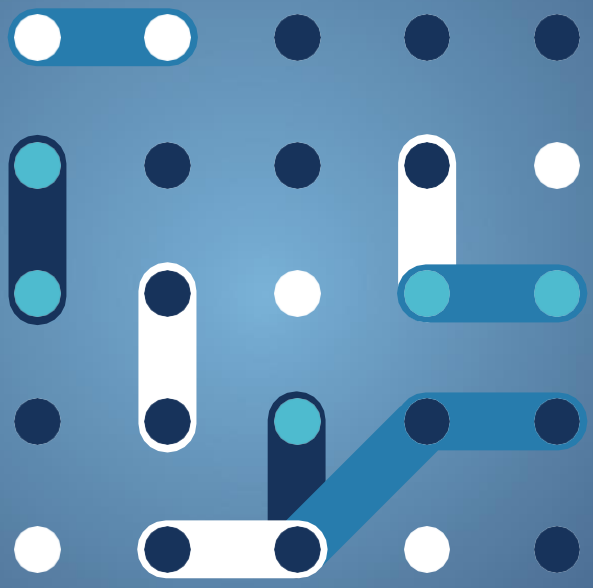
European Commission

bridge

Contribution from BRIDGE projects to Standardisation

Data Management Working Group



May - 2022

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Executive Summary

After analysing Standard Development Organisations, Standardisation topics, this report propose a list of topics, findings and recommendations associated to the potential creation of a BRIDGE Standardisation User Group. This report has identified the following 4 main topics, and for each topic proposed findings and associated recommendations.

- Internal coordination
- External coordination
- Standardisation topics
- Standardisation topics management

It is proposed to create a BRIDGE standardisation user-group, with the following objectives:

- **Establish internal coordination** with BRIDGE Regulation working group and other BRIDGE Data Management actions (Use cases, Reference Architecture, Interoperability of flexibility assets).
- **Establish external coordination** with existing CEN/CLC/ETSI Coordination Group for Smart Grids (CG-SG), and also ENTSO-E CIM Expert Group
- **Educate** projects on CEN/CLC/ETSI and IEC relevant standards
  - BRIDGE towards CEN/CLC/ETSI CG-SG coordination will:
    - Provide feedback on existing standards
    - Raise identified gaps
  - CEN/CLC/ETSI CG-SG towards BRIDGE coordination will:
    - Provide access to draft standards / on-going work
- **Disseminate internally/externally lessons learned on standard implementation** from BRIDGE participating projects
- **Contribute** to ICT standardisation roadmap
- **Establish** a cockpit and a list of resources to manage and support the above objectives
- **Establish after 2022** external coordination with ETIP-SNET WG4 “Digitalisation of the electricity system and customer application”, PANTERA[1], JRC SG-DoIT, DERLab, and other relevant associations (to be discussed with each organisation)
- **Educate after 2022** on some de-facto standards, ontologies

BRIDGE Standardisation User group will also contribute to **Digitalisation of energy Action Plan**[2] (DoEAP) specifically on:

- Enhancing the uptake of digital technologies as some standards will become more and more digital components

[1] Home - PANTERA (pantera-platform.eu)
[2] Digitalising the energy sector – EU action plan (europa.eu)

- Enhancing the cybersecurity of the energy sector as many standards supporting cyber-security are developed
- Developing a European data-sharing infrastructure as data exchange platforms, energy data spaces will support Energy vector integration and cross sector integration.

As a next step, CEN/CLC/ETSI CG-SG is inviting BRIDGE Data Management to its next working group meeting on March 29th. BRIDGE User group proposal and “liaison” with CEN/CLC/ETSI CG-SG will be discussed.

1 Introduction

The Data Management Working Group aims to cover a wide range of aspects ranging from the technical means for exchanging and processing data between interested stakeholders to the definition of rules for exchange, including security issues and responsibility distribution in data handling. Accordingly, the WG has identified 3 areas of collaboration around which mutual exchange of views and discussions have been set:

1. **Communication Infrastructure**, embracing the technical and non-technical aspects of the communication infrastructure needed to exchange data and the related requirements
2. **Cybersecurity and Data Privacy**, entailing data integrity, customer privacy and protection and general security of energy systems
3. **Data Handling**, including the framework for data exchange and related roles / responsibilities, together with the technical issues supporting the exchange of data in a secure and interoperable manner, and the data analytics techniques for data processing

This report fits into the 3nd area "Data Handling" and is covering the topic of "Contribution to Standardisation".

This topic of "Contribution to Standardisation" has been discussed and its scope defined during the BRIDGE General Assembly held on March 11th and 12th 2021 in Brussels.

Following this first release and the BRIDGE General Assembly held in March 2021 online, a consultation phase has been launched to collect feedback from the projects on their contribution to standardisation. The first results and recommendations were presented in October 13th 2021 and January 28th 2022 during the Bridge Data Management Working Group on-line meetings. This report includes the final recommendations.

1.1 Introduction

The Data Management Working Group (WG) aims to cover a wide range of aspects ranging from the technical means for exchanging and processing data between interested stakeholders to the definition of rules for exchange, including security issues and responsibility distribution in data handling. Accordingly, the WG has identified 3 areas of collaboration around which mutual exchange of views and discussions have been set:

- **Communication Infrastructure**, embracing the technical and non-technical aspects of the communication infrastructure needed to exchange data and the related requirements;
- **Cybersecurity and Data Privacy**, entailing data integrity, customer privacy and protection;
- **Data Handling**, including the framework for data exchange and related roles and responsibilities, together with the technical issues supporting the exchange of data in a secure and interoperable manner, and the data analytics techniques for data processing.

1.2 Key objectives and bridge data management actions

Based on the conclusions of 2021 BRIDGE General Assembly, in particular parallel sessions 2.1 and 2.2 related to data management, the WG is willing to address **4 actions in 2021**:

- Extension and enhacement of the BRIDGE repository *(continuation and extension)*
- EU data exchange reference architecture *(continuation)*
- Interoperability of flexibility assets *(continuation)*
- Contribution from BRIDGE projects to standardisation *(new)*

The 4th action is detailed below.

2 Contribution from BRIDGE projects to standardisation

2.1 Description and objectives

BRIDGE builds a collective knowledge, at system level, including outcomes such as a catalogue of standards (existing solutions, identified gaps, ...), practices related to standards (feedback, recommendations, proposed extensions, ...), and possibly the feedback from the scale-up and roll-out following finished projects. This collective knowledge should contribute to European and international standardisation.

For information concerning standardisation benefits, and how it is related to Regulation and Codes, please refer to PANTERA WG3 D3.2 deliverable.

BRIDGE action #4 will contribute to standardisation:

- Based on BRIDGE collective knowledge;
- Contributions will be pushed:
  - (a) through projects partners involved in standardization;
  - (b) through a user group with official liaison with standardization committees;
- Note: Some SDOs may also provide draft standards to R&I projects for free – the purpose for SDOs is to collect implementation feedback during the early phases of the standards development process.

2.2 Workplan

1. Identify on which topics and to which standardisation bodies BRIDGE will contribute
2. Set-up a process to identify relevant contributions from projects and propose them to the selected SDOs
   a. Based on partners involved in standardisation committees
   b. Based on a user group with official liaison(s)
3. Set-up and run a BRIDGE user group to support **Action #4.(b)**

2.3 Link with other BRIDGE working groups and Data Management actions

The results from all the Data Management WG topics will be used to feed the contribution to standardisation. For instance:

_ the BRIDGE **Use Case repository**, described in **Action #1**, could interact with other Use Cases repositories like IEC one[3]. Some BRIDGE Use Case could easily feed IEC repository if repositories interoperability is based on IEC 62559-2, IEC 62559-3.

_ the Reference Architecture described in **Action #2**, will contribute to propose extension to the Harmonized Electricity Market Role Model managed by ENTSO-E, EFET, EbIX. With its proposal named **DERA 2.0**, It will also contribute to establish a reference architecture for **cross-sector integration**. Action #2 report will also contribute to IEC System Committee Smart Energy which published IEC 63200 on Smart Grid Architecture Model.

_ The Flexibility Asset developed by **Action #3**, will contribute to support future grid code on flexibility, but also on future standards supporting Flexibility Assets related business processes. This action has established generic

[3] The IEC Use Case Management Repository status is not known for now.

business processes and specified
generic interfaces. Action #3 has also produced a catalogue of standard related to Flexibility Asset.

The BRIDGE Working Group on Regulation is working on the following topics:
· As regards energy storage, the regulatory framework needs to provide clear rules and responsibilities concerning ownership, competition, technical modalities and financial conditions, for island and mainland cases
· In terms of smart grids, regulatory challenges arise regarding the incentives for demand-side response, commercial arrangements, cooperation with TSO and DSO, smart meter date, etc.

The contribution to standardisation will also take into account BRIDGE regulation working group and its associated recommendations. Our recommendation is:

Topic	BRIDGE internal Coordination
Findings	BRIDGE regulation working group, and other BRIDGE Data Management working groups related actions can contribute to Standardisation.
Recommendation	Establish a close cooperation with BRIDGE Regulation Working Group and other BRIDGE Data Management Working Group Actions in order to be consistent on standardisation issues

2.4 Standardisation overview

The following sections present relevant SDOs and some key principles.

2.4.1 SDOs overview and key methodology artefacts

The following figure illustrates main Standard Development Organizations. At the European level, CEN/CLC/ETSI CG-SG (Coordination group on Smart Grids) has been established

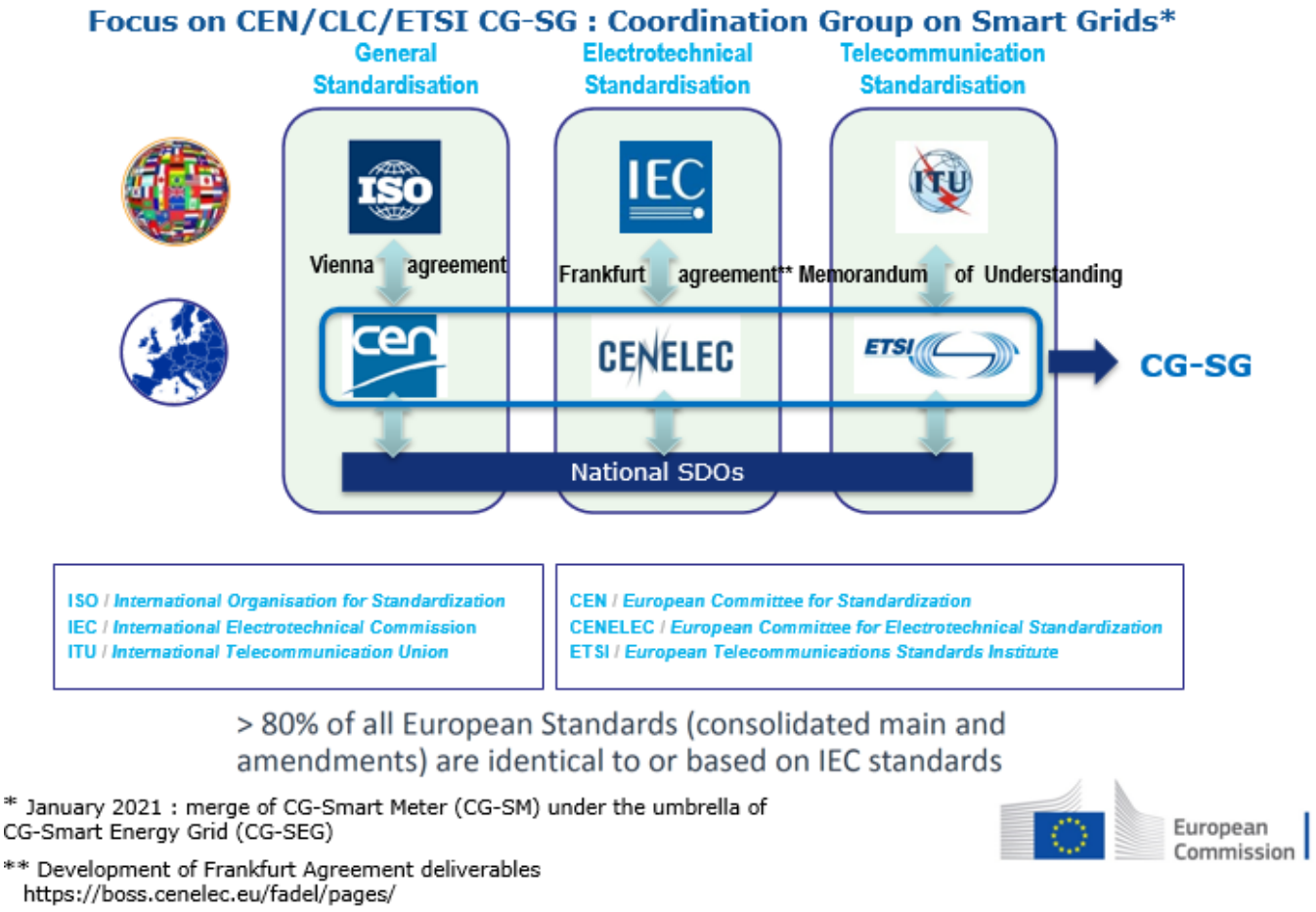

Figure 1. Standardisation Organisations

CG-SG (Coordination Group on Smart Grids) has been established in January 2021 and is the merge of previous CEN/CLC/ETSI CG-SM (Coordination group on Smart Meters) and CG-SEG (Coordination Group on Smart Energy Grid). New convenors have been appointed end of 2021, and CG-SG convenors attended BRIDGE Data Management working group meeting on October 13th, 2021. Discussions took place after the meeting and before January 26h BRIDGE Data Management working group meeting. CG-SG was invited to give a presentation at the 2022 BRIDGE General Assembly, and then BRIDGE Data Management will give a presentation related to action #4 at the CG-SG plenary meeting on March 29th.

.

Another important topic is that IEC
has officialised in 2021 its digital transformation through the creation of Strategic Group 12, as illustrated by following figure:

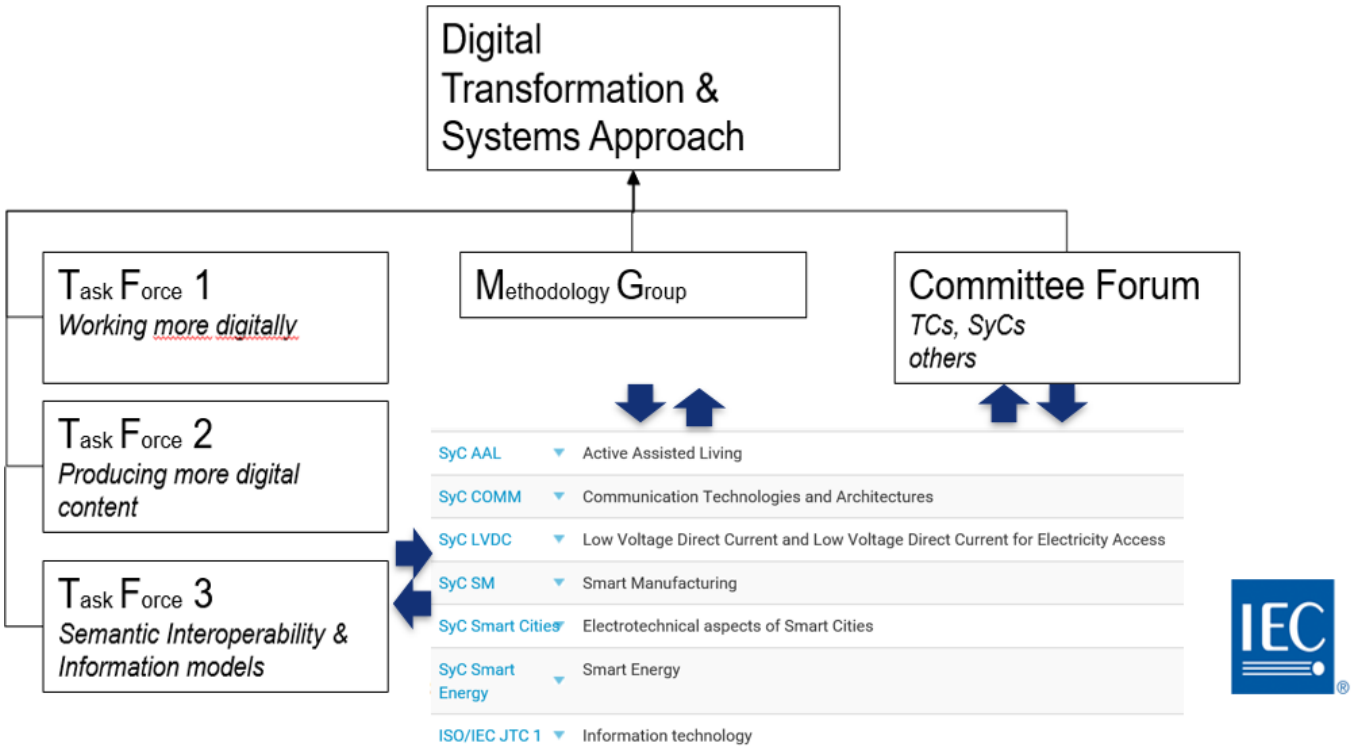

Figure 2. IEC Strategic Group on Digital Transformation and Systems Approach

As illustrated above, the Systems Approach is promoted in the different System Committees (a System Committee involves several Technical Committees and has the objective to better coordinate the work between committees). The Systems approach is briefly reminded in Annex 1.

2.4.2 How standardisation supports regulation ?

We can illustrate this topic through two concrete examples: ENTSO-E and CEN/CLC/ETSI CG-SG.

2.4.2.1 ENTSO-E contribution to regulation and standardisation

ENTSO-E is involved in European regulation drafting with ACER. ENTSO-E standardization approach is illutrated by the following figure:

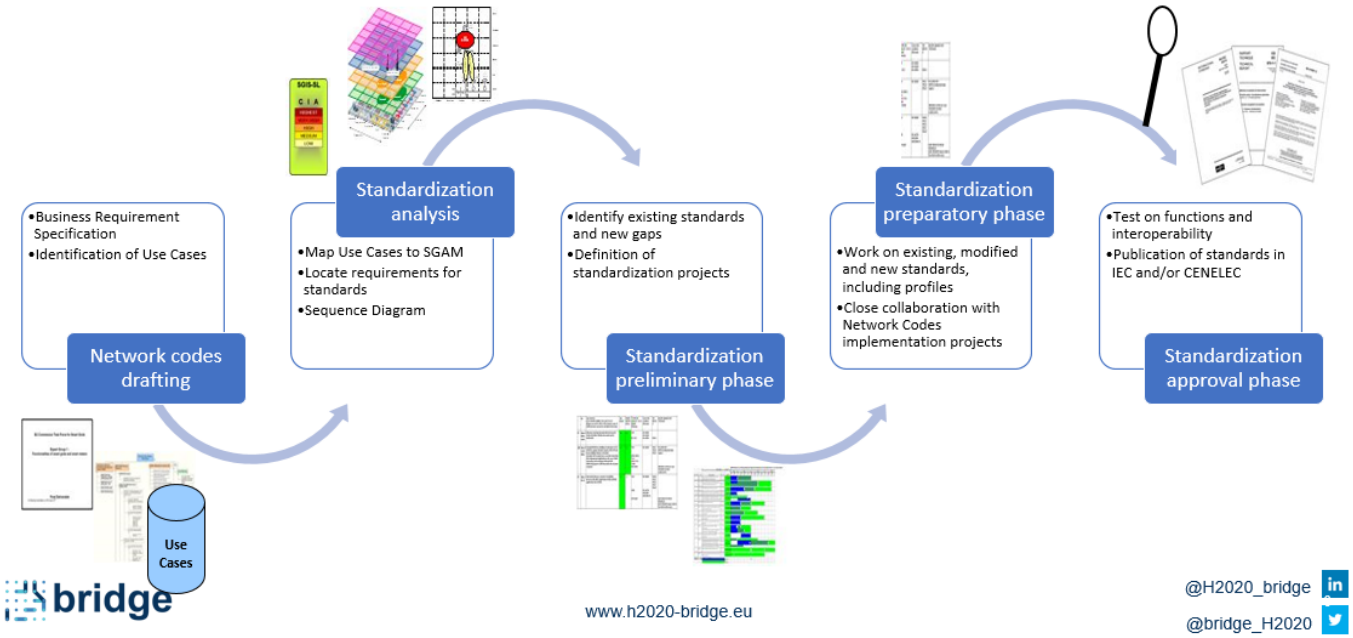

Figure 3. ENTSO-E standardization approach

ENTSO-E has decided to support European regulation requirements by using IEC CIM model and associated profiles since 2009. The CGMES standard series (IEC 61970-600-1, IEC 61970-600-2) is supporting Operation codes, and ESMP standard series (European Style Market Profiles, IEC 62325-351, IEC 62325-45x) is supporting the European Market codes and guidelines. The following figure summarize ENTSO-E involvement concerning standardization and regulation:

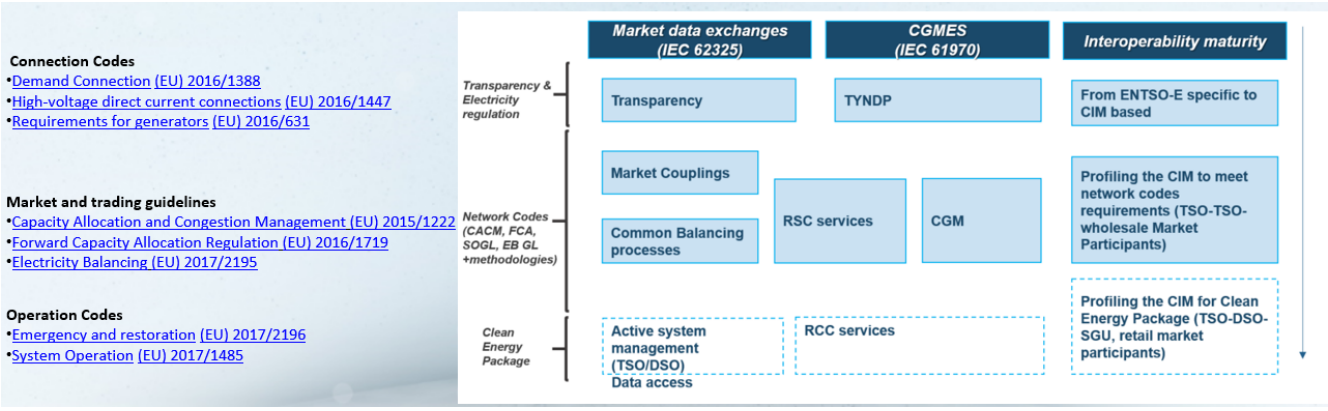

Figure 4. IEC standards series supporting European regulation

A CIM expertise is provided by ENTSO-E CIM expert group. The CIM expert group has the following scope and liaisons with IEC:

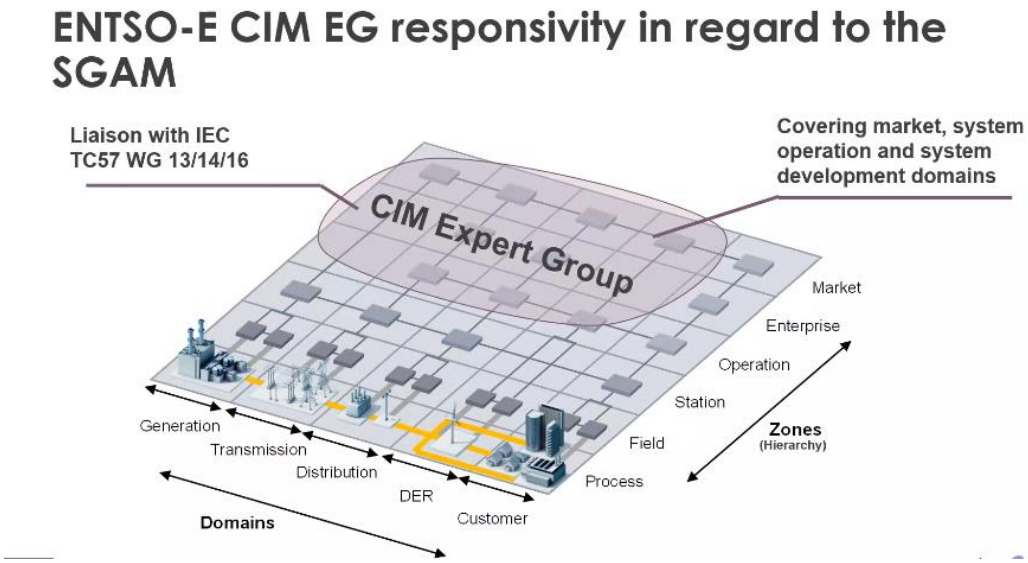

Figure 5. SGAM mapping of ENTSO-E CIM Expert Group

The standardization organization within ENTSO-E is illustrated by the following figure:

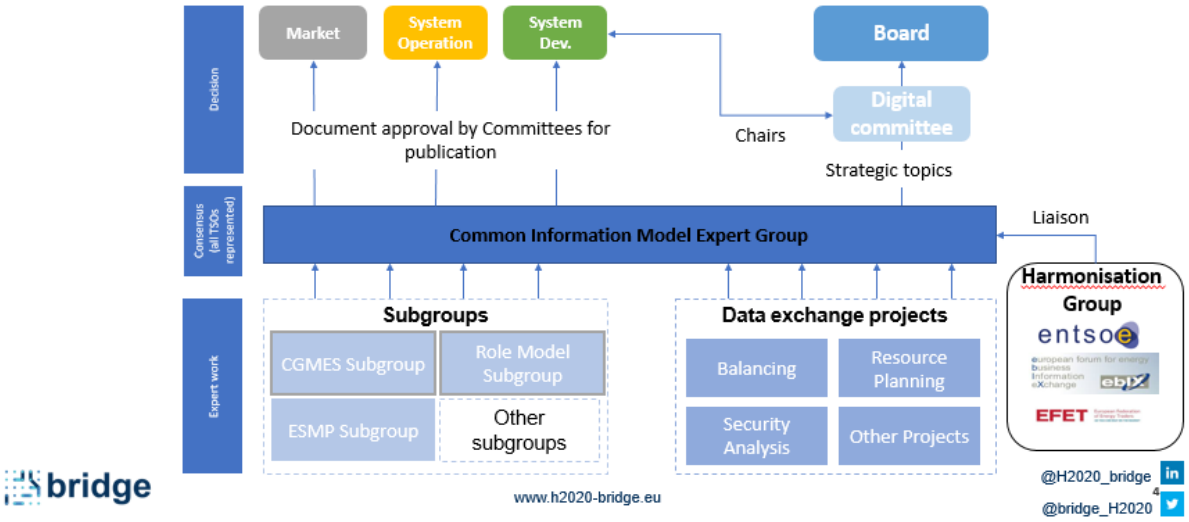

Figure 6. ENTSO-E CIM expert Group organisation

ENTSO-E manages CIM extensions by using a Maintenance request form which is shared with CIM Expert sub-groups named Role Model Subgroup (Role Model update is discussed among ENTSO-E, EFET, EbIX), ESMP subgroup and CGMES subgroup.

ENTSO-E has a CIM roadmap as illustrated by the following figure illustrating CGMES roadmap:

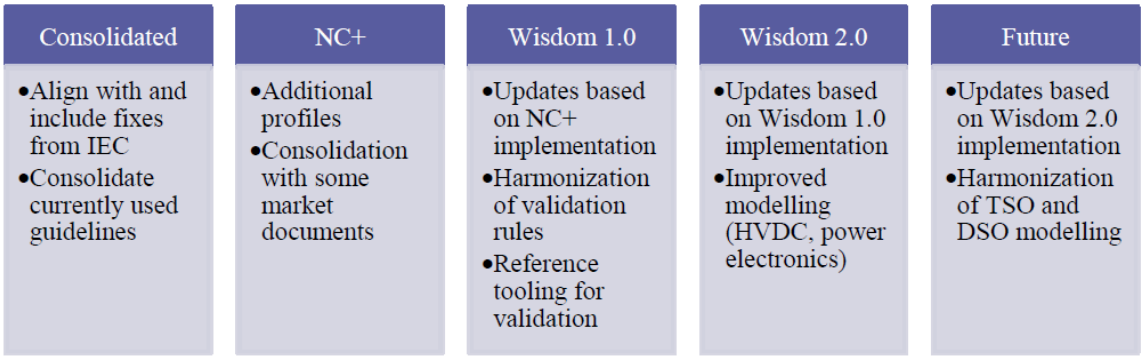

Figure 7. ENTSO-E CGMES roadmap

More information on ENTSO-E CGMES roadmap, CGMES Conformity Assessment Scheme can be found in Annex 1.

According to ENTSO-E R&D Roadmap[4], ENTSO-E participates in several European funded R&D projects, and this participation helps to consolidate IEC CIM standard as described by the following figure:

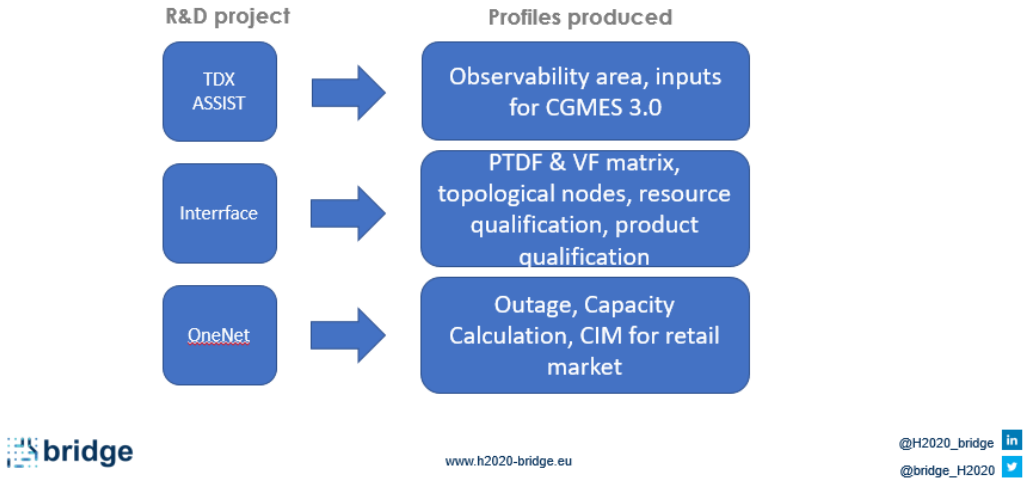

Figure 8. ENTSO-E involvement in European R&D projects

ENTSO-E is also participating in European Smart Grid Task Force which is developping implementing acts. Our findings and recommendation can be summarized as follow:

Topic	BRIDGE external coordination
Findings	The ENTSO-E CIM related story is rich and well explained in CGMES roadmap. Some EU funded R&D projects do not have ENTSO-E as participant, and these projects must benefit from CIM expertise, and be able to use the CIM model in its UML format, and derivatives (associated profiles)

4

Recommendation	In order to facilitate CIM usage by EU R&I projects not involving ENTSO-E, establish a liaison agreement with ENTSO-E, which will include that an ENTSO-E representative will join the BRIDGE UG. It could also include that a BRIDGE representative could join ENTSO-E expert groups. ENTSO-E and BRIDGE will share some documents: ENTSO-E CIM roadmap, EU regulation roadmap, draft specifications, UML models, CIM data sets, CIM issues ...

2.4.2.2 CEN/CLC/ETSI CG-SG contribution to regulation and standardization

CEN/CENELEC published their work program[5], where it is mentioned: "*Regarding digitalisation, the CEN and CENELEC communities are ready to support Europe on its quest towards technological sovereignty, contributing to reaping the benefits of new technologies such as AI, IoT and 5G. In particular, 2021 will be crucial in making the Standardization System fit for the digital age: we will pursue two pilot projects on the digitalisation of the standardization process, to launch fully machine-interpretable standards. These projects will benefit from a close cooperation with IEC and ISO, ensuring harmonisation and the interoperability of digital standards in the world market. Furthermore, we are ready to support the European Commission's ambitious digital policy plans. In the coming months, we are going to explore extensively with our fellow European standardization organisation ETSI the role of standards on the management of industrial data. The likely outcome of this first phase of cooperation will be a conference next year on industrial data infrastructure and cybersecurity. All the above would not be possible without a fully*"

CEN/CLC/ETSI have established a new group in 2021 named Coordination group on Smart Grids (merge of former Smart Meter Coordination Group and Coordination Group on Smart Energy Grids).

As stated in CG-SG terms of reference:

"The CG-SG advises on European standardization requirements relating to smart electrical grid and multi-commodity smart metering standardization, including interactions between commodity systems (e.g. electricity, gas, heat, water), and assesses ways to address them. This includes interactions with end-users, including consumers/prosumers.

Its aim is to promote the deployment of open and interoperable data architectures, based on European and international standards. The scope also includes any standards needed to design, operate and maintain electrical grids securely and efficiently. In the specific area of metering, its scope includes electricity, water, gas and heat/cooling metering devices and systems, and associated architectures.

Within its scope the Group will address the European requirements resulting from the Clean Energy Package, including secondary legislation, and any other relevant Commission initiatives.

The CG-SG shall also receive inputs from and provide input to the European Commission's activities related to standardization in the field of smart grids and meters.

With respect to international standardization activities on smart grids and meters, the Group shall monitor the progress of the relevant standardization activities in ISO, IEC and ITU, and promote coordination between the European activities and those at the international level and promote when needed the consideration of European requirements within international standardization.

The Group shall not develop standardization deliverables (e.g., European Standards, Technical Specifications, Technical Reports), but may develop informative material intended for the public domain after approval by the CEN and CENELEC Technical Boards (BTs) and ETSI Board. "

Two working groups were established named WG-CEP and WG-STD. WG-CEP analyzed Clean Energy Package and identified standardization gaps. The Standard working group (WG-STD) analyzed the standard gaps and classified them. Some of them were forwarded to CENELEC committees for being solved, others were proposed to IEC

[5] https://www.cencenelec.eu/media/CEN-CENELEC/Publications/workprogramme2021.pdf

System Committee Smart Energy,
and contributed to **IEC 63199** which identifies gaps that have to be solved by IEC Technical Committees. All smart Grid relevant standards are listed in **IEC 63097 Smart Grid Standardization Roadmap**.

The following figure illustrates CG-SG process.

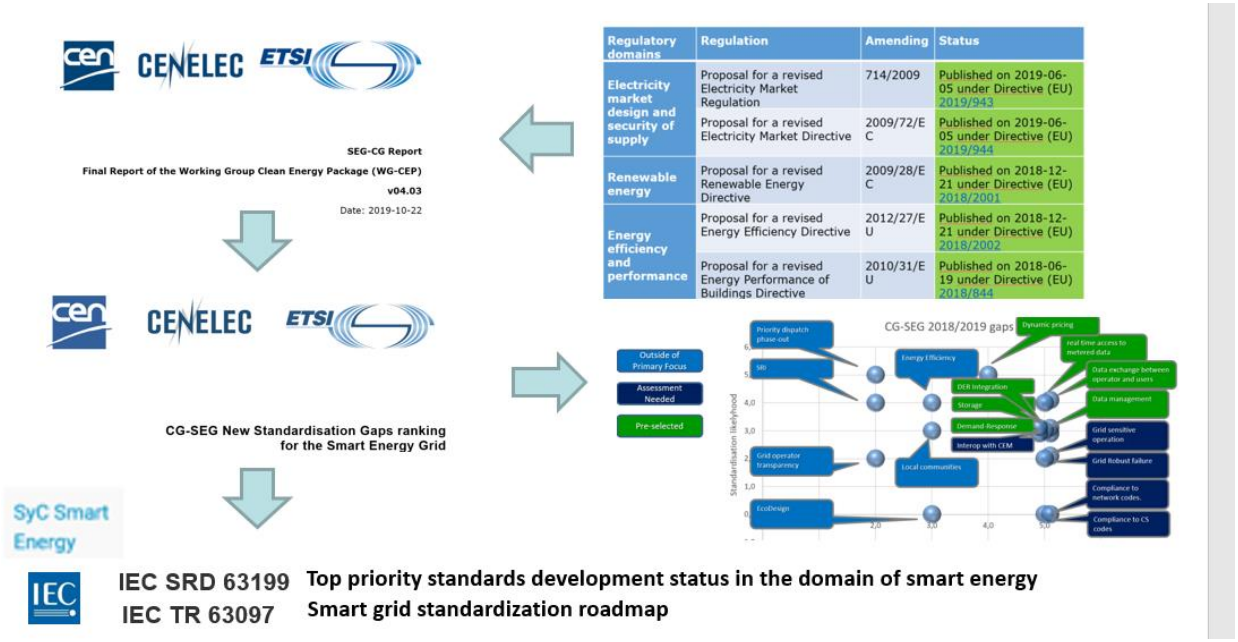

Figure 9. CEN/CLC/ETSI CG-CG regulation and standardisation relationships

CG-CG contributes also to European Smart Grid Task Force and some of its expert groups (EG1 Data Access and Interoperability, EG2 Cyber Security, EG3 Flexibility). At the present time SGTF is developing implementing acts associated to the following European regulation:

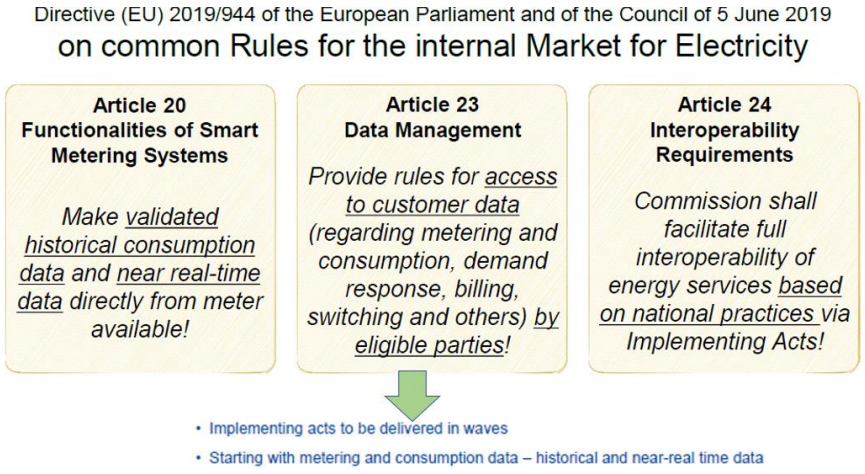

Figure 10. European Commission implementing acts

Our findings and recommendation can be summarized as follow:

Topic	BRIDGE external coordination
Findings	CEN/CLC/ETSI Coordination Group on Smart Grids is well positioned to analyse regulation requirements, and identify standardization gaps. CEN/CLC/ETSI is also participating in SGTF Expert groups. As the ESOs are working closely with the int'l standardisation organisations it would make sense for BRIDGE to use the establishing cooperation mechanisms.
Recommendation	BRIDGE should use the European Standard Organisations as the main conduit to: firstly proposing new topics for standardisation or flagging existing standards that should be updated, and secondly reaching out to the international arena (e.g. IEC). Establish a liaison between BRIDGE Standard User Group and CEN/CENELEC/ETSI Coordination Group on Smart Grids (CG-SG)

2.4.2.3 Interaction with other associations

Besides European and International Standard Organisations, several other associations, SDOs or para-normative associations exist like USEF[6], OCA[7], DLMS-UA[8], UCAIUg[9], CIRED[10], CIGRE[11], W3C[12], IETF[13], EU.DSO[14], …

It would be interesting to identify these other source of potential coordination (at least by identifying standard or study of interest). Our findings and recommendation is:

Topic	BRIDGE external coordination
Findings	Besides European and International Standard Organisations, several other associations, SDOs or para-normative associations exist like USEF, OCA, DLMS-UA, UCAIUg, CIRED, CIGRE, W3C, IETF, EU.DSO, …
Recommendation	Identify if other Association representatives, participating in BRIDGE funded projects need to be included (EU.DSO, USEF, …) or if these liaisons will be supported by Organisation experts participating in EU R&D projects. Organisation experts will be free to inform BRIDGE about these liaisons and inputs done.

[6] Usef Energy – Universal Smart Energy Framework
[7] Home - Open Charge Alliance
[8] Who we are | dlms
[9] Home - UCAIug
[10] CIRED • International Conference on Electricity Distribution
[11] CIGRE > Home
[12] CIRED • International Conference on Electricity Distribution
[13] IETF | Internet Engineering Task Force
[14] Home | EU DSO Entity

2.5 Standardisation topics

2.5.1 Topics impacting standardisation

The topics of interest for standardization are numerous. Utilities nowadays have to adapt their business processes to Global warming stakes, Digital stakes (including Cybersecurity and Privacy), Customer and citizen empowerment trends. The following figure based on SGAM illustrates the topics associated to these stakes:

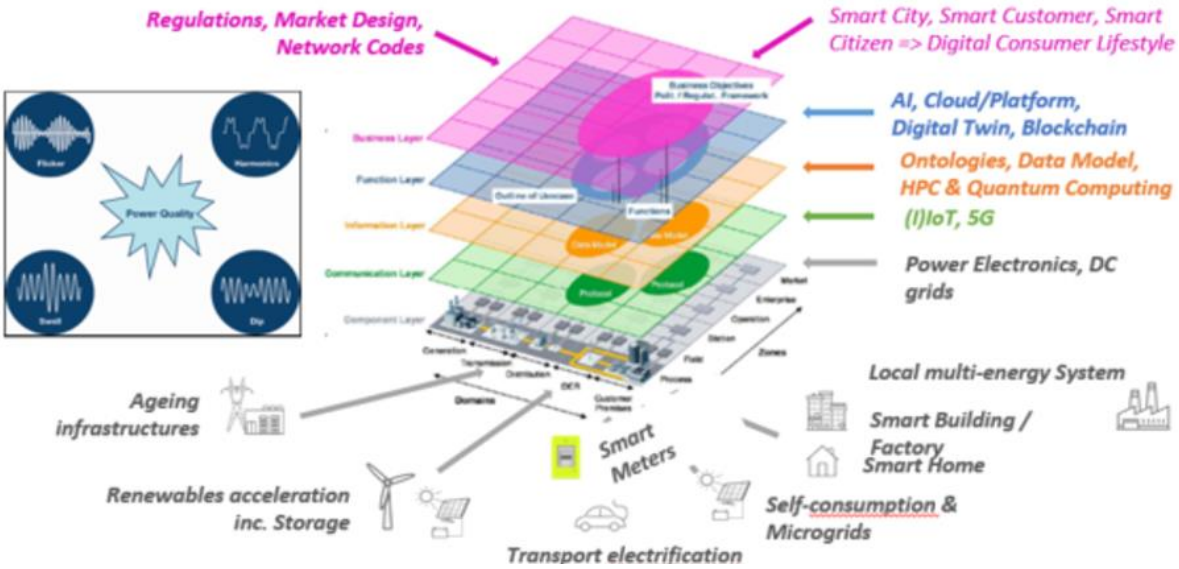

Figure 11. Topics of interest for utilities

As other topics of interest, ETIP-SNET also defined 12 functionalities of interest as illustrated by the following figure:

Building Blocks	Functionality full name	Short name
The efficient organisation of energy systems	F1 Cooperation between system operators	F1 Cooperation
	F2 Cross-sector integration	F2 Cross-Sector
	F3 Integrating the subsidiarity principle - The customer at the centre, at the heart of the Integrated Energy System	F3 Subsidiarity
Markets as key enablers of the energy transition	F4 Pan-European wholesale markets	F4 Wholesale
	F5 Integrating local markets (enabling citizen involvement)	F5 Retail
Digitalisation enables new services for Integrated Energy Systems	F6 Integrating digitalisation services (including data privacy, cyber security)	F6 Digitalisation
Infrastructure for Integrated Energy Systems as key enablers of energy transition	F7 Upgraded electricity networks, integrated components and systems	F7 Electricity Systems and Networks
	F8 Energy System Business (incl. models, regulatory)	F8 Business
	F9 Simulation tools for electricity and energy systems (Software)	F9 Simulation
Efficient energy use	F10 Integrating flexibility in generation, demand, conversion and storage technologies	F10 Flexibility
	F11 Efficient heating and cooling for buildings and industries in view of system integration of flexibilities	F11 Heating & Cooling
	F12 Efficient carbon-neutral liquid fuels & electricity for transport in view of system integration of flexibilities	F12 Transport

Figure 12. ETIP-SNET functionalities

The PANTERA project linked the ETIP-SNET functionalities and technologies with the relevant committees of the main standardization bodies (CEN, CENELEC, ETSI, IEC and ISO) as illustrated by the following figure, which propose an interface through EIRIE platform data base.

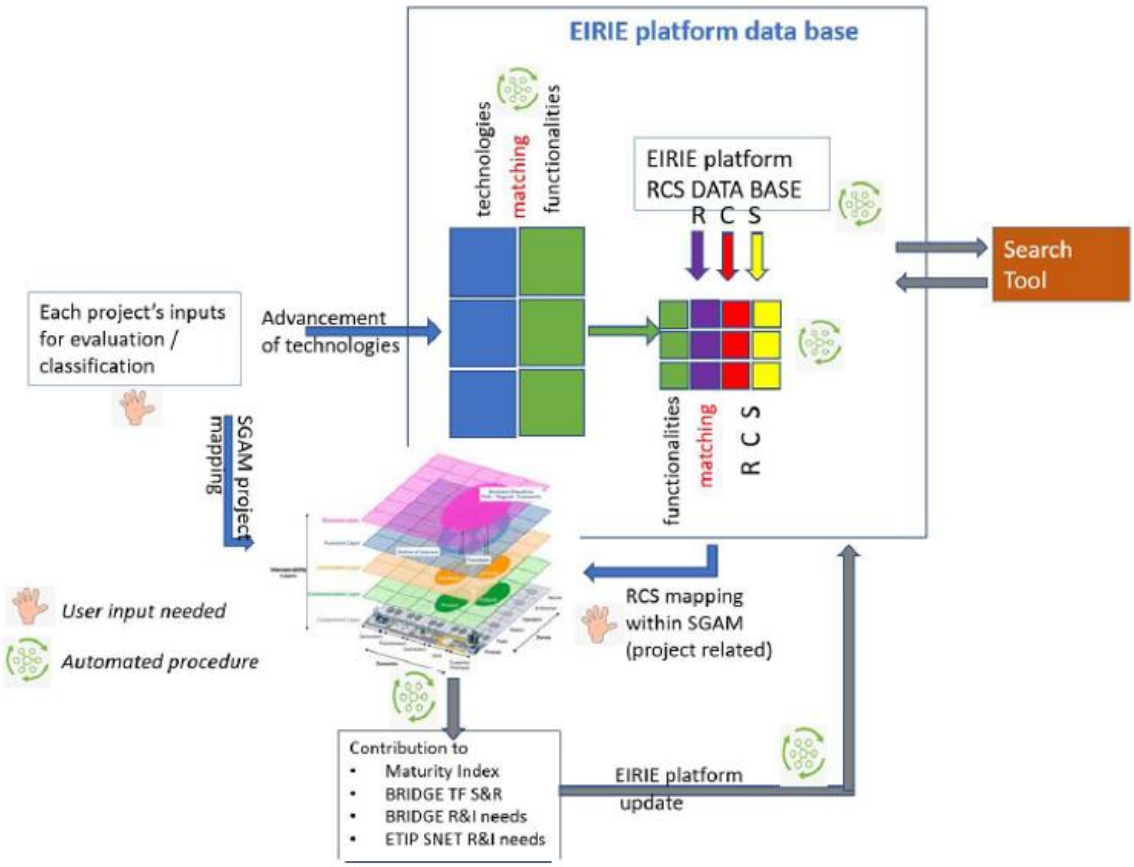

Figure 13. EIRIE platform

The other topics of interest are well
described in 2021 rolling plan for ICT standardization. For each domain identified in the report, related standardization activities are listed.

We remind the objective of this document: "The Rolling Plan for ICT Standardisation provides a unique bridge between EU policies and standardisation activities in the field of information and communication technologies (ICT). This allows for increased convergence of standardisation makers' efforts towards achieving EU policy goals. This document is the result of an annual dialogue involving a wide-range of interested parties as represented by the European multi-stakeholder platform on ICT standardisation (MSP). The Rolling Plan focuses on actions that can support EU policies and does not claim to be as complete as the work programmes of the various standardisation bodies. Standardisation actions identified in this document to support EU policies are complementary to other instruments, in particular the Annual Union Work Programme (AUWP). The Rolling Plan attempts to list all known areas where ICT standardisation could support EU policy objectives. It also details the requirements for ICT standardisation, translates them into actions and provides a follow-up mechanism for the actions"

Our findings and recommendations can be summarized as follow:

Topic	Standardisation Topics
Findings	Other European initiative like PANTERA or ETIP-SNET have worked on related smart energy topics which require standardization, in order to improve interoperability.
Recommendation	Monitor what PANTERA and ETIP-SNET WG4 are doing and use their conclusions to identify standardisation topics. Provide BRIDGE User Group standardisation results to PANTERA and ETIP SNET WG4 to collect feedback.

Topic	Standardisation Topics
Findings	ICT standardization topics are well described in European "Rolling Plan for ICT Standardization", which is a living document.
Recommendation	Anticipate standardization topics based on existing and yearly updated Rolling Plan for ICT Standardization. Contribute to Rolling Plan for ICT Standardization update

2.5.2 Potential contribution by projects

2.5.2.1 Projects involved in BRIDGE Data Management Action #4

The following table summarizes BRIDGE Action #4 participating projects inputs on their potential standardization topics and associated SDOs or associations.

Project	Project objectives	Which topics	Which SDOs

Interconnect	Interoperable smart homes, smart buildings and smart grids	Semantic interoperability, **Ontologies** (incl **SAREF**), Protocols & data models for **flexibility** & smart grid, Trustworthiness, IoT & digital twin	IEC SyC Smart Energy ISO/IEC JTC1/SC27 Trustworthiness ISO/IEC TC1/SC41 Internet of Things & Digital Twins ISO/IEC TC1/SC42 Artificial Intelligence ETSI SmartM2M
EU-SysFlex	Pan-European system with an efficient coordinated use of **flexibilities** for the integration of a large share of **RES**. Provides new types of services that will meet the needs of the system with more than 50% of renewable energy sources. Right blend of flexibility and system services to support **secure and resilient transmission system operation**	Market **Flexibility**, with some « **CIMification** » information exchanges	NA
XFLEX	Create a **capacity market platform** for **DSO** and **aggregators on LV level for congestion management** (MARKETFLEX tool)	**Flexibility** Trading **Capacity** Market **Congestion Management**	**USEF** (Universal Smart Energy Framework) → UFTP (USEF Flexibility Trading Protocol)
SMILE	Demonstrate 9 different innovative technological solutions in large-scale smart grid demonstration projects in three island locations: Orkneys (UK), Samsø (DK) and Madeira (PT).	Smart energy systems, d**emand-side-management**, thermal and electrical **storage**, **electric vehicles**	Danish Standard Deliverable 7.5
FEVER	Increase distribution grid security and resilience by leveraging energy flexibility towards supporting grid operation under normal, critical and emergency conditions	**Data Handling** – core data models used are based on **CIM** standards and FlexOffer specification	NA
ELAND	A modular set of methodologies and ICT tools for the optimized operation of multi energy islands and isolated communities	**Data Handling** – leverages data models from **CIM**	NA
BD4OPEM	Design, develop and deploy a marketplace for innovative energy services targeting the reliable operation of the smart grid - leveraging a modular data analysis toolbox and data exchange solutions	**Data Handling** –models used for the data modelling analysis are **CIM**, **SAREF4ENER** and **FIWARE-NGSI-LD.** Role Model: IDSA (adapted)	NA. BD4OPEM results will be leveraged by Horizon Europe OMEGA-X project
OneNet	**open and flexible architecture** to transform the actual **European electricity system**, which is often managed in a fragmented country- or area-level way, into a **pan-European** smarter and more efficient one, where **market and network technical operations are reciprocally coordinated** closer to real time i) among them, ii) across different countries iii) while maximizing the consumer capabilities to participate in an open market structure	**Flexibility** Products and Services Flexibility Markets Coordination and Integration. Integrated System operation – TSO/DSO coordination OneNet Framework architecture and implementation. Link with **FIWARE** and **IDSA** architecture. **Data Modelling**, AI, Big Data, IoT Enablers, **Cybersecurity**	Links foreseen via consortium members with IEC Data Modelling (CIM)
Coordinet	DSO and TSO interactions for new products	Market communications, processes, **harmonized data models**, pan-European Data Management	IEC, partly ISO. Use Cases

Figure 14. Participating projects involvement in standardisation

Besides contributing projects to BRIDGE, others projects of interest have been identified (see Annex).

It is expected to have concrete feedback from participating projects based on their demonstrator implementation. These demonstrators lessons learnt are essential and should be exchanged with other initiatives like JRC SG-DoIT or DERLab.

Our findings and recommendations are:

Topic	Standardisation Topics
Findings	BRIDGE participating projects represent a source of knowledge on standard usage and associated implementation.
Recommendation	Question the BRIDGE projects each year to identify and prioritize topics

Topic	Standardisation Topics
Findings	Concrete implementation of standards through EU funded research projects and their associated demonstrators are key. JRC SG-DoIT helps the user to create his/her tests by automating the procedure but also using lessons learnt from previous testing by transferring knowledge. SG-DoIT portal aims at the dissemination of information on use cases and test cases, thus it can contribute to standard implementation feedback. DERlab is an association of leading laboratories and research institutes in the field of distributed energy resources equipment and systems, developing joint requirements and quality criteria for the connection and operation of distributed energy resources (DER) and supporting consistent development of DER technologies. DERlab offers testing and consulting services for distributed generation (DG) to support the transition towards more decentralised power systems. Our various activities in research, pre-standardisation and networking are presented in DERlab activity reports[15].
Recommendation	Exchange informations on standard implementation based on BRIDGE demonstrators, JRC SG-DoIT and DERlab in order to identify standard implementation issues, interoperability issues. Contribute to improve standards

Topic	Standardisation Topics
Findings	BRIDGE User group can support European projects on some core standards understanding, and resource repository. BRIDGE Standardisation User Group will organise webinars to support facilitate knowledge sharing between projects

[15] https://der-lab.net/resources/books-and-reports/

Recommendation	Establish a list of standards of interest that the BRIDGE User Group will provide and explain to participating projects. The following list is not exhaustive but will at least include: _ SGAM IEC 63200 _ Harmonized Electricity Market Role Model (HEMRM) _ Use cases: IEC 62559 & IEC 62913 series _ Standardisation roadmap: IEC 63097, IEC 63268, IEC 63199 _ Interface Reference Model: IEC 61968-1 _ IEC TC57 Architecture: IEC 62357-1 _ CIM: IEC 61970 & IEC 61968 & IEC 62325 _ CIM profiles: CGMES profiles, ESMP profiles, utility integration profiles IEC 61968 series _ Profile methodology: IEC 62361-103 _ Harmonisation CIM/61850: IEC 62361-102 _ Communication protocols: IEC 60870-104, TASE-2, MQT, AMQP, ... _ OPC Unified Architecture: IEC 62541 series _ Cyber-security: IEC 62351 series _ De-Facto standards: UFTP, OCPP, FlexOffer, ... _ Ontologies: future IEC 63417 (Smart Energy Ontology), SAREF

3 Conclusion and perspectives

3.1 Main topics, findings and recommendations

We propose to create a BRIDGE standardisation user-group, and its objectives are:

- to educate projects on CEN/CLC/ETSI and IEC relevant standards
- to cooperate bi-directionnally with existing CEN/CLC/ETSI CG-SG as illustrated with the following figure:

Figure 15. BRIDGE Standardization User Group primary liaison with CEN/CLC/ETSI CG-SG

- BRIDGE towards CEN/CLC/ETSI CG-SG will:
  - Provide feedback on existing standards
  - Raise identified gaps
- CEN/CLC/ETSI CG-SG towards BRIDGE:
  - Provide access to draft standards / on-going work

Establishing a liaison with CEN/CLC/ETSI CG-SG will follow CEN-CENELEC Guide 25 on Cooperation with European Organizations and other stakeholders (in particular in §2.3 regarding liaisons, annual fees apply : 570€ per technical body, based on Annex 1).
Open question to be discussed with CEN-CLC Management Centre: do BRIDGE need a legal form to liaise with CEN/CENELEC/ETSI CG-SG ?

- This liaison between CG-SG and BRIDGE will be discussed during the next CG-SG meeting (end of March/Beginning of April)

- It is also recommended to establish a liasion with ENTSO-E CIM Expert group in 2022
- Other liaisons will be established after 2022
- The User Group will be hosted within BRIDGE and might be migrated outside BRIDGE in a second step

This section describes the main findings and recommendations regarding Contribution from BRIDGE projects to standardisation.

Topic	**BRIDGE internal coordination**
Findings	BRIDGE regulation working group, and other BRIDGE Data Management working groups related actions can contribute to Standardisation.
Recommendation	Establish a close cooperation with BRIDGE Regulation Working Group and other BRIDGE Data Management Working Group Actions in order to be consistent on standardisation issues

Topic	**BRIDGE external coordination**
Findings	The ENTSO-E CIM related story is rich and well explained in CGMES roadmap. Some EU funded R&D projects do not have ENTSO-E as participant, and these projects must benefit from CIM expertise, and be able to use the CIM model in its UML format, and derivatives (associated profiles)
Recommendation	In order to facilitate CIM usage by EU R&I projects not involving ENTSO-E, establish a liaison agreement with ENTSO-E, which will include that an ENTSO-E representative will join the BRIDGE UG. It could also include that a BRIDGE representative could join ENTSO-E expert groups. ENTSO-E and BRIDGE will share some documents: ENTSO-E CIM roadmap, EU regulation roadmap, draft specifications, UML models, CIM data sets, CIM issues …
Findings	CEN/CLC/ETSI Coordination Group on Smart Grids is well positioned to analyse regulation requirements, and identify standardization gaps. CEN/CLC/ETSI is also participating in SGTF Expert groups. As the ESOs are working closely with the int'l standardisation organisations it would make sense for BRIDGE to use the establishing cooperation mechanisms.
Recommendation	BRIDGE should use the European Standard Organisations as the main conduit to: firstly proposing new topics for standardisation or flagging existing standards that should be updated, and secondly reaching out to the international arena (e.g. IEC). Establish a liaison between BRIDGE Standard User Group and CEN/CENELEC/ETSI Coordination Group on Smart Grids (CG-SG)
Findings	Besides European and International Standard Organisations, several other associations, SDOs or para-normative associations exist like USEF, OCA, DLMS-UA, UCAIUg, CIRED, CIGRE, W3C, IETF, EU.DSO, …
Recommendation	Identify if other Association representatives, participating in BRIDGE funded projects need to be included (EU.DSO, USEF,…) or if these liaisons will be supported by Organisation experts participating in EU R&D projects. Organisation experts will be free to inform BRIDGE about these liaisons and inputs done.

Topic	**Standardisation Topics**

Findings	Other European initiative like PANTERA or ETIP-SNET have worked on related smart energy topics which require standardization, in order to improve interoperability.
Recommendation	Monitor what PANTERA and ETIP-SNET WG4 are doing and use their conclusions to identify standardisation topics. Provide BRIDGE User Group standardisation results to PANTERA and ETIP SNET WG4 to collect feedback.
Findings	ICT standardization topics are well described in European "Rolling Plan for ICT Standardization", which is a living document.
Recommendation	Anticipate standardization topics based on existing and yearly updated Rolling Plan for ICT Standardization. Contribute to Rolling Plan for ICT Standardization update
Findings	BRIDGE participating projects represent a source of knowledge on standard usage and associated implementation.
Recommendation	Question the BRIDGE projects each year to identify and prioritize topics
Findings	Concrete implementation of standards through EU funded research projects and their associated demonstrators are key. JRC SG-DoIT helps the user to create his/her tests by automating the procedure but also using lessons learnt from previous testing by transferring knowledge. SG-DoIT portal aims at the dissemination of information on use cases and test cases, thus it can contribute to standard implementation feedback. DERlab is an association of leading laboratories and research institutes in the field of distributed energy resources equipment and systems, developing joint requirements and quality criteria for the connection and operation of distributed energy resources (DER) and supporting consistent development of DER technologies. DERlab offers testing and consulting services for distributed generation (DG) to support the transition towards more decentralised power systems. Our various activities in research, pre-standardisation and networking are presented in DERlab activity reports16.
Recommendation	Exchange information on standard implementation based on BRIDGE demonstrators, JRC SG-DoIT and DERlab in order to identify standard implementation issues, interoperability issues. Contribute to improve standards
Findings	BRIDGE User group can support European projects on some core standards understanding, and resource repository. BRIDGE Standardisation User Group will organise webinars to support facilitate knowledge sharing between projects

Recommendation	Establish a list of standards of interest that the BRIDGE User Group will provide and explain to participating projects. The following list is not exhaustive but will at least include: _ SGAM IEC 63200 _ Harmonized Electricity Market Role Model (HEMRM) _ Use cases: IEC 62559 & IEC 62913 series _ Standardisation roadmap: IEC 63097, IEC 63268, IEC 63199 _ Interface Reference Model: IEC 61968-1 _ IEC TC57 Architecture: IEC 62357-1 _ CIM: IEC 61970 & IEC 61968 & IEC 62325 _ CIM profiles: CGMES profiles, ESMP profiles, utility integration profiles IEC 61968 series _ Profile methodology: IEC 62361-103 _ Harmonisation CIM/61850: IEC 62361-102 _ Communication protocols: IEC 60870-104, TASE-2, MQT, AMQP, ... _ OPC Unified Architecture: IEC 62541 series _ Cyber-security: IEC 62351 series _ De-Facto standards: UFTP, OCPP, FlexOffer, ... _ Ontologies: future IEC 63417 (Smart Energy Ontology), SAREF

In order to support above list of topics and recommendations, we conclude with a final topic, findings, and associated recommendations.

Topic	**Standardisation topics management**
Findings	The potential creation of a BRIDGE Standardization User Group and the above list of recommendations necessitates to manage smart energy topics, associated standard and relevant standard organization.
Recommendation	Create a tool like a “standardisation cockpit”, helping monitoring and facilitating coordination with BRIDGE projects, CEN/CLC/ETSI CG-SG, or other external entities. This tool will have to be consistent with CEN/CLC/ETSI CG-SG ones, and with IEC 63097 SmartGrid Standardization Roadmap structure.
Findings	The potential creation of a BRIDGE Standardization User Group must support BRIDGE participating projects on Standardization knowledge.
Recommendation	Create a list of resources to support BRIDGE projects and make these resources accessible from BRIDGE website.

Last but not least, BRIDGE User group will contribute to **Digitalisation of energy Action Plan (**DoEAP) as illustrated hereafter:

Topic	**Contribution to DoEAP**
Findings	BRIDGE Standardisation User group will also contribute through participating projects to **Digitalisation of energy Action Plan** (DoEAP), specifically on: • Enhancing the uptake of digital technologies as some standards will become more and more digital components (see IEC Code Components initiative, IEC SG12) • Enhancing the cybersecurity of the energy sector as many standards supporting cyber-security are developed • Developing a European data-sharing infrastructure as data exchange platforms, energy data spaces will support Energy vector integration and cross sector integration.
Recommendation	BRIDGE participating projects will have to be familiarized with DoEAP, and how standardisation can contribute to some of the five areas.

3.2 Next steps

CEN/CLC/ETSI CG-SG is inviting BRIDGE Data Management to its next working group meeting on March 29th. BRIDGE User group proposal and "liaison" with CEN/CLC/ETSI CG-SG will be discussed.

List of Acronyms and Abbreviations

AMI	Advanced Metering Infrastructure
BESS	Battery Energy Storage System
BPMN	Business Process Model and Notation
BRP	Balance Responsible Party
CEMS	Customer Energy Management System
CEN	European Committee for Standardization
CENELEC	European Electrotechnical Committee for Standardization
CIM	Common Information Model
DER	Distributed Energy Resources
DoEAP	Digitalisation of Energy Action Plan
DR	Demand Response
DSO	Distribution System Operator
ebIX	European forum for energy Business Information eXchange
EMS	Energy Management System
ESB	Enterprise Service Bus
ENTSO-E	European Network of Transmission System Operators for Electricity
ETIP SNET	European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP SNET)
ETSI	European Telecommunications Standards Institute
EU.DSO	European Distribution System Operators
EV	Electrical Vehicle
FAQ	Frequently Asked Questions
FO	Flexibility Offer
FS	Fully Standard
GBP	Generic Business Process
HLUC	High-Level Use-Case
IEC	International Electrotechnical Commission
LEC	Local Energy Community
LV	Low Voltage
MES	Modified or Extended Standard
MO	Market Operator
MV	Medium Voltage

OCPP	Open Charge Point Protocol
OS	Open Specification
PUC	Primary Use-Case
SDO	Standards Development Organisation
SGAM	Smart Grid Architecture Model
SO	System Operator (i.e. TSO or DSO)
TSO	Transmission System Operator
UFTP	USEF Flex Trading Protocol
USEF	Universal Smart Energy Framework
WG	Working Group

Annexe 1
Systems approach

The System approach is illustrated by the following figure:

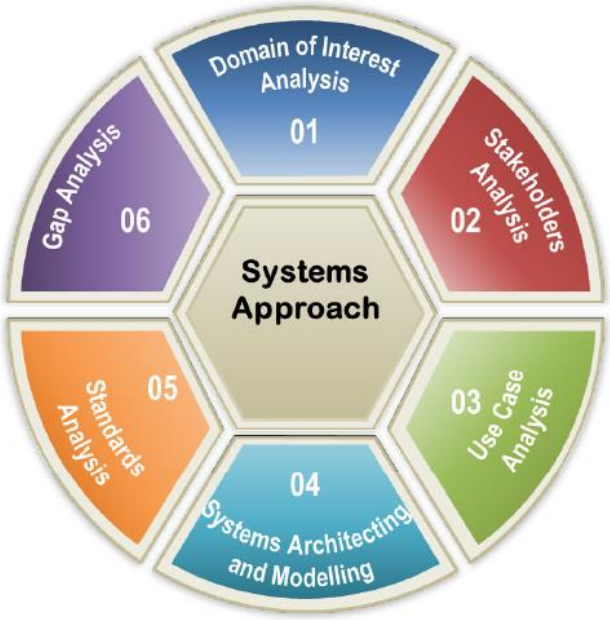

Figure 16. IEC Systems approach

The Systems approach[17] includes a Use Case Analysis (step 3) per domain of interest. IEC system Committee Smart Energy is promoting this system approach and makes available several resources[18].

This Use Case Analysis helps to identify standard gaps. What has been done in BRIDGE Data Management Action #3 is fully aligned with this methodology.

Concerning step 4, as a reminder, the Smart Grid Architecture Model was created by CEN/CLC/ETSI under M/490 Smart Grid Mandate. It was promoted at the international level and IEC 63200 explains how SGAM can be used in the Smart Grid context. As a reminder, the SGAM is illustrated by the following figure:

[17] A systems approach | IEC
[18] Home - SyC Smart Energy (iec.ch)

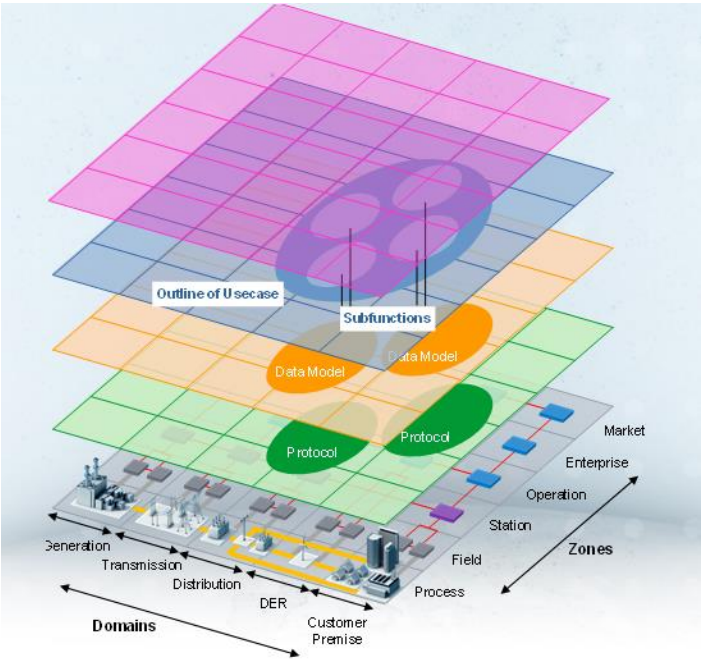

Figure 17. the Smart Grid Architecture Model

BRIDGE Data Management working group Action #2 has extended the SGAM concept and is proposing DERA 2.0 Reference Architecture which could help to support cross-sector interactions, and Energy vector interactions. We can expect to promote and challenge DERA 2.0 at the international level too if some R&D European funded projects are using it.

The Use Cases are decomposed in Business Use Cases, and System Use Cases, as explained in IEC 62913-1 and the following figure illustrates Use cases and SGAM mapping:

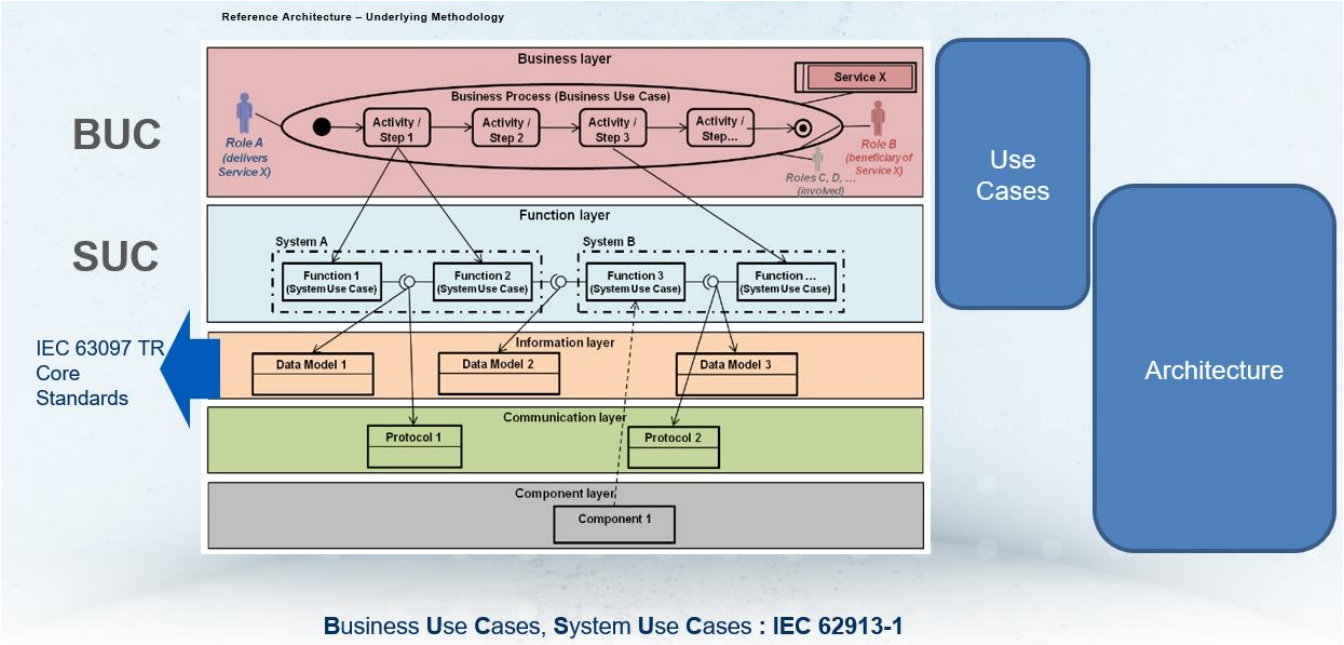

Figure 18. Use cases and Architecture mapping on SGAM

IEC 63097 Smart Grid

Standardisation Roadmap has identified the information models IEC CIM, IEC 61850 and IEC COSEM as core standards for the electricity information layer. These information models are establishing a common understanding between applications, and therefore contribute to interoperability. BRIDGE Data Management working group Action #2 has extended the SGAM information layer to take consider other information models and ontologies used in the energy vector or other sectors.

Annexe 2
CGMES

The detailed CGMES roadmap is presented hereafter:

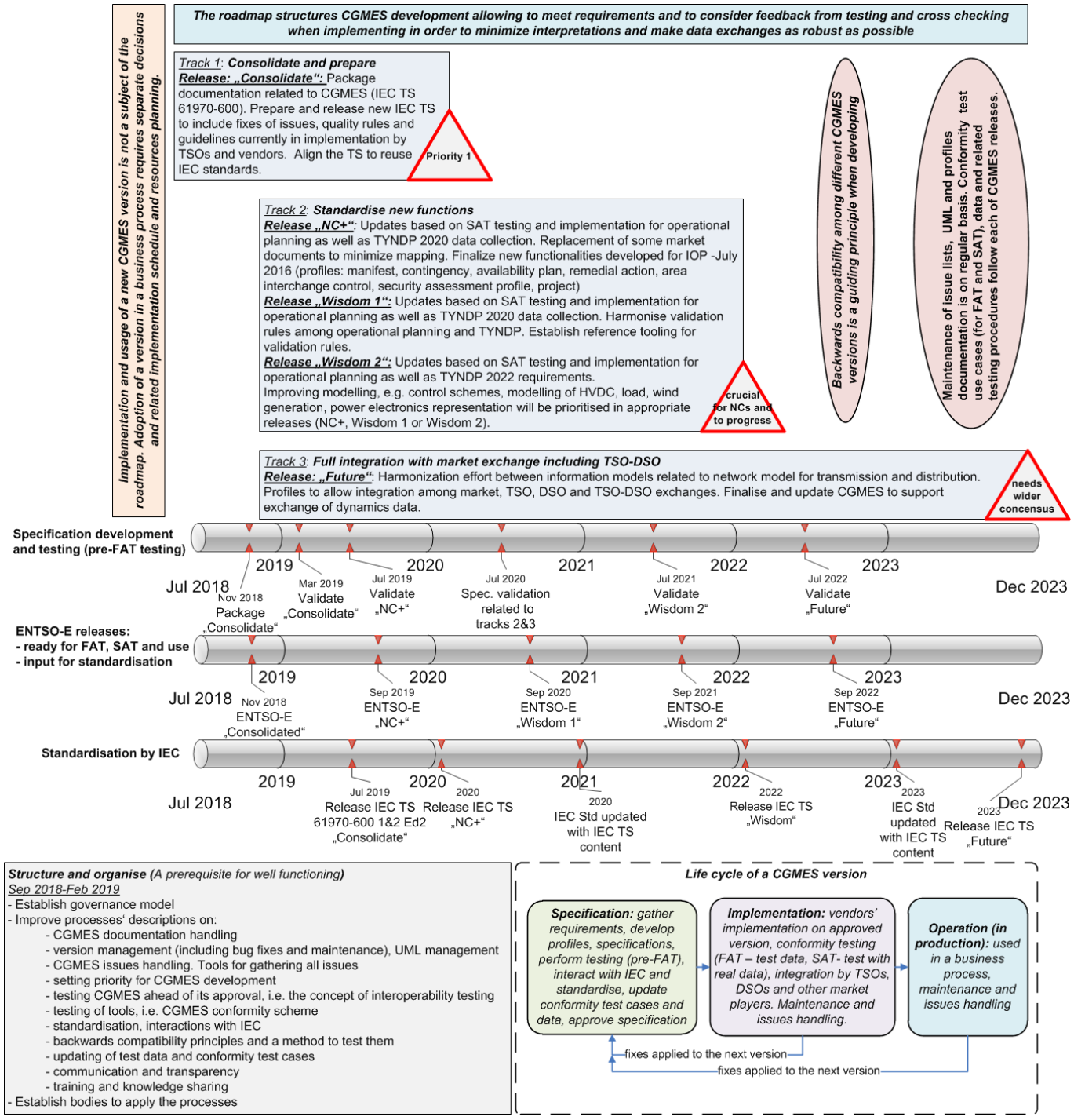

Figure 19. ENTSO-E CGMES detailed roadmap

It has to be noted that full integration with Market Exchange including TSO-DSO is planned.

A CGMES or other CIM related profile can be extended as illustrated by the following figure, provided by TDX-ASSIST project:

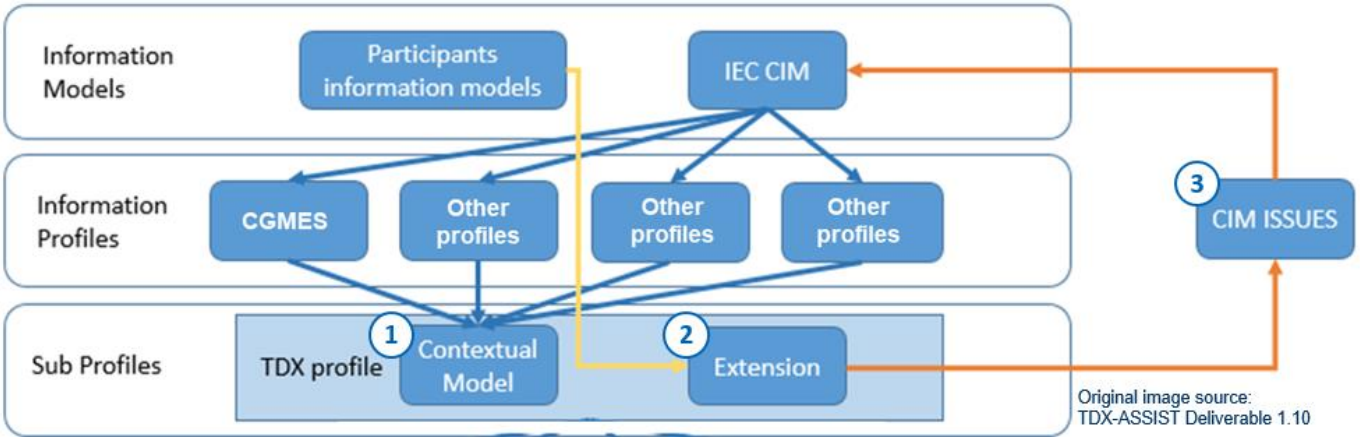

Figure 20. CIM extension management example: TDX-ASSIST project example

CIM issues can be raised and can be discussed at the CIM expert group level and/or at the IEC TC57 level.

As mentioned previously, CIM profiles CGMES and ESMP are supporting European regulation. CGMES 3.0.0 was published as an international standard in 2021, and Conformity Assessment Schemes for CGMES 3.0.0 were also drafted in 2021. It is important to note that Conformity/Compliancy and Interoperability are complementary to standardization process as described by the following figure:

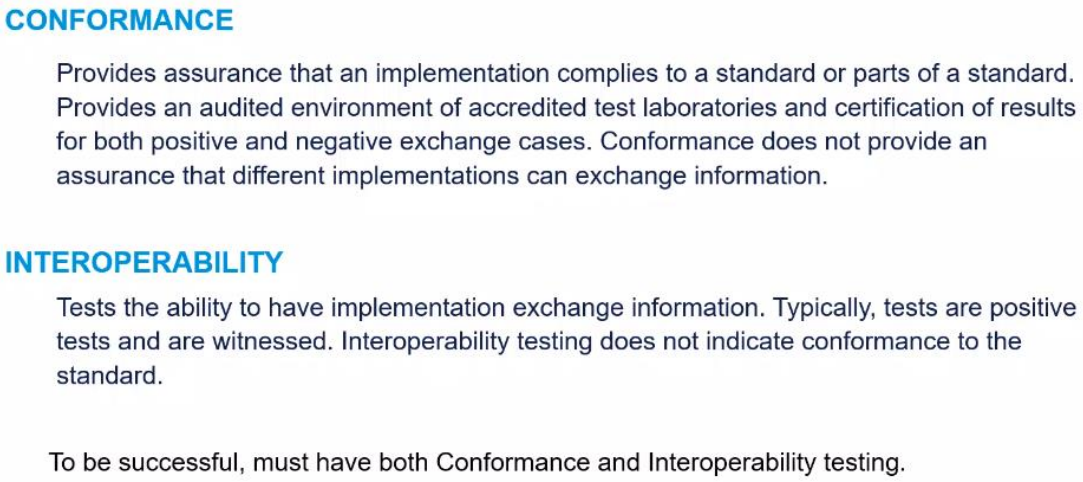

Figure 21. Conformance versus interoperability

ENTSO-E and DNV organized webinar in January 2022 concerning Conformity Assessment Scheme as illustrated by the following figure:

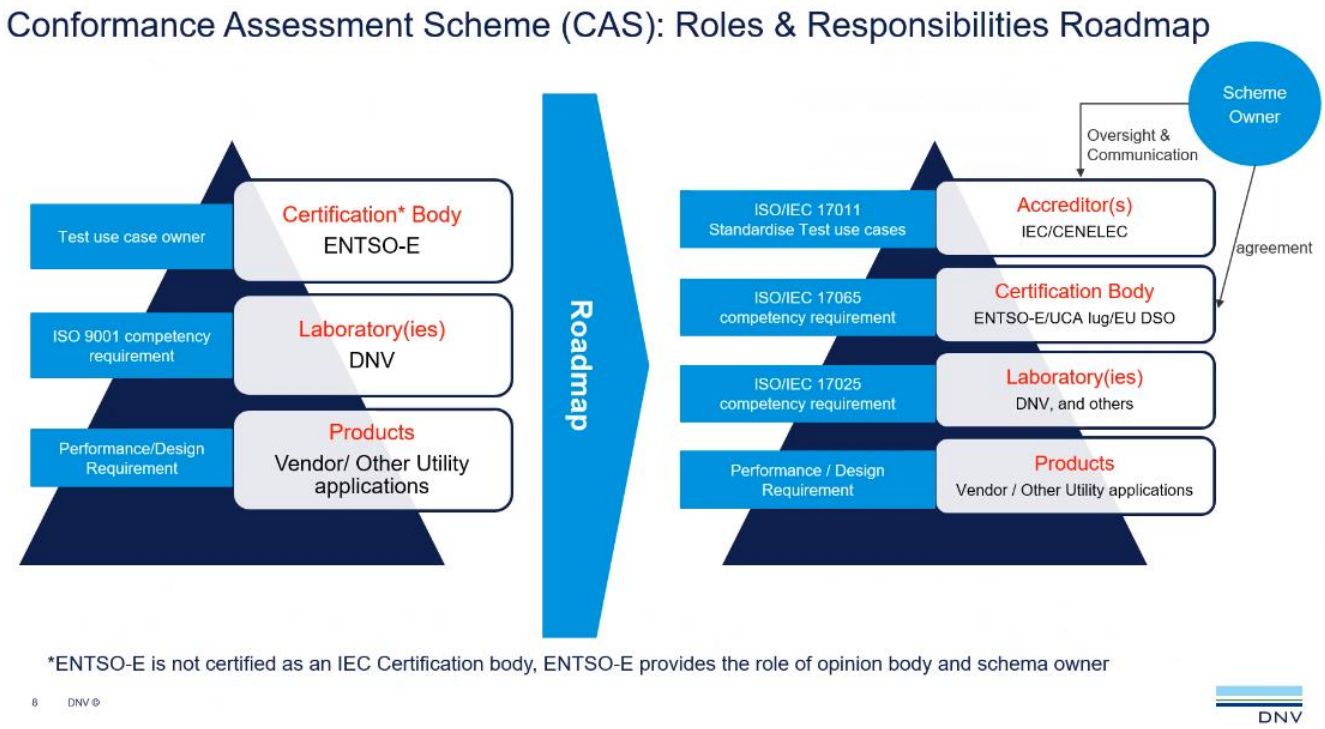

Figure 22. Conformance Assessment Scheme: Roles and responsibilities

List of references

_CEN/CLC/ETSI CG-SEG – CEN/CLC/ETSI CG-SEG – Final Report of the Working Group Clean Energy Package (WG-CEP) - v04.03 Date: 2019-10-22. Ref : CENCLCETSI_SEG-CG/Sec/00115/DC

_CEN/CLC/ETSI CG-SEG – Set of Standards v4.1 – Jan 6th 2017. It proposes an updated framework of standards which can support Smart Grids deployment in Europe.

_CEN/CLC/ETSI CG-SEG – Cyber Security & Privacy – 2016-12 : security standardization specific to Smart Energy Grid and security standardization targeting generic standards are further monitored and analysed.

_European Commission Rolling Plan for ICT Standardisation – 2021. https://ec.europa.eu/docsroom/documents/44998

_DSO priorities for Smart Grid Standardisation – Eurelectric & EDSO for Smart Grid.

https://www.edsoforsmartgrids.eu/wp-content/uploads/public/DSO-Priorities-Smart-Gird-Standardisation.pdf

_IEC SyC Smart Energy Web site and resources Home - SyC Smart Energy (iec.ch), and its delivery folder.

_CEN/CENELEC work program: https://www.cencenelec.eu/media/CEN-CENELEC/Publications/workprogramme2021.pdf

_OPEN DEI Energy pilots explorer : http://interrface.eu/sites/default/files/OPENDEI-Energy%20Booklet_for%20website.pdf

_ETIP-SNET Working Group 4 : Digitalisation of the Electricity System and Customer Participation. Terms of Reference. https://www.etip-snet.eu/wp-content/uploads/2017/03/ETIP-SNET-WG4-Terms-of-Reference-March-2021_FV1.pdf (March 2021)

_Joint Research Centre SGDoIT : https://ec.europa.eu/jrc/en/science-update/sg-doit

Interoperability will not happen spontaneously and needs to be supported with dedicated policy, standardisation and technical instruments. Interoperability tests are an important element in smart grid laboratories. The creation of the SG-DoIT portal aims at the dissemination of information on use cases and test cases. SG-DoIT helps the user to create his/her tests by automating the procedure but also using lessons learnt from previous testing by transferring knowledge. The user will be able to create the use and test cases using pre-designed forms. These forms will constitute the interoperability objects and they may interact with each other automating thus the procedure, facilitating the user in the design and minimizing the possibility of inconsistencies or errors. Last but not least, SG-DOIT will be a continuously growing source of interoperability use cases, which the stakeholders can consult before designing their own use case testing.

Access to portal (restricted) : https://smart-interoperability.jrc.ec.europa.eu/index.php/home

_ PANTERA (GA 824389) : PAN European Technology Energy Research Approach (PANTERA) is a EU H2020 project aimed at setting up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardisation bodies and experts in both research and academia, representing the EU energy system.

PANTERA has several working groups (see https://pantera-platform.eu/resources/) . WG3 “The state of R&I, standardization and regulation” has delivered a report (D3.2, 01/12/2020) on regulations, Codes and Standards in

EU-28 : https://pantera-platform.eu/wp-content/uploads/2021/01/D3.2_Report-on-Regulations-Codes-and-Standards-in-EU-28.pdf. This deliverable aims at reviewing Regulations, Codes and Standards (RCS) in the Smart Grid domain that will form valuable content to the EIRIE (European Interconnection for Research Innovation and Entrepreneurship) platform. Chapter 3 is a review of Standardisation Bodies and relevant committees/ working groups, as Chapter 4 is a review of European regulations on Smart Grids. As for standards, the report includes a review of literature and a review work performed within Smart Grid standardisation domain and a high-level overview of standards developed by officially recognized European Standardisation Organisations (ESO). As for regulations and codes, the report incorporates the literature review and high-level review of the European Network Codes.

_ BD4NGR – GA 872613 (starting January 2021, 36 months)

BD4NRG aims at addressing the emerging challenges in big data management for energy with an open holistic solution to create a European approach to the B2B platforms able to give a competitive edge. BD4NRG vision is to unlock and exploit the economic potential of big data to enable improved operation for all the stakeholders in the energy value chain, through creating and deploying an elastic energy analytics reference framework tailored to the extreme-scale smart energy grids environments.
See: *http://*www.bd4nrg.eu

_ inteGRIDy – GA 731268

inteGRIDy aims at integrating cutting-edge technologies, solutions and mechanisms in a scalable Cross-Functional Platform of replicable solutions. This platform connects existing energy networks to diverse stakeholders, with enhanced observability of both generation and consumption profiles. inteGRIDy pursues facilitating the optimal and dynamic operation of the Distribution Grid, fostering the stability and coordination of distributed energy resources and enabling collaborative storage schemes within an increasing share of renewables.
The project has 10 Pilots. The pilot schemes are based on the programme's four pillars: demand response, smartening the distribution grid, energy storage, and smart integration of grid users from transport

See : http://www.integridy.eu

https://www.integridy.eu/sites/default/files/integridy/public/content-files/article/integridy_whitepapers.v1.1.pdf . (relevant standards Page 17)

_ i3-MARKET – GA 871754

i3-MARKET addresses the growing demand for a single European Data Market Economy by innovating marketplace platforms, demonstrating with industrial implementations that data economy growth is possible. It provides technologies for trustworthy, data-driven collaboration and federation of existing and new future marketplace platforms, special attention on industrial data and particularly on sensitive commercial data assets from both SMEs to large industrial corporations is taken. I3-MARKET Backplane is opensource software that integrates data markets, via APIs, allowing users to access, sell, and buy European data through common interfaces, secure contracts and trusted payments methods. I3-MARKET Backplane will be implemented in 3 industrial domains (Automotive sector, Intelligent Manufacturing sector, Healthcare and wellbeing sector).

See : https://www.i3-market.eu

_ DIH4AI (GA 101017057) AI-based network to support European SMEs : As envisaged in the EC White Paper on AI, by 2025 Europe will lead worldwide in ethical and sustainable adoption of AI. DIHs have become the success factor for European SMEs, leveraging on the DIHs' Pan-European and Regional networks. Through the DIH4AI network, research and industry are intensively collaborating to ensure deployment of available state-of-the-art European AI capacities and capabilities. The network supports joint development and provision of ecosystem-business-technology-transformation services targeting local SMEs and tech governmental agencies. A dynamic European network of regional AI DIHs and AI Testing and Experimental Facilities (AI TEFs) are connected by the

AI-on-demand Platform (AI4EU),
through flexible and standard-based interoperability bridges and cross-border services. GDPR and Data Sovereignty will drive the European AI strategy for personal and non-personal Data Sharing Spaces.

The AI-on-demand regional platforms built by DIH4AI are based on an Innovation & Collaboration platform developed in the H2020 European project **MIDIH**. The DIH4AI project aims at building and networking DIH-driven AI-on-demand regional platforms, linked to the pan-European AI4EU toolbox and experimental facility. DIH4AI will create a critical mass of AI services and seamless operation.

See: https://www.dih4ai.eu/project

_ Smart5Grid (GA 101016912) - Demonstration of 5G Solutions for SMART energy GRIDS of the future

Being the first technology to allow for adaptability concerning the energy sector, 5G technology ensures that both radio and core network performance requirements can be reached in terms of end-to-end latency, availability and reliability. This has been achieved thanks to the main goal in 5G development of supporting the next wave of smart grid features and maintaining efficiency all through integrating multiple low-voltage devices into the power grid through low-demand connections. The EU-funded SMART5GRID project aims to revolutionise the energy vertical industry by establishing four novel fundamental functions in modern smart grids and allow for the continuous and stable advancement of 5G technology by developing a 5G experimental facility for new improvements and changes.

List of figures

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