European Network of Transmission System Operators for Electricity

entsoe

Common Energy Data Space

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ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the association for the cooperation of the European transmission system operators (TSOs). The 39 member TSOs, representing 35 countries, are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E brings together the unique expertise of TSOs for the benefit of European citizens by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the security of the inter-connected power system in all time frames at pan-European level and the optimal functioning and development of the European interconnected electricity markets, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first climate-neutral continent by 2050 by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires sector integration and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources. ENTSO-E acts to ensure that this energy system keeps consumers at its centre and is operated and developed with climate objectives and social welfare in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in solidarity as a community of TSOs united by a shared responsibility.

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by optimising social welfare in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and innovative responses to prepare for the future and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with transparency and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its legally mandated tasks, ENTSO-E's key responsibilities include the following:

› Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;

› Assessment of the adequacy of the system in different timeframes;

› Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);

› Coordination of research, development and innovation activities of TSOs;

› Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the implementation and monitoring of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

TABLE OF CONTENTS

I. INTRODUCTION

The European strategy for data focuses on putting people first in developing technology and promoting and defending European values and rights in the digital world[1]. A common energy data space should enable the sharing of energy-linked data between the different stakeholders, considering the permission of the data owner, fostering interoperable data access to create a single market for data, and the need to support the green energy transition.

Data spaces ensure that more data become available for use in the economy and society, while keeping the companies and individuals who generate the data in control of their own data. This ensures Europe's global competitiveness and data sovereignty. To facilitate the green energy transition, the energy sector requires more communication between the different stakeholders. Data spaces offer a solution to facilitate data sharing and exchange that is scalable, based on privacy-by-design and security-by-design principles.

> 'A data space is defined as a decentralised infrastructure for trustworthy data sharing and exchange in data ecosystems based on commonly agreed principles.'

— Open DEI (Design Principles for Data Spaces)[2]

By decentralising infrastructure and enabling further data access, data spaces encourage the development of new services, business models and data usage scenarios. By allowing cross sector data exchange, the energy sector can participate in such a data-sharing ecosystem, thus benefitting from receiving data from other sectors while also helping other sectors by providing energy-linked data. The common data space makes data accessible from any data-generating device and encourages all stakeholders – data rights holders, data providers, data users and data intermediaries – to participate in the European data economy.

To harvest all the above potential, the energy sector needs to engage in the data space communities. Data spaces encourage (cross sector) data exchange from smart meters and from devices generating data, consequently enabling the development of new services and facilitating the green energy transition. In this manner, all stakeholders of the energy sector are encouraged to participate in the European data economy. The Digitalising the Energy System – EU Action Plan (DESAP)[3] defines the energy sector involvement in the data space community as being orchestrated by the new Data for Energy (D4E) group of the European Commission, in which ENTSO-E should engage to play an active role in setting the core ideas of roles and governance of the data space in the energy sector.

[1] *European Commission - A European Strategy for data | Shaping Europe's digital future (europa.eu)*

[2] *Open DEI. As part of the Horizon 2020 programme, the OPEN DEI project focuses on 'Platforms and Pilots' to support the implementation of next generation digital platforms in four basic industrial domains:*

[3] *DESAP: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0552&qid=1666369684560*

Relevant European legislation paves the way. The Data Act[4] promotes data sharing and collaboration and strengthens the individual's sovereignty over own data, and the Interoperable Europe Act facilitates seamless data exchange among public sector bodies. Together, these acts can be beneficial for fostering innovation and cross-sector and cross-border cooperation in the transition to a more interconnected energy system.

The following sections summarises the intention of the European data space initiatives, introduces the legal background and the most influential working programmes and projects, and presents the core ideas of roles and governance of the data spaces in the energy context.

II. LEGISLATIVE BACKGROUND AND ONGOING INITIATIVES

The European data space initiatives have their roots in the European Data Strategy. The European data strategy is a comprehensive framework to harness the potential of data-driven innovation while ensuring the protection of citizens' rights and fostering digital sovereignty. With this strategy, the European Commission aims to create a single market for data and facilitate data sharing across sectors and borders. For now, it is implemented through three key legislative acts: the Data Governance Act, the Data Act and the Interoperable Europe Act.

The Data Governance Act establishes rules and mechanisms for data sharing, data intermediaries and the creation of common European data spaces. It promotes trust and transparency in data-sharing practices and enables easier access to data across sectors. This can benefit the energy sector by facilitating collaboration and data exchange among actors in the energy sector e.g. Transmission System Operators (TSOs), Distribution System Operators (DSOs), traders, suppliers, producers and consumers by creating new innovative data driven services, for example Granular Certificates[5].

The Data Act is a regulation that aims to strengthen data sharing, data protection and privacy regulations within the European Union. It enhances individuals' control over their data and establishes rules for data access, data processing and data transfers to third parties, thus liberalising the data services market while ensuring the data right holders sovereignty. The act will also enhance data privacy standards, safeguarding sensitive customer information and fostering trust between digital service providers. The Data Act sets the scene for how the energy sector can engage with consumers and their devices; for example, it offers the potential to enable flexibility services.

The Interoperable Europe Act focuses on improving cross-border data flow and interoperability between public sector bodies, possibly including some European TSOs. It aims to establish common

[4] Data governance act: *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R0868*

[5] *Home - Energy (energytrackandtrace.com)*

semantic standards and technical specifications to enable data exchange and collaboration across EU member states. This can benefit the energy sector by promoting the harmonisation of information models, data formats and exchange protocols, facilitating cross-sector and cross-border data exchange, and enhancing cooperation among actors and operators in the energy sector.

The European Data Strategy also promotes initiatives facilitating data sharing within the energy sector. These initiatives are generally funded through the Horizon and Digital Europe Programmes. One of these is the BRIDGE Initiative, which focuses on developing a data exchange reference architecture for sharing energy data. Another is the Data Space for Smart and Sustainable Cities and Communities that focuses on creating common European blueprints for data sharing across sectors and domains, thus emphasising the green energy transition. A third initiative is the Int:net project that focuses on harmonising interoperability within the energy domain. Many past and ongoing Horizon 2020 and Horizon Europe projects, with the involvement of TSOs, are already contributing to the data space discussions. For example, EU-SysFlex[6] proposed the data exchange conceptual model for Europe. OneNet project's Reference Architecture[7] and Reference Data Governance Model[8] were designed to enable interactions among multitude of platforms so that any party can access any market anywhere in Europe. The elements of the governance model are summarised in Chapter **Error! Reference source not found.** of this document.

The DESAP prompts a common European energy data space, ensuring governance and a coordinated European framework for sharing and using energy data, promoting new initiatives and calls from 2024 and onwards. The action plan also plans for Digital Twins of the European energy system, enabling new insights and data exchange possibilities, and new digital consumer services by engaging consumers in the green energy transition.

The implementing Regulation on interoperability requirements and non-discriminatory and transparent procedures for access to metering and consumption data[9] will ensure that data on metering and consumption use one common reference model. ENTSO-E is of the opinion that these requirements and procedures for data interoperability are also natural elements of the common energy data space.

[6] *Recommended data exchange conceptual model for Europe (EU-SysFlex)*
[7] *OneNet Reference Architecture D5.2 (OnetNet)*
[8] *Cross stakeholder Data Governance for Energy Data Exchange D6.2 (OneNet)*
[9] *The implementing Regulation on interoperability requirements and non-discriminatory and transparent procedures for access to metering and consumption data*

III. SCOPE OF THE ENERGY DATA SPACE

Today in the energy sector, mostly the data of the regulated meter at the grid connection point is used (for billing, supplier switching, flexibility provisioning, etc); however, in the future we foresee a shift towards wider usage of submeter data held by commercial parties, such as original equipment manufacturers (OEMs) and energy service providers. In many cases, energy data is locked in by OEMs, service providers or other data holders. If data stands alone and is not facilitated to be shared or valorised with other data and insights, it has less value. In addition, the hesitancy to share data hinders innovation in new services and business models. Of course, the sharing of private data always requires the data owner's consent.

A common energy data space should act as a common set of rules which allows the secure and transparent portability of energy data. An energy data space will bring together relevant data infrastructure and governance frameworks to facilitate data pooling and data sharing. It will include the deployment of data sharing means and services, and data governance structures, and it will improve the availability, transparency and interoperability of data.

In the common European energy data space, data portability for energy linked data is envisaged. Energy-linked data are very broad. Metering data are one of the most important types of data to be shared and include both historical, real-time and predictive data, at the head meter and behind the meter. Next to metering data, master data, reference data, market data and other types of energy related data can also be exchanged in a data space. Any data, public or private, can be open. In the case of private data, valid permission has to be provided to access the data.

The energy data space should include electricity, gas, water and heating & cooling, while other energy carrier forms (such as hydrogen) could also be of interest. In the long term, interoperability with data spaces of all sectors is required; however in the short term, we see a close link to the mobility data space and the industrial and manufacturing data spaces.

For an energy data space, we see 4 key principles defining the scope of the energy data space: interoperability, trust, data value and governance. Each of the 4 principles are explained in more detail below[10]:

Governance

We see different levels of governance, e.g. operational, business and legal. A data space enables data sharing between different stakeholders based on a common governance framework. Therefore, agreements between the different stakeholders are crucial to ensure a smooth cooperation. The governance framework should define the rules and responsibilities and determine the minimal (technical) requirements for participation in the data spaces. This framework also includes the

[10] *Starter Kit For Data Spaces Designers Version 1.0*

operational governance agreements (e.g. GDPR, onboarding, etc.). The continuity and improvement of the data spaces should be ensured by, for example, a steering body.

Interoperability

An efficient data exchange, considering the FAIR (Findable, Accessible, Interoperable and Re-useable) principle is one of the focus points of a data space. Making the data sharing easier will enhance the data portability. Interoperability within the energy sector as well as interoperability between sectors is important to avoid sector-specific data spaces becoming silos. Not only should technical interoperability be ensured but organisational, semantical, functional and legal interoperability should also be considered. Data spaces can be nested or overlapping. In principle, a data space has a decentral infrastructure, connecting different data providers and duplication of data should be avoided where possible.

Trust

Each data right holder should have control over its own data and data that it shares based on permission. An identity management should be put in place. A secured and trusted data exchange should be ensured. Privacy by design, based among others on the General Data Protection Regulation (GDPR), is a key principle. The provenance of the data, traceability and transparency are also required to ensure a trusted environment.

Data Value

One of the important benefits of a data space is to create value from the sharing of data. Data spaces can contain marketplaces where services can be offered (e.g. data visualisation, list of offered services, contracting, etc.). This requires the adoption of interoperable mechanisms enabling the description of terms and conditions (including pricing) linked to data service offerings, the publication and discovery of such offerings and the management of all the necessary steps supporting the lifecycle of contracts that are established when a given participant acquires the rights to access and use data.

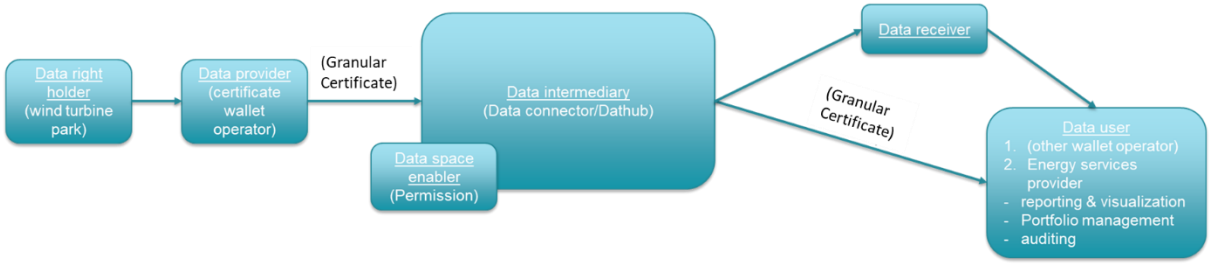
The stakeholders of a common data space are listed below, specifically applied to the energy sector:[11,12]

- **Data rights holder** (data owner): This could be the energy consumer or producer who has the legal right to their own consumption or production data.
- **Data provider**: This could be the entity that holds the production and consumption data from the smart meters.

[11] *DSSC Glossary (data Spaces Support Centre)*
[12] *1. Gather Knowledge - How to Build Data Spaces? (internationaldataspaces.org)*

- **Data intermediary**: This could be a digital service that allows the data rights owners access to their own data and enables conditioned third-party access to be granted.
- **Data space enabler**: An actor or group of actors that are responsible for the governance of the data space.
- **Data receiver**: Actor that provides digital services to the data users.
- **Data user**: The eligible user of the service offered by the data receiver.

Schematic view of data space participants' relations, illustrated with an example.



Based on the produced energy of the wind turbine park, granular certificates (including time and location) are attributed to and managed by the certificate wallet operator. These granular certificates can be exchanged by another wallet operator or with other energy service providers. The granular certificates can be used as proof that, for example, certain production processes use renewable energy.

IV. THE DATA EXCHANGE GOVERNANCE ELEMENTS

Data exchange governance can occur and should be organised in any level of data interoperability. Therefore, governance elements can be clustered per Smart Grid Architecture Model (SGAM)[13] interoperability layers (based on OneNet project – see footnote #4).

Business layer	Function layer	Information and Communication layer	Component layer
1. Data governance business case	4. Data ownership governance	7. Data vocabulary governance	8. Data platforms
2. Orchestrated data governance	5. Data access governance		9. Interfaces
3. Rules and norms	6. Data security governance		10. Repositories

1. The **business case** for the data space's governance should be defined, including the scope and functionalities, responsibilities, and accountabilities, involved partners and customers, associated risks, Key Performance Indicators (KPIs), costs and benefits. Continuous evaluation of the business case will ensure that the most up-to-date needs of stakeholders, policymakers and society are always considered – relating to new data types, new services, new policies, new standards, etc. The party operating the data space should be neutral to guarantee everyone's right of involvement.

2. A **dedicated steering group** for orchestrated data governance is necessary, which is open to different interested projects, initiatives, stakeholders and Member States. There are already good candidates for this – the Data for Energy working group, European Data Innovation Board, Data Spaces Support Centre, joint working group of ENTSO-E and EU DSO Entity advising the Commission regarding data interoperability implementing acts.

3. Proposing, promoting, understanding and **implementing regulations and standards** is required to facilitate efficient data governance. Many relevant European acts are already in place or in the pipeline. The data space has a natural link with the rules and norms related to data formats, communication protocols, cybersecurity, standardised APIs, and information standards (such as the Common Information Model [CIM]), etc.

4. The data space must respect the **data ownership principle**. Even if the data space itself is not necessarily responsible for the consent management, it still should facilitate the

[13] *IEC SRD 63200 – SGAM basics*

ecosystem wherein the data owner's rights are respected and unauthorised data exchange is not enabled by the data space. In any case, the space needs to manage the identities of individuals, organisations and assets.

5. For smooth data access, the data space could provide the **one-stop-shop feature**, where information about and access guidance to different types of data is available. This should include information about data access points, authentication requirements, consent-based terms for access to private data, and licensing terms for access to open data.

6. The data space can also enable **data security governance**. It is particularly concerned with authorised access to data. The harmonisation of authentication schemes for individuals, organisation and assets is necessary across Europe and sectors. The 'Know-your-data-user' principle should be applied to make data usage information available to data owners easily and free of charge. Several tools are available for security – firewalls, encryption, encoding, and privacy-enhancing technologies.

7. **Data vocabulary governance** means the semantic modelling of roles, information exchanges and processes relevant for the data space according to reference models. It should be linked to data interoperability implementing acts (as mandated by the electricity market directive) and as such be supported by a European arrangement, which coordinates the development and implementation of reference models. Access to energy reference data further supports the usage of a harmonised vocabulary.[14]

8. The data space should ensure the interoperability of various national and European data platforms by introducing a **registry of interoperable data platforms** and by issuing compliance labels for these. The primary aim of the data space is not to store any data but rather to connect individual distributed platforms and to facilitate a secure and traceable data exchange between them (including cross-sector data exchange).

9. **Interfacing** with the data space is another key governance feature. Appropriate APIs and graphical user interfaces (GUIs) should be made available to different stakeholders around the data space. User-friendly integration guidance for developers, data intermediaries, data providers and data users should be made available, regardless of their physical location and data type. Integration may include a minimum set of requirements for participation at data spaces in addition to a semantical, technical and organisational compliance check.

10. **Common European data repositories** for data roles, data types (objects, profiles) and processes (use cases) support well-functioning data management. Although repositories are not necessarily part of the data space, they should still entail a catalogue of federated services as a central library referring to relevant repositories. This means that the data

[14] *EU Vocabularies (Publication Office of the European Union) https://op.europa.eu/en/web/eu-vocabularies.*

space can be a marketplace for data services by listing available data source and types as well as services and performing the role of a clearing house.

V. USE CASES

Different use cases can be enabled through an energy data space. All of these use cases have a common need; they heavily rely on the availability and quality of energy data. The different layers mentioned earlier are necessary to solve these needs. TSOs will be a key contributor to the energy data space because they are the data holder for different energy-related data. On the other hand, TSOs will increasingly become the data user of energy-related flowing in the energy data spaces dependent on the use case. The number of use cases that can be enabled by an energy data space are uncountable. As an illustration, two are described further below.

Unlocking flexibility from residential DER: With the energy transition, more and more DER are available at the residential end for consumers, such as heatpump, electric vehicles (EVs), etc. To enable this flexibility to be unlocked, it is key that different data sets, such as metering and meta data, are exchanged between the original equipment manufacturers (OEMs), flexibility service providers and systems operators regarding the consumer's consent. The energy data space must provide a framework and technology under which these data exchanges must take place.

TSO–DSO coordination for flexibility: System operators will face increasing challenges in managing their grids in the energy transition. This will not only impact the data exchange between system operators and energy service providers but also require better coordination between system operators. For example, a local congestion problem while overall demand is too low. It is required that energy service providers receive the right incentive with the right information to gain optimal societal benefit. The same would apply between different TSOs on the European level. To achieve this, it will be important to integrate the different existing energy platforms and hubs into the energy data space on a national and European level.

VI. SUMMARY

The European commission has made it one of its top priorities to develop a digital data-sharing economy within Europe. This data-sharing economy will be key for the realisation of the energy transition to empower consumers. The energy data spaces will define the standards and governance to allow such data sharing with respect of the data owner's consent. The energy data space will deliver value to the different participants, such as system operators, energy service providers and consumers. The TSOs will be important data providers in such an energy data space but will increasingly also become data users of the energy data space. This will allow TSOs to better and more efficiently fulfil their mission in the interests of society.