Project	INTERREG Project SMART ENERGY REGION EMMEN-HAREN (SEREH)
WORK PACKAGE 4	Analysis of Current Legal Situation (WP4.I) and Design of Future Legal Framework for Cross-Border Local Energy Systems (WP4.II)
Deliverable WP4.I.1	Current Legal Framework for Cross-Border Local Energy Markets – EU Legal Framework
Authors	Dr. Lea Diestelmeier and Prof. dr. Martha M. Roggenkamp, University of Groningen, Faculty of Law Groningen Centre of Energy Law and Sustainability
Comments	
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university of groningen

faculty of law

groningen centre of energy law and sustainability

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LIST OF ABBREVEATIONS

CEER	Council of European Energy Regulators
CCU	Carbon Capture and Usage
CDS	Closed Distribution System
CEC	Citizen Energy Community
CEP	Clean Energy for All Europeans Package
DE	Deutschland
DSO	Distribution System Operator
ECJ	European Court of Justice
EEAG	Guidelines on State Aid for Environmental Protection and Energy 2014-2020
EMD	Electricity Market Directive
EMR	Electricity Market Regulation
EU	European Union
ETS	Emission Trading Scheme
FiT	Feed-in Tariff
GMD	Gas Market Directive
IEM	Internal Energy Market
ISO	Independent System Operator
ITO	Independent Transmission System Operator
MS	Member State
NRA	National Regulatory Authority
NL	Nederland

PtG	Power to Gas
REC	Renewable Energy Community
RES	Renewable Energy Source
RESD	Renewable Energy Sources Directive
SCI	Small Connected System
SEREH	Smart Energy Region Emmen-Haren
SIS	Small Isolated System
SNG	Synthetic- or Substitute Natural Gas
TPA	Third-Party Access
TSO	Transmission System Operator
VIC	Vertically Integrated Company

EXECUTIVE SUMMARY

The SEREH project aims at identifying and analysing the preconditions of such a local energy system functioning across the national border between the Netherlands and Germany, more precisely between the municipalities of Emmen (NL) and Haren (DE). The overall goal is to match the supply and demand of RES locally and across the border and thereby improve the efficiency of RES supply and demand.

Object and Scope of this Deliverable

This deliverable 4.1.1 is part of the work within the SEREH project and has as its objective to identify legal and regulatory challenges at the level of the European Union (EU) regarding the implementation of different settings for SEREH.

Overview of Content and Key Findings

The energy sector is subject to sector-specific EU legislation since the aim to establish an internal energy market (IEM) whilst at the same time securing a regular energy supply and combat climate change, inter alia by increasing the use of renewable energy sources. These aims materialise in specific legislation for the electricity and gas sector assigning rights and obligations to producers, system operators (transmission and distribution), cross-border trade, and consumers. The aim of this deliverable is to identify the relevant EU law provisions for SEREH and highlight options and limitations for the implementation under the current EU legal framework. This deliverable is structured on the basis of a variety of SEREH settings, which were developed in consultation with the project consortium. Five settings (plus some sub settings are presented. For the development of these settings the following two main points where relevant

- which *kind of connection* (electricity or gas) needs to be installed
- for which *purpose* (for example cross-border trade, supply to specified customers, hydrogen production, or storage etc).

The legal analysis of each setting presents options and limitations. Subsequently, the limitations are translated in recommendations on how to further develop or adjust the current EU legal framework in order to make SEREH a viable solution. The key findings are the following and should be addressed at EU level:

- Need to develop and publish an official EU document which guides the revision of distribution network tariffs which incentivise flexibility technologies.

- Need to investigate the reasons for reluctance of implementing cooperation mechanisms (especially for joint projects between two MS) in more detail and presents concrete solutions how to remove those obstacles. Furthermore, the scope of cooperation mechanisms should also focus on locally obtained benefits and reduction of system costs.

- Need to evaluate the obligation to open up support schemes for producers located in another Member State with a special focus on the potential of border regions and cross-border projects implementing RES.

- Need to provide further guidelines with regard to the transposition of the concept Citizen Energy Community, especially with regard to the option of system operational tasks, profit-making, and the option to function across borders.

- Need to further research on the topic of alternative decentral energy systems and to identify its potential for the EU context.

- Need to continue efforts to further harmonise gas quality standards at EU level.

- Need to align legal uncertainties between the electricity and the gas regime regarding the operation and ownership of storage facilities

1. INTRODUCTION

In the European Union (EU) the energy transition is not only a transition from fossil- to renewable energy sources (RES), but also a transition of organisational structures of the energy sector. This entails, inter alia, moving away from an energy system in which energy is primarily generated by large centralised installations towards a system with decentral-, or better local, structures involving different stakeholders from the public and the private sector. This requires the implementation of new technologies and energy management systems as the local supply needs to be matched with the local demand. These local structures could also be implemented across national borders of EU Member States (MS) at the distribution system level.[1]

The SEREH project aims at identifying and analysing the preconditions of such a local energy system functioning across the national border between the Netherlands and Germany, more precisely between the municipalities of Emmen (NL) and Haren (DE). The overall goal is to match the supply and demand of RES locally and across the border and thereby improve the efficiency of RES supply and demand. The SEREH project includes electricity generated on basis of RES (wind and possibly solar) and potentially also gas in form of "green" hydrogen (power-to-gas or PtG).[2] Therefore, this document generally refers to "energy" and specifies either electricity or gas where it is relevant. The project includes the following four interrelated parts:

- the technical system,
- the market setting,
- the community, establishing- and potentially benefitting from the project,
- and the wider region across borders.

Linking the components and investigating how they relate to one another is explored in the SEREH project.

The realisation of local energy systems, markets, communities, and regions depends on the legal framework applicable to the energy sector. The legal framework is composed of EU legislation and national legislation of the Netherlands and Germany. Generally, the legal framework is decisive for the following main points:

- setting the rules for the market of production and supply
- prescribing tasks for system operators including cross-border interconnections and guidelines for network tariffs
- allowing exemptions from the general legal framework
- incentivising RES and energy efficiency
- determining the role of consumers in the sector

[1] The electricity system entails two operational levels, the high-voltage transmission system which transports the electricity from large remote generation over longer distances to transformer stations where the voltage level is reduced and from where the electricity is forwarded by the low-voltage distribution systems to the loads, the points of final consumption. Analogically, the gas system also entails two operational systems which are distinguished by high-pressure pipelines and low-pressure pipelines.

[2] This project only considers so called "green" hydrogen, hydrogen which originates from renewable electricity. The role of hydrogen is mainly assessed in WP3.

In 2018 and 2019, the EU legal framework has been extensively revised which resulted in a new focus on decentral approaches.[3] MS are expected to transpose the reformed EU legal framework into their national legal frameworks applicable to the energy sector.[4] The aim of this deliverable (WP4.I.1) is to outline the current EU legal framework of the energy sector which is of relevance to the SEREH project. The second part of this deliverable (WP4.I.2) will in particular address the national legal frameworks (the Netherlands and Germany).

This document is structured as follows:

Table 1: Overview of contents

Section	Aim
1: Introduction	Outline aim and scope of deliverable
2: Background and Legal Settings for SEREH	Outline scope of SEREH project
3: Principles of EU Energy Sector Legislation	Outline general rules on energy sector legislation
4: Electricity Settings	Legal analysis of electricity settings
5: Hydrogen Settings	Legal analysis of hydrogen settings
6: EU Legal Framework: Overview of Options and Limitations for SEREH	Presenting an overview of the main provisions which provide options and limitations for the SEREH settings
7: Recommendations	Present recommendations for EU law
8: Conclusion	Conclude on options and obstacles for SEREH under the current EU legal framework

1.1 WP4: Analysis of Current Legal Situation and Design of Future Legal Framework for Cross Border Local Energy Systems

This work package (WP4) is composed of two main parts. The first part analyses the current legal situation applicable for cross-border local energy systems (WP4.I). Based on findings of the first part, the second part is dedicated to the design of a legal framework which enables the implementation of a cross-border local energy market (WP4.II). Part I is further subdivided

[3] EU Commission, 'Clean Energy Package for All Europeans - Commission proposes New Rules for Consumer Centred Clean Energy Transition' (30 November 2016). The package includes legislation reforming market structures, legislation reforming aims facilitating the shift to a low-carbon-based sector, and new measures.

[4] At latest until 31 December 2020, art. 71 Directive 2019/944/EU of 5 June 2019 on Common Rules for the Internal Market for Electricity [2019] OJ L158/125 (in the following EMD 2019/944/EU); and at the latest 30 June 2021 art. 31 Directive 2018/2001/EU on the Promotion of the Use of Energy from Renewable Sources [2018] OJ L328/82 (in the following RESD 2018/2001/EU).

in a deliverable addressing the EU legal framework (present document, WP4.I.1) and a part addressing the national legal frameworks of the Netherlands and Germany (WP4.I.2).

Table 2: Overview of deliverables

WP4	**Analysis of Current Legal Situation and Design of Future Legal Framework for Cross Border Local Energy Systems**
WP4.I	**The current legal situation applicable for cross-border local energy systems**
➔ WP4.I.1	EU legal framework *(present deliverable)*
WP4.I.2	National legal frameworks
WP4.II	**Design of Future Legal Framework for Cross Border Local Energy Systems**

1.2 Relevance of EU Law for SEREH

EU law is relevant for the SEREH project as both participating countries are EU MS. More specifically, EU law is decisive for the setting of the energy sector in various aspects and determines national law either directly via Regulations or indirectly via the transposition of Directives. The energy sector is subject to sector-specific EU legislation since the aim to establish an internal energy market (IEM) was presented in the 1980s.[5] Commencing in the 1990s, the EU legal framework establishing rules on the IEM has been continuously elaborated and extended with the aim to liberalise and integrate the energy markets of the MS. Additionally, the aim to lower emissions stemming from the energy sector and to reduce fuel dependency from third states was established at EU level in the 1990s and resulted, amongst others, in a legal framework implementing different measures promoting RES. The establishment of the IEM and the promotion of RES, are relevant for the SEREH project. The following section briefly outlines the objective and scope of this deliverable.

1.3 Objective and Scope of this Deliverable: The EU Legal Framework

The objective of this deliverable is twofold: Firstly, outlining the current setting of the EU legal framework on the energy sector with relevance for SEREH. Secondly, identifying potential options and obstacles under the current legal framework for the implementation of the SEREH project. The potential options and obstacles are identified by relating the current legal framework to the scope of the SEREH project. The scope is determined by the technical components and societal goals as outlined in the following sections. Each section concludes by specifically highlighting the relevance for SEREH.

[5] Commission of the EC, Completing the Internal Market: White Paper from the Commission to the European Council, COM(85)310, 28-29 June 1985; Commission of the EC, The Internal Energy Market – Commission Working Document, COM(88)238 final 2, May 1988.

2. BACKGROUND: THE SMART ENERGY REGION EMMEN-HAREN (SEREH)

The main objective of the SEREH project is the assessment of technological, market-relevant, and legal preconditions for the implementation of a local energy system which functions across national borders within the EU. At this stage, the aim is not implementing such a system, but to demonstrate its feasibility and to identify remaining hurdles. The guiding rationale for the design of the assessment of the preconditions is to increase the utilisation of RES and to reduce associated system costs at local level.[6]

In 2015, the SEREH concept was developed in three sessions with the involvement of a total of 31 experts and stakeholders formulating a vision and specific projects for the implementation. Subsequently, the municipalities of Emmen and Haren adopted the vision and the implementation plan. Their aim is to establish a functioning local energy system across the border on distribution grid level as of 2025. Ideally, this would enable reaping the benefits of local RES generation on local scale, i.e. the aim is that industries and possibly residential consumers in the region can profit from such a local energy system. This requires new technologies which facilitate the efficient matching of supply and demand on local scale, such as storage technologies and smart system operation. The following sections outline the scope of the SEREH project regarding the technical components and the societal goals.

2.1 Scope of the SEREH project

The scope of the SEREH project consists of two main parts, namely the technical components and the societal goals. Some of the technical components are already implemented, others are in the development stage. The idea of the SEREH project is to connect the physical parts and to establish the market setting in such a way that the societal goals are maximised. The scope thus extends beyond the geographical- and the physical delineation.

2.1.1 Technical Components

The SEREH project consists of a variety of technical components which can be classified in production and flexibility technologies. The following table summarises the main components.

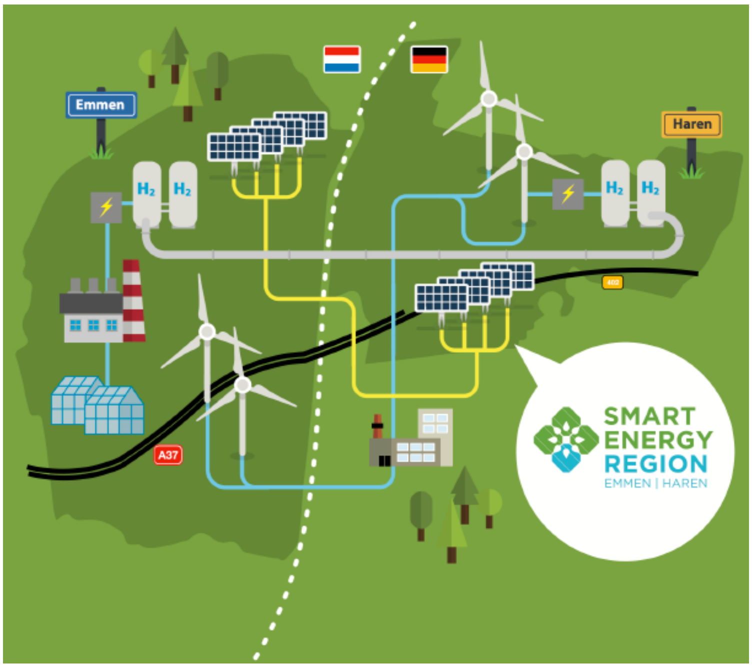
[6] Definition system costs for the purpose of SEREH is undertaken in WP1.

Table 3: Overview of technical components of SEREH

Technology	Specification	Location
Electricity production	Wind farm "Fehndorf-Lindloh" (65 MW)	Germany
Electricity production	Wind farm "Zwartenbergerweg" (24 MW)	Netherlands
Flexibility (battery storage)	Speicherfeld (storage field) (4 MW battery capacity, 4 MW electrolyser, smart container for demand management)	Germany and connected to the wind farm "Fehndorf-Lindloh"
Flexibility (power-to-gas)	Former gas purification plant Emmen (gaszuiveringsinstallatie, GZI next (electrolysis)	Netherlands
Flexibility (demand response)	Local industry	Mainly Netherlands

The SEREH project aims at quantifying the benefits of integrating the technical components of decentral generation and flexibility technologies (storage and demand-response) for increasing the efficient usage of RES at local level. The main question is thus how to integrate and utilise the available technical components in order to increase the share of RES and at the same time minimise system costs at local level. From a technical-economic perspective, the answer to this question bears several options which can be formulated in different scenarios (WP1) which need to be assessed according to their feasibility (WP2).

Figure 1: Schematic sketch SEREH region

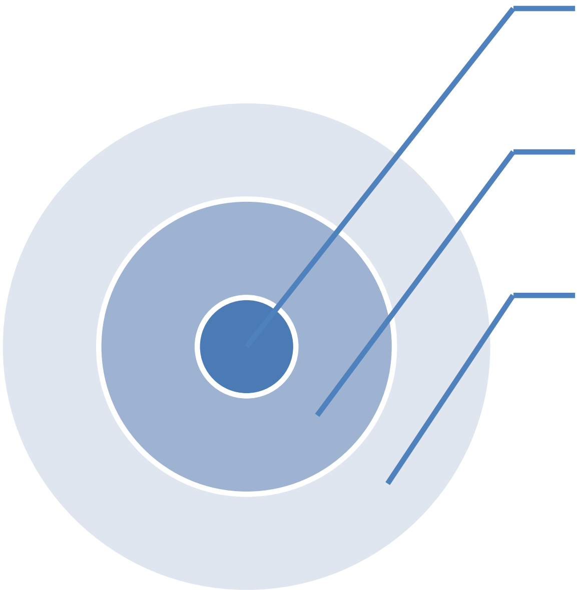


Source: SEREH project 2019.

2.1.2 Societal Goals

The core of the SEREH vision is the aim to lower system costs by matching the supply and demand of sustainable energy regionally and across national borders (NL and DE). The following diagram presents the main societal goals connected to the SEREH project.

Figure 2: Main societal goals of SEREH



At the core of the societal goals is the efficient production and consumption of RES which leads to a minimisation of energy losses in transport and curtailment. Shortening distribution chains will ideally lower system costs and result in lower network tariffs for consumers. Overall, a local energy system should thus result in financial benefits of the energy transition for the region.

2.2 Legal Settings for SEREH

During the SEREH project meeting in March 2020 in Werlte (DE), three general scenarios were sketched ("direct connection", "microgrid-", "switch scenario"). For the legal assessment of these scenarios, we have specified these scenarios in a variety of settings. This involved the need to establish

- which kind of connection (electricity or gas) needs to be installed in the Netherlands and/or Germany and
- for which purpose (for example cross-border trade, supply to specified customers, hydrogen production, or storage etc).

We developed settings which diverge from the "business-as-usual-setting", thus settings which are likely not (yet) to be possible under the current legal framework. The expected outcome of our analysis will show how current legal options (mis)match the anticipated SEREH settings and subsequently which legal changes would be necessary to enable a specific SEREH setting.

Input from all project partners has been incorporated in the setting presented below. In order to classify different SEREH settings from a legal perspective, the type of infrastructure is most relevant, i.e. the type of cross-border connection and the purpose of use for this infrastructure (for example, despite the fact that setting 3 includes hydrogen production, it is classified as an "electricity type of setting" because the cross-border infrastructure is an electricity connection). Accordingly, we identify two main categories, namely "electricity settings" and "hydrogen settings". Both categories unfold in a variety of options. Those settings are presented in the table below.

Table 4: SEREH settings to analyse legal options for cross-border energy trade on local level under the current legal framework

Type Setting	Specified setting	Option	Location RES generation	Type cross-border connection	Connection to	Purpose for use
I Electricity Settings	**1. Connecting distribution systems across the border**	Direct electricity connection between DE and NL distribution systems *("direct-connection setting")*	DE and NL	Electricity	Distribution grids in DE and NL	Enabling cross-border trade on local level via the distribution systems
	2. Direct RES generation connection to DE- or NL distribution grid	a) RES generation installations are located in DE and connected across the border to the NL distribution grid and vice versa *("direct-connection setting")*	*Either* DE *or* NL	Electricity	*Either* NL distribution grid *or* DE distribution grid	Cross-border electricity trade
		b) RES generation installations are connected to the NL and the DE distribution system, i.e. two connections which of which the use depends on the market prices *("double-direct connection-" or "switch setting")*	*Either* DE *or* NL	Electricity	*Either* NL distribution grid *or* DE distribution grid	Local or cross- border trade depending on the market prices in DE and NL
	3. Direct electricity connection for exclusively specified customers	RES generation installation is located in DE and has a direct connection to one specified customer in NL (for example a hydrogen production facility or industrial customers such as a greenhouse grower). There is no direct connection of the RES generation installation to the distribution grid and vice versa. *("direct-connection setting")*	*Either* DE *or* NL	Electricity	Exclusively specified industrial customer or more industrial customers in NL or in DE	Supply to one or more industrial customer(s), including a hydrogen producers/ electrolyser
	4. Cross-border group of producers and consumers	A group of producers and consumers operates a part of the existing distribution systems plus a cross-border-connection across the national border. The connection to transmission systems on each side of the border is limited (the part of the distribution grid functions to the largest possible extent as an "island")	DE and NL	Electricity	Various customers (industrial and households) across the border	Developing a local system facilitating cross-border trade between local producers and local consumers (which can be both, industrial- and household consumers)

II Hydrogen Settings	**5. Direct Hydrogen connection**	RES generation installation is located in DE and is directly connected to an electrolyser in DE. The hydrogen is transported to NL (via an existing- or a new pipeline) and is… a) … injected in the NL national gas grid and vice versa *("direct-connection setting")*	*Either* DE *or* NL	Hydrogen	National gas grid	Cross-border supply of hydrogen
		b) …stored in NL and vice versa *("direct-connection setting")*	*Either* DE *or* NL	Hydrogen	Storage facility	Storage of hydrogen
		c) …directly supplied to an industrial customer in NL and vice versa *("direct-connection setting")*	*Either* DE *or* NL	Hydrogen	End-users of hydrogen	Cross-border supply of hydrogen
		d) All options under setting 5 (a-c) are also considered for the situation where both the electrolyser and the RES generation installation are connected to the grid (so without a direct connection), as this requires an assessment of the extent to which the hydrogen still can be treated as 'green' hydrogen	*See above*	*See above*	*See above*	*See above*

3. PRINCIPLES OF EU ENERGY SECTOR LEGISLATION

Before entering into a detailed assessment of the proposed settings for SEREH under the current legal framework, it is necessary to outline a general overview of some key principles of EU energy law. Outlining them at this point avoids repetitions in the subsequent analysis of the different settings as presented in table 4.

Commencing with the 1988 Working Document "The Internal Energy Market" (IEM) COM (88), the liberalisation process of the energy sector gradually developed along two main objectives.[7] Firstly, the need to apply primary EU law (the principles of free movement and competition) to the energy sector and secondly, to establish secondary sector specific legislation. The focus of this deliverable is on secondary EU energy sector legislation.[8]

Reviewing the political and economic efforts to establish an IEM in the EU, four main legislative phases can be identified which gradually fostered the way towards the establishment of a competitive IEM. The phases are marked by legislative reforms of the energy sector on EU level in 1996 (electricity) and 1998 (gas), 2003, 2009 (electricity and gas), and 2019 (electricity). Throughout this process three main objectives were gradually strengthened. The establishment of a liberalised market for production and supply of energy, whilst ensuring independent network operation, and facilitating interconnection between MS for cross-border trade. Next to these objectives, the goal of promoting RES materialised in EU energy law. The following sections introduce the general rules concerning production and supply and electricity distribution system operation. The other points are discussed in greater detail in the legal settings, i.e. section 4 and 5)

3.1 Liberalised Market for Production and Supply

The main goal of the liberalisation of the sector is to establish a competitive market for generation and supply of energy. Essential for a competitive and free market is that consumers have a free choice among various suppliers of energy and, vice versa, that supply undertakings can freely deliver to their customers. This was not the case prior to liberalisation as usually only one vertically integrated utility produced electricity and gas, operated the national grid system, and also supplied the energy to the consumer.

One of the main aims of liberalisation is therefore to place the consumer more central in the whole energy supply chain by providing a choice among suppliers. Since 2007 have all

[7] Commission of the EC, The Internal Energy Market – Commission Working Document, COM(88)238 final 2, May 1988.

[8] The Treaty of the European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU) establish fundamental principles of EU law. The body of law that comes from the principles and objectives of the treaties is known as secondary law; and includes regulations, directives, decisions, recommendations and opinions. See for more information https://ec.europa.eu/info/law/law-making-process/types-eu-law_en

consumers – industrial and household consumers- the right to freely choose their supplier. This right is fundamental, only very few exemptions allow to deviate from it.

In a liberalised energy sector, anyone can -in principle- become a producer or a supplier as both are considered to be a market activity. The Directive concerning common rules for the internal market for electricity 2019/944/EU (in the following EMD 2019/944/EU) defines the term producer as *"a natural or legal person who generates electricity"*.[9] The term supplier is only defined by the GMD 2009/73/EC as *"any natural or legal person who carries out the function of supply"*.[10] While the activities of production and supply are generally open to anyone, the activities itself may still be subject to a special authorisation procedure.[11] The EMD 2019/944/EU requires MS to adopt an authorisation procedure for the construction of new generation capacity which needs to consider a range of non-exhaustive criteria listed in article 8(2) which include topics of security, environment, public health and land use. The specific criteria for authorisations are adopted in national legal frameworks.

For the setting of SEREH this means that consumers need to have a freedom of choice of supplier and installing new generation capacity (electricity) is subject to an authorisation regime adopted in Germany or the Netherlands, depending on the location of the generation.

3.2 Regulation of Electricity Distribution System Operation

Due to the fact that electricity network operation is a natural monopoly as there is no competition between networks, the regulation of system operation is at the core of EU energy sector regulation since the beginning of the liberalisation process starting in the 1990s. Regulation distinguishes between the two operational system, i.e. the transmission system and the distribution system which are distinguished, respectively, by high-voltage- and low-voltage systems. EU legislation does not define the voltage levels which can thus differ among the MS. For the SEREH project, the distribution system is of relevance. Yet, for the purpose of this deliverable, also the transmission system is at least partly addressed as some responsibilities are currently explicitly assigned to the TSO. This might, however, need to change in the future where DSOs assume more tasks or at least reformed tasks.[12]

[9] Art. 2(38) Directive (EU) 2019/944 of 5 June 2019 Concerning Common Rules for the Internal Market for Electricity [2019] OJ L158/125 (in the following EMD Directive 2019/944/EU).
[10] Art. 2(8) GMD 2009/73/EC.
[11] Art. 4 GMD 2009/73/EC and art. 8 EMD 2019/944/EU.
[12] Sophia Ruester, Sebastian Schwenen, Carlos Batlle, and Ignacio Pérez-Arriaga, 'From Distribution Networks to Smart Distribution Systems: Rethinking the Regulation of European Electricity DSOs' (2014) Utilities Policy 31 229-237.

For each system a different system operator is responsible for the maintenance and operation, for the transmission system these are TSOs and for the distribution system these are DSO. Some MS have several TSOs, while others only have one. For example, Germany has four TSOs, while the Netherlands has only one.[13] At distribution system level the variation is even larger; differences exist in the number, size and governance of DSOs.[14] For example, in Germany almost 900 DSOs were registered in 2019. However, of these only 75 serve more than 100.000 customers. The large majority of DSOs is thus relatively small. In the Netherlands, only eleven DSOs are registered of which eight serve more than 100.000 customers. The distinction between DSOs serving either more or less than 100.000 customers is provided by the EMD 2019/944/EU. DSOs serving customer amounts falling under this threshold may enjoy exemptions from the unbundling rules (outlined below in section 3.2.2).[15] This section outlines the main provisions regarding the rules on third party access, the designation and unbundling of DSOs, their tasks, the setting of distribution network tariffs, and finally identifies challenges for distribution system operation in the context of the energy transition.

3.2.1 Regulated Non-Discriminatory Third-Party Access

Due to the fact that the energy sector is network-bound, access to the system is a precondition for third parties to participate in the market. Therefore, the grid infrastructure is considered to be an essential facility. As established in *Bronner*, refusing access to the essential facility can only be justified by objective reasons.[16] In the electricity sector, this was further confirmed in the case *VEMW* by emphasising the duty of system operators to grant access.[17]

Since 2003 MS need to provide regulated non-discriminatory TPA to the network, which means that both transport tariffs and transport conditions need to be non-discriminatory and transparent. In the current directives the provision for non-discriminatory TPA is established by article 6 for the electricity sector in the EMD 2019/944/EU and article 32 for the gas sector in the GMD 2009/73/EU. Non-discriminatory TPA implies that all system users, who are natural or legal persons supplying to, or being supplied by a network, are charged a non-discriminatory tariff for their system use. For example, this implies that neither the size, the relationship between suppliers and network operators, nor portfolio considerations in the case of large system users must affect the tariffs and other conditions.

An objective justification for system operators to deny access to its system is lacking capacity. EMD 2009/72/EC states *"the transmission or distribution system operator may refuse access*

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[13] In Germany these are Amprion, 50Hertz, Transnet BW und TenneT, and in the Netherlands it is TenneT.

[14] European Commission, Joint Research Centre, Distribution System Operators observatory 2018 – Overview of the Electricity Distribution System in Europe, DSO Observatory Team (Luxembourg, Publications Office of the European Union, 2019).

[15] Art. 35(4) EMD 2019/944/EU.

[16] C-7/97 *Oscar Bronner GmbH & Co. KG v Mediaprint Zeitungs- und Zeitschriftenverlag GmbH & Co. KG* [1998] ECR I-07791, para. 25.

[17] C-17/03 *Vereniging voor Energie, Milieu en Water, Amsterdam Power Exchange Spotmarket BV, Eneco NV v Directeur van de Dienst uitvoering en toezicht energie* [2005] ECR I-04983, para. 46.

where it lacks the necessary capacity".[18] Another objective reason, which has been abolished in 2018, was provided by the RESD 2009/28/EC.[19] The Directive provided for priority access for RES to the grid and thus distinguished between qualities of electricity. The Directive states that *"Member States shall also provide for either priority access or guaranteed access to the grid-system of electricity produced from renewable energy sources"*.[20] This clearly shows that exemptions from the general principle of non-discriminatory TPA are possible but only in cases where the legislation provides for derogations: *"that margin of discretion does not authorize them* [Member States] *to depart from that principle* [of non-discrimination] *except in those cases where the Directive lays down exceptions or derogations"*.[21] The non-discrimination obligation is not a goal in itself, and therefore not absolute, but a tool to ensure a competitive market setting. This also means that

> *"the non-discrimination obligation for system operators does not strive to reach absolute equality of system users. Non-discriminatory behaviour by the monopoly system operators aims at equality of system users to the extent necessary to 'facilitate competition between the competitive market participants'"*.[22]

Next to the objective of establishing a competitive market for generation and supply of electricity, other objectives need to be ensured too. This requires balancing the overall objectives and finding solutions, for example in the form of exemptions, to facilitate the co-existence of conflicting objectives.

For SEREH this means that, in principle, access to all grid infrastructure needs to be provided on non-discriminatory basis to all interested third-parties (also non-SEREH related).

3.2.2 Designation and Unbundling

Due to the fact that the task of distribution system operation is a natural monopoly, i.e. there is only one distribution grid per defined area, the designation and tasks of DSOs is subject to regulation in order to ensure that they fulfil their responsibilities and do not exploit their natural monopoly position. The EMD 2019/944/EU provides some guidance; however, much is left at the discretion of the MS. For the designation the EMD 2019/944/EU only indicates that MS have to appoint an undertaking to be responsible for the distribution system while *"having regard to considerations of efficiency and economic balance"*. Moreover, MS may limit

[18] Art. 32(2) EMD 2009/72/EC.
[19] The Directive is discussed in the following section in more detail in the context of the promotion of electricity generated from renewable energy sources.
[20] Art. 16(2b) EMD 2009/28/EC.
[21] C-439/06 *Citiworks AG* [2008] ECR I-03913, para. 55.
[22] Hannah Kruimer, 'Non-Discriminatory Energy System Operation: What Does It Mean?', (2011) 3 Competition and Regulation in Network Industries 260-286, 274.

the period of time for such a designation.[23] This leniency allows MS to require different criteria for the designation of DSOs.

In order to ensure non-discriminatory TPA, EU regulation includes rules on independent network regulation. “Independent” means that the network operator is not affiliated with any production or supply company in order to ensure a level-playing field for all potential market parties who depend on access to the network. Independence is implemented via unbundling requirements. Unbundling describes the separation of network operators from production and supply undertakings. The measure of unbundling only aims at separating network- and market tasks, it does not prescribe the ownership regime. This is in line with article 345 of the Treaty on the Functioning of the European Union (TFEU) stating that *“the Treaties shall in no way prejudice the rules in Member States governing the system of property rights”*. While this is not an obstacle to liberalisation of the electricity sector, it allows MS to follow different reform pathways regarding public- or private ownership regimes in the liberalisation process.

The concept of unbundling entails different degrees. The first Directives in 1996 and 1998[24] required vertically integrated companies (VIC) to keep separate accounts for each of their production, transmission, distribution, and supply activities. Such accountancy or administrative unbundling provides a limited degree of transparency. Since administrative unbundling proved to be ineffective, it was supplemented in 2003 by reformed Directives[25] with the requirement of legal and functional unbundling. The aim was again to create greater transparency and more independent operators. The regime of legal unbundling required VICs to legally separate the transmission and/or distribution network activities from the production and supply activities so that one of these functions was carried out by a separate company which, however, could belong to the same group or holding of companies. In addition, these VICs had to implement a set of detailed rules to ensure the effective independent operation and decision-making of those subsidiaries dealing with network activities within the integrated group of companies (functional unbundling).[26] The EMD 2009/72/EC introduced three new types of unbundling, which only apply to transmission networks.[27] The preferred and most far reaching unbundling model is “ownership unbundling”, which provides that producers and suppliers cannot own companies operating transmission networks and vice versa.[28] The EMD 2019/944/EU re-confirms the unbundling models established in 2009.

[23] Art. 30 EMD 2019/944/EU.

[24] Directive (EC) No 1996/92 Concerning Common Rules for the Internal Market in Electricity [1997] OJ L27/20 and Directive (EC) No 1998/30 Concerning Common Rules for the Internal Market in Natural Gas [1998] OJ L204/1.

[25] Directive 2003/54/EC Concerning Common Rules for the Internal Market in Electricity and repealing Directive 96/92/EC [2003] OJ L176/37 and Directive (EC) No 2003/55 Concerning Common Rules for the Internal Market in Natural Gas [2003] OJ L176/57.

[26] Tilmann Dralle, ‘The Unbundling and Unbundling-Related measures in the EU Energy Sector’ in *Ownership Unbundling and Related Measures in the EU Energy Sector* European Yearbook of International Economic Law 5 (Springer 2018) 21-63.

[27] Art. 9 EMD 2009/72/EC.

[28] As alternative options to ownership unbundling, the Directive offered two other options. As a second option it introduces the independent system operator (ISO), i.e. a model where the owner of the transmission system does not run the network itself but appoints an ISO to do so (Art. 13-14 EMD 2009/72/EC). As a third alternative

Regarding DSOs, since 2009, the EMD requires at least legal unbundling, which means that they have to form a different legal entity from any production or supply undertaking.[29] This was confirmed, but not extended to ownership unbundling, in the EMD 2019/944/EU[30] although MS are allowed to implement stricter unbundling requirements. The fact that MS may choose for more stringent unbundling measures resulted in different regimes at national level. For example, the Netherlands applies ownership unbundling for DSOs, while Germany sticks to the minimum requirement of legal unbundling. Essentially, the level of unbundling determines the set of activities DSOs are legally allowed to carry out.

The EMD 2009/72/EC elaborates on the choice of less stringent (and harmonised) unbundling requirements for DSOs as follows:

> *"non-discriminatory access to the distribution network determines downstream access to customers at retail level. The scope for discrimination as regards third-party access and investment, however, is less significant at distribution level than at transmission level where congestion and the influence of generation or supply interests are generally greater than at distribution level […]"*.[31]

The stricter regulatory provisions applicable to the transmission system in comparison to the distribution system are thus explained by the fact that most electricity generation is connected to the transmission system. Therefore, the unbundling of TSOs from generation activities is considered more significant than the unbundling of DSOs. Furthermore, DSOs sometimes serve only a relatively small number of connected customers. Full exemption from the unbundling requirements is even allowed in case the DSOs serve *"less than 100.000 connected customers or serving small isolated systems"*[32] as the impact on distortions of the internal market is considered insignificant. However, this might change in the future with more distributed generation which is directly connected to the distribution grid.

MS can opt for an independent transmission operator (ITO), which means that the network company remains legally unbundled and thus remains within a VIC, but independence is achieved by adding several strict rules to prevent the mother company from interfering in the decision-making process of the network company (Art. 17-23 EMD 2009/72/EC).

[29] See section 4.2.2 on unbundling and the different forms of unbundling.

[30] Art. 35 EMD 2019/944/EU.

[31] Recital 26 EMD 2009/72/EC.

[32] Art. 35(4) EMD 2019/944/EU.

For SEREH this means that, in principle, production and supply and network operational tasks cannot be carried out by the same legal person. However, it is important to keep in mind that since unbundling regimes differ across MS (i.e. the Netherlands and Germany), DSOs and related undertakings may engage in different activities.

3.2.3 Tasks

The EMD 2019/944/EU establishes the main tasks for DSOs as follows:

> "[DSOs] *shall be responsible for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity, for operating, maintaining and developing under economic conditions a secure, reliable and efficient electricity distribution system in its area with due regard for the environment and energy efficiency."*[33]

The main challenge in the task of system operation is to strike the balance between the requirement to operate the system economically, reliable, and with regard to the environment and energy efficiency. These objectives partly imply trade-offs in their implementation. Currently, due to the energy transition and increasing amounts of decentral generation connected to the distribution grid, the challenge to balance these objectives amplifies. This issue is discussed further below in section 3.2.6. While this provision remained unchanged with the legal reform of 2019, the EMD 2019/944/EU specifies a new range of tasks for the DSOs. Those include the following:

- Incentives for the use of flexibility in distribution networks (article 32),
- Integration of electromobility into the electricity network (article 33),
- Tasks of DSOs in data management (article 34),
- Ownership of energy storage facilities by DSOs (article 36).

The specification of new tasks indicates the changing role of the distribution grid in general and subsequently the role of DSOs due to the energy transition. The following two subsections present these new defined tasks in two categories, the use of flexibility, which includes electromobility and storage, and the tasks of DSOs in data management.

[33] Art. 31(1) EMD 2019/944/EU.

3.2.4 Distribution Network Tariffs

Distribution network tariffs determine the revenue for DSOs and establish for which costs the DSO can actually request payments from the system users.[34] Generally, the two following objectives prevail for the design of network tariffs in liberalised markets: Network tariffs should be cost-reflective, i.e. meaning that the network tariff needs to reflect the actual costs incurred by a system user, and they should be non-discriminatory, meaning that the same network tariff structure should apply to system users considered to be of the same category.[35] However, which design of tariffs actually captures these two objectives the best is subject to discussion. This question becomes even more complex in the context of the energy transition and an increasing variety of activities at the distribution grid level. An example here is the changing role of household customers which start producing electricity on their premises. They are often referred to as "prosumers". While they use the grid for two purposes, i.e. consumption and feeding-in, they are usually still part of the same category than household customers who only consume. Factually, they are using the grid in different ways, and thus also cause different costs, but legally they are still in the same category of system users and pay the same network tariff.[36] These developments require rethinking the design of network tariffs in order to guarantee the objectives of cost-reflectivity and non-discrimination.

Typically, network tariffs consist of three main elements: a fixed charge (¤/period, i.e. independent of consumption), volumetric costs (¤/kWh/period, i.e. proportional to the energy consumed), and capacity charges (¤/kW/period, i.e. dependent on the maximum power capacity used). Various combinations of these elements are possible.[37] Generally, there is a distinction between a volumetric charge, -a network tariff which is to a larger extent based on the volume of energy consumed, and a capacity charge, - a network tariff which is to a larger extent based on the fixed capacity of the connection. The design of network tariffs structures is highly complex with a trade-off between economic efficiency and equity at its core.[38] The EU legal framework does not prescribe the design of distribution network tariffs. It only establishes guidelines general guidelines.[39] In addition to these guidelines, legislation adopted under the CEP introduces a few more provisions address the design of network tariffs, including the distribution network tariffs. The additional provisions provide more details on

[34] Angela Picciariello, Javier Reneses, Pablo Frias, and Lennart Söder, 'Distributed Generation and Distribution Pricing: Why Do We Need New Tariff Design Methodologies?' (2015) 119 Electric Power System Research 370-376, 371.

[35] Maria Rodríguez Ortega, Ignacio Pérez-Arriaga, Juan Rivier Abbad, Jesús Peco González, 'Distribution Network Tariffs: A Closed Question?' (2008) 38 Energy Policy 1712-1725, 1713.

[36] Lea Diestelmeier, 'Prosumers' in M.M. Roggenkamp, K. de Graaf, and R. Fleming (eds) *Volume XII: Energy Law and the Environment* in Michael Faure (ed) *Edward Elgar Encyclopedia of Environmental Law*, (accepted, forthcoming 2020).

[37] Angela Picciariello, Javier Reneses, Pablo Frias, and Lennart Söder, 'Distributed Generation and Distribution Pricing: Why Do We Need New Tariff Design Methodologies?' (2015) 119 Electric Power System Research 370-376, 371.

[38] Severin Borenstein, 'The Economics of Fixed Cost Recovery by Utilities' (2016) 29(7) The Electricity Journal 5-12.

[39] Annex XI (energy efficiency criteria for energy network regulation and for electricity network tariffs) of Directive 2018/2002/EU amending Directive 2012/27/EU on Energy Efficiency [2018] OJ L 328/210.

the requirements for distribution network tariff design and reiterates the competence of the NRAs for the task of approving the design. The additions can be found in the EMD 2019/944/EU and in the EMR 2019/943/EU.

The EMD 2019/944/EU refers to the distribution network tariffs mainly in the context of the (new) network users, such as active customers, citizen energy communities, and energy storage operators. It is stated that network tariffs for these user groups have to be cost-reflective, transparent and non-discriminatory.[40] Regarding "active customers" the EMD 2019/944/EU even explicitly mentions that

> *"Member States shall ensure that active customers that own an energy storage facility* […] *are not subject to any double charges, including network charges, for stored electricity remaining within their premises or when providing flexibility services to system operators"*.

This provision clearly identifies the problem of double-charging (paying network tariffs for consumption and production) and requires Member States to abolish it.

A more detailed legal framework on network charges is established in the EMR 2019/943/EU. While already the EMR 2009/714/EU provided some guidelines on principles, the amended version of 2019 develops these provisions further. It is further defined what network charges are by establishing that these are *"charges applied by network operators for access to networks, including charges for connection to the networks, charges for use of networks, and, where applicable, charges for related network reinforcements* […]*"*.[41] A more detailed list of guiding principles for tariff design is established. Network tariff shall be:

- Cost-reflective
- Transparent
- Take into account the need for network security and flexibility
- Reflect actual costs incurred insofar as they correspond to those of an efficient and structurally comparable network operator
- Non-discriminatory
- Do not include unrelated costs supporting unrelated policy objectives.[42]

Distribution network tariffs are explicitly mentioned in article 18(7 and 8). The principle of cost-reflectivity is central. Specific tariff design options are mentioned, such as connection capacity (differentiated by use profiles) and time-differentiation. Furthermore, it is stated that distribution tariff methodologies shall promote cost-efficient development and utilisation of the network, including the procurement of services in an efficient manner.

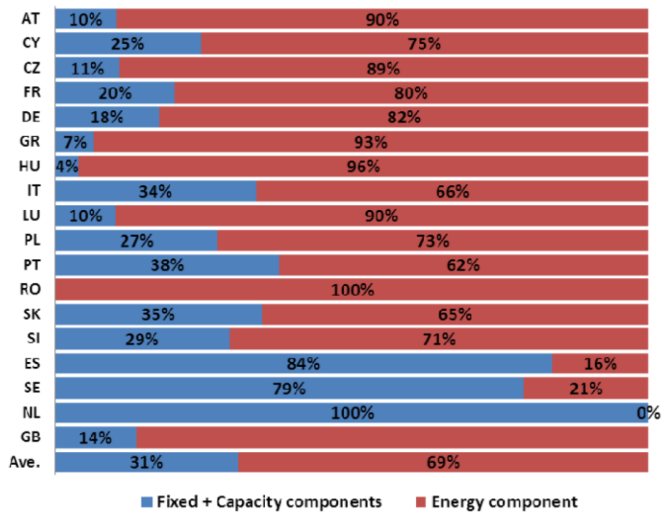
Clearly, with these provisions the aim is to remove existing barriers for flexibility deployment, especially at distribution system level. However, the exact design is left to the MS. A recent position paper of the Council of European Energy Regulators (CEER) provides an analysis of

[40] Art. 15(2 e), art. 16(1 e),
[41] Art. 18(1) EMR 2019/943/EU.
[42] Art. 18(1) EMR 2019/943/EU.

distribution tariff design for supporting the energy transition.[43] They conclude that there is no "one-size-fits-all" distribution tariff design. Instead, they emphasise the needs for strong principles which guide the design. It outlines different design options. Finally, they conclude by urging the NRAs to *"review the current tariff structures to identify how they can be improved, for example, to create stronger incentives for efficient usage of the grid."*[44] At the moment, the tariff designs vary to large (or extreme) extents among the MS. Following the legislative changes under the CEP, it is highly important that MS revise their current tariff designs in order to enable the other aims, such as increasing RES improving efficiency with the aid of flexibility technologies.

The following figure provides a general overview of the different distribution network tariffs designs among the MS for household customers and small industrial customers.

Figure 3: Distribution network designs in EU MS for household customers

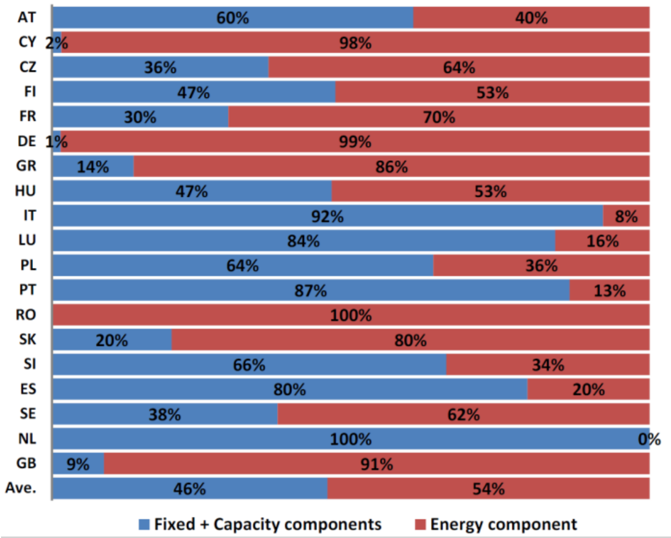


Source: European Commission, 'Study on Tariff Design for Distribution Systems' 28 January 2015, DG Energy.

Currently, most MS in the EU deploy a network tariff structure which is to a larger proportion based on volumetric charges, that means, a large part of the network tariff is based on the volume of the energy distributed (kWh). Precisely, *"the energy component applied to households is on average 69% of the total network charge. This situation is common in most countries apart from three (the Netherlands, Spain and Sweden) where the energy charge weights between 21% and 0%."*[45] Looking in particular at Germany and the Netherlands, the design is quite different. The Netherlands applies a 100% fixed+capacity components, whereas in Germany the larger proportion (82%) is the energy component. Looking at the design of distribution network tariffs for small industrial consumers, a similar picture emerges.

[43] CEER, Electricity Distribution Tariffs Supporting the Energy Transition, Distribution Systems Working Group, Ref: C19-DS-55-04 20 April 2020.
[44] CEER, Electricity Distribution Tariffs Supporting the Energy Transition, Distribution Systems Working Group, Ref: C19-DS-55-04 20 April 2020, 6.
[45] European Commission, 'Study on Tariff Design for Distribution Systems' 28 January 2015, DG Energy (28 January 2015), 2.

Figure 4: Distribution network designs in EU MS for small industrial customers



Source: European Commission, 'Study on Tariff Design for Distribution Systems' 28 January 2015, DG Energy.

Due to the fact that small industrial customers usually require higher power compared to household customers, the fixed+capacity component appears to be more prominent in most of the MS. However, a large variety still exists. Again, especially the Netherlands applies a unique approach with a 100% fixed+capacity-based approach, whereas Germany appears to do the opposite.

In the context of the energy transition, expectedly, overall consumption and grid usage become more complex as they do not only involve the supply of electricity according to highly predictable patterns, but depend on the variability of various small-scale decentralised generation and deployed flexibility technologies. Energy will thus not anymore be the commodity which is of greatest value, but the capacity and services of the grid.[46] This suggests that volume-based distribution network tariffs are not setting the right incentives for the energy transition. However, also the fixed-costs-based network tariff structures are problematic, as they do not incentivise system users to adjust their consumption of energy and usage to the grid according to efficiency gains, flexibility is not rewarded.[47]

Innovative approaches suggest different, although much more complex, designs of distribution network tariffs in order to incentivise distributed generation and flexibility. For example, one approach suggests charging system users for specific services they require based on their deployed technologies (generation and/or flexibilities).[48] This approach is furthered by adding a peak-pricing element and fixed charges in order to improve cost-recovery for

[46] Laura Faerber, Nazmiye Balta-Ozkan, and Peter Connor, 'Innovative Network Pricing to Support the Transition to a Smart Grid in a Low-Carbon Economy' (2018) 116 Energy Policy 210-219, 215.
[47] Christos Kolokathis, Michael Hogan, and Andreas Jahn, 'Cleaner, Smarter, Cheaper: Network Tariff Design for a Smart Future', (2018) Regulatory Assistance Project, 4.
[48] Toby Brown, Ahmad Faruqui, and Léa Grausz, 'Efficient Tariff Structures for Distribution Network Services' (2015) 48 Economic Analysis and Policy 139-149, 148.

system operation.[49] Certainly, this would increase the complexity of network tariff structures tremendously, but only if costs for system use and operation are accurately reflected, is flexibility, and thus efficiency, incentivised.

For SEREH this means that flexibility will take a more central role in the design of distribution network tariffs. MS need to revise their distribution tariff structure. However, the design of the exact tariff can still vary to a large extent among the MS.

[49] Laura Faerber, Nazmiye Balta-Ozkan, and Peter Connor, 'Innovative Network Pricing to Support the Transition to a Smart Grid in a Low-Carbon Economy' (2018) 116 Energy Policy 210-219, 217.

3.2.4.1 The Use of Flexibility in Distribution Networks (including Electromobility and Storage)

The use of flexibility in the electricity system becomes essential with increasing sources of variable RES. Flexibility can be understood as *"the ability of a power system to maintain continuous service in the face of rapid and large swings in supply or demand."*[50] Variable RES cause swings in supply, therefore, in order to use RES to the full extent, demand needs to become more flexible. In the current EU electricity sector, the possibility to offer demand flexibility is mostly directed towards large consumers, for example industries with high electricity consumption.[51] Flexibilities of small consumers located at the distribution grid level remain largely unused yet.[52] The EMD 2019/944/EU aims to encourage the use of flexibility especially at the distribution system level. It therefore specifies that

> "*Member States shall provide the necessary regulatory framework to allow and provide incentives to distribution system operators to procure flexibility services, including congestion management in their areas, in order to improve efficiencies in the operation and development of the distribution system. In particular, the regulatory framework shall ensure that distribution system operators are able to procure such services from providers of distributed generation, demand response or energy storage and shall promote the uptake of energy efficiency measures, where such services cost-effectively alleviate the need to upgrade or replace electricity capacity and support the efficient and secure operation of the distribution system.*"[53]

The regulatory framework thus needs to provide incentives for DSOs to procure flexibility as an alternative to increase network capacities to accommodate RES. The provision includes a non-exhaustive list of flexibility sources which provides a technology-neutral approach regarding the flexibility services. The central question for the transposition of this provision is how to provide for incentives for DSOs to procure flexibility sources as an alternative to grid expansions. Key for setting the incentives are the methodologies for network tariffs which establish the allowed revenue for DSOs and the costs which compose the network tariff for system users.

It is emphasised that DSOs need to procure those flexibility services in principle in accordance with transparent, non-discriminatory and market-based procedures.[54] This further requires the specification of flexibility services or standardised market products at national level which are defined either by the DSOs and the approval of the NRA or the national regulatory itself. Again, such a specification shall include all possible providers of flexibility and the provision names *"market participants offering energy from renewable sources, market participants engaged in demand response, operators of energy storage facilities and market participants*

[50] Ecofys, 'Flexibility Options in Electricity Systems', 2014, Berlin.
[51] European Commission, Joint Research Centre, Demand Response Status in EU Member States, (Luxembourg, Publications Office of the European Union, 2016), 127.
[52] Hans Gils, 'Assessment of Theoretical Demand Response Potential in Europe' (2014) 67 Energy 1-18, 6.
[53] Art. 32(1) EMD 2019/944/EU.
[54] Art. 32(1) EMD 2019/944/EU.

engaged in aggregation".[55] The EU legislator thus clearly strives to develop markets for flexibility which are open and technology-neutral.

Another relevant and newly introduced feature in this context is the requirement for DSOs to draw up network development plans. Up until now, such a requirement only existed for the TSOs.[56] The EMD 2019/944/EU now requires DSOs to publish at least every two years a network development plan which is also submitted to the national regulatory authority. The following specifications regarding the content of the plan are set:

> *"The network development plan shall provide transparency on the medium and long-term flexibility services needed, and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion."*[57]

The DSOs have to consult the relevant system users and the TSOs when drafting the plan. Finally, the regulatory authority may request amendments to the final version of the plan.[58] The requirement to draw up these network development plans forces DSOs to consider the option of flexibility and to assess whether *"such services cost-effectively alleviate the need to upgrade or replace electricity capacity and support the efficient and secure operation of the distribution system"*.[59] Moreover, the input from system users and the possibility of the NRA to require further amendments to the plan provides for a monitoring element. DSOs have to explain their choices for the development of their network and need to consider flexibility as an equal alternative to network expansions.

With the increasing number of activities at distribution grid level, it is also necessary to further distinguish network-related tasks and market activities. For example, the EU legislator clearly decided that storage is, in principle, not part of the task package of DSOs.[60] Similar rules are established regarding the ownership, operation, and management of recharging points for electric vehicles.[61] It is required that DSOs "[…] *cooperate on a non-discriminatory basis with any undertaking that owns, develops, operates or manages recharging points for electric vehicles, including with regard to connection to the grid"*.[62] Exceptions to the prohibition of DSOs owning, operating or managing recharging points include similar requirements as the exceptions of DSOs owning or operating storage facilities. For the case that no other party is interested in investing in storage, the following cumulative requirements apply

[55] Art. 32(2) EMD 2019/944/EU.
[56] The 10-Year network development plans for TSOs.
[57] Art. 32(3) EMD 2019/944/EU.
[58] Art. 32(4) EMD 2019/944/EU.
[59] Art. 32(1) EMD 2019/944/EU.
[60] Art.36 EMD 2019/944/EU.
[61] Art. 33 EMD 2019/944/EU.
[62] Art. 33(1) EMD 2019/944/EU.

> “[…] after *open, transparent and non-discriminatory tendering procedure that is subject to review and approval by the regulatory authority, have not been awarded a right to own, develop, manage or operate recharging points for electric vehicles, or could not deliver those services at a reasonable cost and in a timely manner”*,

the NRA has granted approval, and the DSO operates the charging stations with due regard to the principle of third-party access and *“does not discriminate between system users or classes of system users, and in particular in favour of its related undertakings.”*[63]

Overall, the task package of the DSOs increased as they need to consider flexibility options in their network development. Network development plans need to be published and approved by the regulatory authority which may require changes. This forces the DSOs to carefully consider the technical options in order to carry out their core task, the development, operation and maintenance of the distribution system with regard to economic factors, reliability, the environment and energy efficiency.

For SEREH this means that flexibility technologies at distribution grid level will need to be considered by DSOs for developing and operating their grid, this means that flexibility technologies will gain relevance in the near future.

3.2.5 Tasks of DSOs in Data Management

A precondition for the integration of flexibility sources at the distribution system for grid operation is information, i.e. data, on system usage and flexibilities of all system users. A constant two-directional exchange of data between system users and the system operator is necessary to coordinate the grid capacity and the flexibilities available. The EMD 2019/944/EU specifies that “[…] *for the purpose of this Directive, data shall be understood to include metering and consumption data as well as data required for customer switching, demand response and other services.”*[64] Including data for the operation of the distribution grid also requires establishing who is allowed to collect, coordinate, and manage the data. While MS are free to designate a competent authority for the data collection, it is required that

> *“parties responsible for data management shall provide access to the data of the final customer to any eligible party, in […]. Eligible parties shall have the requested data at their disposal in a non-discriminatory manner and simultaneously. Access to data shall be easy and the relevant procedures for obtaining access to data shall be made publicly available.”*[65]

[63] Art. 33(3 a-c) EMD 2019/944/EU.
[64] Art. 23(1) EMD 2019/944/EU.
[65] Art. 23(2) EMD 2019/944/EU.

This clarifies that access to data shall be open as it is relevant to participate in markets for flexibility services. The EMD 2019/944/EU specifies rules for the case where DSOs are involved in data management. The rules are the same which apply to DSOs which are still part of a vertically integrated undertaking which includes that the DSO "[…] *shall be independent in terms of its organisation and decision-making from the other activities not related to distribution.*"[66] This provision aims at mitigating the risk that vertically integrated undertakings have privileged access to data for the conduct of their supply activities and prevent other eligible parties to offer services. The role of the DSOs is becoming more central in the electricity supply chain. From a regulatory perspective this requires carefully assessing newly emerging activities and analysing whether or to which extent these could be assigned to DSOs without the risk of foreclosing potential markets.

For SEREH this means that the availability of data becomes essential for the use of flexibility in the electricity system. Access to data has to be open in order to participate in flexibility markets.

3.2.6 Challenges in the Context of the Energy Transition

The preceding sections show that the role of the electricity DSOs is changing in the context of the energy transition. The distribution grid is not anymore only used to supply customers on the basis of largely predictable patterns, but needs to accommodate bidirectional flows of electricity due to decentral generation, increasing consumption due to electrification, and different technologies which offer flexibility services. The EMD 2019/944/EU includes a variety of new tasks for the DSOs which extend their role and require a more "active" approach in distribution system operation. For example, the development and maintenance of the networks needs to consider flexibility as an equal alternative to grid expansions which requires a complex assessment by the DSOs. However, the preceding sections also explained that preparing the distribution grid for the energy transition is not only a matter of extending the role of the DSOs. The regulatory framework also needs to provide incentives for the DSOs to procure flexibility via the network tariff structures, and to the system users for offering flexibility services. Implementing the changes thus requires to adjust several regulations at the same time in order to enable the energy transition at distribution system level. While the objective of SEREH is to contribute to solve some of these challenges in the context of the energy transition at distribution system level, the legal framework is not yet entirely tailored to these solutions. The following section outlines potential the legal options and limitations for electricity connections across the border at distribution system level.

[66] Art. 35(2) EMD 2019/944/EU.

4. ELECTRICITY SETTINGS

This section presents the legal options and limitations for the settings outlined above in section 2.2. As mentioned, in order to classify different SEREH settings from a legal perspective, the type of infrastructure is most relevant, i.e. the *type of cross-border connection* and the *purpose of use* for this infrastructure. The legal analysis relates to the EU legal framework and therefore builds upon the preceding section on principles of energy sector legislation (section 3). In addition, however, the legal framework allows for specific exemptions to this general legal regime which might also provide relevant leeway for SEREH. These are explained in the following subsections which explain each legal setting in greater detail.

4.1 Connecting Distribution Systems Across the Border

This setting is the most straight-forward and rigorous solution to connect the German and the Dutch distribution system, "simply" by building a connecting cable between the two distribution systems (a *"direct connection"*).

Currently, electricity systems of different MS are interconnected at the transmission system level. Interconnection of energy networks became increasingly important with the establishment of the internal energy market as it enables the physical exchange of energy between countries which is essential for the cross-border trade. For gas- and electricity networks interconnection is explicitly established at the transmission system level.[67] Due to the fact that interconnectors are vital for cross-border trade, special rules apply for the access to interconnection capacity. The main objective is to provide a transparent and cost-reflective tariffication system. Moreover, several specific rules on interoperability, congestion management, and capacity allocation are applicable. Since interconnectors currently only exist at the transmission system level, the legal regime is not relevant for SEREH. However, as SEREH clearly entails an interconnecting element (which is not yet legally defined) it is relevant to explain the general rules on interconnection.

4.1.1 Cross-border Interconnection

The EMD 2019/944/EU does not explicitly define the term "interconnector" as cross-border link. It simply defines it as *"equipment used to link electricity systems"*.[68] This could then also include equipment which is meant to connect transmission and distribution systems within

[67] Art. 2(1) Regulation (EU) 2019/943 on the Internal Market for Electricity [2019] OJ L158/54 (in the following EMR 2019/943/EU) art. 2(17) Directive 2009/73/EU Concerning Common Rules for the Internal Market in Natural Gas [2009] OJ L49/112 (in the following GMD 2009/73/EC).
[68] Art. 2(39) EMD 2019/944/EU.

one MS. Nevertheless, the EMR 2019/943/EU leaves no doubt that "interconnectors" are meant as a cross-border link by defining it as follows: *"[…] transmission line which crosses or spans a border between Member States and which connects the national transmission systems of the Member States*".[69] Relevant to mention at this point is that since this definition is enshrined in a Regulation, it becomes directly national law. There is thus no leniency for the MS to define interconnectors in their national legal frameworks. The GMD 2009/73/EC even clearly defines them as *"transmission line which crosses or spans a border between Member States for the sole purpose of connecting the national transmission systems of those Member States"*.[70] The clear reference to transmission networks also determines the competence of operating interconnectors to the TSOs.

Access to cross-border infrastructure is subject an explicit legal regime because the allocation of capacity is vital for the IEM. The main objective is to ensure cost-reflective tariffs of cross-border access and excluding excessive costs for cross-border operations. In 2003 and 2005 two Regulations were adopted, the Regulation on conditions for access to the network for cross-border exchanges in electricity and the Regulation on conditions for access to the natural gas transmission networks.[71] Both Regulations were repealed in 2009, and the Regulation on electricity was again repealed in 2019.[72] Both Regulations establish a complex set of rules on interoperability (especially regarding gas quality), compensation mechanisms for cross-border flows of electricity, and capacity allocation mechanisms and congestion management.[73]

For SEREH this means that any infrastructure link between Germany and the Netherlands cannot be classified as interconnector as the definition is explicitly constrained to the transmission network. Linking distribution systems across national borders is not foreseen under the current legal framework.

[69] Art. 2(1) EMR 2019/943/EU.
[70] Art. 2(17) GMD 2009/73/EC.
[71] Regulation (EC) No 1228/2003 on Conditions for Access to the Network for Cross-border Exchanges in Electricity [2003] OJ L176/1, and Regulation (EC) No 1775/2005 on Conditions for Access to the Natural Gas Transmission Networks [2005] OJ L289/1.
[72] EMR 2019/943/EU and Regulation (EC) No 715/2009 on Conditions for Access to the Natural Gas Transmission Networks [2009] OJ L211/36.
[73] Martha Roggenkamp, Catherine Redgwell, Anita Rønne, and Iñigo del Guayo (eds) *Energy Law in Europe – National, EU and International Regulation* (3rd ed Oxford University Press 2016), p. 283-287.

4.2 Direct RES Generation Connection to the German *or* the Dutch Distribution Grid

In contrast to the previous outlines setting, this setting does not connect the two distribution systems across the border, but only a RES generation installation on one side of the border with the distribution grid on the other side of the border. There is thus no interconnection of the two distribution systems, but the RES generation installation is connected for example in Germany and connected to the Dutch distribution system, or vice versa *("double-direct connection")*.

One of the objectives of the EU is to mitigate climate change. As the energy sector is still one of the largest emitters of Green House Gases (GHG), the aim is to facilitate the transition from fossil- to renewable energy sources.[74] SEREH's aim is to increase the share of RES in gross final consumption at the local level and to mitigate associated system costs by cooperating across the national border. This setting entails the connection of a generation installation which is located in one MS and connected to the grid in another MS. Essential for this setting is whether and to which extent the generation installation can benefit from the financial support scheme of the MS to which it is connection. Despite the fact that increasing the share of RES is a set EU objective, MS have the freedom to establish and design support schemes. The current EU legal framework on the promotion of RES entails three main pillars. Firstly, setting targets for the share of RES, secondly, allowing for financial incentives, and thirdly, providing the option for MS to cooperate.

4.2.1 RES Targets

RES targets are important as they indicate the pace of the transition. EU legislation sets targets of shares of gross final consumption of RES. These targets changed from indicative national targets, to binding national target and most recently, to an EU-wide binding target. Most well-known are the EU 20-20-20 targets which aimed set a 20% cut in greenhouse emissions relative to levels in 1990, a 20% share of RES in the EU energy consumption, and a 20% improvement in energy efficiency. This target was translated into different individual targets for each MS and included as an Annex to the Directive.[75] Germany needed to fulfil a target of 18% share of energy from RES in gross final consumption of energy by 2020. By 2018 they reached 16.5%. The Netherlands had a target of 14% and reached about 7.4% by 2018.[76]

The revised RESD 2018/2001/EU changed this approach to a binding Union-wide target for the overall share of RES in the Union's gross final consumption of energy in 2030. *"Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 32%."*[77] This target will be reassessed by the EU

[74] European Environmental Agency, Total Greenhouse Gas Emission Trends and Projections in Europe, December 2019.
[75] Annex I RESD 2009/28/EC.
[76] EUROSTAT, Share of Energy from Renewable Sources (updated 6 March 2020).
[77] Art. 3(1) RESD 2018/2001/EU.

Commission in 2023 regarding the need to increase it in order to achieve the climate mitigation target of reducing 40% of emissions by 2030 compared to 1990s levels. Additionally, however, MS need to fulfil a baseline in gross final consumption of RES as of 2021 which corresponds to the previous national binding target (for Germany 18% and for the Netherlands 14%).[78] In case this target is not reached, the Regulation on the governance of the Energy Union prescribes additional measures to be taken by that MS.[79]

For SEREH this means that the energy transition might accelerate with a higher target. Moreover, the Union-wide target might encourage Member States to cooperate.

4.2.1 Support Schemes

The EU legal framework allows for explicit financial support for RES via support schemes. Support schemes are broadly defined as

> *"any instrument, scheme or mechanism applied by a Member State or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased with the main aim to maintain investor confidence"*.[80]

This definition remained unchanged from the preceding directive and led to a variety of support schemes implemented in the MS. Financial support schemes can have various forms; the two main types are price-driven and quantity-driven schemes. Price-driven strategies constitute financial support for the producer on basis of a subsidy per generated unit. Most popular is the system of a Feed-in-Tariff (FiT) under which the producer receives a fixed amount for a certain period of time. In contrast, quantity-driven schemes quotas are set and the goal is reached through bidding schemes or tradable certificates.[81]

Despite the broad character of the definition of support schemes, support schemes still need to be designed whilst taking into account the "guidelines on state aid for environmental protection and energy 2014-2020" (EEAG). The EEAG emphasises the importance that beneficiaries sell their electricity directly in the market and are subject to market obligations. Three cumulative conditions are applicable to all new aid schemes as of 2016

[78] Art. 3(4) and Part A Annex I RESD 2018/2001/EU.
[79] Art. 32(4) Regulation (EU) No 2018/1999 on the Governance of the Energy Union and Climate Action [2018] OJ L 328/1 (in the following Governance Regulation 2018/1999/EU).
[80] Art. 2(5) RESD 2018.
[81] Hans Auer, Gustav Resch, Reinhard Haas, Anne Held and Mario Ragwitz, 'Regulatory Instruments to deliver the Full Potential of Renewable Energy Sources Efficiently' (2009) 3(2) European Review of Energy Markets, 1-34, 5.

- aid is granted as a premium in addition to the market price (premium) whereby the generators sell its electricity directly in the market;
- beneficiaries are subject to standard balancing responsibilities, unless no liquid intra-day markets exist; and
- measures are put in place to ensure that generators have no incentive to generate electricity under negative prices.[82]

The RESD 2018/2001/EU follows the EEAG and explicitly refers to "market premiums", which can for example be sliding or fixed, to be granted in an open, transparent, competitive, non-discriminatory and cost-effective manner. MS may implement exemptions for small-scale and demonstration projects, in accordance with the relevant EEAG thresholds.[83] The shift towards a larger market integration of RES together with the abolishment of priority access for RES, might be a chance for flexibility technologies (such as storage) to gain in relevance.

MS may restrict their support schemes to production in their territory. This reconfirms a decision taken by the European Court of Justice (ECJ) in the case *Ålands Vindkraft AB vs Energimyndigheten* in 2012. The ECJ ruled that governments can restrict the access to their national support RES scheme for electricity generated outside their territory, even though in this case the production plant was connected to the national grid.[84] The RESD 2018/2001/EU states that MS may include indicative shares of newly-supported capacity, or the allocated budget thereto, in each year for producers in other MS. Such indicative shares may in each year amount to at least 5% from 2023 to 2026 and at least 10% from 2027 to 2030.[85] In 2023, the EU Commission will evaluate the opening of support schemes and assess the need to introduce an obligation on MS partially to open participation in their support schemes for electricity from renewable sources to producers located in other MS with a view to a 5% opening by 2025 and a 10% opening by 2030.[86]

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[82] Para 124, EU Commission, Guidelines on State Aid for Environmental Protection and Energy 2014-2020 [2014] C 200/1 (in the following EEAG).

[83] Para. 125: *"The conditions established in paragraph (124) do not apply to installations with an installed electricity capacity of less than 500 kW or demonstration projects, except for electricity from wind energy where an installed electricity capacity of 3 MW or 3 generation units applies."* EEAG.
Para. 127: *"Aid may be granted without a competitive bidding process as described in paragraph (126) to installations with an installed electricity capacity of less than 1 MW, or demonstration projects, except for electricity from wind energy, for installations with an installed electricity capacity of up to 6 MW or 6 generation units." Demonstrations projects are defined as "a project demonstrating a technology as a first of its kind in the Union and representing a significant innovation that goes well beyond the state of the art."* EEAG.

[84] C-573/12 *Ålands Vindkraft AB v Energimyndigheten*. Marek Szydlo, 'How to Reconcile National Support for Renewable Energy with Internal Market Obligations? The Task for the EU Legislature after Ålands Vindkraft and Essent', (2015) 52(2) Common Market Law Review 489-510.

[85] Art. 5 RESD 2018.

[86] Art. 5(5) RESD 2018.

For SEREH this means that currently support schemes are generally only valid for producers located in the Member State which offers the support scheme. With the possible opening of support schemes, the location of the production facility (NL or DE) might not matter for receiving the benefit in the future (as of 2023).

4.2.2 Cooperation Mechanisms

The RESD 2009/28/EC provided the option for MS to make use of cooperation mechanisms to meet the binding target of RES share. These options remain largely unchanged in the RESD 2018/2001/EU.[87] The following four cooperation mechanisms exist:[88] firstly, the statistical transfer mechanism provides MS the option to trade a generated surplus of RES to another MS struggling to comply with its target.[89] Secondly, the joint project mechanism establishes that *"two or more Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources. That cooperation may involve private operators"*.[90] Thirdly, the mechanism of joint support schemes allows to harmonise support schemes in order to meet the national target.[91] Fourthly, MS have the possibility to engage in joint projects with third countries.[92] The implementation of each cooperation mechanism requires different degrees of cooperation. For example, while a statistical transfer is mainly an accountancy exercise, the establishment of a joint support scheme requires a common fiscal mechanism on this matter. Up until now, according to the National Renewable Energy Action Plans, the vast majority of the MS did not make use of the cooperation mechanisms and is also not planning to do so.[93]

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[87] An addition is included in art. 8 on statistical transfer, which introduces the so-called EU Renewable Development Platform, which is tool to facilitate the achievement of the EU target and the implementation.
of statistical transfers by matching the demand and offer of RES shares.
[88] Corinna Klessmann, Patrick Lamers, Mario Ragwitz, and Gustav Resch, 'Design Options for Cooperation Mechanisms under the New European Renewable Energy Directive' (2010) 38(8) Energy Policy 4679-4689, 4681.
[89] Art. 8 RESD 2018/2001/EU.
[90] Art. 9 RESD 2018/2001/EC.
[91] Art. 13 RESD 2018/2001/EC.
[92] Art. 9 RESD 2018/2001/EC.
[93] Statistical transfers have only been used twice (between Luxembourg and Lithuania and between Luxembourg and Estonia, both in 2017) and this is also the case with the joint support schemes (the joint certificate scheme between Sweden and Norway in 2012 and the mutually opened PV auctions between Germany and Denmark in 2016). The other Cooperation Mechanisms (joint projects) have not been used at all. See Natàlia Caldés, Pablo del Río, Yolanda Lechón, and Agime Gerbeti, 'Renewable Energy Cooperation in Europe: What Next? Drivers and Barriers to the Use of Cooperation Mechanisms' (2019) 12(70) Energies.

Political, technical, and legal barriers to the implementation of cooperation mechanisms have been identified.[94] Political barriers especially include public acceptability and the justification of related costs and benefits. In this context, joint project with a physical connection (as envisioned by SEREH) might be criticised for overburdening the grid of the hosting country and exploiting its energy resources for foreign consumption. Indeed, this confirms the need to specify and quantify the costs and benefits as it is aimed by SEREH. Lacking concrete design options of cooperation mechanisms are considered to be the biggest technical barrier. This relates mainly to transmission and electricity market barriers. The lack of interconnection infrastructure might prevent joint projects with physical imports while insufficiently integrated electricity markets are a barrier to create joint support schemes with market premiums. Moreover, the uncertainty of MS regarding the achievement of their own RES target caused reluctance to engage in cooperation of which the costs and benefits are not clear. All identified barriers are similar to the expected barriers in SEREH. The following section focuses on the cooperation mechanism joint projects in more detail.

4.2.2.1 Joint Projects

For SEREH, the cooperation mechanism of the joint project could potentially provide a basis for setting up an initiative between Germany and the Netherlands. This cooperation mechanism has never been implemented before, so there is no precedent project which could serve as a reference point. It is noted that *"joint projects can be suitable to jointly develop technologies, save costs of RES target fulfilment and prepare long-term electricity imports/exports. They require a higher degree of cooperation, but only for a limited amount of projects."*[95] As joint projects are very broad, it is necessary to identify more specific design criteria for their implementation. The following table summarises the most relevant design criteria (type of cooperation, the scope of cooperation, the flow of support and the contractual arrangements) as identified in a report on the design of cooperation mechanisms.[96] The cells highlighted in green suggest the relevant design option for SEREH.

[94] Corinna Klessmann et al., 'Cooperation between EU Member States under the RES Directive Cooperation between EU Member States under the RES Directive' Task 1 Report. Ecofys 2014.
[95] Corinna Klessmann et al., 'Cooperation between EU Member States under the RES Directive Cooperation between EU Member States under the RES Directive' Task 1 Report. Ecofys 2014, p.16.
[96] Corinna Klessmann et al., 'Cooperation between EU Member States under the RES Directive Cooperation between EU Member States under the RES Directive' Task 1 Report. Ecofys 2014, p. 20.

Table 5: Design options for joint projects under the RES Directive

Type of cooperation		
Design aspect	Design option	Conditions
Number of countries involved	Bilateral	• Early implementation possible; • Lower transaction costs to set up the cooperation; • Precondition: None.
	Multilateral	• Suitable for large-scale projects; • Better risk sharing between participating MS; • Precondition: Inclusion of all relevant/necessary parties.
Individual vs. multiple project framework	Individual project	• Less experience required; • Suitable for swift development of a specific project; • Suitable for first pilot projects that can initiate long-term cooperation; • Precondition: None.
	Multiple projects	• Suitable for mid- to long-term strategic cooperation; • No definition of single projects required; • Precondition: Interest in longer cooperation.
Scope of cooperation		
Design aspect	Design option	Conditions
Additional deployment or existing project	Triggering additional deployment	• Additional RES deployment; • Choice of technology, size, site can be tailored to interest of cooperating MS; • Precondition: Willingness to finance additional deployment.
	Co-financing existing project(s)	• Less initial barriers and less transaction costs as existing site, technology and size selection already occurred; • Does not trigger new RES deployment; • Precondition: Host country does not need additional RES amounts.
Physical transmission of electricity [if technically feasible]	Physical transmission required	• Particularly suitable for long-term cooperation (increases energy security of buying MS, support transformation to sustainable energy system in host MS; • Public in buying MS might expect physical transmission; • Requirement: either neighbouring countries or all transferring countries need to be included; • Precondition: Sufficient interconnection and grid infrastructure.
	No physical transmission required	• Electricity flows are determined by market prices and not by political rationales; • Less complexity and less technical barriers to overcome; • Physical transmission not always feasible and/or technically and economically recommendable in context of European market coupling; • Precondition: none.
Distribution of target credits	Target credits evenly split between MS	• Equally (or otherwise agreed) shared benefits; • Precondition: Both MS need RES target credits.
	Target credits serve only one MS	• Negotiated distribution of costs and benefits; • Possible starting point/precondition: Host country is already likely to meet targets, but is interested in local benefits (jobs etc.) and/or strategic cooperation; • Precondition: Cost-benefit allocation compensates for missed RES amounts.

Joint project support: level of specificity	Technology-specific	• Technology development and innovation in target technologies can be shared; • Design option with regional/site pre-selection can be introduced; • Precondition: Shared objective of technology development.
	Technology-neutral	• Choice of technology left to investor; • Maximises short-term cost efficiency of joint project; • Precondition: Shared objective of cost reduction.
Amount of electricity	Defined fixed amount (or corridor), incl. penalty payment for non-compliance	• Increased reliability for buying MS on target compliance; • Precondition: Delivery risk for project developer does not increase required support significantly.
	No fixed amount	• High insecurity on potential output and target compliance of buying MS; • Reduced risk for project developer; • Precondition: Buying MS mitigates risk of non-delivery.
	Support flows	
Design aspect	Design aspect	Condition
Support scheme for the RES installations	Using existing support scheme of one MS	• Decreases initial transaction costs to establish cooperation, therefore suitable for intermediate solutions by using existing arrangements; • Legal challenge of providing support to some projects while excluding others (non-discriminatory allocation mechanism required); • Precondition: Suitable support scheme in place in either MS (complex for levy-financed support schemes, as offsetting the extra cost for consumer of the host country via payments of the off-taking country would be difficult to arrange for).
	Set-up of a dedicated, new support scheme	• Preferred by many MS; • Support can be tailored to cooperation projects and optimised based on best practices; • Does not endanger integrity of existing support schemes; • Precondition: Willingness to address administrative cost of setting up new scheme.
Type of support	Upfront support	• Accounts for high investment costs; • Specifically adequate for capital-intensive pilot projects with high technology or regulatory risks; • Does not incentivise maximised output; • Precondition: Risk mitigation for non-delivery necessary.
	Production support	• Incentive to maximise output; • Precondition: Financing costs for project developers are adequate.
	Combination of upfront and production support	• Suitable for pilot projects and less mature technologies; • Combination reduces risk for project developers, reduces the risk premium and thus the required support and burden on consumers/tax-payers; • Precondition: Agreement on mix of support.
Determination of support level	Tender/auction	• Suitable for single large project ("project tender") or a larger number of undefined projects ("volume tender"); • Competitive elements increase efficiency of support;

		• Risk of strategic bidding/non- implementation of won projects; • Tender procedure might also be used to determine competitive level of feed-in premium; • Precondition: Sufficient number of bidders to create competition.
	Administratively defined premium/tariff	• Suitable for a large number of small projects as transaction costs for project developers are low; • Precondition: Suitable mechanism and sufficient information to set premium/tariff.
	Negotiated solution	• Suitable in case of missing competition for very-first, high-risk projects; • Potentially not in line with EU public procurement rules; • Precondition: high political priority, too little competition for tender.
Contractual agreements		
Design aspect	Design option	Condition
Rules against non-compliance of RES project	Penalties for delays and non-delivery of RES project	• Ensure RES amount transfer for target fulfilment of buying MS; • Precondition: Risk does not overburden developer; low implementation risk in host country.
	Bid bonds for tender qualification	• Increase certainty that tender-winning project developer will implement the project, but increase barrier for participating in tenders; • Precondition: Risk does not overburden project developer; low implementation risk in host country.
	Performance bond for tender	• Increase timely implementation and transfer of RES amounts of awarded projects, but increase barrier for participating in tenders; • Precondition: Risk does not overburden developer; low implementation risk in host country.

Source: Corinna Klessmann et al. 2014 Ecofys.

It is important to mention that the identified design criteria for joint projects show that these types of projects are meant for increasing the share of RES. SEREH's core goal is more nuanced. As presented in section 2.1 on the scope of the SEREH project, the main goal was outlined as

> *"[1] increasing the efficient production and consumption of RES (minimising energy losses in transport and curtailment); [2] Shortening distribution chains to lower system costs for the benefit of consumers in the region; [3] Keeping the financial revenues of the energy transition in the region".*

These goals are further-reaching than increasing the share of RES in one MS. Nevertheless, the mechanism of joint projects foresees the need of MS to cooperate and to set up initiatives together and provides a legal option to do so. Yet, this option does not abolish all barriers regarding network operation, interconnection and market-coupling as joint project do not provide exemptions from the general legal framework.

For SEREH this means that cooperation mechanisms under the RES Directive 2019 provide options for Member States to increase RES shares together. In particular, the mechanism of joint projects could provide a legal option for SEREH.

4.3 Direct Electricity Connection for Exclusively Specified Customers

This setting entails production on the basis of RES located in one MS (either Germany or the Netherlands) which is directly connected to an exclusively specified customer in the other MS (either Germany or the Netherlands).

As mentioned, the EU legal framework allows for specific exemptions to the general rules on TPA and unbundling. These exemptions are mainly meant for allowing exceptional circumstances which do not have an influence on the functioning of the IEM. Usually, these circumstances concern situations where electricity infrastructure is located in isolation, so not connected to the main grid infrastructure. So, the setting RES generation installation is directly connected to a specified customer and has no other connection to the grid infrastructure could potentially fall under the exemption regime of the "direct line". The following subsection explains this concept in greater detail.

4.3.1 Direct Lines

The concept of a so called "direct line" exists in EU electricity market legislation since the first EMD 1996/91/EC.[97] This indicates that the concept of a "direct line" is a relevant situation for an exemption from the general legal framework since the beginning of the liberalisation.
The EMD 2019/944/EU defines the concept of "direct lines" as follows:

> "[…] *either an electricity line linking an isolated generation site with an isolated customer or an electricity line linking a producer and an electricity supply undertaking to supply directly their own premises, subsidiaries and customers;"*[98]

The relevant provisions for direct lines are provided by article 7. MS have to provide the option for direct lines and need to establish authorisation criteria which are objective and non-discriminatory.

Direct lines appear to be a distinct category of infrastructure. Direct lines are still complementary to the general electricity system, but operate on a very small scale which justifies the classification as an exemption.[99] The exemption entails that unbundling rules do not apply and TPA can be organised on the basis of negotiations. However, in order to prevent operators of direct lines to abuse their position, it is clearly stated that "[the provisions on direct lines] *shall not affect the possibility of contracting electricity in accordance with Article 6* [third-party access]."[100] Based on this, it can be reasoned that the actual exemption regime for direct lines is rather limited. It is argued that

> *"[…] given that the existence of a large number of direct lines could prejudice the effective functioning of the internal market if they were closed to third party access, a*

[97] Art. 21 EMD 1996/92/EC.
[98] Art. 2(41) EMD 2019/944/EU.
[99] Roggenkamp M, Redgwell C, Rønne A, and del Guayo, I, (eds) *Energy Law in Europe – National, EU and International Regulation* (3rd ed Oxford University Press 2016), 294.
[100] Art. 7(3) EMD 2019/944/EU.

> *direct line should be viewed as a transmission or distribution system and thus open to third party access.* […] *Where a company constructs a direct electricity line it is submitted that it will therefore have to comply with the provisions of the third electricity Directive on transmission and distribution system operators, unbundling and regulated third party access*"[101].

Direct lines can thus only be applied in very exceptional situations and also the exemption regime is limited.

For SEREH this means that the concept of a direct line can be applied if the requirement of 'isolation' is satisfied. This would need to include "an isolated producer" and "an isolated customer" who are connected by a direct cable across the border.

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[101] Floris Gräper and Christof Schoser, *EU Energy Law, Volume I*, in Christopher Jones (ed) *The Internal Energy Market* (4th edition Claeys & Casteels Publishing 2016), 85.

4.4 Cross-border Group of Producers and Consumers

This might be the most innovative and at the same time intricate setting for SEREH. The idea is that a group of producers and consumers operates a part of the existing distribution systems plus a cross-border-connection across the national border. The connection to transmission systems on each side of the border is limited (the part of the distribution grid functions to the largest possible extent as an "island").

The current legal framework establishes several settings which potentially facilitate such an alternative operation of the grid. These options are presented in the following subsections.

4.4.1 Closed Distribution Systems

One of the most well-known exemptions is the so-called *"closed distribution systems"*. The origin of this concept emerged in the ECJ ruling *Citiworks*.[102] In this case the issue was raised whether a small network on an industrial site located at the airport of Halle Leipzig (Germany) could be considered an isolated network. The central question in the case concerned the issue whether and to which extent such an isolated system could be granted derogations from the general principles of the EMD 2003/54/EC, and in particular the principle of TPA. While in this case a derogation could not be justified because of the procedural shortcoming of Germany not to request such a derogation, generally, the ECJ affirmed such a possibility. Following this ruling, the (then newly adopted) EMD 2009/72/EC included a new exemption, namely CDS.

The EMD 2019/944/EU kept the provisions on CDS largely unchanged. There is no exact definition of CDS, but the existing provisions indicate the scope of such a system. Recital 66 outlines the main scope and the expected consequences of the applicable legal regime:

> *"Where a closed distribution system is used to ensure the optimal efficiency of an integrated supply that requires specific operational standards, or where a closed distribution system is maintained primarily for the use of the owner of the system, it should be possible to exempt the distribution system operator from obligations which would constitute an unnecessary administrative burden because of the particular nature of the relationship between the distribution system operator and the system users. Industrial sites, commercial sites or shared services sites such as train station buildings, airports, hospitals, large camping sites with integrated facilities, and chemical industry sites can include closed distribution systems because of the specialised nature of their operations."*[103]

The recital already mentions some concrete examples, such as hospitals, airports etc. which could classify as a CDS. More detailed rules are established in the article on CDS which states that

[102] C-439/06 Citiworks AG [2008] ECR I-03913.
[103] Recital 66 EMD 2019/944/EU.

> *"a system which distributes electricity within a geographically confined industrial, commercial or shared services site and does not, […] supply household customers", can be considered as a CDS if:*
> *(a) for specific technical or safety reasons, the operations or the production process of the users of that system are integrated; or*
> *(b) that system distributes electricity primarily to the owner or operator of the system or their related undertakings."*[104]

Nevertheless, it is clarified that CDS *"shall be considered to be distribution systems"*.[105] This implies that in principle the provisions applicable to DSOs are also applicable to operators of CDS. The exemptions are subsequently specified. Operators are exempted from the following

- *"the requirement under article 31 (5) and (7) to procure the energy it uses to cover energy losses and the non-frequency ancillary services in its system",*
- *"the requirement under Article 6 (1) that tariffs, […] are approved […] prior to their entry into force"*

Moreover, the EMD 2019/944/EU introduced the exemption from the obligation to procure flexibility services and *"to develop* [its] *systems on the basis of network development plans"*. CDS are meant to apply to restricted and locally clearly defined areas. The benefits from the exemption regime allow the operators to design their own system. However, the exemptions do not restrict the application of the TPA principle.

The element of geographical proximity and clearly determined scope is central to the concept of CDS. This is exemplified by the non-exhaustive list in recital 66 which includes airports, hospitals, campsites etc. Depending on whether SEREH is further developed as an area which is geographically distinct, CDS could potentially provide leeway. However, generally, CDS is a concept offering an exemption to existing situations (airports etc) and not necessarily to implement for innovative approaches such as SEREH.

For SEREH this means that CDS provides the option to combine various installations within one system, however, the element of geographical proximity and (industrial) service site need to be fulfilled.

4.4.2 Small Isolated Systems

Small isolated systems (SIS) are defined as *"any system that had consumption of less than 3000 GWh in the year 1996, where less than 5% of annual consumption is obtained through*

[104] Art 38(1) EMD 2019/944/EU.
[105] Art. 32(2) EMD 2019/944/EU.

interconnection with other systems".[106] This means that SIS still have a connection to the main grid, but this connection can only be used to a very limited extent. Regarding the extent to which the connection to the main grid can be used, there is some uncertainty. The EMD 2019/944/EU defines the amount of consumption obtained through the interconnection. It is unclear, however, whether 5% of the annual electricity consumption refers to the year 1996 as a fixed reference point in time, or whether the 5% of imports rule refers directly to *"any system"*, which would allow for a yearly assessment of the exports/imports balance via the existing interconnection. Unfortunately, there is no explanatory document for this provision. Regardless of this specific interpretation, it becomes clear that the SIS is a system which to a very large extent functions independently, i.e. generation within the SIS satisfies demand within the SIS.

If a system qualifies as a SIS, MS may decide to exempt operators from the unbundling requirements as established by article 35.[107] Moreover, operators of SIS can be exempted from the obligation to draft network development plans (as outlined in section 3.2.4.1).[108] Further derogations may apply if it can be proven that there are *"substantial problems with the operation of small isolated or connected systems*". Those derogations entail exemptions from the chapters on DSOs, TSOs, from articles dealing with direct lines and authorisation procedures for new generation capacity, and also from the principle of freedom of choice of suppliers for the customers, to market-based supply prices and even to third-party access.[109] These derogations are very far-reaching as they completely eliminate the core principles of the liberalised market. It can be assumed that the options under the SIS are established for already existing systems, but are not meant for establishing systems to escape the general legal framework. Moreover, article 66 of the EMD 2019/944/EU provides limits to the applicability of the provision by establishing a limited timeframe. It is stated that

> *"Derogations granted by the Commission as referred to in paragraph 1* [derogations for SIS and SCI] *shall be limited in time and subject to conditions that aim to increase competition in and the integration of the internal market and to ensure that the derogations do not hamper the transition towards renewable energy, increased flexibility, energy storage, electromobility and demand response."*[110]

The scope of small systems is thus very limited.

4.4.3 Small Connected Systems

A small variation to the SIS is the so called small connected system (SCS). It is defined as *"any system that had consumption of less than 3000 GWh in the year 1996, where more than 5 % of annual consumption is obtained through interconnection with other systems;"*[111] The main difference to SIS is thus the extent wo which the interconnection to the main system can be

[106] Art. 2(42) EMD 2019/944/EU.
[107] Art. 35(4) EMD 2019/944/EU.
[108] Art. 32(5) EMD 2019/944/EU.
[109] Art. 66(1) EMD 2019/944/EU.
[110] Art. 66(2) EMD 2019/944/EU.
[111] Art. 2(43) EMD 2019/944/EU.

used. SCS may enjoy a higher degree of connection than SIS. The potential exceptions from the legal framework remain the same as for SIS (see preceding section).

For SEREH this means that small isolated- and small connected systems are unlikely to be a viable an option for the implementation of SEREH. While the idea, to establish a system which is largely independently operating from the main grid is similar, the legal provisions only allow for limited application (in scope and time).

4.4.4 Local Energy Communities

SEREH aims at integrating the technical components in a way that the societal goals are maximized. From a legal perspective, the SEREH project includes several elements that need to be combined and coordinated in a way to achieve the societal goals. These elements include the interconnection of electricity systems, distribution system operation, demand-flexibility, storage (in particular the conversion of electricity to hydrogen), and the transportation and storage of hydrogen (possibly across the border). While the current legal framework might allow to implementing these elements in isolation (see preceding settings), the aim of the SEREH project is to align the potential of all technologies involved to achieve the societal goals. The preceding section outlined existing legal leeway which allow for an exemption under the current EU legal framework. In addition to these options, the legal reform of the CEP introduced two new options at EU level which allow for a special legal regime. Those options are "renewable energy communities" (REC)[112] and "citizen energy communities" (CEC).[113]

Generally, the term "energy community" covers a wide range of initiatives of a variety of actors which engage in some form of organisation in activities in the energy sector. In the EU context, the origins are often ascribed to environmentalist movements of the 1970s which envisioned a reorganisation of the energy sector as driven by anti-nuclear sentiments and as a response to the oil crisis.[114] On the more recent emergence of energy communities, research aimed at analysing which factors exactly distinguish energy communities from conventional other activities in the energy sector and suggests how to categorise energy communities.[115] Two key dimensions are identified and suggested: a process dimension which determines who is involved and who exercises influence and an outcome dimension which determines how outcomes of a an initiative are spatially and socially distributed, essentially organising who

[112] Art. 2(16) RESD 2018/2001/EU.
[113] Art. 2(11) EMD 2019/944/EU.
[114] European Commission, Joint Research Centre, Energy Communities: An Overview of Energy and Social Innovation, (Luxembourg: Publications Office of the European Union 2020), 17.
[115] Gordon Walker and Patrick Devine-Wright, 'Community Renewable Energy: What Should It Mean?' (2008) 36 Energy Policy 497-500, 498.

benefits in economic and social terms. The research subsequently emphasises that these dimensions are not about defining a specific technology but *"social arrangements through which a given technology, irrespective of its scale or cost, is being implemented and made useful"*.[116] Moreover, various actors from the private and the public sector can be involved to different extents and add to- or form a community.[117]

In the context of the energy transition and growing amount of decentral generation, the need for solutions to enable new grid operational options, and also the quest to offer (new) actors new roles in the energy sector, the EU legislator introduced RES and CEC. The following sections introduce both, however, the focus and the deeper analysis regarding the options for SEREH will be on CEC, as this concept is broader than RES.

4.4.4.1 Citizen Energy Communities

The EMD 2019/944/EU introduces CECs as potential legal vehicle for aligning the technical components and achieving the societal goals. However, the concept of CECs is rather broad and it also provides some discretionary power to the MS for the transposition. While this is positive as it allows for different forms of CECs, this also leaves some legal uncertainty how CECs will be exactly designed and which role they will play. This section aims at identifying possibilities and obstacles for SEREH under CECs. The following subsections introduce the concept of CEC in detail.

4.4.4.1.1 Definition

The definition of CECs establishes four main elements, the legal form of CEC, potential categories of members, purposes, and potential activities.

Table 6: Definition of "citizen energy communities" (art.2(11) Directive 2019/944/EU)

Element	Legal text	Explanation	Obligatory
Form	Legal entity that…	Umbrella organization	yes
Members	- is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;	Effectively controlled by members	yes
Purpose	- has for its primary purpose to provide environmental, economic or social community benefits to its	Rather value than profit-driven Benefits can be distributed broadly (members, shareholders, region)	unclear

[116] Gordon Walker and Patrick Devine-Wright, 'Community Renewable Energy: What Should It Mean?' (2008) 36 Energy Policy 497-500, 498.
[117] Emily Creamer, 'Community Energy: Entanglements of Community, State, and Private Sector' (2018) 12(7) Geography Compass, 2.

	members or shareholders or to the local areas where it operates rather than to generate financial profits;		
Activities	- may engage in generation, including from RES, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders;	No specific activity, non-exhaustive list	no

The definition of CEC is very broad in all aspects which allows for a wide variety of CECs. Yet, local energy systems and related activities do not automatically constitute a CEC. The definition requires at least a legal entity as organizational form which is *"effectively controlled"* by its members. Effective control might, for example, include voting rights, democratic appointment of members of supervisory board, and/or majority shareholding.[118] The definition does not further specify which measures are required to comply with the condition *"effective control"* by members. Regardless of the exact specification, it is clear that CECs cannot be controlled by a single entity. Moreover, membership has to be open and voluntary; this also means that members are entitled to leave the CEC at any time which is governed by the general switching procedure.[119] Potentially, members could include a variety of different actor categories, are natural persons, local authorities, including municipalities, or small enterprises. It is not clear, whether *"citizens"*, as the name suggests, have to included (or at least represented) in CECs. Important to mention is that in case residential customers are members of CECs they do not lose their rights as customers.[120] This also means that if the CEC acts as supplier or as DSO, they have to guarantee all associated rights of small consumers (households and SMEs).

For SEREH this means that CEC have to form a legal entity which is "effectively controlled" by its members. The definition does not further specify which measures are required to comply with the condition "effective control" by members. Furthermore, it is not clear whether the direct inclusion of citizens is obligatory.

[118] EMD 2019/944/EU defines *"effective control"* in the context of unbundling of transmission system operators in art. 43.
[119] Art. 16(1 b) in conjunction with art. 12 EMD 2019/944/EU.
[120] Art 16(1 c) EMD 2019/944/EU.

4.4.4.1.2 Activities and Purpose

The listing of potential activities of CECs is broad and non-exhaustive. The EMD 2019/944/EU does thus not yield at defining the specific activities for CECs, but to provide a facilitating legal framework which ensures that CECs can participate in the market. Furthermore, CECs are not assigned an exclusive right to carry out a specific activity, but can exist in parallel to other forms. The electricity EMD 2019/944/EU therefore states in a recital that *"the definition of citizen energy communities does not prevent the existence of other citizen initiatives such as those stemming from private law agreements."*[121] MS can thus choose to also allow other types of market actors to start activities on local energy systems, which do not fall under the scope of CECs. For example, industrial and commercial entities are allowed to set up and manage closed distribution systems (CDS).[122] In sum, organizing activities related to local energy systems are not automatically a CEC, but only if these activities are organized in a way which complies with the eligibility criteria of CECs.

One of the eligibility criteria of CECs is the effective control by its members (see above) and the establishment of a dedicated legal entity. Another eligibility criterion is the purpose for which potential activities are organized. According to the EMD 2019/944/EU *"CEC constitute a new type of entity due to their membership structure, governance requirements and purpose."* While the Directive aims at providing a level-playing field for this new actor in the electricity sector, so that they can compete on equal footing with well-established conventional actors, the primary purpose of CECs extends beyond the one of *"traditional undertakings"*. The Directive defines that the purpose of CECs is to provide *"environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates"*, as opposed to financial profits. On the one hand, CECs are thus expected to compete on equal footing with traditional undertakings, on the other hand, CECs are expected to rather refrain from financial profit-making and instead contribute to broader societal goals. This raises the question which role CECs are envisioned to play in the electricity sector, -between market competition and wider community benefits.

For SEREH this means that CEC can carry out a variety of activities. The primary purpose of CECs extends beyond the one of "traditional undertakings by providing "environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates", rather than financial profits. It is not clear to which extent it is excluded from profit making.

[121] Recital 44 EMD 2019/944/EU.
[122] Art. 38 EMD 2019/944/EU.

4.4.4.1.3 Rights and Obligations

In order to facilitate CECs, the EMD 2019/944/EU prescribes some elements which MS need to include in *"an enabling regulatory framework"* for CECs. These elements mainly aim at providing equal conditions for CECs regarding existing actors in the sector. Generally, CECs have to be subject to non-discriminatory, fair, proportionate and transparent procedures and charges regarding their registration or licensing. The network tariffs applying to CECs have to be transparent, non-discriminatory, and also cost-reflective, so they contribute to the overall cost sharing of the system".[123]

Article 16(3) further specifies the rights and obligations of CECs. The main points entail the following: CECs have to

- be able to access all electricity markets, either directly or through aggregation, in a non-discriminatory manner;
- be treated in a non-discriminatory and proportionate manner with regard to their activities

Regarding obligations, CEC also have to fulfill the following requirements:

- they are financially responsible for the imbalances they cause in the electricity system;
- with regard to consumption of self-generated electricity, they are treated like active customers concerning network charges;
- they are entitled to arrange within the CEC the sharing of electricity that is produced by their own production installations, subject to the community members retaining their rights and obligations as final customers and without prejudice to applicable network charges, tariffs and levies, in accordance with a transparent cost-benefit analysis of distributed energy resources developed by the competent national authority.

For SEREH this means that CEC will be able to access all electricity markets and need to assume several responsibilities regard their system usage.

4.4.4.1.4 The Relation between CECs and DSOs

CECS operate at distribution system level which requires clarifying their relation with the respective DSO. The EMD 2019/944/EU provides several options for organizing the relation with the DSO. Basically, article 16 provides one obligation and one option for MS to organize the relation with DSOs. MS are obliged to ensure that DSOs cooperate with CECs and MS have

[123] Art. 16(1 e) EMD 2019/944/EU.

the option to allow CECs to autonomously manage distribution networks. In this way the EMD 2019/944/EU aims at providing minimum requirements which are relevant for establishing a level-playing field for CECs and allows for extending the role of CECs. For the latter case, CECs are allowed to operate distribution networks, the directive establishes several obligatory conditions. The following table provides an overview of the obligation and the option for CECs and distribution system operation.

Table 7: CEC and distribution system operation (art. 16 Directive 2019/944/EU)

Obligation for DSOs to cooperate		
Member states **shall**		Explanation
	-ensure that subject to fair compensation as assessed by the regulatory authority, relevant DSOs cooperate with CECs to facilitate electricity transfers within CECs; [Art. 16(1 d)]	-Minimum requirement -DSO facilitates electricity transfer within CEC -assumption: no need for proximity of CEC members
Option to overtake tasks of DSO		
Member States **may** provide in the enabling regulatory framework that CECs	are entitled to own, establish, purchase or lease distribution networks and to autonomously manage them subject to conditions set out in para. 4 of this Article; [Art. 16(2 b)]	-Option -CEC replaces DSO -CEC autonomously operates grid -assumption: proximity of members
Member States **may** decide	to grant CECs the right to manage distribution networks in their area of operation; [Art. 16(4)]	-Option
If such a right is granted, Member States **shall** ensure that CECs:	(a) are entitled to conclude an agreement on the operation of their network with the relevant DSO or TSO to which their network is connected;	-Obligation
	(b) are subject to appropriate network charges at the connection points between their network and the distribution network outside the CEC and that such network charges account separately for the electricity fed into the distribution network and the electricity consumed from the distribution network outside the CEC in accordance with Art. 59(7);	-Obligation
	(c) do not discriminate or harm customers who remain connected to the distribution system.	-Obligation
Option within exemption regime		
Member States **may** provide in the enabling regulatory framework that CECs	(c) are subject to the exemptions provided for in Article 38(2) [CDS]. [Art 16(2 c)]	-Exemption for operator of CDS might also apply to CEC, where CEC operates the system

The minimum requirement obliges DSOs to cooperate with CECs. Beyond this obligation, this provision seems to opens the opportunity that the members of CECs do not have to be in geographical proximity. The provision states that DSOs are obliged to facilitate the transfer of electricity *"within CECs"*. As the definition of CEC does not contain an element which refers to a confined location, this could be understood as "among the members". This would then further imply that members of a CEC can be connected to the same distribution system, but do not need to be located in the same area. Furthermore, this also implies that in the area where the CEC operates, other system users who are no members of that CEC can be connected to the distribution grid. In this case, the DSO needs to cooperate with the CEC and provide electricity transfer services for a *"fair compensation"* from the CEC.

For the case that CECs are granted the right to autonomously operate a distribution system the proximity condition has to be fulfilled, as they would then have the right to manage distribution systems in *"their areas of operation"*. This is also further illustrated by the conditions if such a right is granted to CECs which mainly refer to the regulation of connection points with neighboring networks (art. 16(4 a-b)). Moreover, the CEC operating in its area may not discriminate or harm connected customers who are not members of the CEC.

MS may also decide to grant specific exemptions to CECs which are the same that apply to CDS (art. 38(2)). Recalling from section 4.4.1 above, these exemptions relieve the operator of a CDS (or a CEC) from important obligations. These include the rules on the procurement of energy to cover losses and non-frequency ancillary services in its system, the requirement that tariffs, or their methodologies, are approved prior to their entry into force, the requirements to procure flexibility services and to develop the operator's system on the basis of network development plans, and the requirements not to own, develop, manage or operate recharging points for electric vehicles and energy storage facilities. These exemptions would grant the operator of the CEC (either the DSO or the CEC acting as DSO) considerable leniency in the development, the operation, and the charging of network tariffs.

Overall, it can be concluded from the above that the EMD 2019/944/EU leaves a large degree of leniency to the MS in determining the relation between CECs and DSOs. Some might exclude system operation from the potential task package of CECs and other might allow CECs to autonomously operate systems and possibly also grant them special exemptions. The implementation is not only relevant for the role of CECs, but is just as important for DSOs. All DSOs will have to prepare to at least cooperate with CECs.

For SEREH this means that MS have to ensure that DSOs cooperate with CECs "to facilitate electricity transfer within the CEC". This does not sufficiently define the relation between CECs and DSOs and potentially leaves large discretion to the willingness of DSOs in determining the cooperation.

4.4.4.1.5 Proximity and Cross-border Element

The definition of CEC does not include a proximity element which suggests that CECs are in principle not bound by a confined geographical area or grid. However, as the preceding section on system operation clarified, proximity depends on the role that CEC assumes in system operation. In case that the CEC is not operating the distribution system and the respective DSO is assigned the task to facilitate the electricity transfer within the CEC, proximity is not a relevant element. In case the CEC autonomously operates a system, the proximity element applies as the CEC is confined to the area of its operation.

MS may decide to allow CECs to be open to *"cross-border participation"*.[124] This does however not clarify whether this also includes the physical connection of CECs across borders or whether participation is confined to membership. Preceding draft versions of the directive seemed to be clearer that the cross-border element entails the activities of the CEC, as opposed to the final version which refers to *"participation"*.[125] The question is thus not only whether MS implement the cross-border element, but also how they define *"participation"* in this context. Furthermore, different implementation at MS level might lead to uncertainty, especially, when to neighboring countries implement to contradicting forms.

> *For SEREH this means that CECs are in principle not bound by a confined geographical area or grid. MS may decide to allow CECs to be open to "cross-border participation". This does not clarify whether this includes the physical connection of CECs across borders or whether participation is confined to membership. This implies two uncertainties: whether MS implement the cross-border element and how they define "participation".*

4.4.4.2 Renewable Energy Communities

The RESD 2018/2001/EU introduced REC. These are defined as a legal entity

- *"which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;*

[124] Art. 16(2 a) EMD 2019/944/EU.

[125] The proposal for the directive published by the EU Commission in 2016 included the *"cross-border element"* even in the definition and clearly linked the activities thereto: *"[…] local energy community […] involved in distributed generation and in performing activities of a DSO, supplier or aggregator at local level, including across borders."* (art. 2(7)).

- *the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;*
- *the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits;"*[126]

The definition establishes the scope of the legal entity and the purpose that it is ought to serve. The definition is almost the same as the one for CECs, however, with the exception of three differences. Firstly, in contrast to the definition of CEC, the definition of REC explicitly mentions that the legal entity has to be *"autonomous"*. This characteristic is further explained by in a recital clarifying in as follows:

> *"To avoid abuse and to ensure broad participation, renewable energy communities should be capable of remaining autonomous from individual members and other traditional market actors that participate in the community as members or shareholders, or who cooperate through other means such as investment."*[127]

Secondly, RECs are confined to the production of energy on the basis of RES, while generation carried out by CECs are not limited to a specified energy source. Thirdly, the members need to be located *"in the proximity of the renewable energy projects of that entity"*. The provisions of RECs are also almost identical with the ones of CECs.[128] Nevertheless, an important difference, which makes the concept of RECs narrower than CECs, is that RECs do not entail the option to carry out grid operational activities. The scope of activities of RECs is limited to *"produce, consume, store and sell renewable energy, including through renewables power purchase agreements"* and *"share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community* […]".[129] Moreover, the provisions on REC appear to provide stronger obligations for MS to identify, assess, and remove potential barriers for REC than for CEC. The RESD 2018/2001/EU requires MS to carry out an *"assessment of the existing barriers and potential of development of renewable energy communities in their territories"*.[130] Subsequently, the enabling legal framework for RECs needs to ensure that, inter alia, *"unjustified regulatory and administrative barriers to renewable energy communities are removed*".[131] This seems to provide a rather proactive approach in favour of RECs and aims at providing a low-threshold for RECs to enjoy legal certainty.

For SEREH this means that RECs are narrower than CECs as they exclude the option of grid management and include the requirement of proximity and are limited to RES.

[126] Art. 2(16) RESD 2018/2001/EU.
[127] Recital 71 RESD 2018/2001/EU.
[128] Art. 22 RESD 2018/2001/EU.
[129] Art. 22(2 a and b) RESD 2018/2001/EU.
[130] Art. 22(3) RESD 2018/2001/EU.
[131] Art. 22(4) RESD 2018/2001/EU.

5. HYDROGEN SETTINGS

Before delving into the detailed legal settings connected to hydrogen, it is relevant to mention that the legal framework for hydrogen is far less elaborate or even absent in comparison to that applicable to electricity, at least at EU level. The relevant EU legal provisions are rather fragmented and scattered over various EU laws. The applicability of EU law often depends on specific rules set at national level. In that sense, this section on the hydrogen settings can only provide an initial step for the research that will be conducted as part of the deliverable on the national legal frameworks.

Generally, on EU level, the relevant legal framework (potentially) applicable to hydrogen entails the following legal documents (chronologically presented from older to newer):

- Directive 2009/73/EC (internal market for natural gas, as amended in May 2019)
- Directive 2018/2001/EU (promotion of RES)
- Directive 2019/944/EU (internal market for electricity)

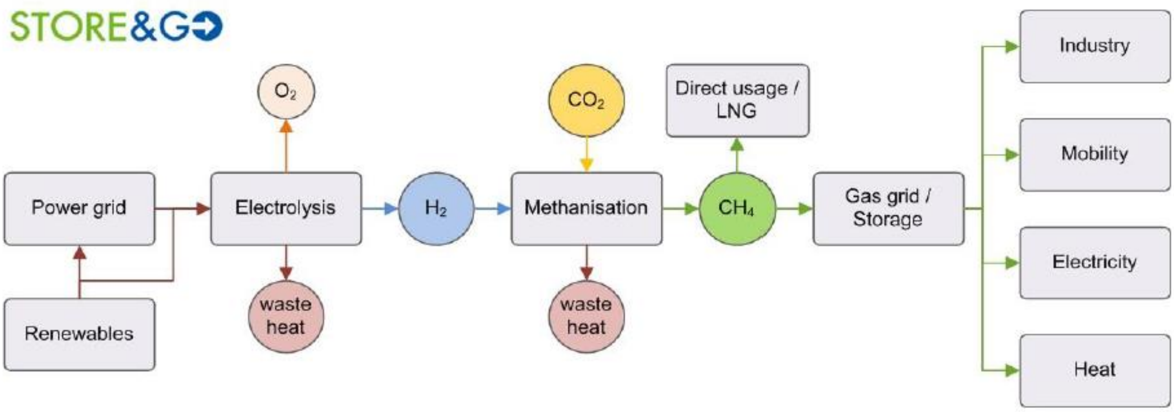
Before delving into the different settings and the relevant provisions of the directives, the following section starts with a brief outline of the power-to-gas (PtG) chain which is relevant for further determining the scope of the settings (section 5.1). After that, a brief overview is provided outlining the policy ambitions of the EU to foster hydrogen (section 5.2).

Regarding the settings, generally, and as a starting point, it is assumed for all settings that an electrolyser is directly and exclusively connected to a RES generation installation. A final section will also elaborate on the setting where the electrolyser is not only directly connected to a RES generation installation, but also connected to the electricity grid. This is relevant, in order to understand whether the generated hydrogen can still be considered "green" hydrogen.

5.1. Brief Overview of the Power-to-Gas Chain regarding the Scope of this Deliverable

PtG refers to the process of converting electricity into another energy carrier for end-use purposes, mostly gas (hydrogen, methane). The process of PtG entails in the first instance the production of hydrogen. In a second, optional, stage, the hydrogen can be upgraded through synthetisation to methane. Both steps are depicted in the following figure:

Figure 5: Overview of PtG chain



Source: Store&Go project 2017, p. 12[132]

Hydrogen in itself can be utilised for electricity generation and mobility through fuel cell technology, or serve as a feedstock for industrial applications. Methane can further be used for various purposes as it has a similar quality than natural gas. It is therefore also referred to as "synthetic-" or "substitute natural gas" (SNG). For the purpose of this deliverable, the technology PtG is mainly considered until the first step, the production of hydrogen. For the setting which concerns the injection in the gas system, upgrading of hydrogen to SNG is also briefly considered.

5.2 Policy Ambition of the EU

As mentioned above under section 4.2.1, the EU has ambitious targets for increasing the share of RES in gross final consumption. Increasing sources of RES also require increasing flexibility of the energy system as a whole. Hydrogen production can contribute to this by converting surpluses of electricity generated on the basis of RES. This potential is also recognised by the EU which published a Communication for a EU hydrogen strategy as part of the "European Green Deal" in July 2020.[133] Here, the explicit focus is on "green" hydrogen, which is also referred to as "renewable" hydrogen. Several potential purposes of renewable hydrogen are mentioned such as replacing fossil fuels in carbon intensive industries (steel or chemical sectors) and replacing fuels in the transport sector.[134] In this context it may be an option to re-purpose existing (unused) parts of the natural gas infrastructure. However, the blending of hydrogen in natural gas system is not considered the best option. It is mentioned:

[132] STORE&GO project, Innovative Large-Scale Energy Storage Technologies and Power-to-Gas concepts after optimization, Deliverable 7.2 European Legislative and Regulatory Framework on Power-to-Gas (author Gijs J. Kreeft), 31 October 2017.
[133] Communication from the Commission `A Hydrogen Strategy for a Climate-neutral Europe´ COM (2020) 301 final.
[134] Ibid. 1.

> *"The blending of hydrogen in the natural gas network at a limited percentage may enable decentralised renewable hydrogen production in local networks in a transitional phase. However, blending is less efficient and diminishes the value of hydrogen."*[135]

Apart from the technical considerations regarding blending, it is further argued that blending might distort the internal market as

> *"Blending also changes the quality of the gas consumed in Europe and may affect the design of gas infrastructure, end-user applications, and cross-border system interoperability. Blending thus risks fragmenting the internal market if neighbouring Member States accept different levels of blending and cross-border flows are hindered."*[136]

This consideration is of special importance for the SEREH project which anticipates cross-border flows of hydrogen. It is further states that this requires updating gas quality standards at national level and also via the European Committee for Standardization (CEN). On this topic it is concluded that this requires further careful consideration in terms of their contribution to the decarbonisation of the energy system as well as economic and technical implications.[137] While this is "only" a strategy for now, it paves the way for an EU-wide approach towards hydrogen, which has been largely absent.

Although this hydrogen strategy is not yet translated in EU law, it does provide relevant background on where the EU is aiming to head towards to. The following sections outline the hydrogen settings and their possibilities and limitations under the current legal framework (including the legal documents presented under section 5).

5.3 Hydrogen is Transported Across the Border and Directly Fed-in the Gas Grid

Hydrogen is produced in either Germany or the Netherlands with the aim to directly inject the hydrogen in the national gas grid connected to the respective other Member State.

As hydrogen is a gaseous energy carrier, it is relevant to assess whether and to which extent the EU directive on the internal market of natural gas (the most recent directive is Directive 2009/73/EC, GMD 2009/73/EC, as amended in May 2019) is applicable. The GMD 2009/73/EC is the pendant to the EMD 2019/944/EU (earlier 2009/72/EC) and establishes the rules for the organisation of the internal market, including the transmission, distribution, supply, and storage of natural gas in the gas system, which would be of relevance for this setting where hydrogen is injected in the gas system. As the title of the GMD 2009/73/EC indicates, the primary scope of the directive is *natural* gas.

Still, the GMD 2009/73/EC is potentially applicable, as it is stated in its scope that

> *"the rules established by this Directive for natural gas, including LNG, shall also apply in a non-discriminatory way to biogas and gas from biomass or other types of gas in so*

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[135] Ibid 15.
[136] Ibid 16.
[137] Ibid 16.

far as such gases can technically and safely be injected into, and transported through, the natural gas system".[138]

Hydrogen would fall under the category "other gases". This, however, for the directive would only become applicable if all safety and technical standards for the injection and transportation of *"any other gas"* in the existing grid system are met. If those requirements are met, *"any other gas"*, i.e. hydrogen, would need to be treated in a non-discriminatory way compared to natural gas or other gases. Technical and safety requirements relate to the quality of gas, which can, in contrast to electricity, vary. Gas quality standards determine the acceptable minimum and maximum components of gas. Due to the fact that these components varied locally, historically the gas quality standards diverged according to the gas transported and supplied in a specific area.[139] While there have been attempts initiated from the EU Commission to standardise gas quality parameters on an EU level, notably via a mandate provided to the European Committee for Standardisation, currently, no legally binding gas standard exists on EU level. In absence of harmonised rules on gas quality standards established at EU level, MS have full discretion to establish these technical and safety norms and conditions for gas injection.[140] This in turn determines the applicability of the GMD 2009/73/EC. Another possibility to inject hydrogen in the existing gas system is to upgrade it via methanisation and substitute natural gas (SNG), which has similar characteristics to natural gas. For this case the requirement to comply with safety and technical standards is equally relevant.

For SEREH this means that the injecting of hydrogen in the gas system depends on the national standards on gas quality.

[138] Art. 1(2) GMD 2009/73/EC.

[139] Daisy Tempelman , ' Harmonising Gas Quality : Obstacles and Challenges in an Internal Market ' in Martha Roggenkamp and Henrik Bjornebye (eds.), *European Energy Law Report X* (Intersentia, Cambridge 2014) 88 – 89.

[140] Ruven Fleming and Gijs Kreeft, 'Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law' in Martha Roggenkamp and Catherine Banet (eds.) *European Energy Law Report XII* (Intersentia, Cambridge 2020) 120 – 121.

5.4 Hydrogen is Transported Across the Border and Directly Connected to a Storage Facility

Hydrogen is produced in either Germany or the Netherlands with the aim to store it in the respective other Member State.

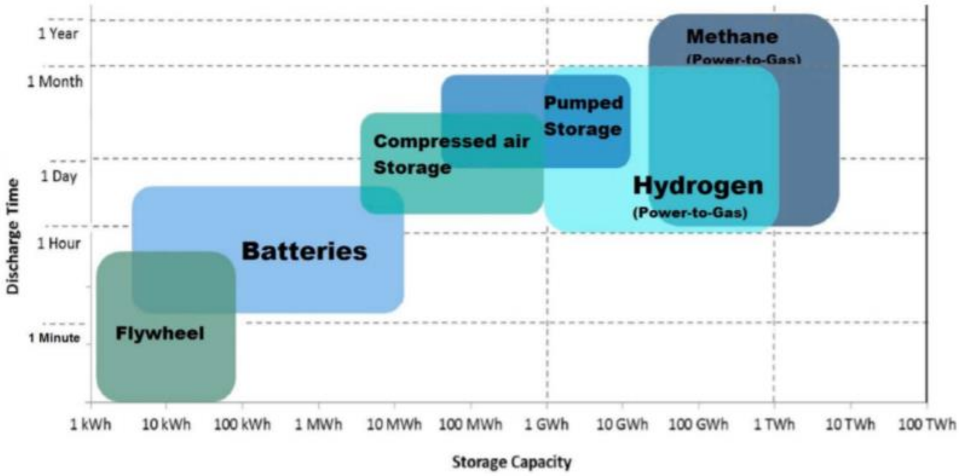
As figure 5 indicates, hydrogen can be used for different (end-use) purposes. The scope of SEREH is the generation of “green” hydrogen, which has the primary purpose of storing surplus of electricity generated on the basis of RES. Subsequently, this “green” hydrogen can of course be used for further purposes, as storage is only a transition stage of energy (in this case from electricity-to-hydrogen-to-X, i.e. conversion either back to electricity or further use of hydrogen). From a legal perspective, it is relevant to consider the final use of hydrogen (after storage) in order to further determine the applicable legal rules. As the purpose of final use for hydrogen is not entirely clarified in the SEREH project, this section can only apply and end-use neutral approach by focusing on the conversion process from electricity to hydrogen and storage thereof. For this purpose, two main directives are potentially applicable: the EMD 2019/944/EU and the GMD 2009/73/EC.

5.4.1 Brief Overview of Storage Technologies in SEREH

Storage becomes relevant with increasing shares of variable RES. Since the production of variable RES does not necessarily coincide with consumption patterns, storage serves as a flexibility technology and allows to maximise the use of RES, which is in line with the overall EU-wide target on increasing the share of RES in gross final consumption (see above section 4.2.1). Various storage technologies exist which can be classified in the five main technical categories. Mechanical, thermal, chemical, electro-chemical, and electrical energy.[141] The following chart provides an overview of the variety of storage technologies and their different characteristics regarding capacity and discharging time. This overview also shows that storage technologies can be utilised for different purposes in the electricity sector.

[141] Commission Staff Working Document, Energy Storage – The Role of Electricity, 1.2.2017 SWD(2017) 61 final, p. 21.

Figure 6: Capacity and discharge time of electricity storage technologies



Source: Commission staff working document, Energy storage – the role of electricity, 1.2.2017 61 final, p. 22).

The SEREH project includes two main, potential, storage technologies, namely electric batteries and the conversion of RES surpluses into hydrogen. Some storage technologies are already implemented in the "Speicherfeld" which is connected to the wind park "Fehndorf-Lindloh" (65 MW capacity) located in Germany. The storage technologies implemented in the "Speicherfeld" include electric batteries (4 MW capacity) and an electrolyser (4 MW capacity) (see above section 2.1.1). Both technologies could possibly play an expanded role in the SEREH project. As figure 6 shows above, electric batteries and PtG are different in their capacity- and discharge time characteristics and therefore complement well. Moreover, both technologies differ fundamentally regarding the fact that electric batteries charge and discharge electric energy while PtG entails a switch from electricity to gas and possibly back to electricity.

For electricity storage in batteries it is clear that the legal framework of the EMD 2019/944/EU is exclusively applicable. However, for the second option, hydrogen, it is not entirely clear which legal framework is applicable as, from a legal perspective, it could either be classified as electricity storage, as gas storage, or as hydrogen production. The following section focuses on this issue.

5.4.2 Legal Definition and Classification of PtG

Considering that PtG entails the conversion from electrons to molecules, it is not clear from a first (and also second) sight whether the legal framework of the electricity or the gas sector, or both, are relevant. As mentioned at the beginning of this setting (section 5.4), the purpose of final use is relevant for further determining the applicability. For example, if hydrogen produced for the storage of electricity, i.e. power-to-gas-to-power, the EMD 2019/944/EU is exclusively applicable. If, however, hydrogen is produced from electricity for the purpose of producing hydrogen and the final consumption thereof, it is not entirely clear which legal framework is relevant. As the purpose of hydrogen production (either storage of electricity or final use of hydrogen) is not entirely clarified in SEREH, the following sections present the legal uncertainties regarding the applicability of either EU electricity or gas legislation.

5.4.2.1 PtG as Electricity Storage under the Electricity Directive 2019/944/EU

Even though the RESD 2009/28/EC already mentioned the importance of storage for the integration of RES in the electricity system,[142] storage was not defined in EU electricity sector legislation until 2019. The definition will further guide the regulation of storage and its integration in the electricity supply chain. The EMD 2019/944/EU defined energy storage for the first time in the legal framework for the electricity sector. The definition establishes the legal concept as follows:

> *"'energy storage' means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier;"*[143]

The definition establishes two main important points:

Firstly, storage is clearly identified as a separate activity in the energy supply chain as it distinguishes it from *"the final use"* and as well from *"the moment it was generated"*. This indicates that storage is neither consumption (charging) or production (discharging). While this distinction seems banal in the first place, the fact that storage is recognised as a separate activity might solve the problem of double-payments (paying grid fees as consumer and as producer) which significantly worsened business cases for storage technologies. This problem is further discussed below in section 5.4.2.2.1.

The second important point established by this definition is that even though the definition is included in the EMD 2019/944/EU (electricity), it is explicitly defined as *"energy storage"* and also includes the option to convert electric energy to- and use "*another energy carrier"*, for example gas as a product of PtG. The EMD 2019/944/EU applies thus a technology- and energy-neutral approach. This allows thus for different technologies to compete and furthermore, the energy-neutral phrasing allows for sector-integration, for example by power-to-X technologies.

Despite this open and technology-neutral approach, some unclarities remain. With the further development of hydrogen technologies and applications in the near future, a relevant question emerges. What if hydrogen is simply produced for the purpose of producing hydrogen and not for storing electricity (or energy)?[144] The question is, whether the element of intention to primarily store energy is relevant. It seems odd to define an activity with the

[142] Recital 57 and art. 16(1) RESD 2009/28/EC.
[143] Art. 2(59) EMD 2019/944/EU.
[144] Ruven Fleming and Gijs Kreeft, 'Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law' in Martha Roggenkamp and Catherine Banet (eds.) *European Energy Law Report XII* (Intersentia, Cambridge 2020) 108.

primary purpose of hydrogen production as *"energy storage"*. This would then lead to the question whether the relevant legal framework of the gas sector is applicable.

Another uncertainty relates to the exact definition of the activity which is energy storage, i.e. is if the PtG plant, the hydrogen storage facility, or the reconversion? The definition seems to suggest that these activities are all integrated within one premise, however, it can very well be the case, as in SEREH, that the different activities are distributed at different locations. The EMD 2019/944/EU defines *"energy storage facility"* as *"facility where energy storage occurs"*.[145] While this seems banal, with the further development of storage facilities and their ability to compete in a market setting, it will become more relevant to exactly classify which activity is defined as storage activity.

For SEREH this means that the EMD 2019/944/EU defines the activity of storage as a distinct activity from production and consumption. Moreover, the option that storage may entail different energy carriers is very positive for SEREH which potentially includes the conversion of electricity to gas (hydrogen). However, uncertainties remain regarding the exact requirements when PtG qualifies as "energy storage".

5.4.2.2.1 The Problem of Double-Payment

All system users (producers, and consumers, or storage facility operators) who are connected to the grid system may have to pay a fee for the usage of the grid. Usually, this fee is referred to as "network tariff", but sometime also as "usage charges", "grid fees", or "use of system charges". "G charges" refer to charges imposed on generators and "L charges" are the ones imposed on the loads, the consumers. There are differences in the split between G and L charges, however, the larger share is imposed on the consumers (L charges). The problem of double-payment for storage entails that operators of storage facilities are charged L and G charges for charging and discharging. Of course, this worsens the business case for storage facility operation tremendously. It is argued that the abolishment of such double payments is one of the most crucial contributors to a profitable business case for energy storage facilities.[146]

As explained above in section 5.4.2.1, the definition in the EMD 2019/944/EU seems to exclude the problem of double payments by defining energy storage as a distinct activity from

[145] Art. 2(60) EMD 2019/944/EU.

[146] European Association for Storage of Energy, EASE Position on Energy Storage Deployment Hampered by Grid Charges, (2017).

production and consumption. Nevertheless, storage operators would still need to pay the usage of the grid. As the actual consumption of the energy is taking place at a later moment in time (after discharge), it can be argued that L charges should not be imposed on storage operators. In the same line of reasoning, the production of the electricity took place at an earlier point in time. Ideally, new dedicated storage network charges should be implemented. However, as EU law does not harmonise tariffication systems, but can only establish guidelines, this remains to a large extent a matter for national legislation (the issue of distribution network tariffication was discussed above in section 3.2.4).

For SEREH this means that depending on the national tariffication system, currently, double payments of grid tariffs for connected storage facilities might be an obstacle for profitable storage operation. Again, which tariffication (gas or electricity) applies depends on the categorisation and thus the purpose of final use of hydrogen. Generally, the obstacle of double payment should be abolished with the transposition of the EMD 2019/944/EU. For this, MS need to revise their tariff design (discussed in section 3.2.4)

5.4.2.2 PtG as Gas Storage or Production under the Natural Gas Directive 2009/73/EU

Despite the fact that the definition of "energy storage" as established under the EMD 2019/944/EU applies a technology-neutral approach which extends electricity as energy source, uncertainties remain regarding the scope of the definition (see section 5.4.2.1). One of the uncertainties concerns the conversion of electricity into hydrogen for the sole purpose of producing hydrogen and not for storing electricity. Depending on where the hydrogen is stored, i.e. above the ground or underground, different legal regimes are applicable. For the case of underground storage, the national legal framework on mining is applicable (in the Netherlands the Mijnbouwwet and in Germany the Bundesbergesetz). For the case that hydrogen is stored above the ground in, for example, tanks several national laws and regulations concerning hazardous substances, environmental protection, spatial planning etc are relevant. Both situations are not further evaluated in this deliverable.

Another case concerns the storage of hydrogen in existing gas storage facilities. As gas storage facilities can be considered to be part of the gas system, this would again require to ensure that the hydrogen can be *"technically and safely"* injected in the gas system (the storage facility). What the exact requirements are depends, again, on the national gas quality standard (as explained above in section 5.3). If this requirement can be fulfilled, the non-discriminatory requirements established by the GMD 2009/73/EC would be applicable.

Possibly, hydrogen production could also be considered to be gas production. Despite the fact that gas production is not defined by the GMD 2003/73/EC, it might be argued that it entails production because new gas molecules are added to the system.[147] This question is not further clarified.

This shows that the current legal framework on storage, and even more precisely PtG as storage technology, bears many legal uncertainties. While the legal classification and definition of PtG seems to be a theoretical exercise, it has clear consequences regarding the question who is allowed to own and operate a PtG facility. The following section focuses on this question.

5.4.3 Ownership and Operation of PtG facilities

The rationale in a liberalised energy sector is to distinguish network operational tasks from potential market activities (see above section 3). On the one hand, storage could be very valuable for network operational tasks as it provides additional flexibility to manage the grid system. Therefore, system operators would be potentially interested in operating storage facilities. On the other hand, the activity of storage does not depend on the grid or *vice versa*, just like production. Storage could thus also perfectly be recognised as a market activity, which

[147] Ruven Fleming and Gijs Kreeft, 'Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law' in Martha Roggenkamp and Catherine Banet (eds.) *European Energy Law Report XII* (Intersentia, Cambridge 2020) 113.

excludes system operators to engage in storage. As the rules on this differ between the EMD 2019/944/EU and the GMD 2009/73/EC, the question of classification and definition is crucial for ownership and operation.

The EMD 2019/944/EU established an elaborate rule set for the ownership and operation of storage facilities. The categorisation of storage in the market-network activity dichotomy was not clear until the EMD 2019/944/EU which opted for the latter alternative and established storage as a market activity.

The ownership and operation of storage facilities is not established in a dedicated article, but incorporated in the chapters focusing on the rules of distribution system operation and on transmission system operation. Article 54 establishes rules on the ownership of energy storage facilities by TSOs. It is clearly stated that *"transmission system operators shall not own, develop, manage or operate energy storage facilities"*.[148] The article further provides some limited exceptions to this general prohibition. TSOs may be allowed to own, develop, manage or operate energy storage facilities, where storage facilities are *"fully integrated network components"* and the regulatory authority has granted its approval. *"Fully integrated network components"* are defined as follows:

> *"network components that are integrated in the transmission or distribution system, including storage facility, and that are used for the sole purpose of ensuring a secure and reliable operation of the transmission or distribution system, and not for balancing or congestion management."*[149]

This definition aims at limiting the possibility for system operators to actively manage storage facilities for the purpose of extra revenues through balancing and congestion management, but confines the option that system operators can operate storage facilities to secure and reliable grid operation. However, in practice the lines might get blurry by the fact that system operators possess relevant information regarding the details of grid operation. In addition to this exemption, article 54(2) provides a second set of circumstances which need to be fulfilled to account as a second possible exemption to the general prohibition of operation of storage facilities by system operators. The following cumulative conditions apply:

> *"a) other parties, following an open, transparent and non-discriminatory tendering procedure that is subject to review and approval by the regulatory authority, have not been awarded a right to own, develop, manage or operate such facilities, or could not deliver those services at a reasonable cost and in a timely manner;*
>
> *b) such facilities or non-frequency ancillary services are necessary for the transmission system operators to fulfil their obligations under this Directive for the efficient, reliable and secure operation of the transmission system and they are not used to buy or sell electricity in the electricity markets; and*
>
> *c) the regulatory authority has assessed the necessity of such a derogation, has carried out an ex ante review of the applicability of a tendering procedure, including the conditions of the tendering procedure, and has granted its approval."*

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[148] Art. 54(1) EMD 20019/944/EU.

[149] Art. 2(51) EMD 2019/944//EU.

In case such an exemption is granted, it is still limited by the requirement that NRAs need to perform *"public consultation on the existing energy storage facilities in order to assess the potential availability and interest of other parties in investing in such facilities."* In case this public consultation brings positive results (interested market parties who could offer storage facilities in a cost-effective manner), the national regulatory authority *"shall ensure that transmission system operators' activities in this regard are phased-out within 18 months."*[150] In case this is taking place, system operators can still expect to *"receive reasonable compensation, in particular to recover the residual value of their investment in the energy storage facilities"*. This provides some legal certainty for system operators who might be in doubt whether to encounter the risk of investments in storage facilities.

Regarding the rules on distribution system operation, the provisions outlined above for TSOs are almost identical for DSOs in article 36 on ownership of energy storage facilities by DSOs. The only difference is provided in the requirements for NRAs to perform public consultations to investigate whether there is new interest by market parties to engage in storage activities. For the DSO who invested in batteries, the public consultation shall not take place in case of "new batteries" with a final investment decision until 4 July 2019. Overall, the EMD 2019/944/EU aims to pave the way for potential market parties to engage in storage activities.

While the EMD 2019/944/EU aims at providing an elaborate legal framework on the ownership and operation of storage facilities against the background of the market-network activity dichotomy, the GMD 2009/73/EC establishes some further limitations. The GMD 2009/73/EC establishes that producers are not allowed to operate a gas storage facility.[151] Again, this leads back to the discussion of the classification and definition of hydrogen storage, -i.e. is it is it storage of gas (then the GMD 2009/73/EC is applicable) or is it storage of electricity in form of gas (then the EMD 2019/944/EU is applicable). Answering this question depends on the purpose of final use of the hydrogen, which is, as mentioned at the outset of this section, not yet entirely clarified in the SEREH project.

For SEREH this means that the applicable legal framework (gas or electricity) for storage depends on the final use of the hydrogen. While under EMD 2019/944/EU storage is in principle defined as a free-market activity (DSOs can only own and operate storage facilities in case no other market party shows interest to do so), the GMD 2009/73/EC places limitation on the ownership and operation on producers. Which rules apply depend on the final use of hydrogen.

[150] Art. 54(4) EMD 2019/944/EU.

[151] Art. 2(9) GMD 2009/73/EC. Ruven Fleming and Gijs Kreeft, 'Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law' in Martha Roggenkamp and Catherine Banet (eds.) *European Energy Law Report XII* (Intersentia, Cambridge 2020) 115.

5.5 Hydrogen is Transported Across the Border and Directly Supplied to an Industrial Customer

Similar to the setting described under section 5.3, injecting hydrogen in the gas grid for transportation requires complying with the technical and safety standards for gas quality of the specific Member State where the gas is injected and to the country where it is transported. In absence of a harmonised EU gas quality standard, this is left at the discretion of the Member States and varies accordingly.

5.6 Electrolyser is connected to RES Generation and to the Distribution Grid

All settings as outlined under section 5.3, 5.4, 5.5 with the adjustment that the electrolyser is not exclusively connected to the RES generation installation, but also to the distribution grid.

All settings presented in section 5.3, 5.4, and 5.5 assumed that the electrolyser is directly connected to a RES generation installation and thus supplied exclusively with electricity generated on the basis of RES. This leaves no doubt that the generated hydrogen can be considered as "green". However, it needs to be assessed whether hydrogen can still be considered as "green" when the electrolyser is not exclusively connected to the RES generation installation, but also to the distribution grid which supplies electricity of all kinds of sources. For this assessment it is necessary to firstly establish what "renewable energy" is from a legal perspective. The RESD 2018/2001/EU does not directly include hydrogen under the definition of renewable energy.[152] However, "green" hydrogen is indirectly included in the scope of the RESD 2018/2001/EU. Article 7(1) on the calculation of the share of energy from renewable sources mentions "[…] *hydrogen from renewable sources shall be considered only once for the purposes of calculating the share of gross final consumption of energy from renewable sources.*" This provision clearly assumes that hydrogen from RES can be considered as renewable energy. Moreover, this provision also clarifies that the production of "green" hydrogen does not add any extra units of RES to the overall share, as the generated unit can only be calculated once.

In order to prove that a specific energy unit stems from RES, the RESD 2018/2001/EU provides for so called "guarantees of origin" which are granted for a generated unit (1MWh). Recital 59 and article 19(7)(b ii) leave no doubt that renewable gas, including "green" hydrogen are now included under this system (before it was only in place for renewable electricity). As a guarantee of origin can be transferred between different holders, independently of the energy unit it refers to, they do not entail a right to obtain benefits from a support scheme.

[152] Art. 2(1) RESD 2018/2001/EU.

Special rules apply to the case when a fuel (either liquid or gaseous, for example hydrogen) generated on the basis of renewable electricity is used for transportation. Article 27(3) states:

> *"However, electricity obtained from direct connection to an installation generating renewable electricity may be fully counted as renewable electricity where it is used for the production of renewable liquid and gaseous transport fuels of non-biological origin, provided that the installation:*
>
> *(a) comes into operation after, or at the same time as, the installation producing the renewable liquid and gaseous transport fuels of non-biological origin; and*
>
> *(b) is not connected to the grid or is connected to the grid but evidence can be provided that the electricity concerned has been supplied without taking electricity from the grid."*

This means that if the generated hydrogen is used for transportation, it is not possible to fully cover electricity from the grid with guarantees of origin in order to label the electricity which is fed into the electrolyser as 100 percent renewable. Even a direct line to an installation which generates renewable electricity does not lead to fully renewable input when this installation is also connected to the grid.

6. EU LEGAL FRAMEWORK: OVERVIEW OF OPTIONS AND LIMITATIONS FOR SEREH

The preceding sections provided an overview and assessment of the current EU legal framework and in particular relevant provisions which are relevant for the SEREH settings as presented in this deliverable. The following table summarises the main findings of this assessment.

Table 8: Overview assessment of current EU legal framework for SEREH settings

Setting	EU law provision	Option	Limitations
	Cross-border interconnection		
1	“[…] *transmission line which crosses or spans a border between Member States and which connects the national transmission systems of the Member States*” (art. 2(1) Regulation 2019/943/EU)	-	The definition of a cross-border connection is confined to transmission lines and therefore falls outside the scope of the SEREH project.
	Joint project		
2	*“two or more Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources. That cooperation may involve private operators”* (art. 9 Directive 2018/2001/EU).	Joint projects aim at encouraging Member States to cooperate and to jointly increase RES. Various design options for such joint projects exists, which could also function across borders.	Design criteria for joint projects show that the primary goal of joint projects is to increase the share of RES. SEREH’s core goal, however, is more nuanced and relates to reducing system costs.
	Direct line		
3	“[…] *an electricity line linking an isolated generation site with an isolated customer* […]” (art. 2(41) Electricity Directive 2019).	If the element of isolation is fulfilled, the connecting cable could be classified as a direct line, and, potentially, exempted from third-party access obligations.	Since the element of isolation needs to be fulfilled, the SEREH project would need to be geographically clearly delimited.

Setting	EU law provision	Option	Obstacle
	Closed Distribution System		
4	"[…] *CDS is used to ensure the optimal efficiency of an integrated supply that requires specific operational standards, or where a CDS is maintained primarily for the use of the owner of the system,* […] *Industrial sites, commercial sites or shared services sites such as train station buildings, airports, hospitals, large camping sites with integrated facilities, and chemical industry sites*" (recital 66 EMD 2019/944/EU.)	CDS allow for different components (generation, storage, consumption) to be integrated within one system. The operator of CDS can potentially benefit from exemptions from the unbundling regime.	The element of geographical proximity and clearly determined scope is central in CDS. Household customers cannot be supplied within a CDS.
	Small isolated and connected systems		
4	*"any system that had consumption of less than 3000 GWh in the year 1996, where* (SIS: *less* or SCS: *more) than 5% of annual consumption is obtained through interconnection with other systems"* (art. 2(42&43) Electricity Directive 2019)	The concept of "small systems" seems to allow for some sort of a microgrid which is able to manage supply and demand to a large extent within one system.	The scope of small systems is not clear regarding the amount of electricity which can be imported via an interconnection. Moreover, the derogations from the general legal framework have to be limited in time.
	Citizen Energy Community (excl. system operation)		
4	*"Member States shall ensure that subject to fair compensation as assessed by the regulatory authority, relevant DSOs cooperate with CECs to facilitate electricity transfers within CECs"* (art. 16(1 d) Electricity Directive 2019)	It is established as a minimum requirement that DSOs have to facilitate electricity transfer within CEC. This suggests that there is no need for geographical proximity of the CEC members. Thus, if SEREH aims to become a CEC, DSOs would at least need to cooperate and facilitate electricity transfers.	It is not clear what *"within CEC"* means and whether it requires proximity of the members. Moreover, the conditions under which the DSOs have to cooperate are not established. Furthermore, this whether and how this cooperation could take place across national borders is not clear.
	Citizen Energy Community (incl. system operation)		
4	*"Member States may provide in the enabling regulatory framework that CECs are entitled to own, establish, purchase or lease distribution networks and to autonomously manage them subject to conditions set out in para. 4 of this Article;"* (art. 16(2 b) Electricity Directive 2019)	Possibly, Member States allow CEC to operate their own grid. This provides the option to match supply and demand locally and to introduce incentives for the use of flexibility technologies.	This provision is only an option for the Member States. Moreover, it is not clear, whether the network could be operated across a national border (both Member States would need to allow CECs to operate distribution grids and allow for cross-border cooperation).

Setting	EU law provision	Option	Limitation
	Renewable Energy Community		
4	*"Legal entity which, […], is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;* *• the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;* *• the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits;"* (Art. 2(16) RESD 2018/2001/EU.)	Option to coordinate a group of different stakeholders for the purpose of local generation, consumption, and storage of RES.	REC exclude the possibility of system operational tasks. The scope is strictly limited to RES and an element of geographical proximity of the participating stakeholders to the RES project needs to be fulfilled.
	Gas quality standards		
5 (a)	*"the rules established by this Directive for natural gas, including LNG, shall also apply in a non-discriminatory way to biogas and gas from biomass or other types of gas in so far as such gases can technically and safely be injected into, and transported through, the natural gas system"* (Art. 1(2) GMD 2009/73/EC)	The non-discrimination obligation established by the GMD 2009/73/EC is potentially applicable to hydrogen which falls under "other gases".	Currently, there is no binding gas quality standard established at EU level. The question whether gas can "technically and safely" be injected in the gas system is thus entirely up to the MS and the respective gas quality standards
	Classification and definition of PtG as storage		
5 (b)	*"'energy storage' means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier;"* (Art. 2(59) EMD 2019/944/EU) "*Gas storage means a facility used for the stocking of natural gas and owned and/or operated by a natural gas undertaking* […]".	Energy storage is defined in a technology neutral way which potentially covers hydrogen. Storage is defined as market activity and system operators are in principle excluded from owning and operating storage facilities. Since gas storage facilities can be considered as part of the gas system, hydrogen storage could fall under the definition of gas storage as long as the gas quality standards allow for a "technically and safely" injection in the gas system (see setting 5 a)	The application of the EMD 2019/944/EU and thus the definition of energy storage depends on the final use of hydrogen. If hydrogen storage falls under the definition of gas storage, production companies are excluded from owning and operating storage facilities.

Setting	EU law provision	Option	Limitation
	Gas quality standards		
5 (c)	*See 5(a)*	*See 5(a)*	*See 5(a)*
	Hydrogen as renewable energy		
5 (d)	"[…] *hydrogen from renewable sources shall be considered only once for the purposes of calculating the share of gross final consumption of energy from renewable sources*." (Art. 7(1) RESD 2018/2001/EU)	Hydrogen produced from renewable energy can be classified as "green" hydrogen under the RESD 2018/2001/EU and can thus obtain guarantees of origin.	Limitations are placed for the case that hydrogen is used in the transport sector. It is not possible to fully cover electricity from the grid with guarantees of origin in order to label the electricity which is fed into the electrolyser as 100 percent renewable. Even a direct line to an installation which generates renewable electricity does not lead to fully renewable input when this installation is also connected to the grid.
	Flexibility in distribution networks		
All	"*Member States shall provide the necessary regulatory framework to allow and provide incentives to distribution system operators to procure flexibility services, incl. congestion management in their areas, in order to improve efficiencies in the operation and development of the distribution system.* […]" (art. 32(1) Directive 2019/944/EU)	Incentivising flexibility is essential for the SEREH project. A regulatory framework which incentivises flexibility is a precondition for the efficient use of flexibility technologies, such as storage (batterie and PtG). DSOs would then be incentivised to make use of flexibility installed at their grid.	One of the key measures to incentivise flexibility is the design of the distribution network tariff. The competence to design network tariffs is entirely left to the Member States. This already results (and will expectedly continue to result) in entirely different distribution network structures. For the particular case of SEREH, this means that flexibility in DE and NL are incentivised in different ways.

7. RECOMMENDATIONS: LOBBY AGENDA FOR SEREH ON EU LEVEL

Based on the findings presented in the preceding sections, this section aims at providing concrete recommendations on how the EU legal framework needs to be adjusted and/or further developed to enable the presented settings.

7.1 Flexible Distribution Network Tariffs

One of the core ideas behind SEREH is to increase the amount of decentral RES and to minimise system costs on a local scale. For this purpose, the deployment of various flexibility technologies (storage in form of PtG, batteries and demand response) are indispensable. Under the CEP several new provisions were introduced to incentivise the deployment of flexibility technologies. Central for the success of this implementation is the design of distribution network tariffs. As presented in section 3.2.4, distribution network tariffs can be designed in various ways. While there is no "one-size-fits-all" approach, it is necessary that all MS (in particular the national regulatory authorities) review their current distribution network tariff design and develop improvements for the deployment of flexibility technologies. For the revision it is important that they thoroughly understand the principles that are guiding for the design of tariffs. As already established by CEER, a comprehensive explanation and overview of design options and their implications is very useful for this purpose. Moreover, special attention needs to be paid to network charges for storage facilities. As explained in section 5.4.4, the problem of double-charging is significant for the profitable deployment and operation of storage facilities. It is necessary that MS avoid charges which discourage storage. To conclude, for the success of SEREH it is a precondition that distribution network tariffs incentivise flexibility of system users.

- **Therefore, it is recommended that the EU Commission develops and publishes an official document which guides the revision of distribution network tariffs which incentivise flexibility technologies. Such a document should also include the procedure of the revision which needs to include different stakeholders.**

7.2 Promoting Cooperation Mechanisms and Including System Cost Savings as Aim

Cooperation between MS is allowed under the current legal framework, i.e. the RESD 2018/2001/EU provides concrete option for MS to cooperate in order to achieve their national and the EU-wide target in gross final consumption of RES. SEREH is an example of cooperation between two MS, in particular, two municipalities which are located in the border region. Especially the cooperation mechanism of joint projects is of relevance for SEREH as it allows a joint infrastructural project which extends across the national border and allows for sharing the benefits of that project. Joint projects are currently barely used by MS and therefore, there is little experience to learn from. The reasons why cooperation mechanisms are not implemented are broad (see section 4.2.2). It is advised the the EU Commission further investigates those reasons and proposes concrete solutions to remove those obstacles in order to promote cooperation mechanisms. Also, the focus of the cooperation mechanisms is primarily to increase the share of RES in gross final consumption. While this is certainly one aim of SEREH, the ambition of SEREH is more focused on the local scale and on the reduction of system costs in that area.

- **It is recommended that the EU Commission investigates the reasons for reluctance of implementing cooperation mechanisms (especially for joint projects between two MS) in more detail and presents concrete solutions how to remove those obstacles. Moreover, the focus should also be on locally achieved benefits from joint projects and the reduction of system costs.**

7.3 Opening Up Support Schemes for other Member States

A variety of support schemes for the promotion of RES are in pace in the different MS. This allows for specified support according to national circumstances and in accordance with the national legal framework. Support schemes are currently primarily targeted towards generation installation which are located in the territory of that MS and which are connected to the grid in that MS. While the EU Commission aimed at opening support schemes for producers located in other MS in an early version of the proposal for a revised RESD, the adopted RESD 2018/2001/EU leaves it at the discretion of the MS whether they choose to open support scheme for producers located in another MS and only includes indicative shares of the budget which is allocated for producers located in other MS. Such indicative shares may in each year amount to at least 5% from 2023 to 2026 and at least 10% from 2027 to 2030.[153] In 2023, the EU Commission will evaluate the opening of support schemes and assess the need to introduce an obligation on MS partially to open participation in their support schemes for electricity from renewable sources to producers located in other MS with a view to a 5% opening by 2025 and a 10% opening by 2030.[154] For cross-border projects, such as SEREH, the accessibility to support schemes is vital for developing RES installations. Uncertainty whether support schemes will be available obstruct the viability of cross-border projects.

- **It is therefore recommended that the EU Commission in its evaluation will especially consider the potential of border regions and cross-border projects implementing RES and subsequently introduce an obligatory opening of support schemes with higher shares in a shorter time-frame in order to provide legal certainty for cross—border projects. This is also relevant considering the EU-wide target of RES in gross final consumption.**

7.4 Citizen Energy Communities beyond National Borders

Another core idea of SEREH is to keep the revenues of the energy transition in the region and to distribute the benefits to various stakeholders in the sector. For this purpose, new entities which allow for innovative organisational forms are necessary. The EMD 2019/944/EU

[153] Art. 5 RESD 2018.
[154] Art. 5(5) RESD 2018.

establishes CEC as such a new entity. While this is overall positive, the provisions leave considerably discretion to the MS for the transposition (see section 4.4.4.1). While this is generally positive, as it allows for a variety of energy community initiatives across the MS, it would be useful if the EU Commission could official guidelines regarding the following points:

Members

The definition requires at least a legal entity as organizational form which is "effectively controlled" by its members. The definition does not further specify which measures are required to comply with the condition "effective control" by members. Furthermore, it is not clear whether the direct inclusion of citizens is obligatory.

- **It is recommended to clarify that CECs are not exclusively "citizen entities", but can also be established solely by enterprises and municipalities.**

Purpose

While the EMD 2019/944/EU aims at providing a level-playing field for CECs, so that they can compete on equal footing with well-established *"traditional undertakings"*, the primary purpose of CECs extends beyond the one of *"traditional undertakings"*. The definition states that the purpose of CECs is to provide *"environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates"*, rather than financial profits.

- **It is recommended to clarify that CECs are not excluded from making profits, but can generate financial profits in line with the aim to provide a level-playing field for CECs.**

Cooperation with DSOs

MS have to ensure that DSOs cooperate with CECs *"to facilitate electricity transfer within the CEC"*. This does not sufficiently define the relation between CECs and DSOs and potentially leaves large discretion to the willingness of DSOs in determining the cooperation.

- **It is recommended to clarify the conditions for DSOs in order to provide a level-playing field for CECs in the cooperation with DSOs.**

Proximity and Cross-border

The definition of CEC does not include a proximity element, so CECs are in principle not bound by a confined geographical area or grid. MS may decide to allow CECs to be open to *"cross-border participation"*. This does not clarify whether this includes the physical connection of CECs across borders or whether participation is confined to membership. This implies two uncertainties: whether MS implement the cross-border element and how they define "participation".

- **It is recommended to clarify that cross-border participation should not be categorically excluded and to extend "participation" in this context beyond membership.**

Coordination between Member States

Especially for facilitating the cross-border potential of CECs MS have to coordinate the implementation of the preceding issues.

- **It is recommended that the EU Commission to urges the MS to cooperate and coordinate the transposition of the provisions on CECs in their national legal frameworks.**

7.5 Alternative Parallel Systems

The societal goals to increase decentral RES, reduce system costs, and to keep revenues of the energy transition in local region, requires new system operational approaches. Possibly, CEC could provide the organisational structures to enable local energy initiatives. Currently, the EMD 2019/944//EU also provides the option for other parallel systems, such as CDS and small interconnected and isolated systems. However, the options under these exemptions are rather limited and do not suffice for implementing goals related to increasing decentral RES and improving efficiency on small scale. With the ambition to sophisticate the distribution system level for increasing levels of intermittent decentral RES and increasing consumption due to electrification (for example electric vehicles), it might be necessary to expand the possibilities for parallel systems beyond the specified options under the current legal framework. More research is needed to investigate possible new forms of alternative decentral systems and their potential for the energy transition in the EU.

- **Therefore, it is recommended that the EU Commission initiates research on the topic of alternative decentral energy systems and to identify its potential for the EU context.**

7.6 Gas Quality Standards at EU Level

Currently, as efforts by CEN have not resulted in a common gas quality standard, the determination of gas quality standards is entirely at the discretion of the MS. While this is logically explained by different natural gas qualities in the different regions, different parameters between MS may hamper the injection of alternative gases (such as hydrogen) to the natural gas system and the cross-border trade therein. Despite the fact the admixing hydrogen to the existing natural gas system does not seem to be a primary priority according to the EU Hydrogen Strategy (see section 5.2), it is a precondition to align gas quality standards to further enable cross-border trade.

- **It is therefore recommended that the EU continues its efforts to further harmonise gas quality standards at EU level.**

7.7 Aligning Uncertainties between the EMD 2019/944/EU and the GMD 2009/73/EC regarding the Operation and Ownership of Storage Facilities

PtG as storage technology is recognised by the definition of “energy storage” as established by the EMD 2019/944/EU, as it establishes a technology-and energy neutral approach. However, the conversion of electricity to a gas, which can also be considered a gas production activity, and the subsequent storage thereof, is also regulated under the GMD 2009/73/EC. This results in legal uncertainties on how these definitions and subsequent ownership regimes align. Therefore, it needs to be clarified whether and when PtG is both an energy storage and gas production activity. Related to that, it needs to be clarified how the conditional ownership and operation of a PtG facility by a system operator under the EMD 2019/944/EU fits with the exclusion for such operators to perform production activities under the GMD 2009/73/EC. This also requires clarifying to what extent gas storage system operators are allowed to operate a PtG energy storage facility when this could also be considered a gas production activity. It would thus be required that the EU legislator explicitly prescribes to what extent the proposed legal framework on energy storage applicable to PtG takes precedence over similar rules under the GMD 2009/73/EC. These uncertainties illustrate the complexity by increasing sector integration (electricity and gas).

- **It is therefore recommended that the EU Commission takes sector-integration into account when drafting legislation. This has been the case with the establishment of the definition on "energy storage" as adopted under the EMD 2019/944/EU and needs to be continued in the future.**

8. CONCLUSION

This deliverable provided an overview of the relevant EU legislation for the SEREH project. Several settings where presented which could be part of the SEREH project. These settings are to different extents possible under the current EU legal framework. This deliverable aimed at identifying the main options and limitations and presented recommendations on how the EU legal framework would need further adjustments for SEREH to become viable.

The main observation is that the legal framework facilitates an internal energy market in the EU which is physically connected via the transmission system level. While the EMD 2019/944/EU acknowledges that the distribution system will need to play an extended role in the context of the energy transition, little is added in terms of market integration at distribution system level. Despite this major limitation, this deliverable identified options under the presented settings on how to implement (parts of) SEREH.

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