Broj rada: R5-15
DOI:10.46793/CIRED2026.R5-15_257

ENERGETSKE ZAJEDNICE I IEC 62559-2 – METODOLOGIJA SLUČAJA UPOTREBE

ENERGY COMMUNITIES AND IEC 62559-2 – USE CASE METHODOLOGY

Eldar HUKIĆ*, Federal Ministry of Energy, Mining and Industry, Bosnia and Herzegovina
Matej ZAJC, University of Ljubljana, Faculty of Electrical Engineering, Slovenia
Nermin SULJANOVIĆ, Elektroinštitut Milan Vidmar, Ljubljana, Slovenia
University of Tuzla, Faculty of Electrical Engineering, Bosnia and Herzegovina

KRATAK SADRŽAJ

Brzo širenje distribuirane proizvodnje energije iz obnovljivih izvora i institucionalizacija Energetskih zajednica (EZ) zahtijevaju strukturirane metode za prevođenje inovativnih poslovnih koncepata u interoperabilne tehničke dizajne sistema. Ovaj članak ispituje primjenu Metodologije slučaja upotrebe IEC 62559-2 kao formalnog okvira za usklađivanje Poslovnih Modela (PM) Energetskih zajednica sa slučajevima upotrebe na nivou sistema, komunikacijskim strukturama i zahtjevima za razmjenu podataka. Cilj je pokazati kako standardizirana dokumentacija slučajeva upotrebe podržava operacionalizaciju koncepata EZ-a, a istovremeno osigurava interoperabilnost, sljedivost i arhitektonsku konzistentnost unutar okruženja pametnih mreža. Energetske zajednice uvode decentraliziranu proizvodnju, kolektivnu samopotrošnju, trgovanje energijom i zajedničku infrastrukturu poput stanica za punjenje električnih vozila. Iako PM-ovi definišu mehanizme stvaranja vrijednosti, uloge sudionika i sheme raspodjele prihoda, oni ne pružaju dovoljno tehničkih detalja za implementaciju sistema. Stoga je potrebna strukturirana transformacija od PM-a do specifikacije slučaja upotrebe. Slučajevi upotrebe opisuju interakcije aktera, razmijenjene informacije, granice sistema te funkcionalne i nefunkcionalne zahtjeve, čime se premošćuje strateški dizajn i tehnička realizacija. Standard Međunarodne elektrotehničke komisije IEC 62559-2 pruža usklađeni predložak za dokumentiranje slučajeva upotrebe pametne mreže. Metodologija definiše sveobuhvatnu strukturu koja uključuje opise slučajeva upotrebe, UML dijagrame, tehničke detalje, detaljne analize, razmjenu informacija, zahtjeve, terminologiju i kontekstualna ograničenja. Ovaj strukturirani pristup osigurava dosljednost među sudionicima i omogućuje sistematsko mapiranje između poslovnih ciljeva i tehničkih funkcionalnosti. Eksplicitnim definisanjem aktera, sučelja i modela podataka, metodologija ugrađuje razmatranja interoperabilnosti u najranijim fazama dizajna. Analiziraju se dva reprezentativna poslovna modela Međunarodne elektrotehničke komisije kako bi se ilustrirala metodologija: (i) kolektivna proizvodnja s sudjelovanjem na veleprodajnim tržištima električne energije i (ii)

* Eldar Hukić, eldarh@bih.net.ba

kolektivna samopotrošnja, uključujući javne i privatne punionice za električna vozila. Za svaki model razvijeni su UML dijagrami slučajeva upotrebe i aktivnosti za vizualizaciju interakcija dionika, uključujući članove Međunarodne elektrotehničke komisije, operatore sustava, dobavljače i trgovce. Posebna se pažnja posvećuje odjeljku predloška o „razmjeni informacija“, gdje su formalno navedeni tokovi podataka mjerenja, koraci obrade podataka, informacije o poravnanju, procesi naplate i ugovorni preduslovi. Ove strukturirane tablice razmjene informacija pojašnjavaju komunikacijske kanale i tehničke ovisnosti, koje su bitne za Sisteme upravljanja energijom (SUE) i druge aktere pametnih mreža. Članak dalje raspravlja o komplementarnosti između IEC 62559-2 i Modela arhitekture pametne mreže (MAPM-SGAM). Dok SGAM pruža slojevitu referentnu arhitekturu za pozicioniranje komponenti u poslovnim, funkcionalnim, informacijskim, komunikacijskim i komponentnim slojevima, IEC 62559-2 pruža detaljne opise ponašanja i informacija potrebne za arhitektonsko mapiranje. Zajedno, ove metodologije su usklađene s arhitektonskim načelima ISO 42010 i olakšavaju koherentnu specifikaciju sistema u složenim okruženjima s više aktera. Na kraju, članak naglašava ključnu ulogu tačne razmjene podataka, infrastrukture pametnog mjerenja, standardiziranih sučelja i interoperabilnih modela podataka u omogućavanju pouzdanog rada Energetske zajednice. Interoperabilnost je identificirana kao osnovni zahtjev za skalabilne i otporne aplikacije pametnih mreža. Rezultati pokazuju da IEC 62559-2 nudi robustan metodološki most između poslovnih inovacija Energetske zajednice i tehnički izvedivih, interoperabilnih arhitektura pametnih mreža.

Ključne reči: IEC 62559-2, Energetske zajednice, Poslovni modeli, Model arhitekture pametne mreže, Interoperabilnost

ABSTRACT

The rapid proliferation of distributed renewable generation and the institutionalization of Energy Communities (ECs) require structured methods for translating innovative business concepts into interoperable technical system designs. This article examines the application of the IEC 62559-2 Use Case Methodology as a formal framework for aligning Energy Community business models (BMs) with system-level use cases, communication structures, and data exchange requirements. The objective is to demonstrate how standardized use case documentation supports the operationalization of EC concepts while ensuring interoperability, traceability, and architectural consistency within smart grid environments. Energy Communities introduce decentralized generation, collective self-consumption, energy trading, and shared infrastructure such as electric vehicle charging stations. While BMs define value creation mechanisms, stakeholder roles, and revenue distribution schemes, they do not provide sufficient technical detail for system implementation. A structured transformation from BM to use case specification is therefore necessary. Use cases describe actor interactions, exchanged information, system boundaries, and both functional and non-functional requirements, thereby bridging strategic design and technical realization. The International Electrotechnical Commission standard IEC 62559-2 provides a harmonized template for documenting smart grid use cases. The methodology defines a comprehensive structure including use case descriptions, UML diagrams, technical details, step-by-step analyses, information exchanged, requirements, terminology, and contextual constraints. This structured approach ensures consistency across

stakeholders and enables systematic mapping between business objectives and technical functionalities. By explicitly defining actors, interfaces, and data models, the methodology embeds interoperability considerations at the earliest design stages. Two representative EC business models are analyzed to illustrate the methodology: (i) collective generation with participation in wholesale electricity markets, and (ii) collective self-consumption including public and private electric vehicle charging stations. For each model, UML use case and activity diagrams are developed to visualize stakeholder interactions, including EC members, system operators, suppliers, and traders. Particular attention is given to the "information exchanged" section of the template, where metering data flows, data processing steps, settlement information, billing processes, and contractual preconditions are formally specified. These structured information exchange tables clarify communication channels and technical dependencies, which are essential for Energy Management Systems (EMS) and other smart grid actors. The article further discusses the complementarity between IEC 62559-2 and the Smart Grid Architecture Model (SGAM). While SGAM provides a layered reference architecture for positioning components across business, function, information, communication, and component layers, IEC 62559-2 supplies the detailed behavioral and informational descriptions required for architectural mapping. Together, these methodologies align with ISO 42010 architectural principles and facilitate coherent system specification in complex, multi-actor environments. Finally, the article emphasizes the critical role of accurate data exchange, smart metering infrastructure, standardized interfaces, and interoperable data models in enabling reliable EC operation. Interoperability is identified as a foundational requirement for scalable and resilient smart grid applications. The results demonstrate that IEC 62559-2 offers a robust methodological bridge between Energy Community business innovation and technically executable, interoperable smart grid architectures.

Keywords: IEC 62559-2, Energy Communities, Business Models, Smart Grid, Architecture Model, Interoperability

INTRODUCTION

This paper examines the use of IEC 62559 Use Case Methodology in regard to ECs, as well as its relationship with the SGAM Methodology. In order to do so it is necessary to examine various BMs for ECs on a strategic level, and their relevant stakeholders (participants) including their mutual relationship. The objective is to explore how to meet the ECs needs and requirements in regard to communication architecture, data exchange, and interoperability. Also, how to gain necessary data in order to adopt and develop appropriate system design considering the ECs influence on power system operations as well as their interaction with other market participants and power system components.

1. ENERGY COMMUNITY - REVIEW AND DEFINITION OF STAKEHOLDERS

1.1 Overview

Stakeholders can be defined as the range of actors who are likely to use a system or be influenced either directly or indirectly by its use.

1.2 Traditional electrical energy systems

Table I provides an overview of the general stakeholders that can be found within the traditional electrical energy market.

Table I - General stakeholders in traditional systems

Stakeholder	Description
Transmission System Operator (TSO)	Entity responsible for the transmission and balancing of the electrical energy on the transmission network, operating, maintaining and developing of the infrastructure
Distribution System Operator (DSO)	Entity responsible for the distribution of the electrical energy on the distribution network, operating, maintaining and developing of the distribution infrastructure
Regulator	Actor that regulates the electrical energy markets
Energy Supplier	Actor responsible for billing and contracting the grid operator with the consumer
Energy Trader	Actor who buys electrical energy from producers and sells it
Consumer	Electrical energy end-user
Energy Producer	Entity responsible for electrical energy production

1.3 Modern electrical energy systems

The additional generation on the distribution networks could impact the quantity and price of the electrical energy on the electricity market, as well as the operation of transmission and distribution networks [1]. Following Table II provides an overview of the new stakeholders.

Table II - New stakeholders in modern systems

Stakeholder	Description
Initiator	Initiator of the EC who can be a private person, private entity or social enterprise/NGO
External Investor	Private person or entity/NGO who invests in the EC
Insurance Party	Private entity providing insurance services to the EC
Financing Party	Private person, private entity or public body providing financial support schemes
EC participant	EC member - private person or private or public entity and a consumer or prosumer
Asset Owner	Private person or private or public entity owning part of the EC system
Engineering Office	Private entity ensuring the technical set-up and maintenance of the EC
EC decision-making body	Private or public entity responsible for decision-making within the EC
Government	Public entity responsible for decision-making at higher levels
Legal Party	Private or public entity that supports the EC with legal support
Prosumer	Consumer of a product who at the same time participates in the production [2]
Aggregator (service provider)	Aggregator act as intermediary between prosumers and electricity markets, offering competitive pricing and facilitating the buying and selling of energy services [3]
CPO (charge point operator)	Installs, owns, and operates charging station hardware and software. Offer access through roaming networks and electromobility service providers (EMSPs) [4]

EMSP	Connect EV users with a CPO charger and starts and stops the charging and organizes payment. They take a percentage of what the user pays. The rest goes to the CPO [4]
Energy storage system operator	Installs, owns, and operates energy storage system hardware and software standalone or in co-operation with land or facility owners

1.4 Mutual relations between identified stakeholders

Following Figure 1 generally depicts the positions and mutual relations between stakeholders.

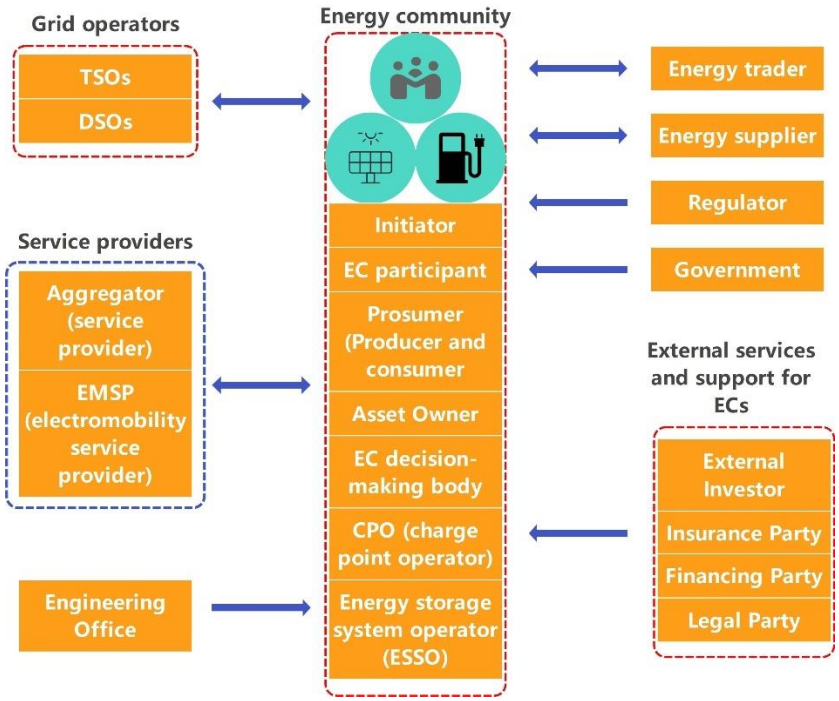


Figure 1 - The positions and mutual relations between identified stakeholders in regard of EC

2. ENERGY COMMUNITY BUSINESS MODELS (STRATEGIC LAYER)

2.1 Overview

With EC BMs we can describe at a strategic level how EC members and other relevant stakeholders collaborate and what is required to ensure their alignment. It can be seen that intermediaries play an important role in the EC development process.

2.3 A typology of BMs for ECs

A typology of BMs for ECs can be categorized by different aspects of their activities and organizational structures. One study presented 25 design options (BMs) clustered in several key BM dimensions [5]. Table III provides an overview of the ECs archetypes, design options and key references/activities.

Table III - Overview of the ECs archetypes, design options and key references/activities

BM dim.	Design option	Key references/activities
EC value proposition	Generating electrical energy	Electrical energy generation; Avoiding carbon-intense or nuclear power; flexibility generation
	Increasing self-consumption	Electrical energy self-sufficiency; smart energy management; heat pumps; storage; e-Mobility; virtual energy storage
	Increasing grid reliability	Avoid grid expansions; cooperation between grid companies and the local community; reduce outages/overload
	Reducing energy consumption	Energy efficiency measures; behavioural change
	Reducing energy costs	Virtual power plant for electrical energy and flexibility; energy management; flexibility services; peak shaving/shifting
	Becoming a living lab	Tech park as laboratory; testing new technologies, materials, and systems
EC members	Residential prosumers	Residential prosumer-based communities; energy management system; crowd-balancing platform
	Large-scale prosumers	Large scale communities (shopping mall, island and harbour); flexibility programs for industries
	Local electrical energy producers	Platform for connecting producers and consumers
	Energy service company	Development of ECs trading platforms; project development; energy management services
	Community platform operator	Energy platform; energy management and virtual power plant; blockchain-based flexibility trading platform
Energy value capture	Revenues from energy services	Energy services for EC members; local energy trading; smart charging service
	Saving energy costs	Energy savings; energy management
	Revenue from external services	Electrical energy trading as retailer, or on spot market, or balancing market participation; DSO peak shaving, ancillary services; price forecasting
	Community investing	Energy services; investment in storage, demand shifting, seasonal storage, and platform services
	Data valorisation	Provide data for forecasting; provide data as a product
Key functions	Facilitating P2P trading	Local electrical energy trading within the EC; independent marketplace for trading flexibility; software-as-service for trading platforms
	Aggregating electrical energy and flexibility	Aggregate electrical energy generation and flexibility; aggregate demand; aggregate and manage multiple energy assets
	Managing storage systems	Virtual storage; district battery; storage services for self-consumption; peak shaving; centralized storage
	Co-optimizing energies	Local energy management services; demand shaping toward the power purchase agreement
	Coordinating partners	Provide a customer acquisition, engagement and retainment solutions
Network effects	Peer and community effects	Social influence on citizens to invest in RES; community feeling; peer effects
	Economies of scale	Scaling up and providing customers to electrical energy retailers
	Learning effects	Knowledge exchange; pilot projects
	Exploiting co-benefits	Planning and investing; multiple usages of the device

2.4 Most common energy relate activities and BMs

From Table III we can define the most common energy related activities of ECs. These most common energy related activities of ECs are in line with the definitions of “Renewable Energy

Communities" (RECs) [6], and "Citizen Energy Communities" (CECs) [7]. Following Table IV provides an overview of the most common BMs according to energy related activities.

Table IV - Overview of the most common BMs according to energy related activities (functionalities)

	Activities					
Type of EC (BM)	Generation	Self-consumption	Market trading	Storage	Individual and/or public EV CSs	Flexibility
Collective generation and trading	+	-	+	-	-	-
Collective self-consumption (+EV CSs)	+	+	+	-	+	-
Collective self-consumption (+EV CSs+Flex market)	+	+	+	-	+	+
Collective self-consumption (+storage)	+	+	+	+	-	-
Collective self-consumption (+storage+Flex market)	+	+	+	+	-	+
Collective self-consumption (+EV CSs +storage)	+	+	+	+	+	-
Collective self-consumption (+EV CSs +storage+Flex market)	+	+	+	+	+	-

3. IEC 62559-2 – USE CASE METHODOLOGY (TECHNICAL LAYER: USE CASE & COMMUNICATION DESIGN)

3.1 BMs and use cases

As renewable technologies and smart grid systems evolve, ECs will become a more integral part of global energy systems. Therefore, in addition to defining BMs, it is necessary to define use cases that are related to BMs. BMs can be created using a top-down or bottom-up approach. In the development of a product or service, BMs typically come first, followed by use cases.

3.2 IEC 62559-2 overview

IEC 62559-2 is a part of the series of IEC 62559 standards and defines the structure of a use case template, template lists for actors and requirements, as well as their relation to each other. This standard provides a methodology which is used to define use cases in smart grid and automation systems. The methodology is used to structure and document use cases and its focus is to describe how systems interact with each other to achieve specific functions or goals, i.e. interoperability, which is a critical enabler of smart grid potential [8].

3.3 IEC 62559-2 Use Case Methodology

IEC 62559-2 Use Case Methodology is a process which describes use cases and their functionalities in a structured and organised way. The process is specified as a template in the standard IEC 62559-2 [9].

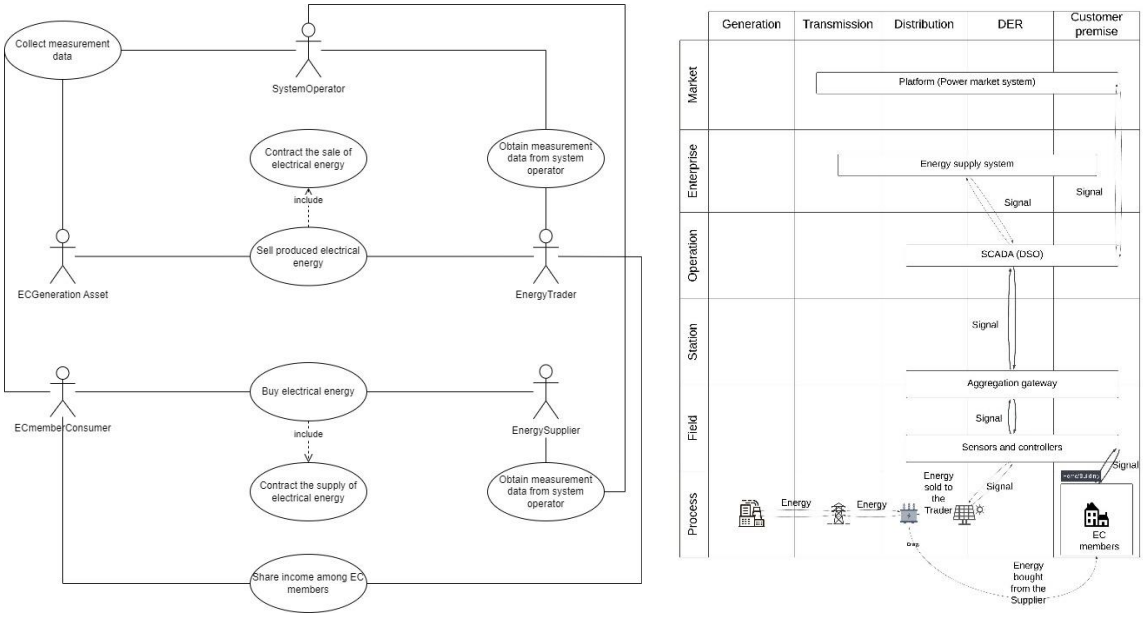
Tabel V - Overview of the IEC 62559-2 template sections

Section name	Description
Description of the use case	A concise overview of the use case, including its purpose and scope. This section should explain the problem or need that the use case addresses and who the users or stakeholders are.
Diagrams of use case	Visual representation of the use case, which could include flowcharts, UML diagrams (like use case diagrams), or any other relevant illustrations that provide clarity.
Technical details	A deep dive into the technologies, platforms, systems, or tools involved. This might include technical specifications, system architecture, and integration details that support the use case.
Step by step analysis of use case	A detailed, sequential breakdown of the steps involved in the use case from start to finish. This helps to understand the flow of events, including actions taken by the user and the system, as well as any decisions or exceptions that may occur.
Information exchanged	Describes what data is exchanged in the use case, such as inputs, outputs, or messages between systems or users. This section could also cover formats, protocols of the information.
Requirements	Lists the functional and non-functional requirements for the use case.
Common terms and definitions	A glossary of key terms and concepts used within the use case documentation. This ensures clarity and consistency, particularly when dealing with technical jargon or industry-specific terminology.
Custom information	Any additional details or specific considerations unique to this use case, which might not fit neatly into the other sections. This could include business rules, constraints or assumptions.

4.4 UML use case diagram examples

4.4.1 Overview. A UML use case diagram represents the behaviour of a system and helps capture its requirements. It outlines the high-level functions and scope of the system, highlighting interactions between the system and its actors. The use cases and actors in these diagrams show what the system does and how the actors engage with it, without delving into the internal workings of the system. A complex system can be modelled with a single use case diagram, or multiple diagrams can be created to represent different system components.

4.4.2 Example 1 - Collective generation and trading – Use case and Activity diagram. This BM represents a group of EC members which collectively generate electrical energy and trade it on a wholesale market. This type of EC allows participants to produce and trade electrical energy and to reinvest the profits back into the community and/or to share it among themselves.



(a) (b)

Figure23 - Example 1 - Collective generation and trading
(a) Use case diagram; (b) Activity diagram

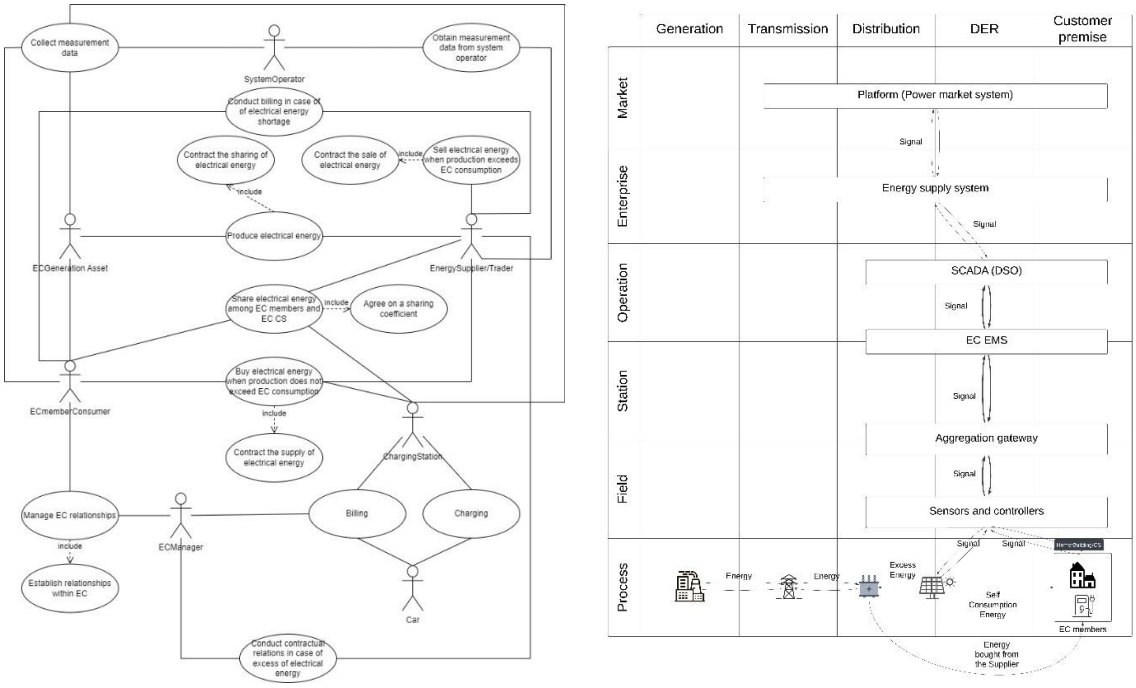
4.4.3 Example 1 - Collective generation and trading – information exchanged.

Tabel VI - Example 1 - IEC 62559-2 information exchanged summary

Information ID	Name of information	Description of information	Requirements
INF 1.1 (Producer to System operator)	Metering data	Raw data that have been received from meters	Meters have been installed properly (AMI and MDM)
INF 2.1 (System operator to Energy trader)	Processed and cleansed metering data	Data that have been processed and cleansed	Communication channel established
INF 2.2 (System operator to Energy supplier)	Processed and cleansed metering data	Data that have been processed and cleansed	Communication channel established
INF 3.1 (Energy trader to EC member)	Processed data and reimbursed energy	Data about traded energy have been processed and profit shared	Energy price contracted; energy reimbursed
INF 4.1 (Energy supplier to EC member)	Processed data and billed energy	Data about bought energy have been processed and bill made	Energy price contracted; energy billed

4.4.4 Example 2 - Collective self-consumption (+EV CSs) – Use case and Activity diagram.

This BM represents a group of EC members which collectively generate renewable energy, with individual and public EV CSs, where excess of electrical energy if it occurs is sold to the supplier according to the signed contract.



(a) (b)

Figure 3 - Example 2 - Collective self-consumption (+EV CSs)
(a) Use case diagram; (b) Activity diagram

4.4.5 Example 2 - Collective self-consumption (+EV CSs) – information exchanged.

Tabel VII - Example 2 - IEC 62559-2 information exchanged summary

Information exchanged ID	Name of information	Description of information	Requirements
INF 1.1 (Producer and consumers to System operator)	Metering data	Raw data that have been received from meters	Meters have been installed properly, AMI and MDM systems set up
INF 2.1 (System operator to Energy Supplier/Trader)	Processed and cleansed metering data	Data that have been processed and cleansed	Communication channel established
INF 3.1 (Energy Supplier/Trader to EC Member and EC Manager (for CS))	Processed and cleansed energy shared metering data	Data that have been processed and cleansed	Energy sharing coefficient agreed
INF 4.1 (Energy Supplier/Trader to EC Member and EC Manager (for CS))	Processed metering data and bought energy	Data about bought energy have been processed	Energy price contracted; energy bought
INF 4.2 (Energy Supplier/Trader to EC Member and EC Manager (for CS))	Processed metering data and sold energy	Data about sold energy have been processed	Energy price contracted; energy sold
INF 5.1	Processed metering data and billed energy	Data about consumed energy have been	Energy price contracted; energy billed

(Energy Supplier/Trader to EC Member and EC Manager (for CS))		processed and bill made	
INF 6.1 (Energy Supplier/Trader to EC Member and EC Manager (for CS))	Processed consumed energy data and billed energy	Data about consumed energy have been processed, bill made and forwarded to EC Manager	Energy price established; energy billed

4.5 Correlation between IEC 62559-2 and SGAM

The IEC 62559 Use Case Methodology and the SGAM Methodology can each be used independently, but they complement each other and function together smoothly by collecting data based on a shared meta-model aligned with the ISO 42010 architecture standards. The static nature of SGAM, along with its processes and exceptions, can be documented using an IEC 62559-2 template, while individual solutions can be categorized within the SGAM as part of a reference designation system. Although the IEC 62559-2 use case template is not directly involved in SGAM modelling, it provides the necessary information to model the use case within SGAM [10]. Following Figure 4 depicts the components of the use case template and their relationship to SGAM.

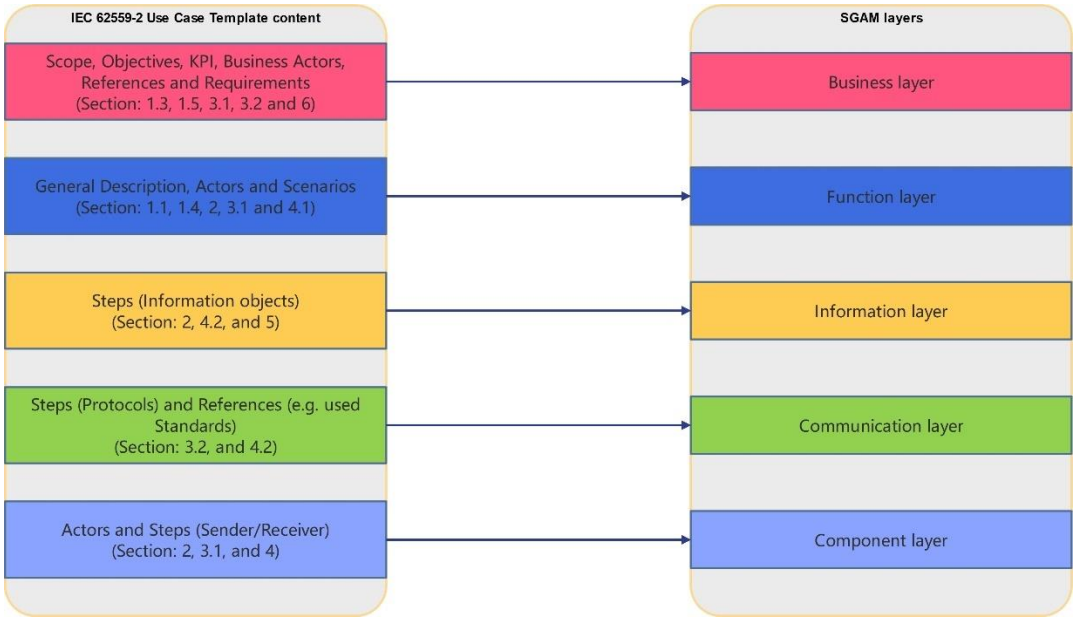


Figure 4 - The components of the use case template and their relationship to SGAM

4. CONCLUSION

At the first part of this paper, we explored the relationships of stakeholders within the context of ECs and outlined their role and their interaction with the power system. We reviewed the stakeholders in traditional and modern electrical energy systems, highlighting the increasing complexity and interdependence of these systems. This complexity is further amplified by the

emergence of ECs, where electrical energy generation, distribution, and consumption are more decentralized. Then this paper delved into various BMs for ECs and their development. Then we categorized and examined the most common BMs according to energy related activities (functionalities). Further we explained an application of the IEC 62559-2 Use Case Methodology, which offers a structured approach to defining and modelling the interactions between EC stakeholders and their respective systems (power energy systems). Through the UML use case diagrams, and activity diagrams, we illustrated practical examples, such as collective generation and trading and collective self-consumption (+EV CSs), to showcase how these BMs can be implemented in real-world scenarios, how we can identify their needs and requirements regarding information (data) exchange and ICT design, and how they influence power system operations generally. At the end, we explored the correlation between the IEC 62559 Use Case Methodology and the SGAM Methodology. We explored which components of the IEC 62559 use case template are associated with the corresponding SGAM layer. This paper explored and gave an insight how IEC62559-2 template can be visualized through the SGAM, ensuring power system operations and system interoperability.

LITERATURE

[1] Aleksandar Dimovski; Matteo Moncecchi; Marco Merlo; Impact of energy communities on the distribution network: An Italian case study, *Elsevier,* 2023, volume 35, 101148, https://doi.org/10.1016/j.segan.2023.101148

[2] Javier Parra-Domínguez; Esteban Sánchez; Ángel Ordóñez; The Prosumer: A Systematic Review of the New Paradigm in Energy and Sustainable Development, *Sustainability,* 2023, 15(13), 10552, https://doi.org/10.3390/su151310552

[3] José Iria; Filipe Soares; An energy-as-a-service business model for aggregators of prosumers, *Elsevier*, 2023, volume 347, 121487, https://doi.org/10.1016/j.apenergy.2023.121487

[4] Erik Figenbaum; Paal Brevik Wangsness; Astrid Helene Amundsen; Vibeke Milch; Empirical Analysis of the User Needs and the Business Models in the Norwegian Charging Infrastructure Ecosystem, *World Electr. Veh. J.*, 2022, 13(10), 185; https://doi.org/10.3390/wevj13100185

[5] Merla Kubli; Sanket Puranik; A typology of business models for energy communities: Current and emerging design options, *Elsevier*, 2023, volume 176, 113165; https://doi.org/10.1016/j.rser.2023.113165

[6] DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources (recast), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001

[7] DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast), https://eur-lex.europa.eu/eli/dir/2019/944/oj/eng

[8] Günther Eibl; Jawad Kazmi; Oliver Langthaler; Maximilian Schirl; Stefan Wilker; Towards interoperable local energy communities in Austria; *Elektrotech. Inftech*, 2023, 140:432–440; https://doi.org/10.1007/s00502-023-01150-4

[9] Mathias Uslar; Sebastian Hanna; Teaching Domain-Specific Requirements Engineering to Industry: Applying Lego Serious Play to Smart Grids, ISEE 2018: 1st Workshop on Innovative Software Engineering Education; https://ceur-ws.org/Vol-2066/isee2018paper10.pdf

[10] Johann Schütz; Mathias Uslar; Jürgen Meister; Julia Köhlke; Interoperability of digital (ICT) systems in the energy sector: How to Improve the Interoperability of Digital (ICT) Systems in the Energy Sector; ISGAN Annex 6 Power Transmission & Distribution Systems Focus area „System Operation and Security“; https://www.researchgate.net/publication/365070537_Discussion_paper_on_how_to_Improve_the_Interoperability_of_Digital_ICT_Systems_in_the_Energy_Sector