication. With the publishing of the Implementing Regulations a yet uncovered domain of the final customer, posed a challenge to the existing model.

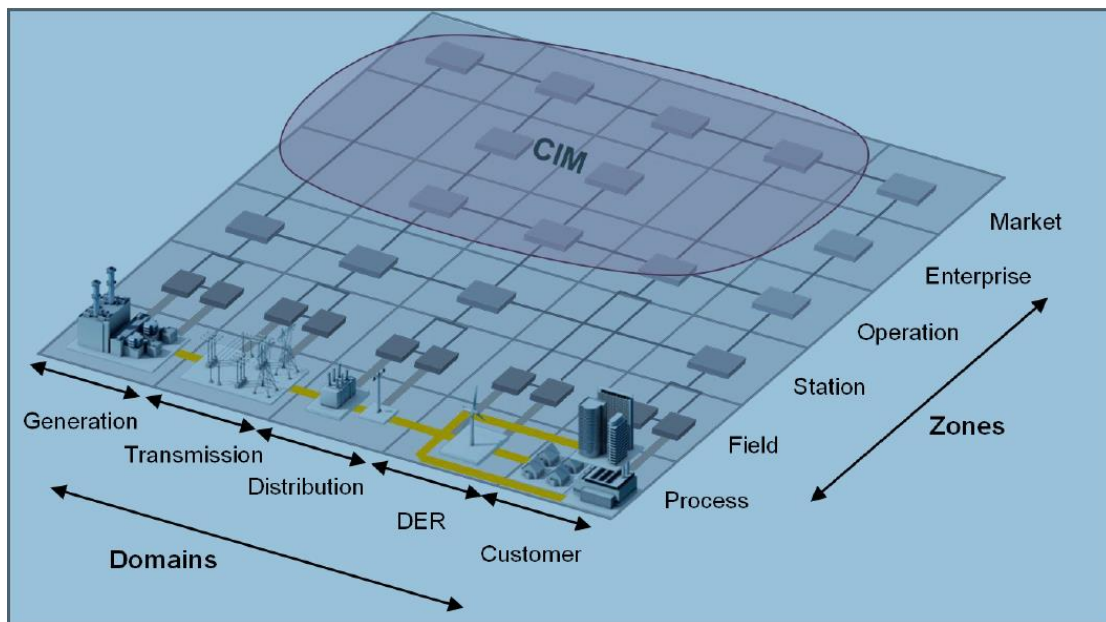


Figure 12: CIM and the smart grid plane.

The European Network of Transmission System Operators for Electricity (ENTSO-E), publisher of the European style market profile (ESMP), started working on the omission with the release of the 'MyEnergyData'-profile (2019) and the continuation of that work by the CIM for retail market Working group on the 'Procedures for access to metering and consumption data' and the IEC TC57 WG16 maintenance request on the Permission class.

2.5.2 SAREF

The Smart Appliance ReFERENCE (SAREF) model is an ontologies originally defined by ETSI for IoT devices to enable interoperability and self-discovery.

SAREF4ENER includes a reference ontology that targets appliance energy efficiency and is in the process of extending into the new demand side flexibility use cases through Horizon Europe Projects such as Interconnect.

The core base SAREF ontology model is pictured in Figure 13.

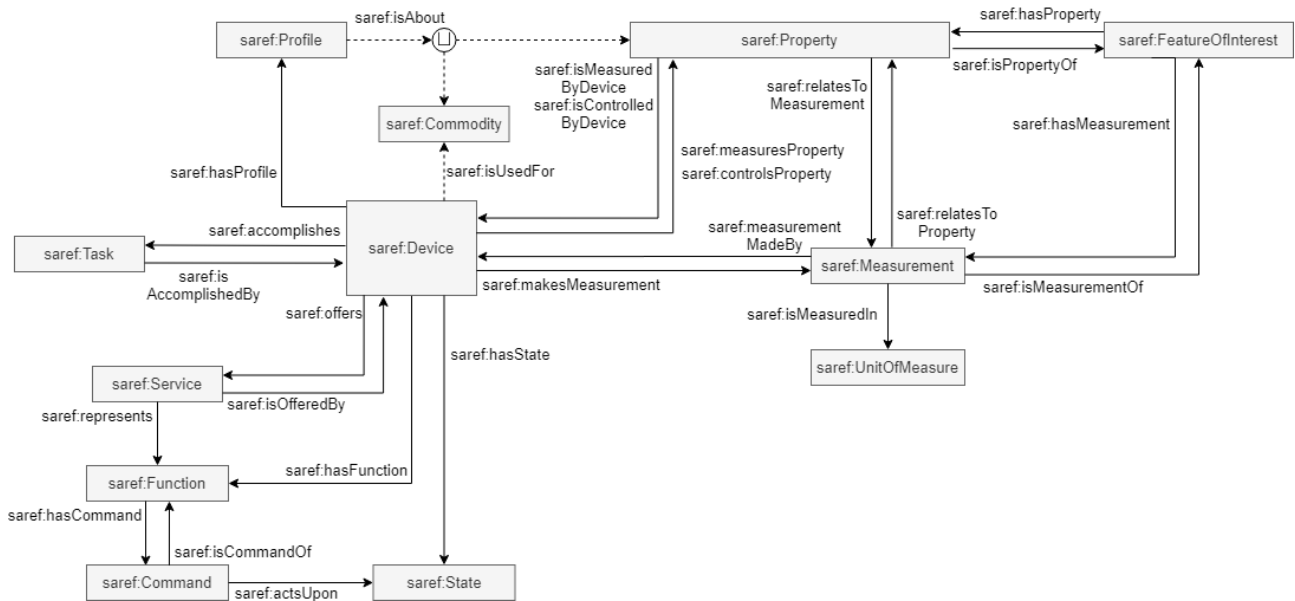


Figure 13: SAREF base ontology description.

SAREF is well advanced in modelling behind-the-meter devices. In the demand response use cases gives SAREF a head start over other ontologies like CIM. Centrally positioned is the Device object which has several derived classes. The Device object is centrally positioned and has several derived classes, as you can see in Figure 14.

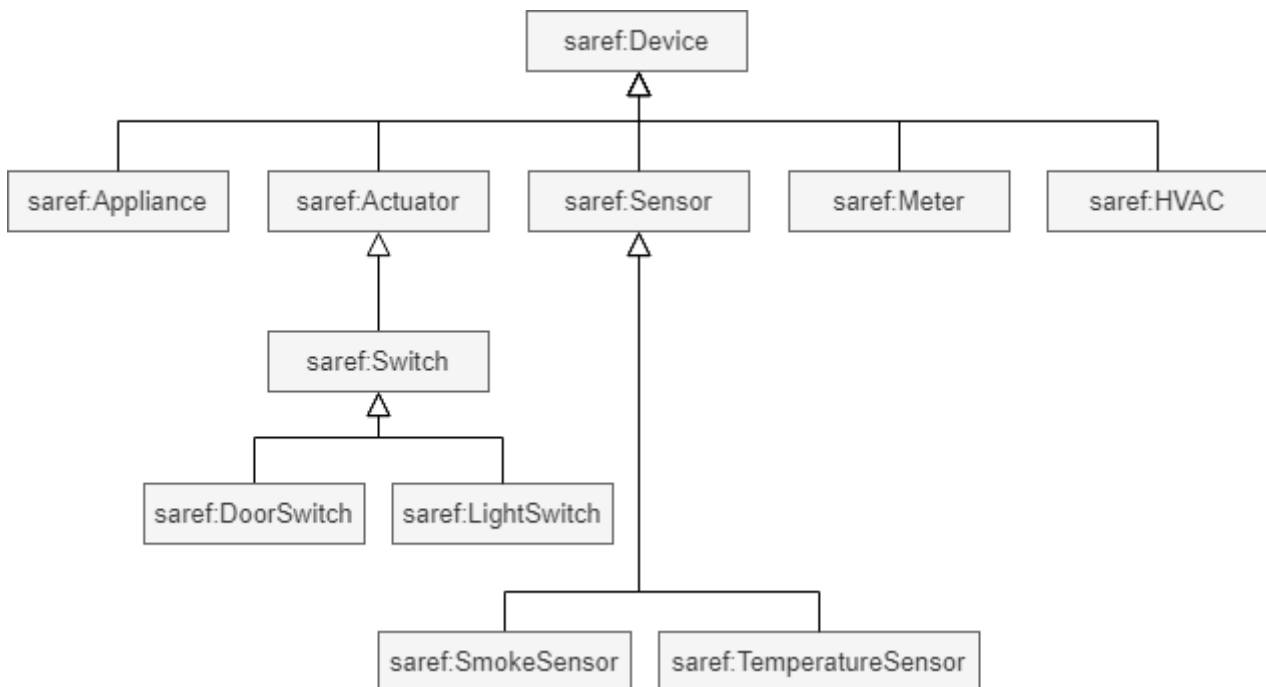


Figure 14: SAREF DeviceTypes.

EDDIE in its current phase is dedicated to the CIM standard. Given the fact that the CIM extension to near real-time data exchange and demand response scenarios have not yet started, it is tempting to revert to SAREF for this topic. However, supporting two different ontologies in one project is a serious overhead which given the lifespan of the project imposes a serious threat on the deliverables. Ignoring SAREF completely and not using their lesson's learned is not attractive either. EDDIE thus decided to use SAREF as a reference for inspiration and supply a mapping for the base SAREF model to the near real-time CIM based information schema.

2.5.3 OCPP

The Open Charge Point Protocol (OCPP) originated in 2009 in the Netherlands from the electromobility domain and is currently managed by the ElaadNL foundation, a collaboration between Dutch grid operators, Charging Point Operators and suppliers of Charging Point hardware vendors. The objective of the protocol is to develop an open standard that connected electric vehicles to back-office systems and the grid and so prevent any vendor lock-in from charge point vendors. Developed as an open freely available standard, OCPP has very quickly become the de facto open standard in this domain, as recent major Charging point vendor bankruptcies in the US have illustrated the vulnerability of propriety standards.

The OCPP original deployments are based on OCPP version 1.6 consisting of 5 data exchange message structures to manage simple Charging Point operation. First energy management messages have more recently been introduced to exchange target power curve profiles with charge points (CP) and receive associated charging metering data (one set of data per charging session). This first version of the standard did not support natively ISO 15118-2 Plug & Charge data exchanges, but this has been corrected through OCPP 1.6.32.

The development of a new OCPP 2.0 was started in 2015 with the prime objective to completely redefine protocol profiles based on the experience acquired through first deployments and on future market needs such as the integration of more complex energy flexibility use cases requiring data exchanges with Grid operators and/or Flexibility Service providers depending on the associated flexibility market design. This new version introduces new data exchange profiles for the better management of remote charging station operation and for the identification of the charging station's hardware and

configuration details. It also includes significant improvements for the management of charging and DER flexibility transactions while introducing new JSON/REST APIs.

A second OCPP 2.0.1 was released late 2020 adding improvements discovered through the first OCPP 2.0 deployments. This latest version provides full support to ISO15118-2 (including Plug and Charge and the management of different tariff schedules). OCPP 2.0.1 documents have improved to limit project specific interpretations.

In 2013 the Open Charge Alliance (OCA) was founded, bringing together EV charging hardware, electromobility platform vendors, and charging network operators. Similarly to the OpenADR alliance for demand response, OCA's mission is to foster global development adoption, and compliance of the Open Charge Point Protocol (OCPP) and related standards through collaboration, education, testing, and certification.

The alliance currently includes 220 members in 43 countries and 5 continents spanning across the electromobility business domain. The alliance collaboration model is open with free to use rights to use the standard using pragmatic development approach from experts of EV infrastructures.

The OCPP version 1.6 is the protocol version predominantly deployed through the European markets raising questions on backward compatibility across versions of OCPP deployment. In parallel to this initiative the IEC TC69 has launched a new Joint Working Group 11 to develop interoperability across the electromobility and grid domains which is very active and composed over 95 experts from 22 countries.

Currently, the IEC 63110 object model is based on OCPP 2.0 draft 4 model. Additions have been made to introduce some objects or properties that are needed by OCPP 2.01, IEC 63110 or ISO/IEC 15118 use cases requirements. The support for bi-directional EV charging is foreseen for OCPP 2.1.

The IEC 63110 standard is targeting to bring better harmonisation with other data exchanges considered through the electromobility domain as showed through the following diagram. In particular it should offer better consistency with:

- IEC 61850/IEEE2030-5 for Distribution Grid data exchanges
- ISO/IEC 15118 with the EV
- IEC 63119 considered for exchange clear Clearing houses and Electromobility Service Providers

First activities have been initiated to derive a CIM based ontology and reference data structure from the IEC 63110 and OCPP work which should serve as a natural basis to initiate first data space deployments for electromobility.

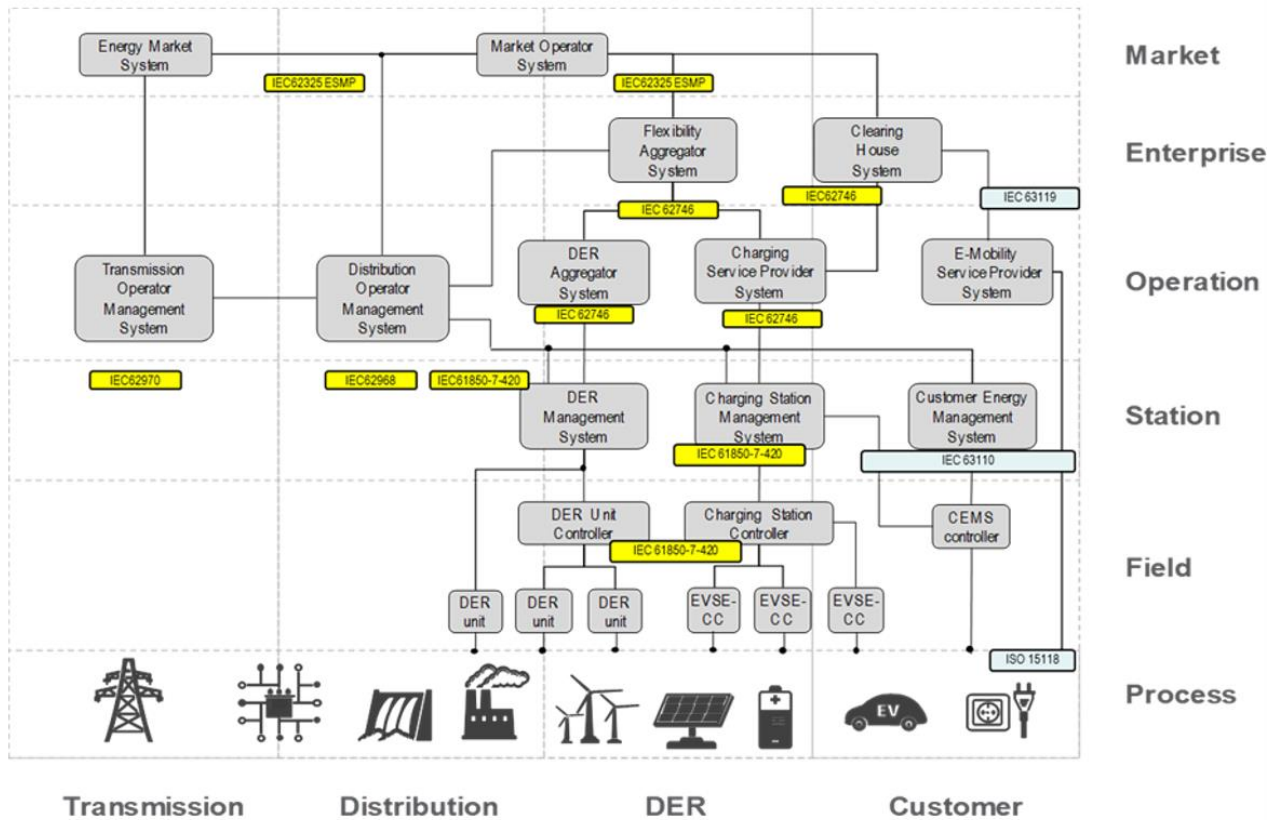


Figure 15: Smart grid plane.

In the diagram above (see Figure 15), we see the Smart grid plane we discussed in chapter 2 projected with the position of IEC 63110 among current and future standards. Some abbreviations explained:

DER = Distributed Energy Resources (PV, Stationary battery, Wind energy)

EVSE-CC = Electric Vehicle Supply Equipment Charging Controller

CEMS = Customer Energy Management System

Scope defined

When designing the information schema's, several considerations are taken into account. The most significant design choice is between performance and standardization. EDDIE has committed itself to European data format standards. While there are many standards already available, CIM seems to be the first choice for many users in Europe. Standards, however, come at a price: performance. Especially in the near-real time data exchange, with potential 300 million metering points, performance issues cannot be ignored. Within EDDIE we have decided to optimize the performance for internal data exchange and to use CIM-based message formats when communicating with external parties. For a smooth transition between internal and external formats, message mappings are designed and documented to make sure no information is lost during processing. Even the incoming messages from a regional connector (none of them CIM compliant) are mapped to a CIM message format, to make sure all data of relevance can be stored in a CIM format.

As new market processes are introduced (see chapter 2), the CIM standard is continuously under revision. EDDIE is running ahead of the game, with its data needs that sometimes are not currently part of the CIM standard. The ENTSO-E organization has working groups occupied with the adaption of the CIM standard. EDDIE works in close relation with ENTSO-E on data needs that occur in the implementation of the EDDIE framework. For more details on the process of synchronising with the CIM standard see chapter 4 "Towards a better standard".

2.6 Permission data

The establishment of consent is one of the first stages of interaction with a region connector. Several stages are passed through in this communication process which need to be traceable to be able to monitor progress and identify obstacles. These stages are recorded in the Status attribute of type StatusTypeList in the IEC ESMP standard. The WG21 of the TC57 who are working on the Permission Class created the classes as represented in Figure 16.

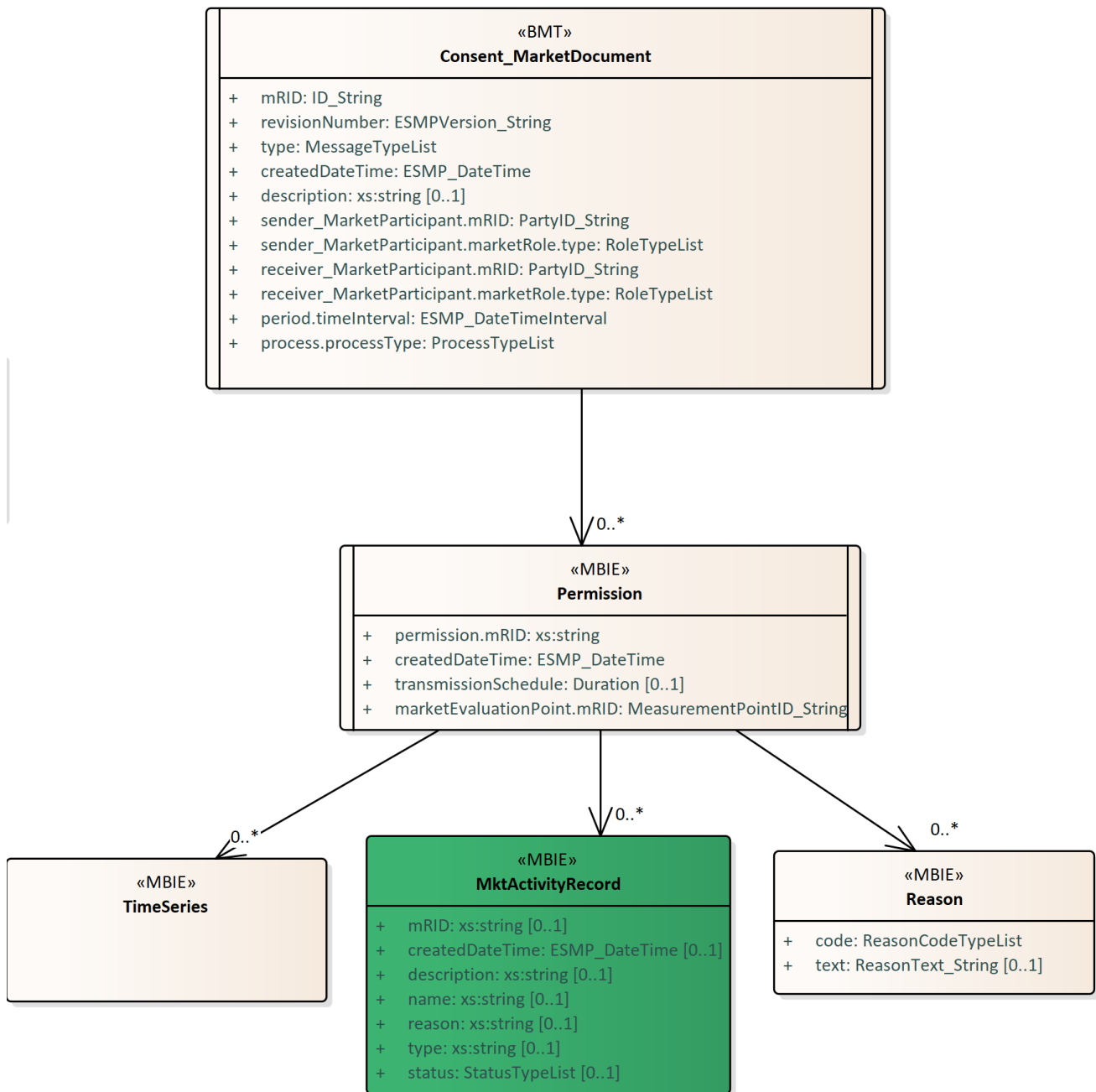


Figure 16: Permission data initial.

At this point a serious drawback was identified: the StatusTypeList enumeration did not have the needed entries. Statuses are important in tracing the workflow in order to identify possible disruptions. By using an Internal format optimised for performance, EDDIE came up with a list of permission specific additions as indicated in Figure 17.

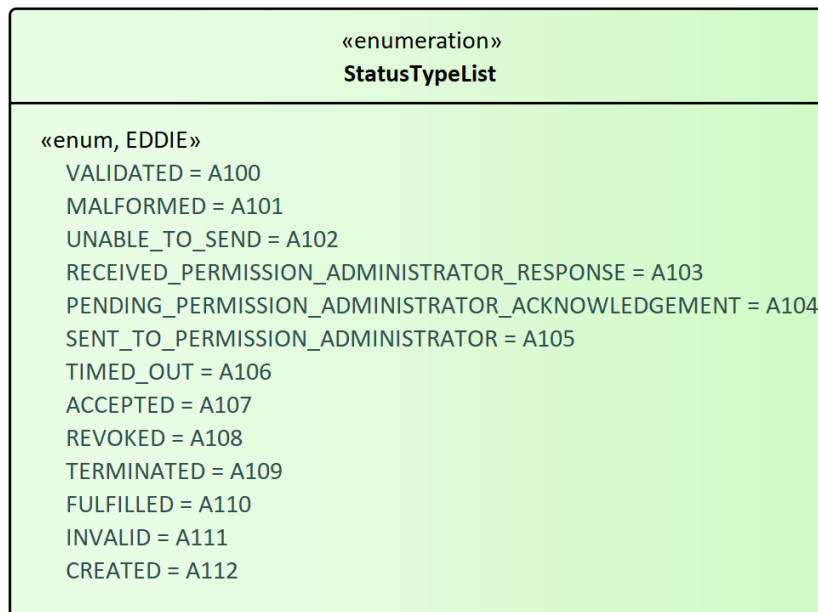


Figure 17: StatusTypeList addition proposal.

The statusTypeList values of EDDIE are used in the following process model and state changes:

Happy or default flow

Description: the request passes all tests and is finally fulfilled by the permission administrator. The following statuses are passed in the process:

- Created
- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Received_Permission_Administrator_Response
- Accepted
- Fulfilled

Alternative flow 1

Description: the request passes all tests but is finally terminated by the permission administrator. The following statuses are passed in the process:

- Created

- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Received_Permission_Administrator_Response
- Accepted
- Terminated

Alternative flow 2

Description: the request passes all tests but is finally revoked by the permission administrator. The following statuses are passed in the process:

- Created
- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Received_Permission_Administrator_Response
- Accepted
- Revoked

Error flow 1

Description: the request passes the validation test but is not able to reach the permission administrator. The following statuses are passed in the process:

- Created
- Validated
- Unable_to_Send

Error flow 2

Description: the request passes the validation test, has reached the permission administrator but is returned as invalid. The following statuses are passed in the process:

- Created
- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Invalid

Error flow 3

Description: the request passes the validation test, has reached the permission administrator but is returned as rejected. The following statuses are passed in the process:

- Created
- Validated

- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Rejected

Error flow 4

Description: the request passes the validation test, has reached the permission administrator but fails to respond timely. The following statuses are passed in the process:

- Created
- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Time-out

Error flow 5

Description: the request passes the validation test, has reached the permission administrator but is returned as malformed. The following statuses are passed in the process:

- Created
- Validated
- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Malformed

The ENTSO-E StatusTypeList has entries that are meant to be used in a generic context, not for permission handling in specific. For this reason, the following process statuses are demoted to EDDIE's specific statuses:

- Pending_Permission_Administrator_Acknowledgement
- Sent_to_Permission_Administrator
- Received_Permission_Administrator_Response
- Unable_to_Send
- Malformed

For the following an existing entry is chosen:

- Accepted → A37 – Confirmed
- Rejected → A34 – Rejected
- Revoked → A13 – Withdrawn
- Terminated → A16 – Deactivation
- Fullfilled → A37 – Confirmed

For the next four statuses a maintenance request has been issued and accepted:

StatusType enumeration			
Type of code	Code ³	Definition	Description
statusType	Axx	Validated	The document or action was validated
	Axx	Invalid	The document or action was invalid.
	Axx	Timed out	The action was timed out
	A13	Withdrawn	The information or action has been withdrawn by the submitter.

Table 2: ENTSO-E Code List change request for StatusType enumeration.

EDDIE issued a maintenance request to the WG21 of the TC57 working on the Permission class to have the StatusTypeList extended with missing values needed for this process. The result of these changes (currently under revision at ENTSO-E) will be reflected in version 0.83 of the EDDIE Permission class.

2.7 Validated Historical Metering Data

The validated historical metering data (see Figure 18) is based on the European Style Market Profile (ESMP - IEC62325-351 Ed.3). The EDDIE added data needs are listed below:

1. TimeSeries.marketEvaluationPoint.meterReadings.readings.ReadingType.accumulate
2. TimeSeries.marketEvaluationPoint.meterReadings.readings.ReadingType.aggregation
3. TimeSeries.marketEvaluationPoint.meterReadings.readings.ReadingType.commodity

Ad. 1 The Accumulate attribute we need for a registered countervalue of a direct meter read (AccumulateKind=BulkQuantity) or a calculation on the differential between two meter reads (AccumulateKind=summation).

³ The "Code" field is to be completed in the case of modifications to existing codes.

Ad.2 The Aggregate attribute we need when consumption and production are not registered separately but discounted in one value (AggregateKind=sum).

Ad. 3 The CommodityKind attribute we might need when incorporating gasmeter readings in intersectorial scenarios where we would use the CommodityKind=naturalGas for this purpose.

At the time of submitting this deliverable, negotiations with the ENTSO-E TC57 Working group 16 are ongoing to see how we can accommodate for these EDDIE requirements.

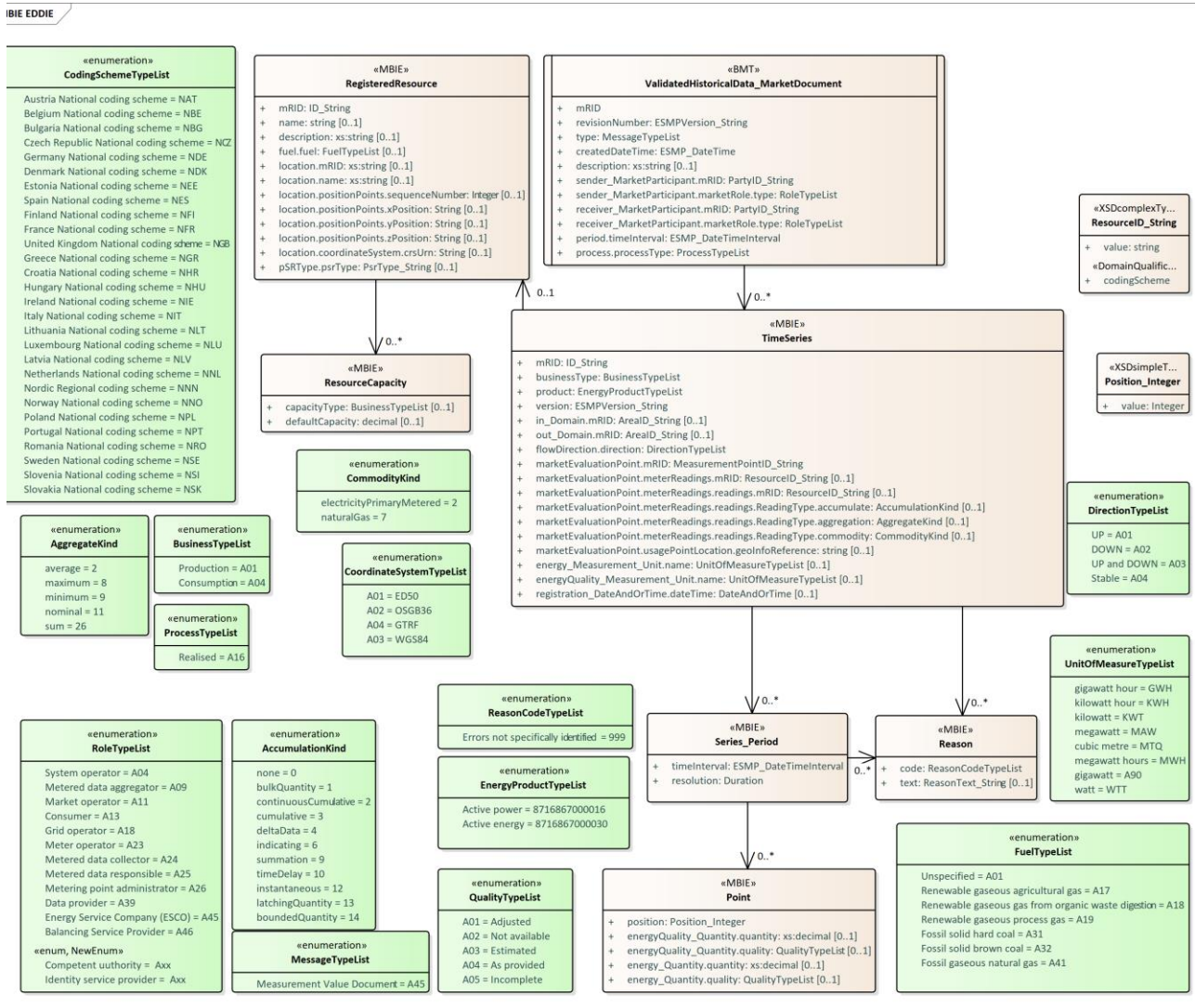


Figure 18: EDDIE Validated Historical Data.

2.8 Near real-time measurement data (CIM-based format)

EDDIE needs to supply for a number of timeseries for the near-real time data. For this the IEC62746-4 Message Model is used, which is the proposed European profile EDDIE is assisting in as part of the Digital 4 Grid demonstrator. In co-operation with ENTSO-E, DCBEL and former Elix contributors, EDDIE will be working on the further developments of this profile as it needs to align with the Network Code on Demand Response and the Implementing regulation on Demand Response, article 20 of [1], [5]. Figure 19 shows the version as of May 2024.

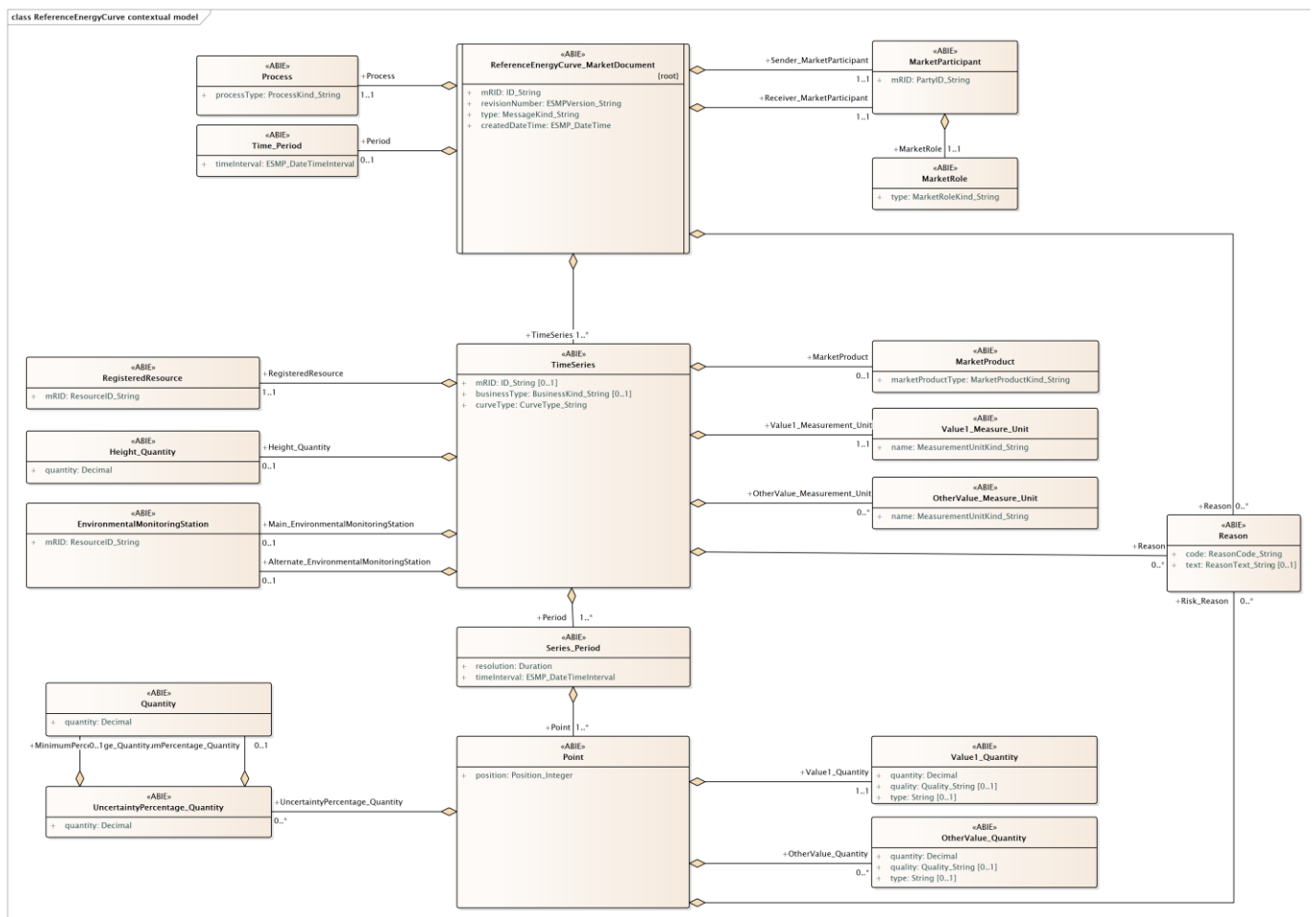


Figure 19: EDDIE near real-time measurements data.

2.9 Near real-time measurement data (internal format)

To ensure scalability and the support for many Administrative Interface for In-house Data Access (AIIDA) instances sending data simultaneously, a custom internal data format will be used for the data transferred from an AIIDA instance to EDDIE. EDDIE will then convert this

custom format to the CIM format and the data in the CIM format is made available to the eligible party via Kafka.

Using a custom protocol instead of the CIM reduces the size of the transmitted messages drastically, enabling the simultaneous support of a large amount of AIIDA instances. At this stage of the project, the internal format is still work in progress and the compatibility to the CIM standard has to be kept in mind.

Possibilities to reduce the amount and size of the transmitted messages, while ensuring that all values are received by EDDIE and thereby the EP, are actively investigated.

One approach could be to introduce a certain threshold, transmitting a message to EDDIE only when, for example, the power consumption crosses this threshold. This message would still contain all measurement values that have been recorded in the timeframe, but by being batched together, they allow a better compression and reduces the message frequency significantly. The eligible party would only receive a message if the power consumption reported by the AIIDA instance changes significantly. The message would contain the new value as well as all the values recorded since the last transmitted message. To achieve compression and reduce message size, a binary protocol like Protocol Buffers will be used. Another way to reduce transmission sizes is to include only data that has changed. For example, if only the power consumption measured by the smart meter has changed since the last message, but the energy production counter has not, then only the updated power consumption will be transmitted.

2.10 Master data

For correct interpretation of the dynamic data (both historical and near real-time) master data on e.g. accounting points is essential.

2.10.1 Accounting point master data

“According to eBix “The Accounting Point is a representation of a connection to the physical grid, hence there may be a “Grid connection ID” assigned to the Accounting Point. An Accounting Point can in rare cases have multiple connections to the grid (typically for large industries)” [13]. The EDDIE accounting point master data is primary based on the IEC-CIM ESMP [14] and the Business requirements for accounting point document issued by Ebix.

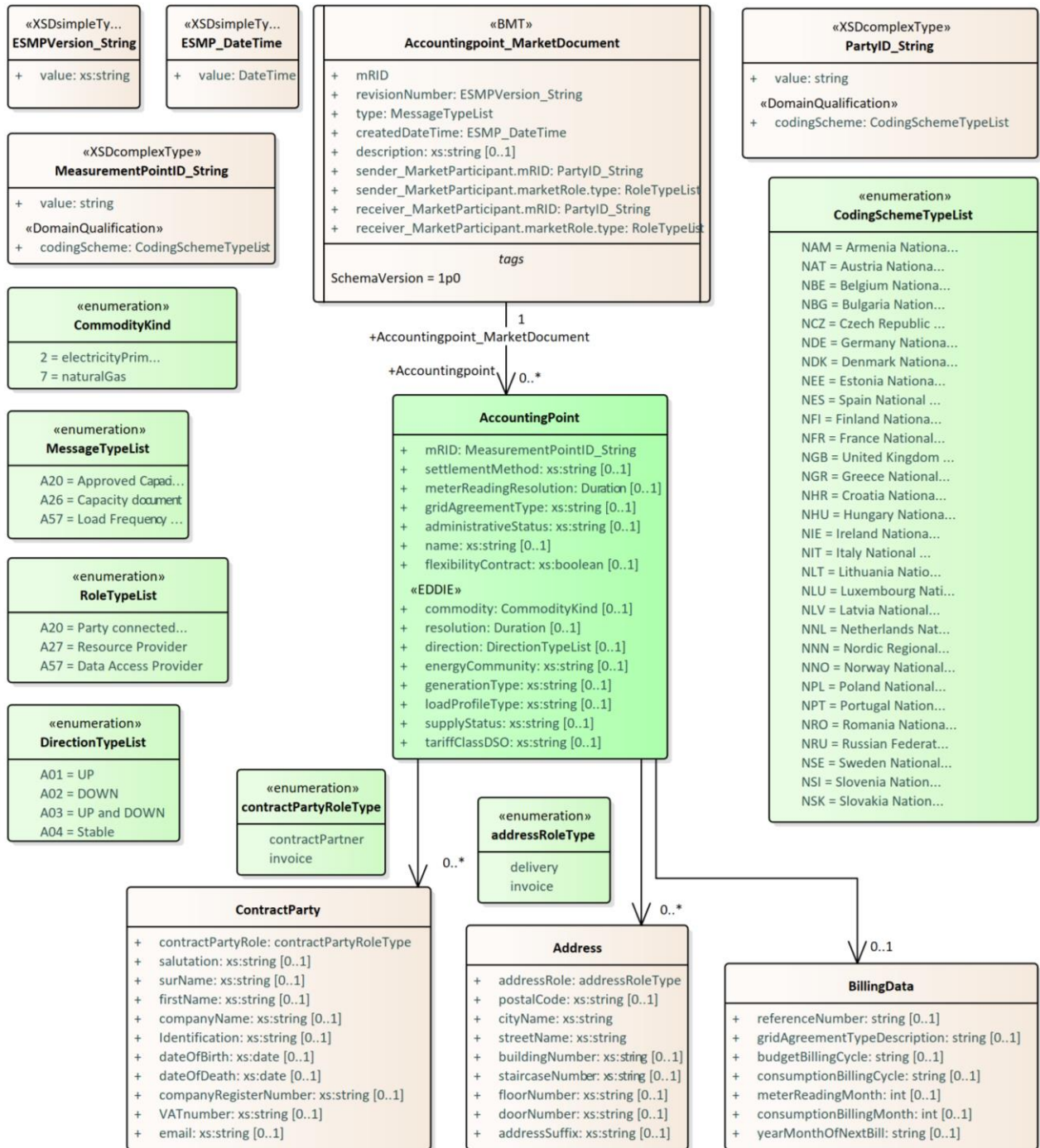


Figure 20: EDDIE Accountingpoint Master Data.

The accounting point characteristics (see Figure 20) define important properties for interpreting the dynamic data. Here are the most important one's:

- Direction (production or consumption)
- Commodity (gas or electricity)
- Energy community participation

Accounting point financial characteristics include:

- Contract person and address.
- Invoice person and address.
- Generic billing data (e.g. billing frequency. Month of annual statement).

The aligning with the regional connectors is the main challenge as data structure can vary substantially. For the Gas Heat of the Austrian Energy Association Gas Heat [15], the Invoice and the delivery address are duplicated in different structures, with only marginal differences. Furthermore, contract partner attributes have a-typical names to supply for both natural persons and companies:

- Name1: Surname; company name part 1.
- Name2: First name; optional company name part 2.
- Name3: company name part 3.
- Name4: company name part 4.

3 Towards a better standard

As discussed in paragraph 2.5.1, CIM [16] is a widely used standard for data exchange in electricity domain governed by the International Electrotechnical Commission (IEC). Several working groups under the Technical Commission (TC57) are actively involved in the change process. Over the last decade several profiles have been develop and maintained. The three most important profiles are:

- IEC 61970 – Energy Management System Application Program Interface (grid related)
- IEC 61968 – Application Integration at Electric Utilities – System Interfaces for Distribution Management (support related)
- IEC 62325– Framework for Energy Market Communications (market related) and it’s subset IEC 62325– Ed.3 ESMP – European Style Market profile.

The actors and their roles in the Maintenance request procedure are summarised in Table 3.

Party	Description	Role
IEC TC57	International Elektrotechnical Commission	Determines new standard releases
UCA IUG	UCA International Users Group is a not-for-profit corporation focused on assisting users and vendors in the deployment of standards for real-time applications for several industries with related requirements. The Users Group does not write standards, however, works closely with those bodies that have primary responsibility for the completion of standards (notably IEC TC 57: Power Systems Management and Associated Information Exchange).	Model Manager
ICTC	Information & Communication Technical Committee	Advisory
Special interest group (SIG) ICT Strategy	Subgroup of ICTC	none
CIM working group	ENTSO-E working group under the SIG ICT Strategy	Advisory/Model manager (IEC 62325 only)
CIM ESMP subgroup	ENTSO-E sub group under the CIM working group	Advisory
CIM for Retail subgroup	ENTSO-E sub group under the CIM ESMP subgroup	Reviewer

Table 3: Parties involved in maintenance Request procedure.

Hierarchical the following organogram illustrated in Figure 21 can be drawn up:

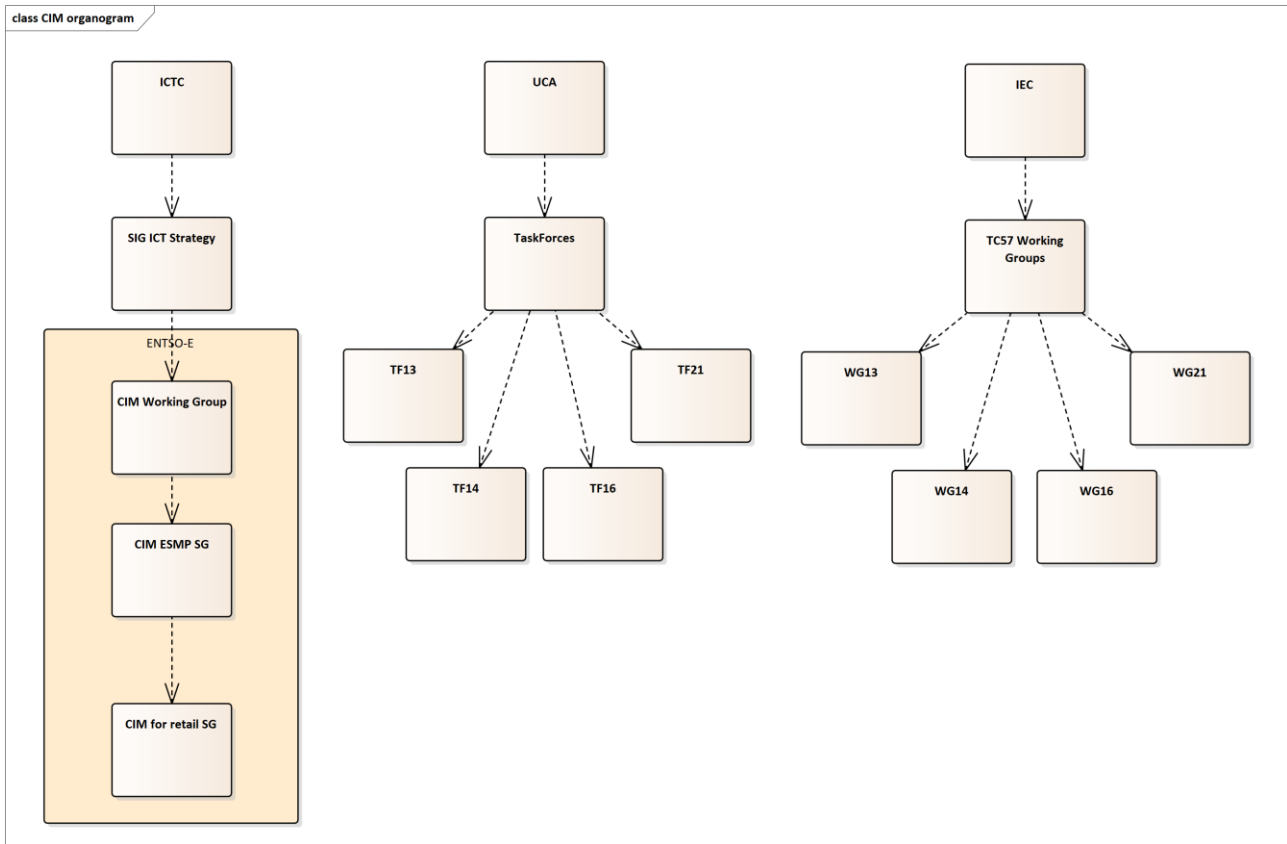


Figure 21: CIM maintenance procedure organogram.

In Table 4 is an overview of the IEC CIM working groups under the TC57 (technical committee), some of which are dormant. For Project EDDIE the working groups 16, 13, 14 and 21 are of relevance.

Technical Committee (TC)	Title	Key words
IEC/TC 57	Power systems management and associated information exchange	information exchange, data spaces: interoperability, sector coupling
WG 3	Telecontrol protocols	telecontrol protocols
WG 10	Power system IED communication and associated data models	communication, protocol, application, interface
WG 13	Software interfaces for operation and planning of the electric grid	substation, grid integration
WG 14	Enterprise business function interfaces for utility operations	CIM, market, data model

WG 15	Data and communication security	cybersecurity, end2end, access control, grid integration, trust management, data transactions
WG 16	Deregulated energy market communications	communication, market, grid integration
WG 17	Power system intelligent electronic device communication and associated data models for microgrids, distributed energy resources and distribution automation	data exchange, renewables
WG 18	Hydroelectric power plants – Communication for monitoring and control	monitoring, control, hydro storage
WG 19	Interoperability within TC 57 in the long term	SGAM, grid integration, CIM, mapping
WG 20	Power Line Carrier Communication Systems	PLC, communication
WG 21	Interfaces and protocol profiles relevant to systems connected to the electrical grid	SGAM, grid integration

Table 4: Summary of the IEC/TC57 Working Groups.

3.1 The IEC CIM change process

Three possible triggers can start the maintenance request process:

1. Needs from the market part of CIM (IEC 62325)
1. Needs from the grid part of CIM (IEC 61970)
2. Needs from the support part of CIM (IEC 61968)

Ad. 1 Needs from the market part of CIM (IEC 62325)

In order to start a Maintenance request the ENTSO-E template is required to be filled in. It includes the motivation for the change, details of the requestor and the proposed change to the CIM model.

This subsequently is put on the agenda of the CIM for Retail Subgroup. Usually, some discussion rounds take place with updated versions of the maintenance request. When fully reviewed, the result is forwarded to the CIM ESMP Workgroup.

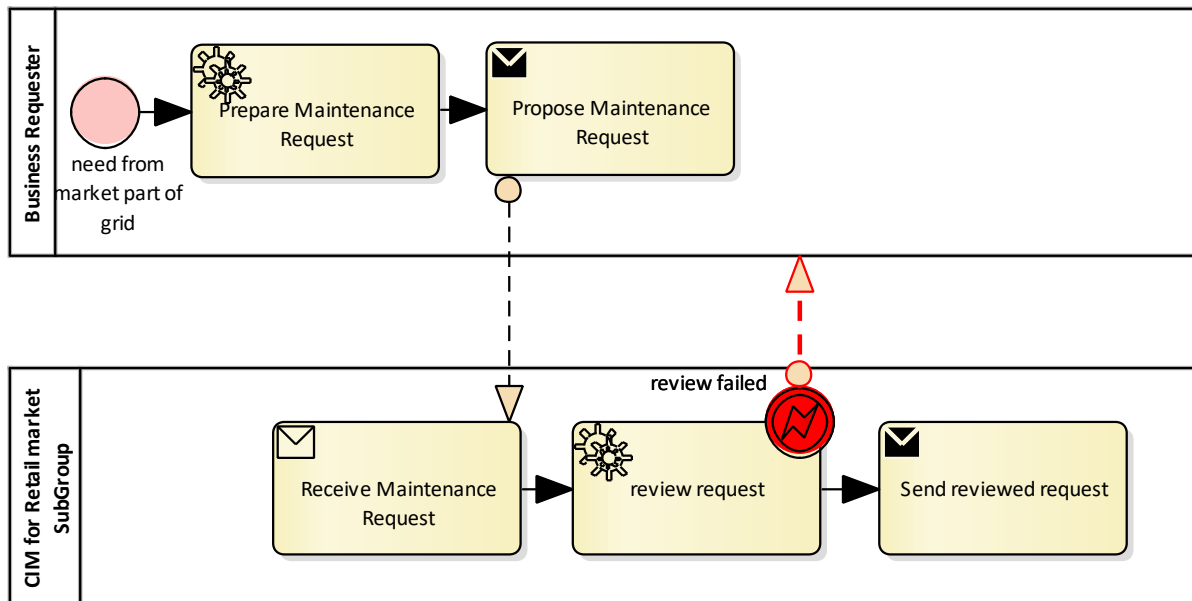


Figure 22: Maintenance Request - CIM for Retail Market.

The CIM ESMP workgroup on receiving the prepared maintenance request must decide on the approval, taken into account other concurrent requests received. If the request has strategic (e.g. on the organisational level) implications, the request is forwarded to the Information and Communication Technical Committee (ICTC). Otherwise it is forwarded to the CIM Working Group (which falls under the ICTC). When not approved, the request is sent back to the CIM for Retail Market subgroup for revision.

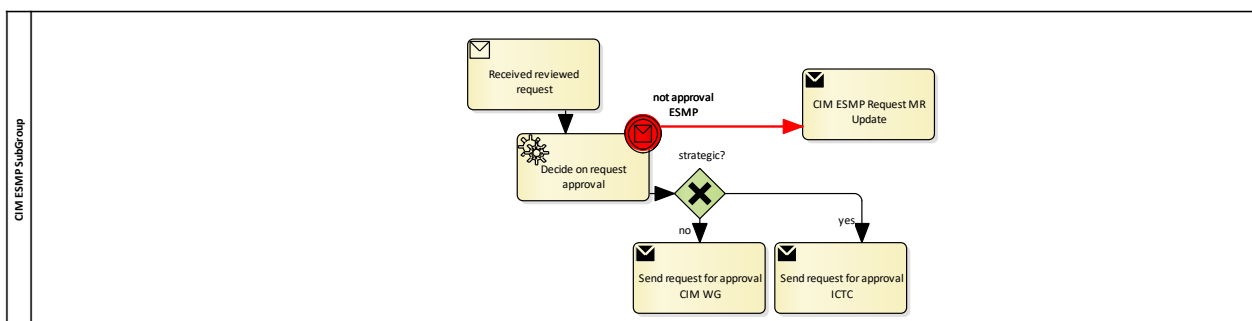


Figure 23: Maintenance Request - CIM ESMP SubGroup.

Both the International ICTC core team and the CIM Working Group evaluate the maintenance request and demand a revision (update) in case no approval. Both tracks reach the ICTC

core team and when the scope is limited to changes in the ESMP (IEC 62325-351) the requested changes are included in the appropriate profile.

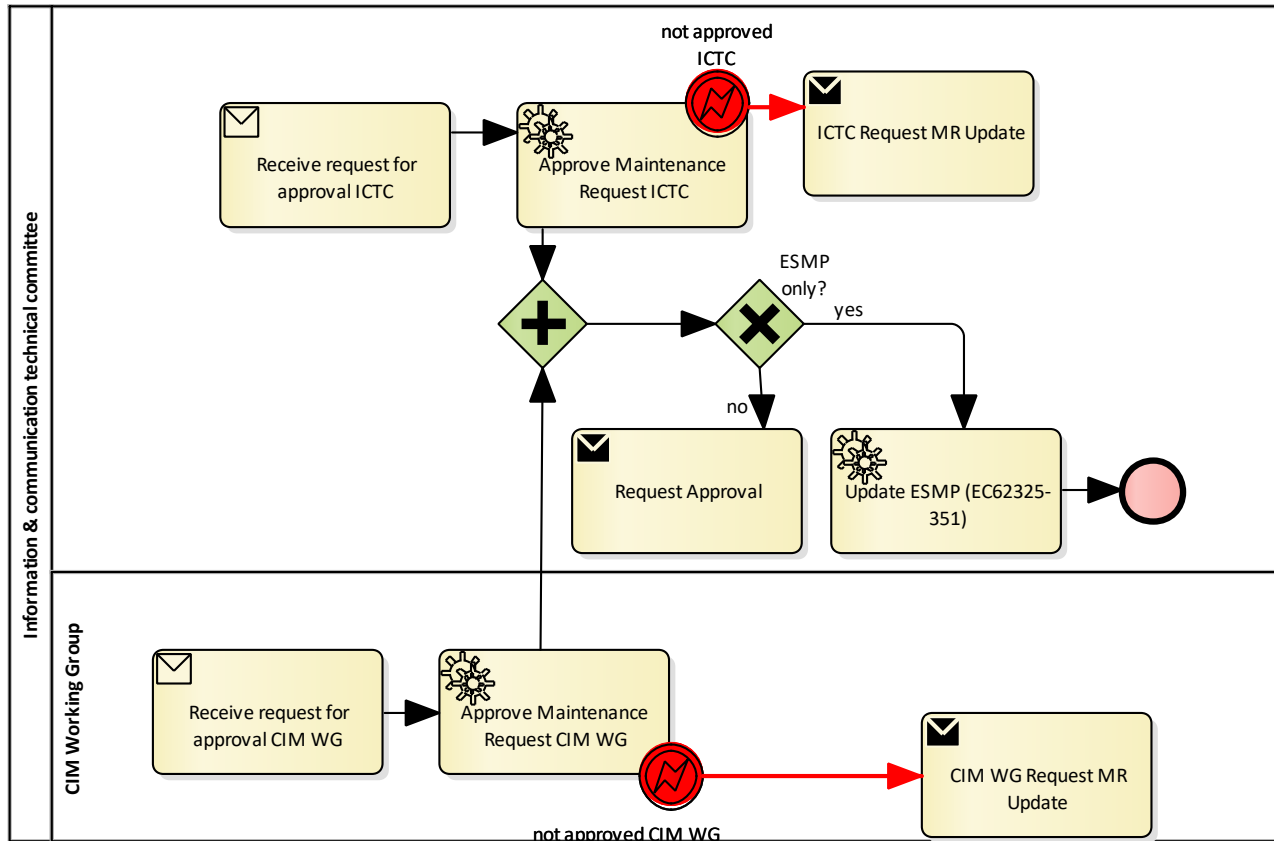


Figure 24: Maintenance Request – ICTC.

If the scope of the maintenance request exceeds the ESMP domain and necessitates changes to the grid (IEC 61970) and/or support (IEC61968) profile, the TC57 Taskforce 16 triggers a discussion for a joined approval. If agreed upon, TF 16 will include the changes in the relevant profiles.

Ad. 2 Need from the grid part of CIM (IEC 61970)

Maintenance requests for the grid profile are handled in the UCA Taskforce 14. when the scope is limited to changes in the ESMP (IEC 61970) the requested changes are included in the appropriate profile. Otherwise, the TC57 Taskforce 16 triggers a discussion for a joined approval.

Ad. 3 Need from the grid part of CIM (IEC 61968)

Maintenance requests for the support profile are handled in the UCA Taskforce 13. when the scope is limited to changes in the ESMP (IEC 61968) the requested changes are Included in the appropriate profile. Otherwise the TC57 Taskforce 16 triggers a discussion for a joined approval.

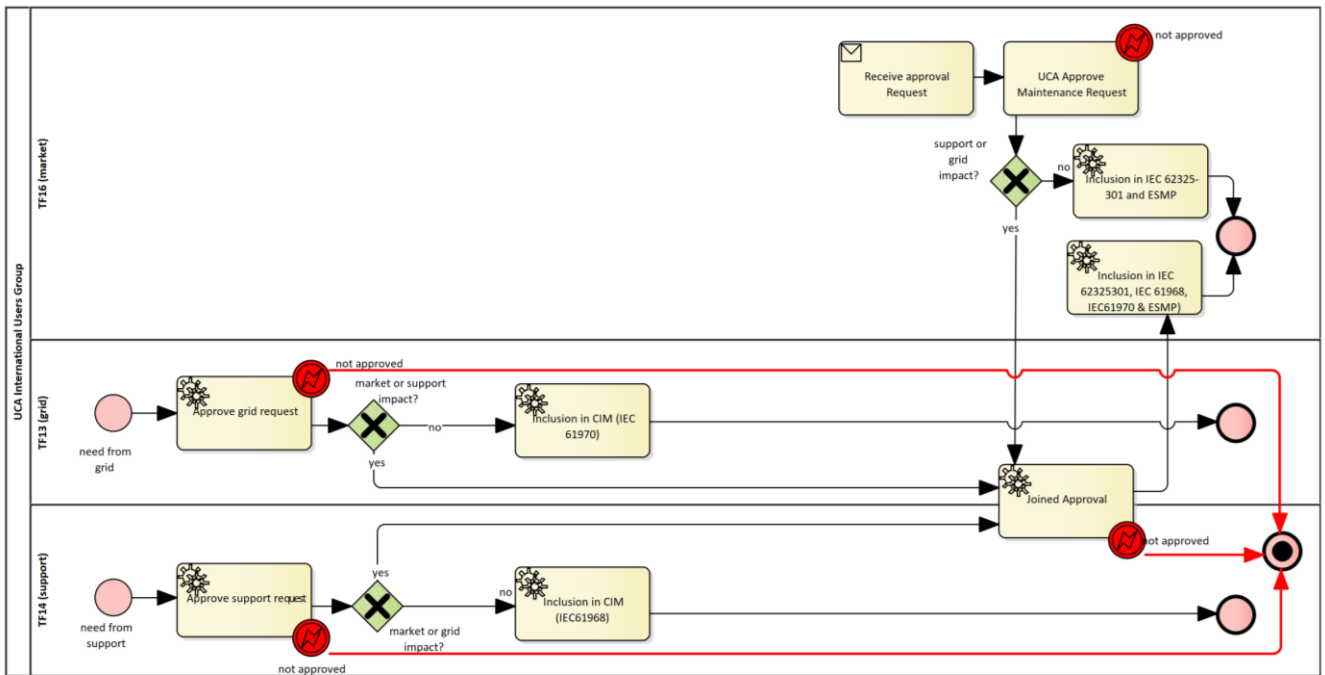


Figure 25: Maintenance Request – UCA.

Once every 3rd or 4th year a new edition of the standard is implemented by the IEC CIM TC57 working group. They decide which part of all approved maintenance request will make it into the official standard.

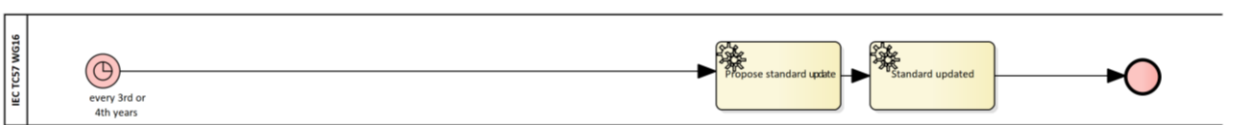


Figure 26: CIM Maintenance Request procedure overview.

3.2 Project EDDIE way of working concerning IEC CIM changes.

To decouple EDDIE data needs from the CIM standard developments, the following approach is adopted:

1. ENTSO-E is contacted to discuss the hosting of the EDDIE data needs in a future version.
2. A CIM compliant message is generated from the existing CIM library using the official CIM generation tool (CIMeXtractor).
3. A copy made of the above message, with the addition of missing entities or enhanced datatypes/enumerations.
4. A version of the message is created which does not link to the existing central ENTSO-E code lists, but instead refers to a localized version with the needed additions. This results in a *CIM-compatible message*.
5. A Maintenance Request is issued to ENTSO-E to incorporate the missing data needs in the official CIM standard.

When the data needs are part of a new releases CIM standard, step two is repeated and will produce a *fully compliant CIM message*.

4 Synchronising with tasks T2.2–T2.4

4.1 Synchronising with T2.2

This Documentation describes all topics currently available in the context of the European Distributed Data Infrastructure for Energy (EDDIE). It also describes the used schema in JSON format and their data types. As of the 20th of February 2024, there are 5 different kinds of topics available in EDDIE:

- consent-market-document
- consumption-records
- raw-data-on-proprietary-format
- status-messages
- validated-historical-data
- terminations

Each topic serves a different role and can be either an inbound or outbound topic.

4.1.1 Consent Market Document

The consent-market-document topic serves documents in the Consent Market Document format. These messages are CIM compliant and represent the latest status of a permission request.

Each consent market document has a Market Resource ID (mRID), which is the internal ID EDDIE uses to identify a single permission request. The current revision number is 0.82. The type is always Z04, which identifies it as a permission administrator document. The `createdDateTime` is the time the document was created, and the description contains the Data Need ID.

The sender role type is A20, which identifies a party connected to the grid and the receiver is A50, the permission administrator. The reason for that is that the eligible party(A20) sends permission requests to the permission administrator. This process produces the consent market documents.

The process type is to request access to metered data(A55) since we are only requesting metered data so far.

The first nested object is the sender market participant mRID, which consists of a coding scheme and a value. The value is an identifier, which identifies the eligible party in the country of the permission administrator. The coding scheme is the permission administrator's country.

The receiver market participant mRID consists of the coding scheme which is just the country code of the permission administrator and the permission administrator's ID.

The permission object in the consent market document represents the actual permission and its status within the permission administrator's process, which is a component of the reference model. The permission mRID is a unique identifier for a permission request and stays the same over the course of a permission process. The `createdDateTime` is the timestamp when the permission was initially created.

The next attribute is the `transmissionSchedule`, which is only relevant for future metered data, it contains when and how the metered data is available.

The `marketEvaluationPoint` mRID has a coding scheme, which is again the country code of the permission administrator and a value. The value is mapped to the connection ID. The connection ID is given by the eligible party to a permission request. The `Reason` object can be omitted since it is used only for revocation purposes.

The revocation messages, which are based on consent market documents, will be explained further down.

The `MktActivityRecord` contains a unique GUID, a timestamp called `createdDateTime` and a description, which can be chosen freely depending on the implementation of the region connectors. The `type` attribute contains the region connector ID, which identifies a region connector in EDDIE. The `status` attribute contains the status of the permission request. Possible values for the status can be seen in the following image.

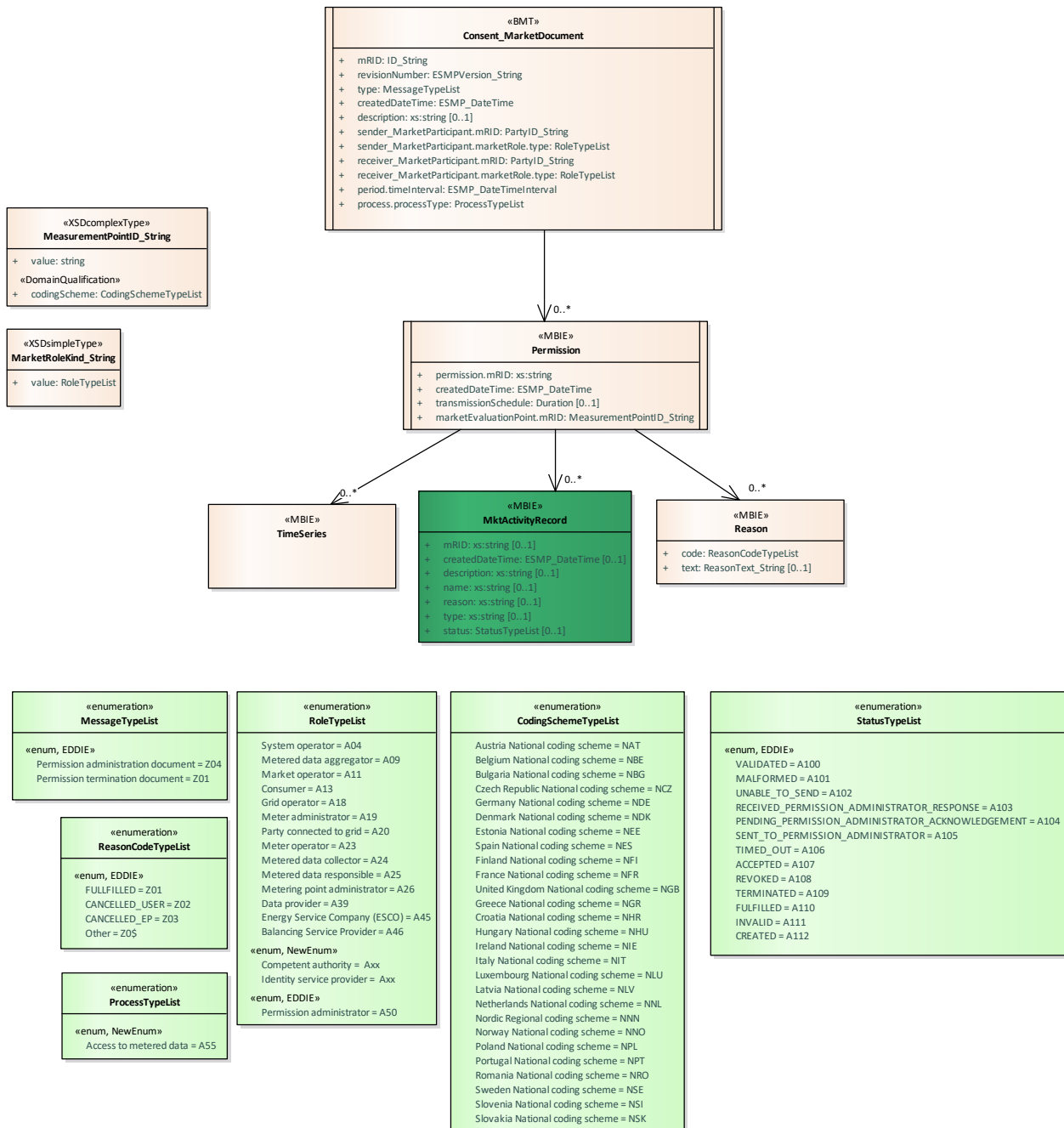


Figure 27: EDDIE Consent Market document.

4.1.2 Consumption Records

The consumption-records Kafka topic contains messages in an internal format for EDDIE. These messages are solely used for trouble shooting, as they do not contain as many information as the CIM compliant validated-historical-data-format.

The messages served in that topic are in JSON and contain the permissionID, connectionID, meteringPoint, dataNeedId, startDateTime, meteringInterval, and an array of consumption points.

Each consumption point has a meteringType to differentiate between measured values and extrapolated values. Furthermore, and a value, which is the meterreading.

The ConsumptionRecord message type is very lean but cannot distinguish between power and energy and is also missing an end date. For these reasons is the consumption record deprecated.

4.1.3 raw-data-on- proprietary -format

This Kafka topic is only used for debugging proposes and contains all metering data in the same format as provided by each countries metered data administrator. This topic can contain several different formats since the metered data formats differ between countries.

4.1.4 status-messages

The status-messages Kafka topic contains roughly the same information as the consent-market-document topic, but in an EDDIE internal format. This topic is primarily used for debugging purposes, since the consent market document contains a lot of data not needed for trouble shooting.

It contains a connectionId, permissionId, dataNeedId, timestamp, status, a custom message, which can be freely chosen, and data source information.

The data source information contains the country code, metered data administrator, permission administrator and the region connector ID.

4.1.5 terminations

The terminations Kafka topic is a topic an eligible party can use to terminate permission requests after they have been accepted. The eligible party must send CIM compliant messages to terminate a permission request. The message is a consent market document, with a mRID, which identifies the permission request, the type of the document should be Z01(Permission termination document), the MktActivityRecord type should contain the region connector ID, so the permission can be terminated with the correct permission administrator, and the Reason object has to be set to Z03(cancelled_by_ep).

If the type and reason are not correctly set the region connector will not terminate the permission request. If the region connector does not own a permission request with the same mRID, it cannot terminate the permission. If the MktActivityRecord type does not contain a valid region connector ID, the permission request will not be cancelled.

4.2 Synchronising with T2.3

EDDIE utilizes multiple Kafka topics to provide data and status messages to the eligible party. The contents of these topics have already been described in the previous section.

As the CIM mapping was gradually developed over the course of development, in the beginning, the Kafka topics *status-message* and *consumption-records* have been created to get started with the Kafka communication without being blocked by the CIM mapping. As these custom formats do not contain as much information as the CIM compliant topics, the corresponding Kafka topics will be removed in the future, to encourage to EP to use the CIM compliant formats.

Although there is a dedicated *region-connector* per region, there is only one termination topic. This provides the EP with a central point where they can send termination requests, and EDDIE will take care of forwarding the termination request to the concerned region connector.

To provide better performance, the region connectors forward the data they receive from the respective MDA directly to EDDIE instead of writing it to a dedicated region connector Kafka topic, to which EDDIE would have to subscribe.

There are no separate topics per EP service, but rather one to which all e.g. status messages are published. Each CIM message contains the necessary information that the eligible party can associate the message with a certain service.

As the CIM mapping for the near real-time data from AIIIDA instances is not finalized yet, it has not been decided yet, whether these messages will be published to a dedicated Kafka topic, or if they will also be sent to the *validated-historical-data* topic.

4.3 Framework Deployment & Documentation

4.3.1 Introduction

This section covers the specific components of task 2.4 (“Scripted deployment configurations and EDDIE Framework documentation”) from WP2 as defined in the EDDIE grant agreement [17]. Specifically, this task involves setting up automated systems for continuous integration, delivery, and deployment of the EDDIE framework’s specific components. This includes managing versions of the source code, establishing guidelines for maintaining thorough documentation of the source code and its interfaces and creating automated pipelines. These pipelines will handle testing, integrating, and delivering the framework in a containerized setup. Notably, the task is scheduled for a timespan from M7 to M30 meaning

that at the time of this deliverable, the task is still ongoing. In the following the respective tools and practices are explained that are established within the development stream of project EDDIE.

Continuous Integration (CI) and Continuous Delivery (CD) are essential practices in the modern software development lifecycle, aimed at improving software quality and accelerating the delivery process. These methodologies involve a series of practices and tools that help software teams to automate the building, testing, and deployment of applications. The integration of tools such as Git, GitHub, Pull Requests, SonarCloud, and Docker into these practices plays a crucial role in enhancing these processes.

4.3.2 Continuous Integration & Delivery

Continuous Integration is a development practice where developers integrate code into a shared repository frequently, preferably several times a day. Each integration is then verified by an automated build and automated tests. The main aim of CI is to provide quick feedback so that if a defect is introduced into the code base, it can be identified and corrected as soon as possible.

Git is a distributed version control system that is integral to supporting the CI process. It allows multiple developers to work on the same project without interfering with each other's developments. Developers commit their changes to local branches, which are then integrated into a shared branch (like main or master) in a central repository.

Pull Requests (PRs) are also a crucial part of the CI process. A PR is a method used by developers to notify team members that they have completed a feature or fixed a bug. This is done by "requesting" to merge their branch into the master branch. Before this merge occurs, automated build and test processes can run, and other developers can review the code and provide feedback, ensuring that only quality code is integrated into the main branch. In the following figure a part of an exemplary PR in EDDIE is shown:

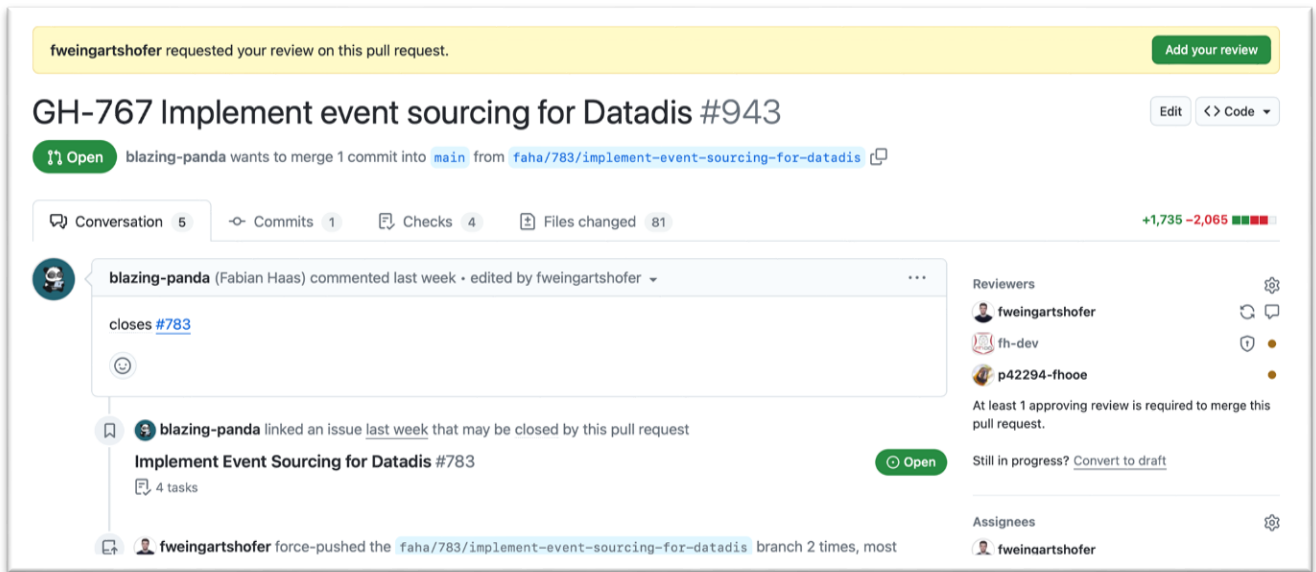


Figure 28: Exemplary Pull Request in the GitHub Repository.

Additionally, our system for internal communication – Slack – connects seamlessly to GitHub and displays active PRs as shown in the following image:

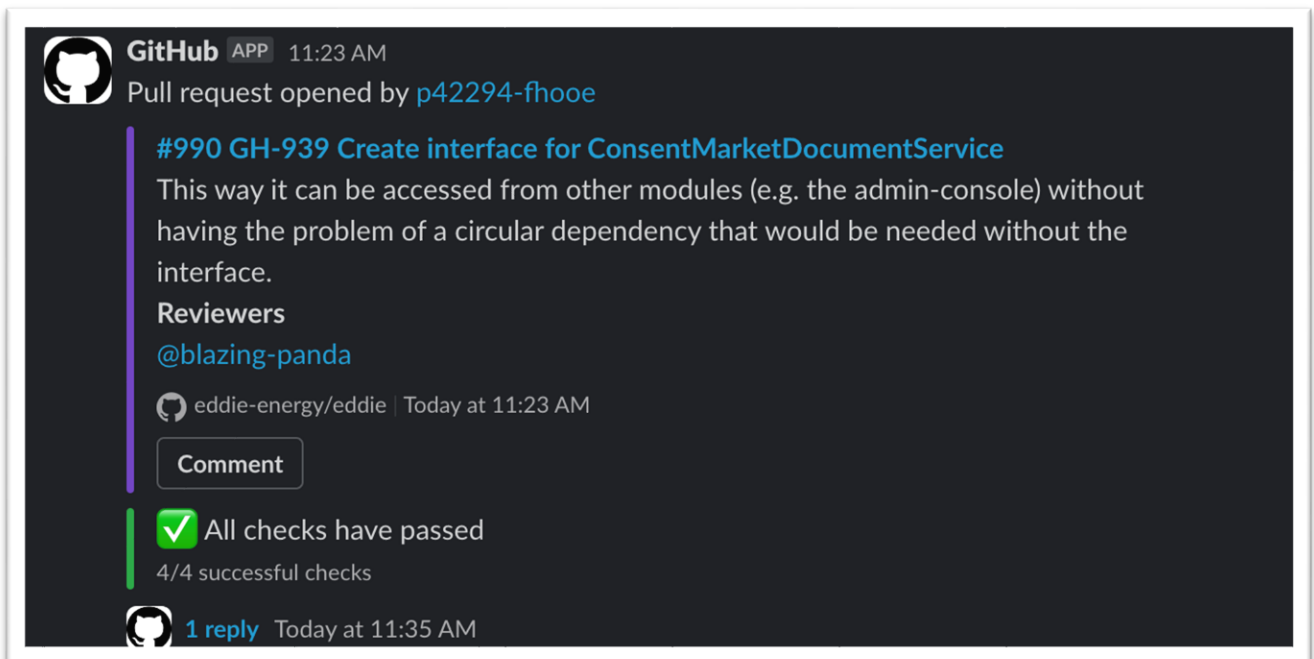


Figure 29: Integration of PR-information into Slack.

Continuous Delivery extends CI by ensuring that, in addition to automated testing, all code changes can be deployed to a production-like environment successfully. The deployment process itself is also automated, allowing for the application to be released with just a few clicks when needed.

4.3.3 Established CI/CD Tools and Practices in Project EDDIE

SonarCloud plays a significant role in both CI and CD. It is a cloud-based service that provides code quality and security analysis. When integrated into the CI/CD process, SonarCloud automatically performs detailed code quality checks and security scans on each commit to a repository or on each pull request. This helps ensure that the codebase remains high-quality and secure over time. Issues detected by SonarCloud can range from code smells and security vulnerabilities to bugs that could potentially break the application in production.

In the following screenshot an example of a SonarCloud analysis for the EDDIE framework is shown:

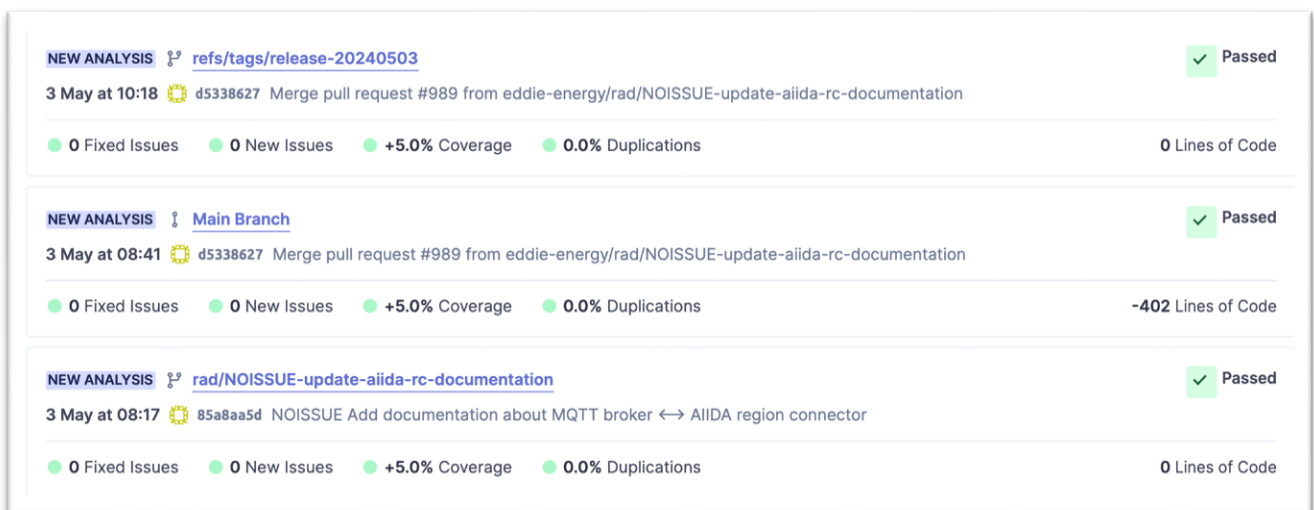


Figure 30: Exemplary SonarCloud analysis runs of the EDDIE Framework.

Docker is a platform that enables developers to package an application with all of its dependencies into a standardized unit for software development, called a container. In the context of CI/CD, Docker provides several benefits:

- Consistency across environments: Docker containers ensure that the software runs the same way in every environment, from a local development machine to the production server.
- Rapid Deployment: Docker containers can be spun up in seconds, which is ideal for a CI/CD pipeline that requires multiple deployments.
- Isolation: Docker ensures that applications are isolated in their containers, which improves security and reduces conflicts between different software running on the same infrastructure.

In the following image, a screenshot is shown from the latest Docker-build of the EDDIE framework. This image is automatically generated after a sprint according to a new release.

The screenshot displays the Docker Hub interface for the 'eddie' container image. At the top, it shows the 'eddie' repository name and a 'Private' status. Below this, there is a section for installing from the command line, providing the command: `$ docker pull ghcr.io/eddie-energy/eddie:latest`. The main section lists 'Recent tagged image versions' with four entries: 'latest' (published about 2 hours ago), 'release-20240503' (published about 5 hours ago), 'release-20240412' (published 21 days ago), and 'innonet' (published 23 days ago). Each entry includes a download icon and a count (1 or 2). The right sidebar contains 'Details' for the 'eddie-energy' repository, including the image name 'eddie', the license 'GNU General Public License v2.0', and statistics: 'Last published 2 hours ago', 'Issues 163', and 'Total downloads 129'. A 'Collaborators' section lists five users: blazing-panda (Fabian Haas), p42294-fhooe (Rainer Danner), fweingartshofer (Florian Weingartshofer), re1 (Markus), and h-carl (Henner Carl).

Figure 31: Information regarding a released Docker container.

GitHub Actions is an automation tool that enables you to build, test, and deploy your code right from your GitHub repository. It can be configured to run workflows based on a variety of events within GitHub, such as pushing to a branch, creating a pull request, or tagging a release. GitHub Actions uses YAML syntax to define the workflow configuration.

In EDDIE, different GitHub action workflows are used, e.g. for checking commit messages, building Docker containers, testing, etc. In the following screenshot, the GitHub action workflows are shown with some exemplary runs:

The screenshot displays the GitHub Actions interface for the 'Build Containers' workflow. On the left, a sidebar lists various actions under 'Build Containers', including 'Check commit messages format', 'Commit Message Check', 'Gradle Build and Test', 'Gradle Build, Test, and Analyze', and 'Run playwright E2E tests'. The main area shows the workflow details for 'Build Containers' (build-containers.yml). It indicates that the workflow has a 'workflow_dispatch' event trigger and shows a 'Run workflow' button. Below this, a table lists recent workflow runs:

Run ID	Event	Status	Branch	Actor	Time
Build Containers #236	Merge pull request #990 from eddie-energy/rad/939-create...	Success	main	p42294-fhoee	2 hours ago (1m 38s)
Build Containers #235	Merge pull request #989 from eddie-energy/rad/NOISSUE-u...	Success	main	p42294-fhoee	5 hours ago (5m 29s)
Build Containers #234	Merge pull request #988 from eddie-energy/rad/972-endpoi...	Success	main	p42294-fhoee	6 hours ago (1m 35s)

Figure 32: Overview of GitHub Action workflows.

4.3.4 Integrating Tools in CI/CD Pipeline

Incorporating these tools into a CI/CD pipeline typically follows these steps:

1. Code Commit: Developers commit code to their Git branches and create pull requests.
2. Automated Build and Test: When a PR is opened or updated, an automated process builds the software and runs predefined tests using GitHub Actions.
3. Code Analysis with SonarCloud: Post-build, the code is analyzed using SonarCloud for any code quality issues or security vulnerabilities.
4. Dockerisation: If the build and code analysis are successful, the application is packaged into a Docker container that can be further deployed.

The use of these tools and practices helps to ensure that software delivery is as efficient, reliable, and error-free as possible. They enable the EDDIE development team to maintain a high pace of development while still ensuring that the software being produced is of high quality and ready for production at any time.

4.3.5 EDDIE Framework operation manual

In the following the entire EDDIE Framework operational manual is described. This manual is kept in GitHub and is available to all developers. Since it is intended to make the framework open source, this description will be made available to all interested users/collaborators/stakeholders. The operational manual is updated during development regularly to fully meet the new features and developments. The listed manual is the version from May 2024.

Quickstart

A quickstart configuration to run the EDDIE Framework is provided in the env folder of the development project. The steps to make it run are:

1. Download the quickstart configuration folder from EDDIE /env
2. Run `docker compose up -d` in that folder.
3. Open browser on <http://127.0.0.1:9000/prototype/main/> and experiment with the provided sample application.
4. As many permission administrators and metered data administrators require additional installation or registration steps, it's best to try out the framework functionality using the permission administrator called simulation.

Installation

A sample container configuration in `docker-compose.yml`:

```
version: "3.9"
services:
  eddie:
    image: ghcr.io/eddie-energy/eddie:latest
    environment:
      JDBC_URL: "jdbc:postgresql://localhost:5432/example_app"
      JDBC_USER: "test"
      JDBC_PASSWORD: "test"
      PUBLIC_CONTEXT_PATH: "" # default value
      EDDIE_DATA_NEEDS_CONFIG_FILE: "./config/data-needs.json" # default value
    volumes:
      - ./ponton:/ponton
      - ./data-needs.json:/opt/eddie/config/data-needs.json
```

Variable	Description
EDDIE_DATA_NEEDS_CONFIG_FILE	File containing data needs definitions.

As the configuration of region connectors is quite complex and there are many properties, the environment is configured in the accompanying `.env` file (see EDDIE /env directory for a reference). The example `.env` file contains all configuration options.

Using the EDDIE Button in an application

To use the *EDDIE Button* in an eligible party application, the EP application has to include the button in its HTML page. It can be integrated into a frontend-based application (e.g. a single-page application) or into a server rendered web application as it's implemented using standard HTML custom elements.

```
<script type="module" src="${eddieUrl}/lib/eddie-components.js"></script>
<!-- ... -->
<eddie-connect-button
  connection-id="1"
  data-need-id="9bd0668f-cc19-40a8-99db-dc2cb2802b17"
></eddie-connect-button>
```

`${eddieUrl}` is to be replaced with the public base URL of your EDDIE instance.

The `eddie-connect-button` element can be configured using the following attributes described in Table 5:

Attribute	Type	Description	Required
<code>connection-id</code>	String	The connection id is generated by the EP application <i>integrating</i> EDDIE and is used to identify generated requests.	Yes
<code>data-need-id</code>	String	ID of a pre-configured data need. Required if <code>allow-data-need-selection</code> is not true.	Yes
<code>allow-data-need-selection</code>	Boolean	If true, the user can select a pre-configured data need. This feature is intended for development purposes only.	No
<code>permission-administrator</code>	String	Sets a fixed permission administrator to use by its id.	No
<code>accounting-point-id</code>	String	Sets a fixed accounting point id for permission administrators supporting this feature.	No

remember-permission-administrator	Boolean	If true, the most recent permission administrator is stored and loaded from local storage	No
--	---------	---	----

Table 5: Attributes of the EDDIE button element.

The **connectionId** has to be generated by the EP application. It's included in the messages sent by EDDIE so that button instance can match with the data stream that is created using it. The EP application is also responsible for storing previous connection IDs and linking them to the users of the EP application. Each connection id must be used only once to create a uniquely identifiable connection with EDDIE.

Configuration

It is recommended to configure EDDIE core and the region connectors via the **.env** file in combination with the **docker-compose.yml** file.

Configuring EDDIE Core

EDDIE Core can be configured by the following environment variables (see Table 6). You can also modify the **application.properties** file directly, but the recommendation is to use the **.env** which accompanies the **docker-compose.yml** file.

Parameter	Description
CORE_PORT	Port on which the server should listen. 8080 by default.
JDBC_URL	JDB URL to PostgreSQL database where EDDIE will store permission requests and data needs.
JDBC_USER	Username to authenticate with the PostgreSQL server.
JDBC_PASSWORD	Password to authenticate with the PostgreSQL server.
EDDIE_CORS_ALLOWED_ORIGINS	Pattern for allowed CORS origins. See SpringDoc for more details. If not specified, no CORS requests will be allowed.
EDDIE_JWT_HMAC_SECRET	Secret used to sign JWTs issued by EDDIE. Supply 32 random (!) bytes encoded as Base64 string.

EDDIE_PUBLIC_URL	Public URL where external clients can reach EDDIE core.
KAFKA_ENABLED	Set to true to enable publishing of status & data messages to the specified Kafka cluster.
KAFKA_BOOTSTRAP_SERVERS	Comma separated list of Kafka server IPs/hostnames.
EDDIE_RAW_DATA_OUTPUT_ENABLED	If set to true, supporting region connectors will publish the raw message as they receive it from the MDA to a dedicated Kafka topic.
MANAGEMENT_SERVER_PORT	Port for the management api (only available if EDDIE_DATA_NEEDS_CONFIG_DATA_NEED_SOURCE=DATABASE).
MANAGEMENT_SERVER_URLPREFIX	Url prefix for the management api (must not be used for other purposes).
EDDIE_DATA_NEEDS_CONFIG_DATA_NEED_SOURCE	Source where to read data needs from. Either config or database.
EDDIE_DATA_NEEDS_CONFIG_FILE	File containing data needs definitions.
REGION_CONNECTOR__ENABLED	true to enable the specific region connector. By default, only region connectors requiring no explicit configuration are enabled. Ensure that you set any other required configuration for the region connector as otherwise EDDIE may fail to start.

Table 6: Environment variables for EDDIE Core configuration.

Configuring region connectors

To retrieve data from various regions and countries, it is crucial to correctly set up the relevant region connectors.

For each region connector, specific configurations and prerequisites are necessary for operation. Details for these setups are provided in the README file of the individual region connector. You can locate these files under `region-connectors/region-connector-<country-code>-<permission-administrator>/README.md`.

Business domain related configuration

Common Information Model (CIM)

For the mapping of region-specific data to the common information model (CIM) the following configuration parameters need to be set (see Table 7):

Parameter	Type	Description
<code>cim.eligible-party.national-coding-scheme</code>	A valid CodingSchemeTypeList value	Most of the time just 'N' + your country code e.g NAT if you are located in Austria

Table 7: Configuration parameters for CIM.

E.g. eligible party in Austria:

```
cim.eligible-party.national-coding-scheme=NAT
```

Data need configuration

A data need describes a configuration for the *Connect Button*. By using that button, the type of data and time frame is predefined so that the EP application receives data that it actually needs to perform its job.

Data needs can be configured in two ways (see Table 8): via a JSON file that is read on startup, they can be created via a REST-ful API which stores the data needs in the core's database.

Parameter	Type	Description
<code>eddie.data-needs-config.data-need-source</code>	CONFIG / DATABASE	Specifies the location where data needs are read from.

Table 8: Configuration of data needs.

If this is set to **CONFIG**, the property **EDDIE_DATA_NEEDS_CONFIG_FILE** needs to be set, otherwise the file is ignored. It is not possible to combine **CONFIG** and **DATABASE** modes.

Data needs in config mode

While the REST-API ignores the ID field for creation requests, when supplying data needs via the JSON file, the ID is a mandatory field.

```
{
  "type": "validated",
  "id": "9bd0668f-cc19-40a8-99db-dc2cb2802b17",
  "name": "LAST_3_MONTHS_ONE_MEASUREMENT_PER_DAY",
  "description": "Historical validated consumption data for the last three months, one measurement per day",
  "purpose": "Some purpose",
  "policyLink": "https://example.com/toc",
  "duration": {
    "type": "relativeDuration",
    "start": "-P3M",
    "end": "P0D"
  },
  "energyType": "ELECTRICITY",
  "minGranularity": "P1D",
  "maxGranularity": "P1D"
}
```

All data needs have these common fields (see Table 9):

Attribute	Type	Description
type	String	Type of the data need, e.g. validated for historical validated consumption data. Please check the OpenAPI documentation for all supported values.
id	String	Unique id that can be used to reference this data need.
name	String	Short memorable name of the data need that may be presented to the customer.
description	String	Multiline string that describes this data need in a human readable form to be shown in the UI. May be formatted using Markdown.
purpose	String	Multiline string that describes the purpose of this data need. May be formatted using Markdown.
policyLink	URL	URL to the data policy that applies to this data need.

Table 9: Common fields of data needs.

Depending on the **type**, a data need may require more fields, e.g. for validated historical consumption data (see Table 10):

Attribute	Type	Description
duration	Object	Describes the timeframe for this data need.
energyType	String	Type of energy to be requested. See OpenAPI documentation for all possible values.
minGranularity	String	Desired granularity of the data that should be requested.
maxGranularity	String	Maximum accepted granularity. Not all MDAs supply the data in the same granularity, if your application can handle multiple granularities, set this to a higher value than minGranularity and the region connectors will automatically retry to fetch the data in a higher granularity if the data is not available in minGranularity .

Table 10: Additional fields for data needs, on the example of Validated Historical Consumption Data.

A data need is mandatory for each Connect with *EDDIE Button*.

Please see the OpenAPI documentation (default: <http://localhost:8080/data-needs/swagger-ui/index.html>) for further details about all possible data need types and their respective fields. Please note that while the REST-ful API allows that data needs are deleted, it might not be a good idea to delete a data need in production. This is because permission requests reference the data need and deleting the data need may render the data needs useless.

External system related

Kafka Connector

All configuration values that are available for Kafka producers and consumers are supported, see <https://kafka.apache.org/28/documentation.html#producerconfigs>. To include them the prefix **kafka.** has to be used.

The following parameters are of special interest (see Table 11):

Parameter	Type	Description
kafka.bootstrap.servers	comma-separated <i>host:port</i> tuples (mandatory)	A list of host/port pairs to use for establishing the initial connection to the Kafka cluster.

kafka.enable	true/false	Enables or disables the kafka connector
kafka.termination.topic	valid kafka topic name	The topic on which the kafka connector listens for termination requests. Optional, the default is terminations .

Table 11: Parameters to configure the Kafka Connector.

E.g. if Kafka is installed locally:

```
kafka.bootstrap.servers=localhost:9094
```

Termination of Permission Requests

To terminate permission requests, a consent market document in json format has to be sent to the **kafka.termination.topic**. The key should be the ID of the region connector, from which the request originated. The consent market document for termination can look like the following JSON message. Keep in mind that some kafka clients use newlines as message separator, in that case minimize the message, or change the message separator!

```
{
  "mrid": "REPLACE_ME",
  "type": "Z01",
  "permissionList": {
    "permissions": [
      {
        "reasonList": {
          "reasons": [
            {
              "code": "Z03"
            }
          ]
        },
        "mktActivityRecordList": {
          "mktActivityRecords": [
            {
              "type": "at-eda"
            }
          ]
        }
      }
    ]
  }
}
```

The MRID should be replaced by the permission ID, the code **Z03** stands for „cancelled by eligible party“ and the type **Z01** identifies this document as a termination document. If the kafka message key is unknown, the type of the mktActivityRecord is used, which is identical to the region connector id.

4.3.6 Exemplary Release Notes

At EDDIE, the development methodology aligns with agile principles, specifically following the Scrum framework (refer to <https://www.scrum.org> for comprehensive details). As part of this process, the achievements of each sprint are systematically summarized through the creation of release notes for every new version. These release notes serve the purpose of consolidating the latest developments and providing detailed deployment instructions. Presented below are exemplary release notes from sprint 13, released on May 3rd, 2024:

Sprint 13 Latest

Changelog 03.05.2024 | Sprint No. 13

EDDIE

- PA metadata API implemented.
- Fixed a bug where a permission request HTTP request would not return until Kafka throws a time out exception.
- Fixed a bug where the OpenAPI documentation could not be fetched due to missing credentials.

EDA

- Improved handling of disconnects and use health endpoint of Ponton XP Messenger.
- Support AccountingPointMasterData.

Datadis

- Support production data.
- Fixed a bug where DST was not handled correctly.

E2E Tests

- Use sandbox for Enedis.

AIIDA

- Implemented endpoint to create and fetch MQTT credentials per permission.

- Add authentication & authorisation.
- Use same error message format as EDDIE.

The switch to MQTT as transport protocol is not yet completed fully, therefore AIIDA (in combination with EDDIE) will not properly work in this release.

Market Place

- Database connection and REST API for creating & fetching data requests.
- Start with Flutter customer app and connect to backend.

Internal changes

- Updated process model, new model can be found on the wiki, implementation is not completed yet.
- Enedis and AIIDA region connectors are using event sourcing approach.
- Create new self-hosted Github runners, improve caching, use hosted runners as fallback if self-hosted are unavailable.
- Various cleanup tasks.

Operational changes

- AIIDA region connector requires a MQTT broker. See the docker-compose file for an EMQX example, and the README for details.

New environment variables

Documented as always in OPERATION.md and the region connector READMEs.

```
REGION_CONNECTOR_AIIDA_BCRYPT_STRENGTH=  
REGION_CONNECTOR_AIIDA_MQTT_SERVER_URI=tcp://localhost:1883  
REGION_CONNECTOR_AIIDA_MQTT_USERNAME=myUser  
REGION_CONNECTOR_AIIDA_MQTT_PASSWORD=superSafe  
EDDIE_PUBLIC_URL=https://your-domain.com/any/other/path
```

Docker image

Use the tag **release-20240503**

```
docker pull ghcr.io/eddie-energy/eddie:release-20240503  
docker pull ghcr.io/eddie-energy/eddie-example-app:release-20240503  
docker pull ghcr.io/eddie-energy/aiida:release-20240503
```

References

- [1] "DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL," 19 June 2019. [Online]. Available: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019L0944>. [Accessed 18 June 2024].
- [2] "Object Management Group, Inc.," [Online]. Available: <https://www.bpmn.org/>. [Accessed 18 June 2024].
- [3] European Smart Grids Task Force, Expert Group 1 – Standards and Interoperability, Working Group on Data Interoperability, *Accompanying Report to the EGI advice on the implementing acts on data access and interoperability – metering and consumption data*, 2022.
- [4] Expert Group 1 - Smart grids standards & Interoperability, "Reports," [Online]. Available: https://circabc.europa.eu/ui/group/f5b849d3-26ae-4cba-b9f9-6bc6688c5f58/library/dbe55e69-25e7-43df-9bc3-0132d80118d7?p=1&n=10&sort=modified_DESC. [Accessed 18 June 2024].
- [5] EU DSO Entity , "Call for members of the stakeholders' panels for the Task Forces of the Joint Working Group on Data Interoperability," 23 October 2018. [Online]. Available: https://eudsoentity.eu/nl_BE/blog/news-6/call-for-members-of-the-stakeholders-panels-for-the-task-forces-of-the-joint-working-group-on-data-interoperability-58. [Accessed 18 June 2024].
- [6] DHK/JLI, "CUSTOMER AND THIRD PARTY API FOR DATAHUB (ELOVERBLIK) – DATA DESCRIPTION," 6 January 2023. [Online]. Available: https://energinet.dk/media/bxjaubil/customer-and-third-party-api-for-datahub-eloverblik-data-description_updated_20231031.pdf. [Accessed 18 June 2024].
- [7] "IEC 62325-451-10," November 2020. [Online]. Available: https://webstore.iec.ch/preview/info_iec62325-451-10%7Bed1.0%7Db.pdf. [Accessed 18 June 2024].
- [8] "IEC 62325-351," June 2016. [Online]. Available: https://webstore.iec.ch/preview/info_iec62325-351%7Bed2.0%7Db.pdf. [Accessed 18 June 2024].
- [9] ENTSOE, "Electronic Data Interchange (EDI) Library," ENTSOE, 21 December 2023. [Online]. Available: <https://www.entsoe.eu/publications/electronic-data-interchange-edi-library/>. [Accessed 18 June 2024].
- [10] "Edig@s The European message format for the gas market," [Online]. Available: <https://www.edigas.org/>. [Accessed 18 June 2024].
- [11] "EASEE-gas Streamlining the gas business," [Online]. Available: <https://easee-gas.eu/>. [Accessed 18 June 2024].
- [12] "UN/CEFACT Modelling Methodology (UMM)," [Online]. Available: <https://unece.org/trade/uncefact/umm>. [Accessed 18 June 2024].
- [13] ebix® Forum, "Business Requirements for Alignment of area characteristics," August 2023. [Online]. Available: <https://mwgstorage1.blob.core.windows.net/public/Ebix/ebix%20BRS%20for%20Alignment%20of%20area%20characteristics%20-%20v2r0B%2020230815.pdf>. [Accessed 18 June 2024].
- [14] ENTSOE, "Common Information Model (CIM) for Energy Markets," [Online]. Available: <https://www.entsoe.eu/digital/common-information-model/cim-for-energy-markets/>. [Accessed 18 June 2024].
- [15] Österreichs Energie Fachverband Gas Wärme, "Dokumentation Masterdata 01.32," 2 April 2024. [Online]. Available: https://www.ebutilities.at/documents/2024/05/Masterdata_01p32_Schemadoku.pdf. [Accessed 18 June 2024].
- [16] ENTSOE, "Common Information Model," [Online]. Available: <https://www.entsoe.eu/digital/common-information-model/>. [Accessed 18 June 2024].
- [17] EDDIE, "EDDIE Grant Agreement," 2022.
- [18] "https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/report/data-management-plan_he_en.docx," 05 05 2021. [Online]. [Accessed 06 04 2023].
- [19] UK Data Service, "Consent for data sharing," [Online]. Available: <https://ukdataservice.ac.uk/ukdamodelconsent/>. [Accessed 26 April 2023].
- [20] W. K. Michener, "Ten simple rules for creating a good data management plan," *PLoS computational biology*, 2015.
- [21] ENTSOE, "Common Information Model," [Online]. Available: <https://www.entsoe.eu/digital/common-information-model/#common-information-model-cim-for-grid-models-exchange>. [Accessed 08 May 2023].
- [22] ENTSOE, [Online]. Available: https://www.entsoe.eu/fileadmin/user_upload/_library/resources/CIM/Profiles/Profile1_v14.zip. [Accessed 08 May 2023].
- [23] *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Da.*



- [24] EDDIE, "EDDIE – European Distributed Data Infrastructure for Energy," [Online]. Available: <https://zenodo.org/communities/eddie/about/>.
- [25] EDDIE, *Consortium Agreement*, version 2.2 ed., 2022.
- [26] ONENET, "Report on Extended Data, Platform and Service D5.6," [Online]. Available: https://onenet-project.eu/wp-content/uploads/2022/12/OneNet_D5.6_v1.0.pdf.



Annex – 1 Overview CIM Maintenance Process

