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Market and Governance of Existing Data Access & Exchange Platforms

Sub-task 5.1.3

EU-SysFlex

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ABBREVIATIONS AND ACRONYMS

BRP	Balance responsible party
BSP	Balancing service provider
BUC	Business use case
CMS	Central market system
DEP	Data exchange platform
DPO	Data platform operator
DSO	Distribution system operator
EDSN	Energie Data Services Nederland
ESCO	Energy service company
EV	Electrical Vehicle
FSP	Flexibility service provider
ICT	Information and communication technology
NBS	Nordic Balance Settlement (eSett)
RES	Renewable energy sources
RSC	Regional security coordinator
SUC	System use case
TSO	Transmission system operator
UMIG	Utility Market Implementation Guidelines

EXECUTIVE SUMMARY

EU has declared that validated historical consumption data shall be made available to final customers on request, easily and securely and at no additional cost [1]. To comply with this, several countries are currently implementing solutions for access to and exchange of meter data, incl. central national data hubs but there are also several countries that already have implemented similar solutions earlier. Beside central solutions also more decentralized options exist (e.g. in Austria) for meter data access and exchange, but were not interviewed for this study. However, regardless of the level of (de)centralisation all solutions need to be interoperable inside the given country as well as across borders in coming years. The intention of this document is not to evaluate the benefits on central solutions compared to decentral solutions (and vice versa). As this comparison is beyond the scope no evaluation and no recommendation towards a central or decentral solution are given. It rather evaluates the benefits of easy data access and exchange as such.

The aim with the report is to investigate the key characteristics of some European 'data access&exchange platforms' today and in the future with an emphasis on how they are governed and which markets and stakeholders they support. To comply with the aim, several interviews have been performed with data platform operators (DPOs) with additional questionnaire for them to fill in regarding their status quo and future plans. The information from DPOs has been supplemented with information from relevant reports to provide a complete picture. The term 'data (access&exchange) platform' captures the concepts of both 'data hub'[1] and 'data exchange platform' (DEP)[2], in most cases data hub acting also as DEP.

The results show that the data platforms are owned and operated by transmission system operators (TSOs) and distribution system operators (DSOs) mainly today where the aim to large extent is to be an independent party providing secure, reliable and qualitative data for different stakeholders. The limited answers from the DPOs in terms of which business use cases (BUCs) and system use cases (SUCs) are managed in respective data platforms also confirm that the core business for data platforms (i.e. data hubs in most cases) is to provide *access to data for different stakeholders*.

There is also a distinction between the data platforms that integrate smaller customers to use and benefit from the services and data platforms that mainly provide benefits to larger stakeholders. The data platforms in the Nordic countries, Estonia and the Netherlands are examples of more electricity end-customer (consumers, prosumers) oriented solutions whereas the Belgium and the Italian data platforms are more focused on suppliers and BRPs to facilitate their business processes.

[1] Data Hub is an information system which main functionality is to store and make available measurements (e.g. meter data, operational data) and associated master data. Data Hubs are not necessarily centralized in a country or in a region. [10]

[2] Data exchange platform (DEP) is a communication platform the basic functionality of which is to secure data transfer (routing) from data providers (e.g. data hubs, flexibility service providers, TSOs, DSOs) to the data users (e.g. TSOs, DSOs, consumers, suppliers, energy service providers). DEP stores data related to its services (e.g. cryptographic hash of the data requested). The DEP does not store core energy data (e.g. meter data, grid data, market data) while these data can be stored by data hubs. Several DEPs may exist in different countries and inside one country. [10]

The future of the data platforms according to the DPOs lies in a mix between the focus on today's business but also to enable a more market-oriented business where all kinds of consumers and generators can benefit from the data platforms. There is also a focus to include more and other types of data and/or allow third party applications to connect to the data platform, *inter alia*, to be part of the flexibility market for the energy system. The interviewed data platforms have in general a focus on national data access and exchange, but the Nordic countries and the Data Bridge Alliance initiative are two examples where data platforms in different countries work together (or plan to work together) for a cross-border data exchange collaboration.

1. INTRODUCTION

1.1 BACKGROUND

Data management has become important in today's society and the electricity sector is not an exception. Countries, both within and outside Europe, are working on new solutions to increase the usage and efficiency of energy data management and how this could be implemented. National data platforms to store and process energy data is seen as one key player to coordinate this work. Several European countries have already implemented national data platforms (data hubs, data exchange platforms) with shifting focuses. The experience from these implementations could bring valuable information for the EU-SysFlex project in its aim for interoperability of different platforms across Europe as an enabler for increased share of renewable energy in the electricity system.

According to the Description of Action of EU-SysFlex, the outcome of task 5.1 is a conceptual data exchange model for the pan-European electricity system with descriptions, including functionalities, processes, roles and services. The model does not imply a single data exchange platform but rather allows for interoperability of different platforms across Europe.

While the topic of metering data processing has been addressed and regulated, this is not the case with access and sharing (including across the borders) of end-user electricity consumption data. The situation regarding collecting and processing consumption data varies across states in terms of regulation and across energy providers in terms of advancement in the adoption of information technology. It is a challenge to develop a single homogenous model or a set of rules to fit all. Requirements of network codes and new market design legislation need to be considered when developing a data exchange model.

These business and IT needs have been studied in task 5.2, by means of data exchange SUCs [10]. These SUCs defined how systems interact with each other. They also give definitions to

- Data Exchange Platform (DEP): DEP is a communication platform the basic functionality of which is to secure data transfer (routing) from data providers (e.g. data hubs, flexibility service providers, TSOs, DSOs) to the data users (e.g. TSOs, DSOs, consumers, suppliers, energy service providers). DEP stores data related to its services (e.g. cryptographic hash of the data requested). The DEP does not store core energy data (e.g. meter data, grid data, market data) while these data can be stored by data hubs. Several DEPs may exist in different countries and inside one country,
- Data Hub: Data Hub is an information system which main functionality is to store and make available measurements (e.g. meter data, operational data) and associated master data. Data Hubs are not necessarily centralized in a country or in a region.

The aim of sub-task 5.1.3 with this report is to investigate the key characteristics of some European data hubs and DEPs today and in the future with an emphasis of how they are governed and which markets and stakeholders they

support. In the following it will be referred to 'data (access & exchange) platform' capturing concepts of both 'data hubs' and 'data exchange platforms'.

Based on the Electricity Market Directive (2019/944/EU), validated historical consumption data shall be made available to final customers on request, easily and securely and at no additional cost. Final customers should be able to retrieve their own metering data and to give another party access, acting on their behalf. In order to promote competition in the retail market and to avoid excessive administrative costs for the eligible market participants, Member States must facilitate interoperability and non-discriminatory and transparent procedures for data access. The Electricity Market Directive does not require the implementation of data hubs or other platforms *per se*, but there is no coincidence why the data hubs and DEPs are high on the agenda in many European countries today.

The vision of the data platform as a means is to structure electricity market data on national level, and to harmonise markets and management systems to enable cross-border competition within these platforms in Europe. Markets could be opened up to new players and make the consumer more active in the market. Existing data platform solutions are currently not homogenously structured, and this report focuses on the differences and similarities in governance and their relation to the markets they operate in.

1.2 CONTEXT

Within the EU-SysFlex project, interviews with five different DPOs have been performed which form the basis for this report. The answers from the DPOs are then compiled with relevant reports in the subject in order to understand the current status of data platforms today, what services they provide, and how they might develop in the future.

The five DPOs that were interviewed represent the Danish hub, the Dutch hub, the Italian hub, the Belgian hub and the Estonian hub+DEP. To provide a broader understanding of the current status on data platforms, information from the Nordic data hubs (Sweden, Finland, Norway and Denmark) is included. The interviewed and presented data platforms represent rather central approaches. For a full picture decentralised approaches need to be equally analysed additionally. As this analysis would go beyond the scope of this document, the selection represents a first step to evaluate the benefits of easy data access and exchange as such, but does not intent to give recommendations about the approach.

To provide a brief understanding of the characteristics of the data platforms that are in focus in this report, Table 1 and Table 2 are presented.

TABLE 1: SUMMARY OF THE STUDIED DATA PLATFORMS' OWNERSHIP, OPERATION AND CONNECTION POINTS. INFORMATION REGARDING NETHERLANDS, ESTONIA AND BELGIUM FROM [2] AND THE NORDIC COUNTRIES FROM [3].

Country (name)	Data platform ownership	Data platform operator	Operational since (planned)	Connection points 2017
Netherlands (EDSN)	TSO and 7 DSOs	Private company owned by grid operators	2013/2018	15.7 Mil (inc. gas)
Estonia (Estfeed)	TSO	TSO	2012	0.75 Mil
Italy (SII)	The State	Third party	2016	37 Mil
Belgium (Atrias)	5 DSOs	Atrias*	2018	-
Denmark (DataHub)	TSO	TSO	2013/2016	3.3 Mil
Sweden (Data hub)	TSO	TSO	(2023)	5,3 Mil**
Finland (Datahub Oy)	TSO	TSO	(2021)	3.6 Mil**
Norway (ElHub)	TSO	Subsidiary of TSO	2019	3 Mil**

*Atrias is private company

**Estimation of connection points when online

TABLE 2: SUMMARY OF THE CONCERNED MARKETS, MARKET PARTICIPANTS AND ACCESS TO DATA FOR THE STUDIED DATA PLATFORMS. INFORMATION REGARDING NETHERLANDS, ESTONIA AND BELGIUM FROM [2] AND THE NORDIC COUNTRIES FROM [3].

COUNTRY (NAME)	RETAIL OR WHOLESALE DATA?	DATA PLATFORM FACILITATES MARKET DATA?	ALLOWS APPLICATIONS OR ESCOs?*	CUSTOMERS HAVE ACCESS TO DATA?
Netherland (EDSN)	Retail	No	No, external	No
Estonia (Estfeed)	Both	Yes	Yes	Yes
Italy (SII)	Both	No	No	No
Belgium (Atrias)	Retail	planned: flexibility	No	Planned
Denmark (DataHub)	Retail	No	Yes	Yes
Sweden (Data hub)	Retail	No	Yes	Yes
Finland (Datahub Oy)	Retail	No	Yes?	Yes
Norway (ElHub)	Retail	No	No	Yes

*Energy service company

2. STATUS OF DATA PLATFORMS IN EUROPE

This chapter includes a presentation of the current status of a few data platforms already implemented or with imminent implementation expected. The description is especially focussing on the Danish hub, the Dutch hub, the Italian hub, the Belgian hub and the Estonian hub+DEP as they have been approached and interviewed by the EU-SysFlex team. For the interviewed data platforms, the answers from the interviews form the foundation of text where the focus is on:

- Governance of the data platforms
- Prioritised principles for energy data exchange
- Data access and stakeholder related/benefiting from the data platform
- Future plans

The first subchapter, 2.1, comparing the function of the current and the planned data hubs in the Nordic countries which have a common goal of integrating new energy markets over the national borders. Subchapter 2.2 focus on the Danish hub, 2.3 on the Dutch hub, 2.4 on the Belgium hub, 2.5 on the Italian hub and 2.6 on the Estonian data hub and DEP. In subchapter 2.7 the focus is on the BUCs and the SUCs for the data platform. Here, the Estonian, the Italian and the Dutch DPOs completed the form describing BUCs and SUCs supported by the respective data platform.

2.1 THE NORDICS

Sweden, Norway, Finland and Denmark, from now on called “the Nordics”, share a common aim to harmonise the electricity retail markets. Already today, the Nordics have common wholesale and balancing markets organised by Nord Pool and imbalance settlement provided by eSett. Denmark and Norway have already implemented data hubs, Sweden and Finland will launch their data hubs in 2023 and 2021 respectively. With the introduction of the supplier-centric data hubs, the Nordics have the possibility to also harmonise the retail market.

In the Nordics, all data hubs are owned and operated by respective TSO (or a subsidiary thereof) in the country. Especially the Norwegian, the Swedish and the Finnish data hubs feature a similar interface and structure. Table 3 shows a comparison between the functions of the data hubs in the Nordics.

TABLE 3: FUNCTIONS OF THE DATA HUBS IN THE NORDICS TODAY [3].

FUNCTION	DENMARK	NORWAY	FINLAND	SWEDEN
Metering point management	Yes	Yes	Yes	Yes
Customer data management	Yes	Yes	Yes	Yes
Customer moving and switching	Yes	Yes	Yes	Yes
Contract management	Yes	Yes	Yes	Yes
Forwarding service requests from supplier to DSO	Yes	Yes	Yes	Yes
Meter value management	Yes	Yes	Yes	Yes
Third party access to metering data	Yes	Yes	Yes	Yes
Provides settlement data to NBS**	No*	Yes	Yes	Yes
Market monitoring	Yes	Yes	Yes	Yes
Correction settlement	Yes	Yes	Yes	Yes
Compiling statistics	Yes	Yes	Yes	Yes
Combined billing	Yes	Yes	No	Yes

*Denmark is planning to join

**Nordic Balance Settlement (eSett)

2.2 DENMARK

The first version of the Danish data hub (DataHub) went online 2013 and the second version 2016 which made them to be the frontrunner in the Nordics in the area. The data hub was developed as a result of a law, is owned and operated by the Danish TSO Energinet and is paid by customers via TSO tariff [4]. The goal of DataHub is to make all meter data from generation and demand at all levels centrally accessible and make the customer more active by providing them secure and reliable data [5]. DataHub does not contain any market data but allows applications and energy service companies on the platform [2].

The most prioritized principles for energy data exchange according to the Danish DPO are:

- Data hub operator to be neutral to ensure independence and fairness of treatment of different actors
- Provide secure data access to suppliers, BRPs and to enable technical unbundling of grid operators
- Also, easy access to data enabling customer to become active is considered to be prioritized

Data access and stakeholder related/benefiting from the data hub

The DSOs own, operate and collect data from the meters and are responsible for the data quality and the meter master data to be sent to the data hub. Suppliers are responsible for the customers' master data and its delivery to the data hub.

TSO, DSOs, BRPs, suppliers, third parties and customers are benefiting and/or are related to the data hub. In 2017 there were in total 160 third parties consisting of suppliers, groups of customers represented by third parties to

procure energy, monitoring service providers, which accessed the data hub. Another feature of the Danish data hub is that the customers have the possibility to access their own data by authenticating themselves using national digital signature. The data hub also works as a consent data base and a register of service providers by giving unique codes where a stakeholder can give consent to application through the data hub portal [5].

Future perspectives

The following future steps for DataHub were presented by Energinet:

- Not only DSO-collected metering data should be accessible via DataHub but also e.g. Electric Vehicle (EV) charging and other possible flexibility providers' data. The granularity of the data is not clear yet.
- Data potentially to be used for network planning. [5]

2.3 NETHERLANDS

The Dutch DEP was original commissioned 2013 with major upgrades 2018 and is owned and operated by a consortium of several DSOs called EDSN (Energie Data Services Nederland) [6]. About 15.7 million metering points, gas and electricity, were connected 2017 [2].

The most prioritized principles for energy data exchange according to the EDSN are:

- Data hub operator to be neutral to ensure independence and fairness of treatment of different actors
- Fair and equal access to data and/or information
- Easy access to data enabling customer to become active
- Enable supplier switching
- Imbalance settlement
- Also, data quality (data integrity, ability to handle massive flows of data, timely uploading, etc.) is considered to be prioritized

The business model of the platform is to administer all electricity and gas metering points and register parties like BRPs, suppliers and metering companies. The data hub is currently paid by the DSOs and TSO which could potentially hinder innovative developments of new functionalities (e.g. customer access).

Data access and stakeholder related/benefiting from the data hub

TSO, DSOs, BRPs, suppliers and metering companies are benefiting and/or are related to the data hub. For big consumers, above 3x80A, metering companies collect and validate data. For smaller consumers, the DSO or the supplier, performs the validation instead. The metering companies, DSOs and suppliers then send their data to the platform and directly to the TSO for imbalance settlement. For big end users, metering is a free market where metering company owns and operates meters.

Future perspectives

The aim for the platform in the future is to be operated by an independent party and that data should be available to interested parties immediately, driven by the customer [6].

2.4 BELGIUM

On behalf of the Belgian DSOs, Atrias is developing a central market platform with a new single CMS (central market system). The CMS will replace the existing platforms of the distribution system operators and facilitate migration and transition to the new system. Atrias will then both deliver system operations services as well as manage the maintenance of the CMS. The CMS is a technical platform to gather, structure and exchange data between different market parties where all the market transactions are treated centrally in a uniform way. The CMS executes operations and calculations on the behalf of the DSOs and facilitates the access for newcomers to the energy market [7] [4].

Atrias will act as a neutral, objective consultation platform for the energy system operators, suppliers and regional regulators and offer a technical platform for structuring and exchanging data between the Belgian energy sector players. Atrias develops the normalization and standardization of procedures (Utility Market Implementation Guidelines (UMIG)) for the exchange of information.

Business model of the data hub and Atrias as market facilitator:

- Organize a consultation platform for:
    - DSOs and TSO
    - Suppliers, BRPs, Third Parties, ESCOs, BSPs, FSPs
    - Regional regulators

Develop the standards for the exchange of information between market parties active in the distribution system

Data access and stakeholder related/benefiting from the data hub

TSO, DSOs, Brussels Airport, BRPs, third parties – ESCOs and a few retailers benefiting and/or are related to the data hub. Also, BSPs and FSPs have the possibility to use the data hub. Access for consumers is not in the scope. Consumer can access their data directly from DSO / Data Manager or communicate directly with supplier regarding supplier switching. The DSOs are responsible for the collection, validation, retention and provision of meter data, which are used in the regulated market.

Future perspectives

According to Atrias, a new society is evolving where every consumer is also a potential generator, decentralized and renewable generation increases, electrification of building heating and transportation occurs and political “governance” concerning the above needs to be addressed. This will lead to the appearance of new roles and services, which will drive even more data and information flows to deliver these services. Atrias aims to develop an adapted market model, processes and data hub to comply with this. Another important step is to link an external flexibility platform to Atrias to enable more flexibility in the grid [7].

2.5 ITALY

The Italian data hub named SII is operated by Acquirente Unico (AU) which is a public company wholly owned by the GSE (Energy Services Manager), a company of the Ministry of Economy. It cannot generate revenue to cover its operating costs, so all SII's users (energy operators) pay a little fee to cover operating costs. Every year AU submits to the authority an annual budget for the management and development of new functionalities.

The Integrated information system was established in 2010 by the law and the platform has been operational since 2014.

The most prioritized principles, in ranked order, for energy data exchange according to AU are:

1. Data hub to be neutral to ensure independence and fairness of treatment of different actors
2. Guarantee data privacy, data security, and communication security
3. Fair and equal access to data and/or information
4. Data quality (data integrity, ability to handle massive flows of data, timely uploading, etc.)
5. Support market competition

Data access and stakeholder related/benefiting from the data hub

Every month SII manages over 2 million performances (switching, customer change, activation, deactivation, etc.) and every month, the DSOs transfer the consumption measurements via the SII to suppliers. This means that every day, suppliers, DSOs and the TSO are working with the SII producing data and information. This data and information are stored in the SII's database and provided by the DSOs, but it is the DSO that assure the data quality.

Specific role per stakeholder:

- TSO, DSOs and suppliers
    - SII is a central point to information for suppliers, generators and aggregators about grid congestions and the impact they may have on their ability to participate in energy or reserve markets. Also, third parties can potentially take advantage of the data hub in the future.
- Authority
    - Authority can monitor and control the market in cooperation with the SII and contribute to the regulation development or punish those who commit unfair business practices.
- Customers
    - Correct billing and correct information about own consumption of energy and profiling to choose the best supplier for your needs. Direct access to SII since 2019.

Future perspectives

The evolution in the future is vast and has the opportunity for plenty of new functionalities. Below are a few examples presented by AU:

- Web portal for consultation of consumption and supply for customers
- Web portal to enable comparability of energy offers
- Energy footprint analysis
- Provision and monitoring of incentives for renewable sources
- Monitoring of energy efficiency measures [8].

2.6 ESTONIA

Estonia has a central data access and exchange platform for electricity and gas meter data called Estfeed which is owned and operated by the Estonian TSO Elering. Estfeed was started as R&D project which was partly financed through network tariffs, foreign grants and TSO's own profit. Stand-alone part of Estfeed is data hub which was established few years before and it was mainly commissioned because of the reason that it would be more cost efficient to develop a single data hub than for every DSO, mainly smaller DSOs, to develop their own. Estfeed consents access to all the market actors (DSOs, suppliers, customers and third-party applications) once provided the required authorization by the consumer. The consumers can then give access right to their data to third parties through the platform. Discussions about possibilities for commercial revenues are ongoing [4] [9].

The most prioritized principles, in ranked order, for energy data exchange according to Elering are:

1. Easy access to data enabling customer to become active
2. DEP operator to be neutral to ensure independence and fairness of treatment of different actors
3. Guarantee data privacy, data security, and communication security
4. Fair and equal access to data and/or information
5. Facilitating innovation by opening, as much as possible and legally allowed, the access to the data
6. Ability to communicate with other DEPs for completing internal energy market
7. Support to competition

Data access and stakeholder related/benefiting from the data hub

- Today Estfeed provides historical values for electricity and gas in terms of consumption and generation data with an hourly resolution. Connections to other data sources have been piloted like heat meter data, weather data and the spot price data.

It is the DSOs' responsibility to transmit data to the data hub but any data source (e.g. meter data, public data base for public market data) and application receiving the data (supplier, energy service provider) can be integrated with Estfeed and thereby also benefit from the services [9].

Future perspectives

Estfeed is working on integrating data where near-real-time (i.e. higher resolution, quickly available) data can be exchanged, behind the meter data exchange will be possible, where flexibility services will be possible more widely

and where all that will enhance customer-centric approach and the collaboration between DSOs and TSOs and other stakeholders. Estfeed declares that any energy use case in need for data exchange will be possible to manage through the platform in the future.

Examples of new types of data:

- Behind the meter data
  - Both generation and consumption data from sub-meters with down to second-level resolution that will be available near real time.
- Data needed for flexibility services
  - By introducing other data such as reactive power, voltage and frequency together with price signals of flexibility services and flexibility offers, Estfeed plans to enable a growing flexibility market for a diversity of stakeholders.

Another aspect for the future is increased cross-border and cross-sector data exchange. Elering together with several other grid operators is part of the Data Bridge Alliance which aim is to facilitate and standardise data exchange between data hubs, incl. cross-border [11].

2.7 SUMMARY OF BUSINESS USE CASES AND SYSTEM USE CASES FROM INTERVIEWS

To understand which, and how many, SUCs are needed for any BUC to work, and to understand which are the most common SUCs for each respective data platform, a matrix was prepared for the DPOs to fill in, see exemplified matrix in Table 4. The matrix included in total 12 BUCs and 34 SUCs, most of them defined in task 5.2 of EU-SysFlex [10].

TABLE 4: EXEMPLIFIED MATRIX TEMPLATE OF BUCs AND SUCs FOR ONE DATA PLATFORM

	BUC 1	BUC X	BUC 12	TOTAL
SUC 1	X	X		2
SUC X		X		1
SUC Y		X		1
SUC Z				0
SUC 34		X		1
Total	1	4	0	

In the example illustrated in Table 4, BUC 1 only needs SUC 1 to run, BUC X is the most complex BUC which needs 4 SUCs to work and BUC 12 is not used at all in this specific data platform. According to Table 4, SUC 1 is the most common SUC for this data platform and SUC Z is not used. The same method was used to quantify and analyse the answers from the DPOs. The DPOs from the Netherlands, Estonia and Italy filled in the matrix and the result

together with an average number for the three data platforms is illustrated in Table 5 and Table 6. The original answers are found in appendix 1.

The results give an interesting view of the data platforms, but it should be noted that with such a limited number of answers, a quite subjective selection of use cases and inhomogeneous answer structure the results provide an incomplete picture and rather constitute a starting point for discussion then a final answer.

TABLE 5: THE NUMBER OF SUCs TO RUN THE EACH OF THE BUC IN RANKED ORDER

BUC	NL	EE	IT	AVERAGE
ACCESS TO DATA	13	14	13	13
SERVICES RELATED TO END CUSTOMER	19	15	0	11
BALANCE MANAGEMENT	15	11	0	9
OPERATIONAL PLANNING AND FORECASTING	11	0	14	8
MARKET FOR FLEXIBILITIES	16	3	0	6
ENERGY TRADING	15	0	3	6
CONNECTING TO THE NETWORK	15	0	0	5
RES ADMINISTRATION	7	8	0	5
REPORTING	10	4	0	5
SERVICES OF RSCs	11	0	0	4
LONG-TERM NETWORK PLANNING	2	0	0	1
CAPACITY ALLOCATION	0	0	1	0

As mentioned above, the limited number of answers means that the results should be used as an indication rather than a complete answer but according to Table 5 and Table 6, the three different data platforms are used for different purposes.

BUCs

Common for the data platforms are the purpose of providing access to data. EDSN and Estfeed have more focus on services related to the end customer and for balancing settlement compared to SII which is more focused on operational planning and forecasting. For several of the BUCs to be utilized, at least 10 SUCs needs to be used which can facilitate the implementation of respective BUCs. According to the answers from the DPOs, EDSN facilitates more BUCs with the data hub than both Estfeed and SII and also more SUCs per BUC. A certain conclusion could not be drawn from just these answers because of the very limited response from the DPOs and also the fact that the personal interpretation for each of the DPO could impact the result. One interpretation of the results is that EDSN is more diverged than Estfeed and SII which are more focused on fewer BUCs currently.

SUCs

According to Table 6, management of user's requests, management of authorizations (consent management), authentication of data users, aggregation of data, data transfer and retrospective corrections of data are the most used SUCs for these three data platforms. Data exchange between DER and SCADA, detection of data breaches,

management of security logs and prediction of flexibility availability are not used by any of these data platforms today. Just as for the BUCs, a certain conclusion could not be drawn from just these answers because of the very limited response from the DPOs.

TABLE 6: THE NUMBER OF BUCs THAT NEED A SPECIFIC SUC TO RUN

SUC	NL	EE	IT	AVERAGE
Management of user's requests	10	4	2	5
Management of authorizations	10	4	2	5
Authentication of data users	10	4	2	5
Aggregation of data	9	4	2	5
Data transfer	6	6	2	5
Retrospective corrections of data	8	4	2	5
Change of data format inside DEP	11	0	2	4
Data collection	6	3	3	4
Quality check of data	10	0	2	4
Customer notifications	9	0	2	4
Assignment of EIC codes	5	5	0	3
Massive data processing	6	0	1	2
Device level (sub-meter) metering	5	0	2	2
Erasure, restriction and rectification of personal data	1	3	2	2
Data storage	0	3	2	2
Management of network agreement	3	2	0	2
List of suppliers and service providers	2	3	0	2
Verification of activated flexibilities	4	0	1	2
Anonymisation of data	5	0	0	2
Management of supply agreement	2	2	0	1
Management of portfolio agreement	3	1	0	1
Integrating new application	0	3	1	1
Maintaining list of platform services	1	2	1	1
Management of flexibility bids	2	0	0	1
Management of flexibility activations	2	0	0	1
Peer-to-peer trading	2	0	0	1
Integrating new data source	0	2	0	1
Management of bids and offers in DA, ID and forward markets	1	0	0	0
Baseline calculation	1	0	0	0
Data exchange between DER and SCADA	0	0	0	0
Detect data breaches	0	0	0	0
Manage security logs	0	0	0	0
Predict flexibility availability	0	0	0	0

3. EVOLUTION OF DATA PLATFORMS FROM STATUS QUO TO FUTURE VISION

3.1 MAIN TAKEAWAYS FOR THE FORESEEABLE FUTURE, REFLECTIONS FROM CURRENT DPOs

The interviews together with the available literature in the area provide several interesting thoughts on how the data platforms can evolve in the foreseeable future and what is not in scope. The main takeaways are listed below:

- Continuation of settlement data dominance
- No operational or real time aspects described this far
- Integrating the consumer/prosumer to the data hub
- Integrating types of data (e.g. sub-meter data for renewable energy and EV-charging, market data like prices, etc.)
- The data platforms are heading in the direction to be market driven and independent
- Increased focus to provide and/or be part of the flexibility solution for the electricity sector

The above-mentioned takeaways do not apply to every each of the data platforms and some of the stated future plans are already implemented in few of the data platforms, but the list provides an interesting snapshot on where this sector is heading. Most of the data platforms have come online during last several years, therefore it is essential to work with the core business and then take small new steps rather than leapfrogging. This is for example shown by the fact that the data platforms today look to integrate more data and users to the data platforms as well as enable a market driven focus rather than to plan for integrating real time data and/or cross-border exchange with other data platforms. The Nordics is one example where cross-border data exchange between the data hubs has been implemented though.

3.2 INTERMEDIATE TO LONG TERM DEVELOPMENT DIRECTION

The intermediate and long-term development of European data platforms are more uncertain and will be dependent on how the current data platforms will evolve within the next few years, but it is of great interest to understand where this specific area is heading. The list below highlights some of the direction for the long-term focus:

- Data platform as an enabler for the transformational shift in the European energy market. From conventional generation and passive consumption to variable renewable generation and demand side response.
- Shift from settlement focus to use cases enabling and supporting cross-border trades at operational time scale.
- Vision of distributed computation and operational support close to real time as well as higher level coordination / co-optimisation of bids and proof of service functions on minute to quarterly scale.
- Integration and interoperability with market driven applications for new services.

4. DISCUSSION AND CONCLUSIONS

The number of countries with national data platform solutions has increased over the past years and several will come online within the next few years. Interviews have been performed with five different DPOs to understand how the data platforms are operated today and what they see as their next steps. The interviewed DPOs were also asked to fill in a matrix of which BUCs and SUCs that were currently used in respective data platform. Relevant reports were also reviewed to get more complete picture of the market and governance of existing data platform solutions today.

Out of the interviewed DPOs, only the Italian (named SII), the Dutch (named EDSN), and the Estonian (named Estfeed), operator filled in the matrix of which BUCs and SUCs that are implemented by the respective data platform. A certain conclusion could not be made based on these answers alone because of the very limited response from the DPOs and also because of the fact that the personal interpretation for each of the DPO representatives could impact the result. With the limited answers in mind, a preliminary conclusion of the BUC-and-SUC-matrix is that the core business for the three data platforms is to provide access to data for different stakeholders. EDSN and Estfeed have more focus on services related to the end customer and balancing settlement compared to SII which is more focused on operational planning and forecasting. The most utilised SUCs for the three data platforms were to a large extent similar. Management of user's requests, management of authorizations, authentication of data users, aggregation of data, data transfer and retrospective corrections of data where the five most utilized.

The data platforms are mainly owned and operated by TSOs and DSOs today where the aim to a large extent is to be an independent party providing secure, reliable and qualitative data for different stakeholders and to handle imbalance settlement. There is also a distinction between the data platforms that integrate smaller customers to use, and benefit from the services and data hubs that mainly provide benefits for larger stakeholders like DSOs/TSOs and energy suppliers. The data hubs in the Nordic countries, Estfeed and EDSN are examples of more customer-oriented platforms whereas the Atrias and SII are more focused on suppliers and BRPs to facilitate their business processes.

The future of the data platforms according to the DPOs lies in a mix between the focus on today's business but also to run a more market-oriented business where all kinds of consumers and generators can benefit from the data platforms. There is also a focus to include other data and/or allow third party applications on the data platform to be part of the flexibility solution for the energy system. The general focus for the future is still on services which only requires low resolution data like imbalance settlement, rather than real time or close to real time applications which require high resolution data. Services relying on high resolution data could instead by carried out by distributed applications connected to the data platforms where these could be used for data storage and invoicing only. Estfeed is one exception to this where they plan to integrate close to real time data exchange and new types of services and market data which will enable flexibility services through the data platform.

There is also a vision to implement cross-border data exchange between data platforms, but that will require a unified way of handling data, providing similar functions and a common interface for the end user. The Nordic countries and a collaboration between several system operators under the name of Data Bridge Alliance constitute examples of a unified vision for their data platforms where cross-border data exchange will be made possible for coordination of services.

This report has shown that there are several different models of how existing European data platforms are governed and which markets and stakeholders they are aiming to cover. It has also shown the trend of more European countries to introduce national data platforms and new collaborations between data platform operators to standardize the data exchange. With more investments and increased policy maturity in the energy data exchange field, we will see more applications, both national and cross-border, additional market integration and possible decreased cost for the end user if stakeholders can standardize the data exchange on a European level.

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6. COPYRIGHT

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ANNEX I. ANSWERS FROM DPOs REGARDING SUCs AND BUCs

		BUSINESS USE CASES												
		ACCESS TO DATA	BALANCE MANAGEMENT	MARKET FOR FLEXIBILITIES	SERVICES RELATED TO END CUSTOMER	SERVICES OF RSCs	OPERATIONAL PLANNING AND FORECASTING	ENERGY TRADING	CAPACITY ALLOCATION	REPORTING	LONG-TERM NETWORK PLANNING	CONNECTING TO THE NETWORK	RES ADMIN.	Rationale
		1	2	3	4	5	6	7	8	9	10	11	12	
SYSTEM USE CASES	Data collection	NL,IT,EE	NL		NL,EE		IT	NL,IT		NL		NL	EE	
	Data transfer	NL,EE	NL,EE	EE	NL,EE		IT	NL,IT		NL,EE		NL	EE	
	Data storage	IT,EE			EE			IT					EE	
	Assignment of EIC codes	NL,EE	EE		NL,EE			NL		NL,EE		NL	EE	
	Retrospective corrections of data	NL,IT,EE	NL,EE	NL	NL,EE	NL	NL,IT			NL,EE		NL?	NL?,EE	
	Management of supply agreement		NL,EE		NL,EE									
	Management of network agreement		NL,EE		NL,EE							NL		
	List of suppliers and service providers	EE	EE	NL	NL,EE									
	Management of portfolio agreement		NL,EE		NL?			NL						
	Management of bids and offers in DA, ID and forward markets							NL						
	Management of flexibility bids			NL	NL									
	Management of flexibility activations			NL								NL?		
	Verification of activated flexibilities		NL	NL			NL,IT					NL?		
	Management of user's requests	NL,IT,EE	NL,EE	NL	NL,EE	NL	NL,IT	NL			NL	NL	NL,EE	
	Customer notifications	NL,IT	NL	NL	NL	NL	NL,IT	NL				NL	NL	
	Management of authorizations	NL,IT,EE	NL,EE	NL,EE	NL,EE	NL	NL,IT	NL		NL		NL	NL	
	Authentication of data users	NL,IT,EE	NL,EE	NL	NL,EE	NL	NL,IT	NL		NL		NL	NL,EE	
	Baseline calculation			NL										
	Change of data format inside DEP	NL	NL	NL	NL	NL	NL,IT	NL	IT	NL	NL	NL?	NL	
	Massive data processing		NL	NL	NL	NL	NL,IT	NL						
	Quality check of data	NL,IT	NL	NL	NL	NL	NL,IT	NL		NL		NL	NL	
	Device level (sub-meter) metering	NL,IT		NL	NL		NL,IT					NL?		
	Data exchange between DER and SCADA						IT?							
	Peer-to-peer trading			NL				NL						
	Anonymisation of data	NL			NL	NL		NL		NL				
	Aggregation of data	NL,IT,EE	NL,EE	NL	NL	NL	NL,IT	NL		NL,EE		NL	EE	
	Integrating new data source	EE			EE									
	Integrating new application	IT,EE		EE	EE									
	Maintaining list of platform services	IT,EE			EE	NL								
	Erasure, restriction and rectification of person	IT,EE			EE		IT						NL,EE	
	Detect data breaches													
	Manage security logs													
	Predict flexibility availability													

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