



Mapping of TSO and DSO roles and responsibilities related to information exchange

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About the project

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About the report

Brief summary

A study commissioned by NordREG that maps the roles and responsibilities of TSOs and DSOs with regard to information exchange and stakeholders' access to and communication between data-hubs and information exchange systems. It maps the existing legislation and requirements in primary and secondary legislation in Denmark, Finland, Iceland, Norway and Sweden. Where there are specific proposals for changes to existing legislation made by the proper authorities, a description both of the current framework and proposed changes is included. The rights and obligations in information exchange of the main electricity market actors are covered: TSO, DSO, suppliers, consumers, third-parties and data-hubs.

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SUMMARY AND CONCLUSIONS

NordREG has commissioned a study to map the roles and responsibilities of TSOs and DSOs with regard to information exchange and stakeholders' access to and communication between data-hubs and information exchange systems. The study maps the existing legislation and requirements in primary and secondary legislation in Denmark, Finland, Iceland, Norway and Sweden, as well as where applicable, guidelines and industry standards. Where there are specific proposals for changes to existing legislation (made by the proper authorities), a description both of the current framework and proposed changes is included. The rights and obligations in information exchange of the main electricity market actors are covered: TSO, DSO, suppliers, consumers, third-parties and data-hubs.

As members of the European Union or part of European Economic Area, the Nordic countries have a similar legal basis for their electricity market structure since it derives from EU regulations. These are briefly discussed but not further considered since the main focus of this study is to map the different national legal regimes.

The Nordic countries have generally similar electricity market regulations. This applies also to the rights and obligations of market players in information exchange. Recent political, technical and regulatory developments affected these rights and obligations.

Most Nordic countries are in a transition phase towards operation of a central data exchange platform (data-hub); ranging from early development to operational use. In practice, a number of responsibilities that originally were allocated to DSOs have been transferred to the data-hub, or will be according to the outstanding proposals. Additionally, the transition towards a supplier centric model has increased the role of suppliers as central contact person for consumers. European requirements for and technical development of intelligent metering systems (smart meters) allow for more accurate consumption registration, e.g. hourly meter values. Access to own consumption data allows consumers to adjust their consumption pattern to be more energy efficient. Moreover, third-parties that provide energy services require access to consumers' consumption data.

Denmark is the only Nordic country with an operational data-hub to date. The data-hub is developed and operated by the TSO. The DSO remains responsible for the physical meter, meter reading and meter data validation. A proposed new change in regulation allows for a supplier centric model, in which the supplier will be the only contact point for the consumer and the consumer will receive one bill. The data-hub serves as centralised data storage to which DSOs submit meter data, suppliers submit personal data of consumers and TSO submits balance settlement information.

Finland has a high roll-out of smart meters (90%). The responsibility for development of a data-hub is allocated to the TSO, but no formal decision has been made. The existing legal structure allocates the responsibility for meter operation and meter reading to the DSO. It is also the DSO that is responsible for consumers' access to its own consumption data.

Iceland has a closed electricity grid and market without interconnections. It has no direct plans for roll-out of smart meters. The TSO is imbalance settlement responsible and the DSOs are responsible for data collection and meter operation. Data storage is outsourced by most DSOs to a central data base operated by a third party. There are currently no plans for a centralized data-hub.

Norway has a target for roll-out of smart meters for 2019 and is in an advanced stadium for development of a centralized data-hub. With a pending revision to the balance settlement regulation, operation of the data-hub will be allocated to the TSO as imbalance settlement responsible. In the existing system most responsibilities for meter operation and reading are allocated to the DSO. There is still separate billing and access to own consumption is only on-demand.

Sweden has a high roll out of smart meters. The TSO is imbalance settlement responsible and DSOs are responsible for data collection, meter operation and data distribution to other market players. Development of a centralized data-hub is at an early stage. A report by the regulator proposing a data-hub has been submitted in 2014, but no formal decision on its development has been made.

The TSO's main task with regard to data exchange is currently to handle the financial settlement of imbalances. TSOs are also responsible for development of data exchange platforms. Although not

clear in all Nordic countries, operation of the data-hub will probably be allocated to TSOs too. The development of data exchange platforms requires TSOs to play a more active role in the electricity retail markets.

DSOs are currently responsible for most of the functions regarding information exchange. This includes meter operation, data collection, data storage, meter data validation and distribution of data to other market participants. Exceptions to this are the countries that have a data-hub in operation, here the data storage function lies with (the operator of) the data-hub. With the development of more data-hubs it is expected that more responsibilities transfer from DSOs to data-hubs.

Suppliers are responsible for (im)balance settlement for their customer portfolios. In case of data-hubs and a supplier centric model, suppliers will operate as the main contact person for consumers. Proposed regulatory revision in Denmark even allocates combined billing to suppliers; grid operation costs and electricity usage in one bill.

In all countries, customers have access to their own data. It differs per country if it is the responsibility of the supplier or the DSO to provide the consumer this access. It depends mostly on the roll-out of smart meters what level of detail the consumption data is.

Third-party access to consumer data (including by ESCOs) is possible in most Nordic countries. All countries require a 'power of attorney' as prior consent from the consumer. The format of this power of attorney differs greatly amongst the countries. Data-hubs allow for a more customer-driven consent format (a digital plug-in in which every consumer allocates access to third-parties) as is described in the proposed regulation of Denmark and Norway.

There is no regulation on cross-border information exchange or interaction between data-hubs at this moment in place. There has however been initial contact and the intention of data-hub developers is to facilitate interaction between data-hubs in the future if necessary.

Data security, the protection of data against external threats, is in most cases the responsible of the actor that is responsible for the data storage. This is the DSO or the data-hub (operator). Additional protection that applies to all digital information is supplied by general (and European) data integrity regulation and national data protection institutions.

1 INTRODUCTION

1.1 Background and problem statement

Harmonisation of the Nordic retail markets has been a target of NordREG since 2006. A key issue for harmonisation is the development of efficient information exchange infrastructures between end-users, distribution system operators (DSOs), TSOs and other market agents, including new entrants such as Energy Service Companies (ESCOs). Denmark has introduced a national data-hub run by the TSO Energinet.dk, and Norway is in the process of developing a similar hub. Decisions on future infrastructures for information exchange and hubs are expected to come in Finland and Sweden. With the introduction of TSO-run data-hubs, like in Denmark, the roles and responsibilities of TSOs and DSO will change. The introduction of data-hubs will also have an impact on the Nordic retail market harmonisation, and it may be necessary to consider the need for Nordic rules on information exchange infrastructures.

On this background, NordREG has commissioned a study to map the roles and responsibilities of TSOs and DSOs with regard to information exchange and stakeholders' access to and communication between data-hubs and information exchange systems. Issues raised by NordREG include:

- The obligations of TSOs and DSOs with regard to information exchange with electricity suppliers, energy service companies (ESCOs), customers and national communication systems such as hubs.
- The rights of suppliers, ESCOs and customers to access hubs/information exchange systems, both the types of information, accessibility and economic terms
- Rules of conduct for gaining access to a hub/information exchange system
- Interaction between hubs and information exchange systems across borders
- Nordic plans for further harmonisation in light of ongoing work at the EU level
- Data protection and integrity issues for customers both nationally and with regard to cross-border exchange of information

The study describes the existing legislation and requirements in primary and secondary legislation in Denmark, Finland, Iceland, Norway and Sweden, as well as if applicable, industrial codes of good practices. Where there are specific proposals for changes to the legislation in place (made by the proper authorities), we include a description both of the current framework and proposed changes.

By information exchange we understand in this report exchange of data regarding electricity consumption and customers between network companies, TSOs, suppliers, end-users and other market players. This can include consumption measured in kWh over a specified time period, peak consumption, name and address of customers, information on the type and identity of meter and similar information.

Other market and network data such as prices, network tariffs, power flows, outages, voltage quality are not covered by the information exchange term used here. The technical aspects of information exchange (message formats etc.) is not part of the project scope. Neither do we carry out any evaluation or present our own proposals for changes to the rules and regulatory and legal frameworks. Obligations on billing and billing information are therefore excluded from this report.

1.2 About the report

The report has been prepared for NordREG, and has the following structure:

- In chapter 2, we describe the mapping methodology in detail.
- In chapter 3, we go through the Nordic countries separately and describe the legislation and other relevant regulatory frameworks and guidelines.

- In chapter 4, we compare the results across countries.

Supplementary information can be found in the appendices.

2 METHODOLOGY

This chapter describes the methodology that we used for information gathering and the structure of the report. First, it describes the scope and framework of the project by setting focus areas, guidelines and limitations. Subsequently this chapter outlines the legal framework standards. These standards can clarify the type of regulation or source the relevant rights and obligations are laid down in. Finally, this chapter describes in more detail the Harmonized Role Model that is used as basis for the mapping of the rights and obligations for information exchange in the Nordic Countries.

2.1 Framework for mapping

This report covers the rights and obligations in relation to electricity market information exchange between the following actors:

- Transmission System Operator
- Distribution System Operator
- Electricity Supplier
- Customer
- Data Exchange Platform
- Third Party, including Energy Service Companies

As a basis for the mapping of the rights and obligations in relation to information exchange we will use internationally harmonized role models and, if available, national role models. The roles allocated by the various international and national role models allow detailed distinctions of the various functions in relation to information exchange. By using these roles (and their functions) as basis for the mapping of the different rights and obligations pursuant to legislation, the report covers the most important types of interactions between market actors. To simplify the structure and obligations the report uses the Harmonized Nordic Retail Role Model as basis for the different roles (See also chapter 2.3 below).

The roles (and the model) will be solely used descriptively and not normatively. This means that the roles and connections from the role models will be used as a 'guideline' to describe the factual situation in the different Nordic countries. The models' roles and connections will serve as a threshold and basis to compare the countries' situations. The role models will be in no way whatsoever the norm for the mapping of the rights and obligations of the actors in the Nordic countries.

Information exchange exists in different business processes. In this report we refer to the most relevant forms of information exchange and do not separate specifically between the business processes, but for simplicity reasons we will describe the rights and obligations along to the following (business) processes (non-exhaustive):

- Metering
- Supplier switching, moving, end and start of supply
- Balance settlement
- Access to customer data

Within these business processes we will refer to some of the following types of information exchange (non-exhaustive):

- Meter data reading (hourly, 15 minutes, real-time etc.)
- Data validation
- Obligation to deliver information
- Right to access information

- Operation of data exchange platform
- Data protection and integrity
- Interaction between HUBs and information exchange systems across borders

Data format of information exchanges or international standards for data exchange are outside the scope of this report.

Commonly used terms

Based on our review of available documents, it is our experience that different terms are used for describing the same underlying concepts in different contexts. Hence, we will use the following terms in this report:

- *Data exchange platform* – any type of digital platform that support information exchange between electricity market actors. A data exchange platform in this context can be classified as centralized or decentralized or to its type of functions; storage or other functions.
- *TSO* – Transmission System operator, the system operator that is responsible for the operation of the high and very high voltage electricity grid. The voltage level can differ per country.
- *DSO* – Distribution System Operator, the system operator that is responsible for the operation of the low, medium and high voltage electricity grid. The voltage level can differ per country.
- *Supplier* – an electricity supplier that buys electricity in the wholesale market and sells electricity to end customers.
- *ESCO* – energy service company or energy service provider. A natural or legal person that delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises. In the context of this report this person is mostly considered a third party.
- *Data quality* – maintaining and assuring the accuracy and consistency of data, e.g. the accuracy of the metered data by a DSO.
- *Data security* – the protection of data as such, meaning the protection of database against internal and external unauthorized access. This also covers privacy of data, e.g. privacy of customers metering data and information.
- *Balancing* – Electricity balancing is the process through which a system operators ensures that they are able to access a sufficient amount of energy to balance the differences between supply and demand that occur in every electricity system.
- *(Im)balance settlement* – The settlement of actual electricity generation, consumption and transactions, carried out after the specific hour. The power balance of each party of electricity trade is obtained as the result of imbalance settlement.

2.2 Legal framework

The legal framework utilized for the mapping of the rights and obligations of actors in this report distinguishes five categories of (non-)legal documents. The categories reflect the international accepted standards for distinction of legal documents but are not exhaustive and exceptions are possible. Due to national circumstances and customary translation efforts different labels can be used for similar documents; some countries use the word 'act' for formal legislative legislation whilst others use 'law' or even 'bill'. Table 1 provides a description of the five categories of (non-)legal documents including a prioritization of their legal precedence.¹

Table 1: Overview and description of legal documents

Category of law	Labels / names	description
EU Law	<ul style="list-style-type: none"> • Directive • Regulation • Decision 	Legislation enacted at EU level that has (in-) direct effect on the law of Member States. This does not include strategic documents, studies, guidelines or any other document of descriptive nature.
Primary national law (<i>Formal legislation</i>)	<ul style="list-style-type: none"> • Acts • Laws • Statute • Bill² 	Legislation that is enacted via a formal procedure: approval / inclusion of / by executive and legislative powers.
Secondary national law (<i>Bylaws or delegated legislation</i>)	<ul style="list-style-type: none"> • Regulation • Decisions • Grid Codes • Public license 	Legislation that is enacted / adopted by a body other than the legislator (often a governmental authority) pursuant to a mandate / delegation deriving from a formal law. It is not required that the author of the legislation is a governmental authority, it is the adoption that is the key element. Secondary legislation cannot create new obligations, but defines at detail level what the primary law mandates.
Soft law	<ul style="list-style-type: none"> • Sector-specific agreements • Recommendations • Declarations • Codes of conduct 	Documents or quasi-legal instruments which do not have any legally binding force. They often contain aspirational goals and can become 'legally' or socially binding to a sector or those who sign up for it.
Other documents without any legal character	<ul style="list-style-type: none"> • Rest 	Any document that can be informative but has no legally or socially binding character.

¹ Norway and Iceland are not EU Member States and therefore not subject directly to EU Legal obligations, but via the EEA Treaty. Hence for them national rules for international treaties apply. In EU Member States, EU legislation (treaties and applicable legislation) is considered to be above national legislation (supremacy) as is laid down in EU Case Law (In *Costa v ENEL* [1964] ECR 585 the European Court of Justice; in case of conflict between the national and EU law, EU law prevails).

² A 'bill' is a proposal for (an amendment to) a formal law, e.g. the United States. It is therefore not (yet) an act. In some countries acts are translated as bill. The report will explain the document's legal character if experienced confusing.

Considering the terms of reference, we will focus mainly on primary and secondary national legislation. Due to their legal character, soft law and other type documents are considered less relevant, since they prescribe no formal rights or obligations upon market actors. The EU dimension is taken into account as a common legal basis for the electricity markets in the Nordic countries. In the next chapter we describe the EU context and focus on the Energy Efficiency Directive, ENTSO-E's work and the General Data Protection Regulation.

EU context

The European context is directly relevant for the Nordic countries that are EU Member States, but also indirectly for the EEA members (Iceland and Norway). A lot of the relevant obligations and criteria prescribed at EU level are laid down in so-called Directives. This means that the regulation leaves room for national interpretation and implementation and that, although EU legislation covers the subject, the different countries can have different national legislation in place to comply with it.

The EU Directive on the Internal Energy Market (2009/72) sets a framework for roll-out of smart meters. The Energy Efficiency Directive (2012/27) clarifies that relevant information from metering and billing will be provided to final customers using smart meters. The foremost requirements are divided in (i) metering information, (ii) billing and billing information and (iii) free of charge bills and billing information.³ The two latter (concerning billing) are less relevant for this report. The main focus is thus on the metering information.

Whereas outside the scope of this report, the roll-out of smart meters (80% target by 2020) depends on conditions (technical feasibility and cost-effectiveness) set forth in Directive 2009/72. The roll-out of smart meters will however impact the exchange of information between market players (including customers). The EED clarifies some of the types of information exchange. The EED states that smart metering systems must provide final customers with information on actual time of use. Third parties (like ESCO's or aggregators) should be granted access on behalf of the final customers for the purpose of comparing of usage (or deals on a like-for-like basis). The data should be the same as the customer would receive.

Data protection at EU level is regulated via various legislative acts.⁴ The contemporary regime for data protection and integrity issues is outdated and fragmented. All Member States have national regulatory offices handling data protection and all data processors use different formats. The EU Commission is currently revising part of its regime, i.e. the general data protection regulation (GDPR).⁵ The GDPR is expected to be adopted in 2015 and enter into force in 2016. It will amongst others cover utility data-exchange and the use of smart metering systems. The revision focusses on strengthening of individuals' rights and reduction of administrative burdens to ensure free and easy flow of personal data within the EU and beyond. In general, it comes down to that Member States are (will be) responsible for ensuring privacy for the historical and real-time data in collection, storage, processing and communications regarding the energy consumption of final customers. More specifically, the revision introduces 'data portability' - the right to receive user data at request in a format usable in other processing systems. This means that data needs to be compatible between different Member States and different utility providers (data processors). Other important obligations cover privacy (by design or default), transparency and breach notification. For (small scale) suppliers, any data on input of electricity to the grid and off-take should be made available to the customer or a third party at request of the customer.⁶

Network Codes, as the commonly used name for European regulations establishing criteria for harmonization of cross-border electricity networks, are not considered relevant for this report. This is partly because most Network Codes have not yet been adopted, but foremost, they do not cover

³ Art. 9 – 11 Energy Efficiency Directive 2012/27/EU.

⁴ E.g. Directive 2009/136/EC and Regulation (EC) 45/2001.

⁵ COM (2012)11 final, 25 January 2012.

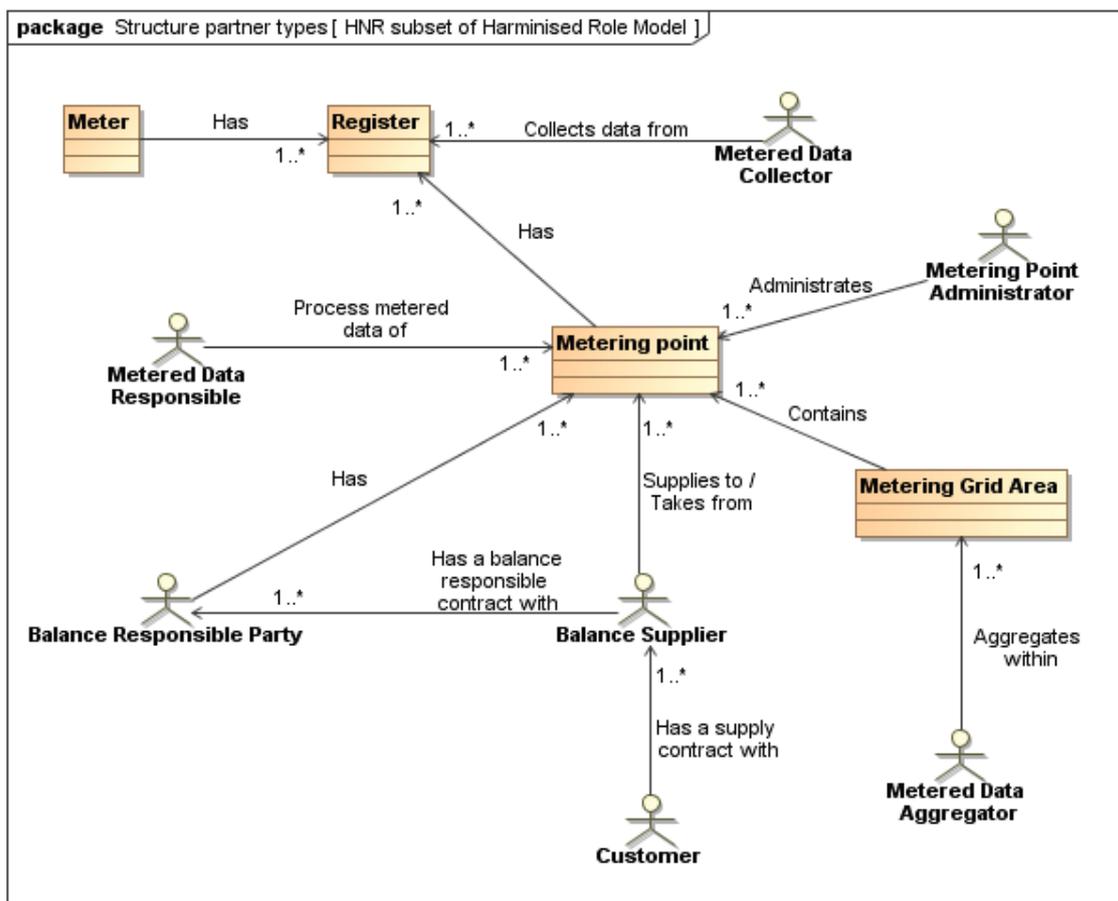
⁶ See also, Commission Staff Working Document - Guidance note on Directive 2012/27/EU on energy efficiency articles 9 – 11, SWD(2013) 448 Final of December 2013.

the obligations for information exchange within the scope of this project. Network Codes set minimum criteria, even up to interaction of market players, but with a focus on the topic they particularly cover, and not information exchange as such. This does not mean that ENTSO-E, author of Network Codes, is not performing relevant documentation in the area of information exchange. On the contrary, ENTSO-E has been a key promoter of the structuring of the obligations and relations regarding information exchange. Their role model will therefore be used as a descriptive guideline for the mapping of the different roles and relations in the Nordic market.

2.3 Harmonized role model

Actors can have various roles. The basis for mapping the rights and responsibilities of the actors is the ENTSO-E Harmonised Role Model (EHRM) for information exchange. The EHRM is a detailed role model for information exchange and for the purposes of this report too detailed. We therefore simplify the roles by using the Nordic Harmonized Role Model for the Retail Market (NHRM) (see figure 1) that was drafted by the Nordic Ediel Group in their recent report on *Business Requirement for a Harmonised Nordic Retail Market*.⁷ The roles in the NHRM can be found in Figure 1 and their definition explanation in Table 2.

Figure 1: Harmonized Nordic Retail Market Roles Model



Source: Nordic Ediel Group Report: *Business Requirement for a Harmonised Nordic Retail Market*, 22 May 2014. This is a UML class diagram: UML symbols indicating the 'actors', the class to define the 'domain' and the arrows to describe the processes.

⁷ Nordic Ediel Group, *Business Requirement for a Harmonised Nordic Retail Market*, 22 May 2014, Version 2.0.

Table 2: Definition of the roles of the Role Models

Roles	Description
Balance Responsible Party	Has a contract proving financial security and identifying balance responsibility with the Imbalance Settlement Responsible of the Market Balance Area entitling the party to operate in the market. This is the only role allowing a party to nominate energy on a wholesale level. Additional information: The meaning of the word "balance" in this context signifies that that the quantity contracted to provide or to consume must be equal to the quantity really provided or consumed.
Balance Supplier	Markets the difference between actual metered energy consumption and the energy bought with firm energy contracts by the Party Connected to the Grid. In addition the Balance Supplier markets any difference with the firm energy contract (of the Party Connected to the Grid) and the metered production.
Consumer	Consumes electricity. Additional information: This is a Type of Party Connected to the Grid.
Imbalance Settlement Responsible	Is responsible for settlement of the difference between the contracted quantities and the realised quantities of energy products for the Balance Responsible Parties in a Market Balance Area. Note: The Imbalance Settlement Responsible has not the responsibility to invoice. The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.
Meter Operator	Responsible for installing, maintaining, testing, certifying and decommissioning physical meters.
Metered Data Aggregator	Responsible for the establishment and qualification of metered data from the Metered Data Responsible. This data is aggregated according to a defined set of market rules.
Metered Data Collector	Responsible for meter reading and quality control of the reading.
Metered Data Responsible	Responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. And is responsible for the history of metered data for a Metering Point.
Metered Data Administrator	A party responsible for administering metered data on behalf of the Metered Data Responsible. The party administers historical data for the Metering Points. (Only defined in Norway at present)
Metering Point Administrator	Responsible for registering the parties linked to the metering points in a Metering Grid Area. He is also responsible for maintaining the Metering Point technical specifications. He is responsible for creating and terminating metering points.
Party connected to the Grid	Contracts for the right to consume or produce electricity at an Accounting Point.

There are more roles than actors. This allows for differences in systems (countries) as one actor can have more than one role. It also allows more detailed allocation of different responsibilities to market actors.

The development of a data-exchange platform differs per Nordic Country. Whereas Denmark already has a Data-hub in place, Norway is in an advanced stage of developing one. Finland has recently published a feasibility study (November 2014) and Sweden has not yet taken any formal decision. This has resulted in Denmark and Norway already having designed a specific version of the role model. These are in line with the EHRM and the NHRM and we have included them in the national chapters. Where none exists and we deemed appropriate, we included our own schematic role model for the country in question.

The System Operation Agreement between the Nordics manages balancing management within the Nordic Countries, but national balancing is managed at national level.

3 COUNTRY ANALYSES

This chapter describes the legal framework and national situation in relation to information exchange per Nordic country. Each country has its own development and characteristics that will be explained. Special focus will be on the initiatives and development of data exchange platforms considering their central role in exchange of information now and in the near future. Where available we have included country specific role models and will explain their details.

The chapters individually describe the national circumstances, followed by a description of obligations per market player and business process. The chapters are concluded by an enumeration of observations.

3.1 Denmark

3.1.1 Overview

Denmark has been a frontrunner in Europe in the development of a central data exchange platform. The Danish TSO, Energinet.dk, has the overall responsibility to ensure a well-functioning electricity market both at wholesale and retail level, as well as carrying out the technical system operator functions (maintaining frequency stability etc.).⁸ This mandate includes the development and operation of a data exchange platform.⁹

In 2007 Energinet.dk executed a study to evaluate the development of a data exchange platform and in 2009 the Danish Government instructed Energinet.dk to develop such a platform.¹⁰ The instruction contained the order to set-up a data exchange platform with a database function (storage and information facilitation) that could be assigned additional functions. The data exchange platform (hereinafter Data-Hub) has been accordingly developed and has been in operation since March 2013.

Recently, Energinet.dk has submitted a proposal to amend the regulations covering the Data-Hub.¹¹ Once the amendments will be enacted, the Data-Hub will support a supplier centric model. In a supplier centric model, the customer only has contact with a supplier and not with a DSO anymore.

Access to metering data (values) is possible via the website of the supplier. With the implementation and operation of the Data-Hub the roles of DSOs have been minimized and those of the supplier as central contact point increased. In the new system network operators will bill the supplier for all grid costs (on a monthly basis) and the suppliers will invoice the customer for their electricity use as well as the grid costs (and taxes). The network operators will be paid by the supplier, but responsibility for payment of taxes remains with the network operators.

The rights and responsibilities in relation to information exchange are laid down in the Electricity Supply Act (primary legislation) and regulations that are adopted by Energinet.dk (secondary legislation). Since Energinet.dk has the overall responsibility for the Electricity Market, it drafts the regulations for the electricity market that are subject to approval of the national regulator. In relation to information exchange, the most relevant regulations are Regulation A, C1, H1 and I. Additional informative documents are also produced by Energinet.dk, e.g. guidance documents for market actors.¹² As mentioned, the latest regulation, Regulation I, is not yet into force and is expected to enter in force in 2015.

Figure 2 displays the Danish role model. We included some actors for clarification purposes. The role of Energinet.dk is that of Data-Hub (Metered Data Administrator and Metered Data Aggregator)

⁸ § 27a Electricity Supply (Consolidated) Act no. 1115 of 8 November 2006 and § 1 Regulation A: Principles for the electricity market.

⁹ § 28 Electricity Supply Act and § 1 Regulation A: Principles for the electricity market.

¹⁰ Letter from Minister of Climate and Energy 2009.

¹¹ The proposed amendments include enactment of Regulation I on Master data (Regulation I).

¹² Aktører i Elmarkedet, Marts 2014 LRO/HSF/JOG, Energinet.dk.

DSOs operate the distribution network and perform all meter readings (Metered Data Collector).¹⁵ They send all metering data and meter values to the Data-Hub. DSOs remain responsible for connection of customers to the grid and for data validation (data quality).¹⁶ DSOs can choose to be the Metering Point Administrator or outsource this to a third party, however it will not be able to 'outsource' the legal responsibility for meter administration.¹⁷

A supplier sells electricity to customers (end-users) and is their main contact point.¹⁸ The supplier is billed by TSO and DSOs for grid operation costs. The supplier invoices the grid operation costs and electricity usage to the final customer including taxes. The supplier subsequently pays TSO and DSOs for grid operation costs. TSO and DSO remain responsible for payment of taxes to the tax authorities.

The end-user (customer) has access to its own data (usage) via its suppliers' web-interface.¹⁹

ESCOs fall within the category of legitimate interested party and are not a market player.²⁰ They can be allowed access to customers' metering information via a power of attorney. The existing procedure for a power of attorney is a written document. The proposed change in regulation allows for a consumer-driven digital access portal in which consumer can digitally provide legitimate interested parties with access to their meter data.²¹

3.1.3 Business processes

Meter data is metered (meter reading) on an hourly basis. In some parts metering is performed quarter-hourly but settlement is based on hourly values.²²

According the new regulation, different market actors will be responsible for the data in the Data-hub. Energinet.dk is responsible for the data related to the wholesale market. DSOs are responsible for the metering point related data. And suppliers are responsible for the customer-related master data.

All customers, both natural as well as legal persons, have a specific identification number. This number allows access to its own data through the Data-Hub. Any third-party access requires for a separate 'data access number'. This data access number is the third-parties identification number and is specifically designed for access to the customer data by a third party.²³

Information exchange with moving, switching or any other change of supplier is generally done by the supplier and partly the DSO. A supplier requires a power of attorney to access any customer's master data (e.g. for acquisition purposes) from the Data-Hub. The new supplier must notify the grid company (DSO) on the change of supply after contractual consent by the customer. The DSO must approve the change of supplier within two hours. Settlement requires the DSO to read the final data and forward it to the Data-Hub.²⁴ The current condition for third-party access is via a power of attorney. This is a written and often cumbersome procedure. For information about a potential new customer an oral empowerment suffices, but for any change in supply a written power of attorney is currently mandatory.²⁵ In the proposed change in regulation, third-party access is made less bureaucratic. Third party access (via a data access number) to customer data will be possible via a consumer-driven 'power of attorney'. Such an empowerment requires prior approval and can be awarded digitally. For access, there is a distinction between legitimate interested parties and market

¹⁵ E.g. § 1.14 Regulation C1.

¹⁶ § 1 Regulation A, § 3 Regulation I and Energiforsyningsloven § 20 stk. 1, nr 4.

¹⁷ § 2.3 Regulation D1.

¹⁸ § 1 Regulation B.

¹⁹ Chapter 1 Aktører i Elmarkedet, Marts 2014 LRO/HSF/JOG, Energinet.dk.

²⁰ § 3.2 Regulation I.

²¹ Chapter 5 Aktører i Elmarkedet, Marts 2014 LRO/HSF/JOG, Energinet.dk.

²² § 2.2 Regulation A.

²³ § 4.1 Regulation I.

²⁴ § 4 Regulation C1.

²⁵ § 3.5 Regulation H1.

players. Market players have a direct role in the market unlike legitimate interested parties. Actors with a role in the market already have, although regulated, access to information. Since ESCOs are not regulated market players they are considered legitimate interested parties that require a power of attorney prior to having access to customer information. The type of information available is the same as is visible to the customer but via a third-party access identification number.

Central in imbalance settlement is the role of the Balance Responsible Party (BRP). There are three types of BRP; one for consumption, one for trade and one for production. The first is responsible for consumption, including grid losses, and related agreements on the physical trading of electricity. The second is exclusively responsible for the physical trading of electricity (trader). The third holds responsibility for the production of physical trading of electricity. An electricity supplier can be a BRP for consumption, but in case it is not, it must have an agreement with one.²⁶ It is the BRP that is financially liable to Energinet.dk for any imbalance.

Smart meters are due to be introduced for all customers by 2020,²⁷ but a significant share of Danish households have smart meters already (around 50 per cent in 2013 according to the Ministry of Climate, Energy and Building).

General data protection and integrity is governed by the Act on Processing of Personal Data²⁸ that is based on existing EU legislation. Datatilsynet is the regulatory agency that ensures that the Act is abided by. For data security in relation to information exchange in the electricity market, Energinet.dk is responsible. Energinet.dk has outsourced the security to a specialized third-party. Generally, all information (meter data etc.) exchanged electronically must be in Ediel Format.²⁹

3.1.4 Observations

In the following, we sum up our main observations with reference to the questions highlighted in the introduction:

- The TSO develops and operates the Data-hub. The Data-hub has more functions than just data-storage, it is (will be) used in other processes, e.g. combined billing.
- The TSO is the final imbalance settlement responsible.
- The Data-Hub is a centralized mandatory data exchange platform.
- The DSO is obliged to deliver data to the Data-Hub. Currently, the DSO is also obliged to provide data for suppliers (for billing).
- Customers have access to their own data via the supplier's website.
- Third-party access to hub is possible for legitimate interested parties (ESCOs) with a power of attorney from the customer. A special third-party access identification number will allow them access.
- The power of attorney is currently a written document. With the proposed change in regulation in place, consumer-driven digital empowerment will be the standard.
- There is currently no information available on how the national hub will interact across borders.
- Energinet.dk is responsible for data security. In addition, general regulations based on EU Regulations apply.

²⁶ § 1 Regulation C1.

²⁷ Act No. 642 of 12 June 2013.

²⁸ Act No. 429 of 31 May 2000.

²⁹ § 3 Regulation H1.

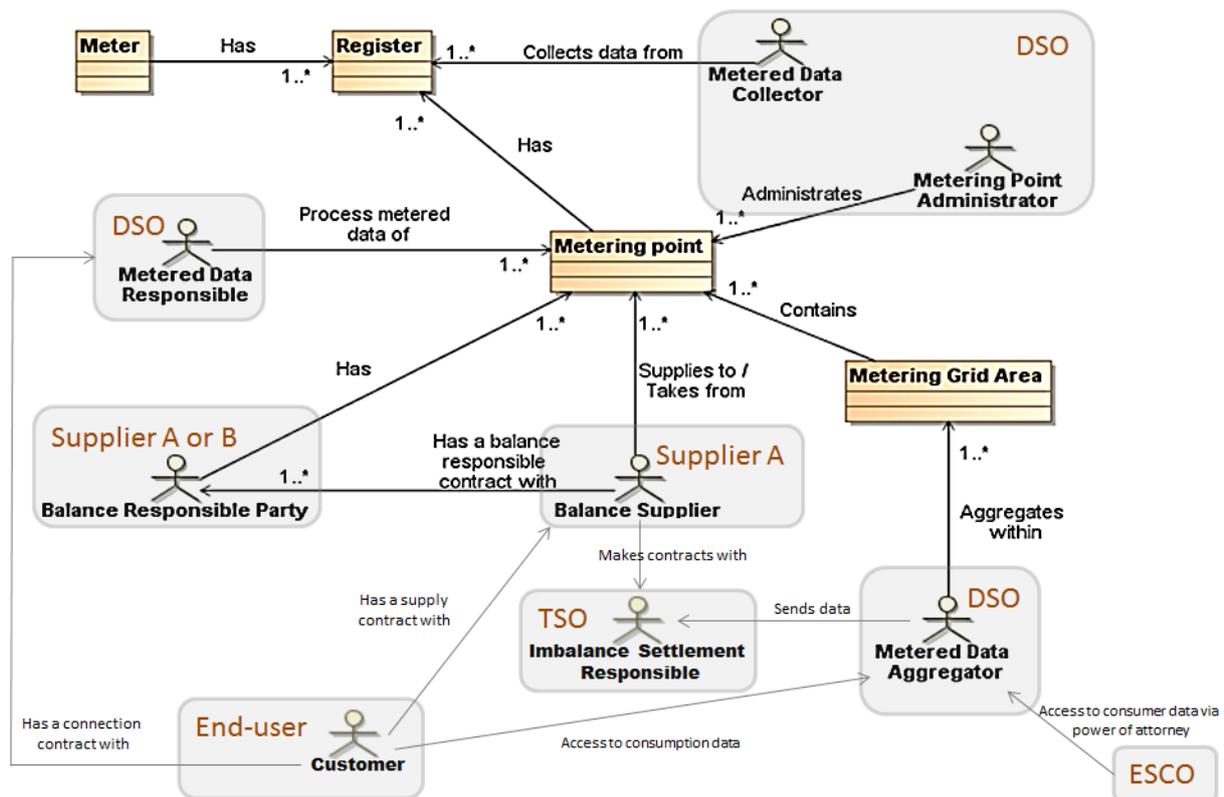
3.2 Finland

3.2.1 Overview

The Finnish electricity grid system is characterized by a large number of DSOs (ca. 74). Finland also has a large number of electricity suppliers. Finland has been a frontrunner with the roll-out of smart metering systems. Their target of an 80% roll-out of smart meters by 2014 has been successfully implemented and has resulted in (real-time) hourly registration of consumption in more than 98% of the meters. Fingrid Oyj has the role of imbalance settlement responsible. The legal obligations for information exchange and balance responsibility have been laid down in the Electricity Market Act (Elmarknadslag) and ministerial decrees. In particular ministerial decree no. 809/2008 provides a clear framework for information exchange obligations. This decree is currently under revision and a new version is expected to be adopted in first half year of 2015.³⁰ The energy industry organisation, Finnish Energy Industries, has additionally published procedural instructions and recommendations to streamline implementation of energy market legislation. Fingrid is obliged to maintain and instructs the technical side of information exchange for example messaging standards.

Fingrid has recently published a study 'to identify the present situation with information exchange in the electricity market in Finland and to present a future information solution to be used in the retail market of electricity.' In it Fingrid proposes the development of a centralized data exchange platform under the operational responsibility of Fingrid.

Figure 3: Finnish electricity market role model



Source: Draft based on the Nordic Harmonized Role Model (THEMA Consulting Group AS).
(NB this model serves for clarification purposes only and is not an official role model)

³⁰ This revision is not taken into account in this report.

There is currently a national database for metering point IDs that supports information exchange. This database supports suppliers in business processes like switching and moving. The register contains metering point IDs, addresses and DSO information. DSOs are required to have identical data stored.³¹

Figure 3 is a draft of the current role model for the Finnish electricity market (as we understand it). In the Figure a supplier can be both Balance Supplier as well as Balance Responsible Party. The role model foresees in the possibility that not all suppliers are Balance Responsible Party. Some roles are alike the role models of the other Nordic countries, but a distinct difference is the access of information of the consumer (and the third-party) via the DSO. In this role model we did not include the national database for metering point IDs, but left the responsibility of Metered Data Aggregator with the DSO.

3.2.2 Market players

The TSO, Fingrid Oyj, is the final responsible party for the financial balance settlement in the national grid, also referred to as the imbalance settlement responsible.³²

The TSO is responsible for developing standards for information exchange to ensure trade in electricity and balance settlement. Additionally, the TSO is responsible for training and advisory services in relation to information exchange.³³

DSOs are responsible for operation of the meter and registration of the meter data that will be the basis for balance settlement and billing. The information will be sent to relevant market players.³⁴ Depending on the meter in place and a margin of 20% (if conditions are met) the meter values are based on hourly consumption registration.³⁵ Alternatively, if hourly registration is not possible metering values will be based on load profiles and reconciliation. A DSO is also responsible for the verification and validation of meter registration consumption data. The meter operation may be outsourced to a third-party; however outsourcing does not transfer the responsibility of the DSO.³⁶ Hourly consumption registration must be delivered to the supplier on the next working day.

DSOs are responsible to inform current suppliers on a change in supply as the result of supplier switching. DSOs will inform suppliers on supplier switching within two working days after having received notification on the switching and DSOs will inform suppliers within two weeks after supply switching on the meter registration data when supply ceases.³⁷ DSOs will notify the new supplier when supply starts and the current estimate of annual consumption of the supply in question. DSOs will also inform the new supplier with meter registration data (values) when supply starts.

DSOs are obliged to offer their customers information on their own consumption, i.e. access (often via a web-portal function).³⁸ The DSO is also responsible for data protection related to meter reading and data.³⁹

DSOs have to inform balance responsible parties on the preliminary meter registration data (consumption) the following business day and the confirmed data has to be sent within 14 days.⁴⁰

Suppliers can be a Balance Responsible Party that is responsible for the imbalance settlement in their market balance area. Suppliers have to use the registered consumption data it in its billing of

³¹ NordREG, *High level suggestion for common Nordic Processes for information exchange- obstacles and possibilities*, Report 1/2012.

³² § 8 Electricity Market Act and Ministerial decree 1172/2004.

³³ § 49 EML 588/2013.

³⁴ § 11 Decree 809/2008.

³⁵ Ch. 6 § 4-6 Decree 66/2009.

³⁶ FEI – principles of hourly metering recommendation, 2010, p.12.

³⁷ § 8, 10 Decree 809/2008.

³⁸ Ch. 6 § 8 Decree 66/2009.

³⁹ FEI – principles of hourly metering recommendation, 2010, p.12.

⁴⁰ § 11 Decree 809/2008.

the customers. The supplier shall inform the DSO on any errors in data. The supplier has to inform the DSO upon receipt of a notification of a supply switching of a consumer.⁴¹ Suppliers must provide their customers an annual report on their usage that year.⁴²

End-user (customer) can opt to have only communication with the supplier. The practical application of this possibility often depends on whether or not the DSO and supplier are vertically integrated. In the situation of an 'obligated supplier' (Supplier of last resort) customers will have the right to have one contact point and one bill that will be provided by the supplier. Customer will always have, at no extra cost, the right to access their own data.⁴³

ESCO or third party access is possible after consent by the customer.⁴⁴ ESCOs will receive metering data either from the customer or from the DSO if authorized by the customer. There is no information available on the format of the consent that is required for third-party access.

3.2.3 Business processes

Consumption is registered at an hourly time interval, the meter is read daily and settlement is based on hourly values.⁴⁵

Consumption data is accessible to the customer via the website of the DSO. For third parties a power of attorney is required.

Data security falls under the responsibility of the Data Protection Ombudsman and is embedded in the Personal Data Act (523/1999) and the Act on the Protection of Privacy in Electronic Communications (516/2004). The DSO is responsible for data security related to meter reading and the recording and transmission of metering data.⁴⁶

In the situation of supplier switching the DSO must report the meter readings to the customer's new and current supplier within 14 working days of the beginning and ending of delivery.

3.2.4 Study and proposal by Fingrid for a future information exchange solution

In the Electricity Market Act the responsibility to develop the exchange of information is attributed to the Finnish TSO, Fingrid. In that function, Fingrid executed a study 'to identify the present situation with information exchange in the electricity market in Finland and to present a future information solution to be used in the retail market of electricity.' The study was executed in close cooperation with market actors. The final report was published in December 2014 (an English summary is currently available, and the entire English version of the report will be available in March 2015). The study analyses two alternatives for the future development of information exchange; (i) a centralized data exchange platform and (ii) further development of the current model (current+). The two alternatives were compared along quality indicators and a cost-benefit analysis. The study concludes that a centralized data exchange platform is the economically and qualitatively more advantageous alternative. This is therefore also the alternative that Fingrid proposes. The study concluded that the annual costs for a data-hub were € 7.6 million less than the current+ alternative. However, the decisive factors to propose the data-hub are of qualitative nature; a data-hub simplifies customers' transactions, is less vulnerable to errors, increases competition and the number of services offered and enhances unbiased and non-discriminatory treatment. In the proposed solution, the data-hub will serve as the only point of communication with standardised access, open interfaces that allow third-party access. In the proposal Fingrid foresees that the data-hub will have the function of a centralized storage facility for market information. In addition, the data-hub will act as sole

⁴¹ § 9 Decree 809/2008.

⁴² FEI – principles of hourly metering recommendation, 2010, p.12.

⁴³ Ch. 6 § 8 66/2009.

⁴⁴ Ch. 6 § 8 66/2009.

⁴⁵ Ch. 4 § 1 66/2009.

⁴⁶ FEI – principles of hourly metering recommendation, 2010, p.12.

counterpart for market actors, allowing real-time carrying out of contractual processes, eliminating differences between suppliers and facilitating data validation.

The study further discusses specific points that require attention, e.g. data security and operational responsibility of the data-hub, and implementation costs. Development of the proposed solution is subject to a political decision. Fingrid expects that full implementation of the data-hub will require 4-5 years, meaning that if a political decision is taken in the first half of 2015; the data-hub can be in operation in approximately 2019. Up to now, the Finnish government has not taken a decision on the development of the proposed solution by Fingrid.

3.2.5 Observations

We make the following observations on the main questions addressed in this report

- The TSO is the final imbalance settlement responsible.
- The TSO is responsible to develop the exchange of information.
- The TSO has executed a study on information exchange alternatives.
- The DSOs are responsible for information transmission to other market players and most other business processes. DSOs are obliged to provide web access for customers to their data. However, if desired by the customer the communication can go through the supplier.
- Suppliers can be a balance settlement party in its balance market area.
- ESCOs and other third parties have access to customer data via the DSO given that they have power of attorney.
- Data protection and integrity are regulated by a separate Data Protection Ombudsman, while the DSO is responsible for the practical maintenance and compliance with the rules.
- Based on a study, Fingrid has recently proposed a solution for a centralized data exchange platform. Any future development of a data exchange platform is subject to a formal political decision.
- There is currently no information available on information exchange interaction across borders.

3.3 Iceland

3.3.1 Overview

The Icelandic electricity system is an isolated network without interconnections. The Electricity Act (No. 65/2003) is the primary legislation for the electricity market. It provides the basis for several government regulations and Grid Codes. The Ministry of Industries and Innovation is responsible for the Electricity Act and making decisions on Regulations and Grid Codes. The regulatory authority Orkustofnun (National Energy Authority) is responsible for carrying out the regulation in practice. The TSO Landsnet is responsible for drafting Grid Codes. The Grid Codes are reviewed by Orkustofnun and finally decided by the Ministry. The Icelandic Competition Authority is responsible for supervising the sector with regard to competition (according to Article 27 of the Electricity Act).

A national power exchange is currently not in place, although there have been plans for developing such an exchange in the past.

Iceland currently has no plans for introducing smart meters.

In addition to the Electricity Act, important legislation and regulations are the following:

- Regulation 1040/2005 on the implementation of the Electricity Act
- Regulation 1050/2004 on exchanges in electricity and metering

The relevant grid codes include:

- B2. Terms for Sales Metering and Settlements
- B3. Terms for the procurement of regulating power and settlement of balancing energy
- B6. Terms for Relations between Electricity Market Participants
- B7. Terms for Metering Data, Consumption Profile and Consumption Profile Settlement

3.3.2 Market players

The TSO Landsnet is inter alia responsible for settling imbalances and is entitled to have access to all the information from generators, DSOs and suppliers that is necessary for carrying out Landsnet's obligations. At the same time, Landsnet also has obligations to provide different types of information to the regulator, transmission grid customers and the public.

There are 6 DSOs in the Icelandic market and 7 suppliers. The DSOs are responsible for operating the distribution network and are subject to regulation by Orkustofnun. The DSOs are also responsible for collecting metering data and providing other market players with the metered data.

Netorka is a company jointly owned by Landsvirkjun and DSOs. Netorka is a service provider that carries out many of the practical functions for which the DSOs are responsible, although the DSOs still have the legal responsibility towards the regulator. Netorka's services include:

- Centralised storage of metered data
- Calculation and distribution of consumption profiles to TSO, balance responsible parties and suppliers
- Calculation of energy forecasts for balance responsible parties
- Acts as a central hub for all supplier change in Iceland, i.e. collects supplier change requests and processes them
- Collects remote meter readings

End-users have access to their consumption data via the DSO's website.

3.3.3 Business processes

Meters are read on an annual basis. The DSO carries out the physical meter readings.

In connection with supplier switching, the DSO is responsible for informing the suppliers. The customers are responsible for finding a new supplier when moving. If no supply contract is entered into, the DSO appoints a supplier of last resort.

In the event that the DSO has transferred the practical operations with regard to information exchange to Netorka, Netorka will handle all of the processes regarding information exchange between suppliers, customers and the TSO as described above.

3.3.4 Observations

- The Icelandic information exchange model is based on the DSOs collecting metering data and distributing the information to suppliers and the TSO.
- Customers have access to their own data via the DSO's website.
- There are no plans for a compulsory central data-hub, although there is a voluntary solution that performs many of the same tasks as a hub on behalf of the DSOs. However, in the absence of smart metering, the amount of data is necessarily limited.
- Data protection has not been discussed in relation to the electricity retail market. This should be seen in light of the fact that there are no plans for introducing smart meters.

3.4 Norway

3.4.1 Overview

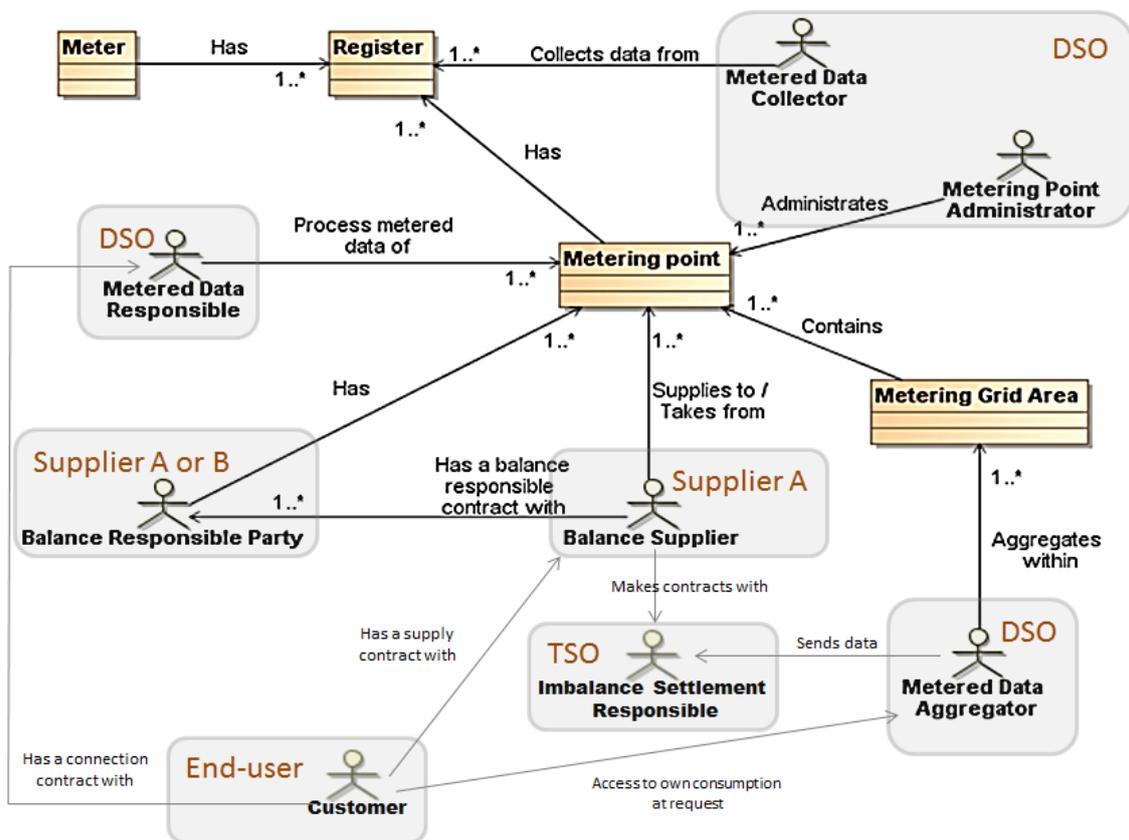
The Norwegian power market is characterized as a fragmented market with more than 130 DSOs and more than 100 retail suppliers. In the current Norwegian model the DSOs are responsible for collecting and distributing metering data to other market actors. The TSO Statnett has the role as imbalance settlement responsible.⁴⁷ Information exchange is regulated through the Energy Act (Energiloven) and underlying regulations, of which the Regulation (1999/301) on metering, settlement and coordinated action in electricity sales and invoicing of network services (Avregningsforskriften) is the most important.⁴⁸

In June 2014 the Norwegian regulator NVE (the Norwegian Water Resources and Energy Directorate) submitted a proposal to revise the Regulation 1999/301. The revision intends to update the balancing settlement system and the roles of market players with the introduction of the ELHUB. In this chapter we will discuss both the current regime in relation to information exchange as well as the proposed revised regime in relation to information exchange. We would like to stress that the revision has no formal status other than a proposal. The main difference between the current and revised regime is the existence of the ELHUB.

In the current regime, DSOs are responsible for collecting data and distributing it to market actors. Consumers can have access to their own consumption, if AMS is installed and via the DSO. Statnett is final imbalance settlement responsible and suppliers can be balance responsible parties. Figure 4 displays the roles of market actors in the current regime.

⁴⁷ Konesjon for avregningsansvarlig, i medhold av energiloven, 20 December 2012, NVE 201207726-4.

⁴⁸ Forskrift om endring i forskrift om måling, avregning og samordnet opptreden ved kraftomsetning og fakturering av netjtjenester, 1999/301. (Am. Regulation 1999/301)

Figure 4: Current Norwegian Electricity Market Role Model

Source: Draft based on the Nordic Harmonized Role Model (THEMA Consulting Group AS).
(NB this model serves for clarification purposes only and is not an official role model)

3.4.2 Market players

The TSO is the Imbalance Settlement Responsible that is responsible for the financial settlement of the electricity. This applies for the current regulation as well as in the revised regulation.

The DSO is obliged to provide data to suppliers (for billing), customers (on request) and the TSO (for imbalance settlement purposes). The DSO also provides the necessary information in supplier switching and other business processes.

In the current regime third party access to consumption data is possible if AMS (smart metering systems) is installed. This is the responsibility of the DSO. There is currently no information on the format of the power of attorney available.

3.4.3 ELHUB and revision of Avregningsforskriften

Introduction of the ELHUB is a main element of the revision of Regulation 1999/301. The development of the ELHUB dates back to 2010. In 2010/2011 NVE outsourced a study to explore the possibilities for a common IT-solution (or data exchange platform) for the future electricity market.⁴⁹ This study, *inter alia*, showed considerable gains by setting up a data exchange platform with standardized data handling for the entire power market. In 2012, NVE amended Statnett's licence as imbalance settlement responsible (Avregningsansvarlig) to include the responsibility to investigate and develop a data exchange platform.⁵⁰ Statnett convened with stakeholders and

⁴⁹ Devoteam Davinci & THEMA, Felles IKT-løsninger i kraftmarkedet.

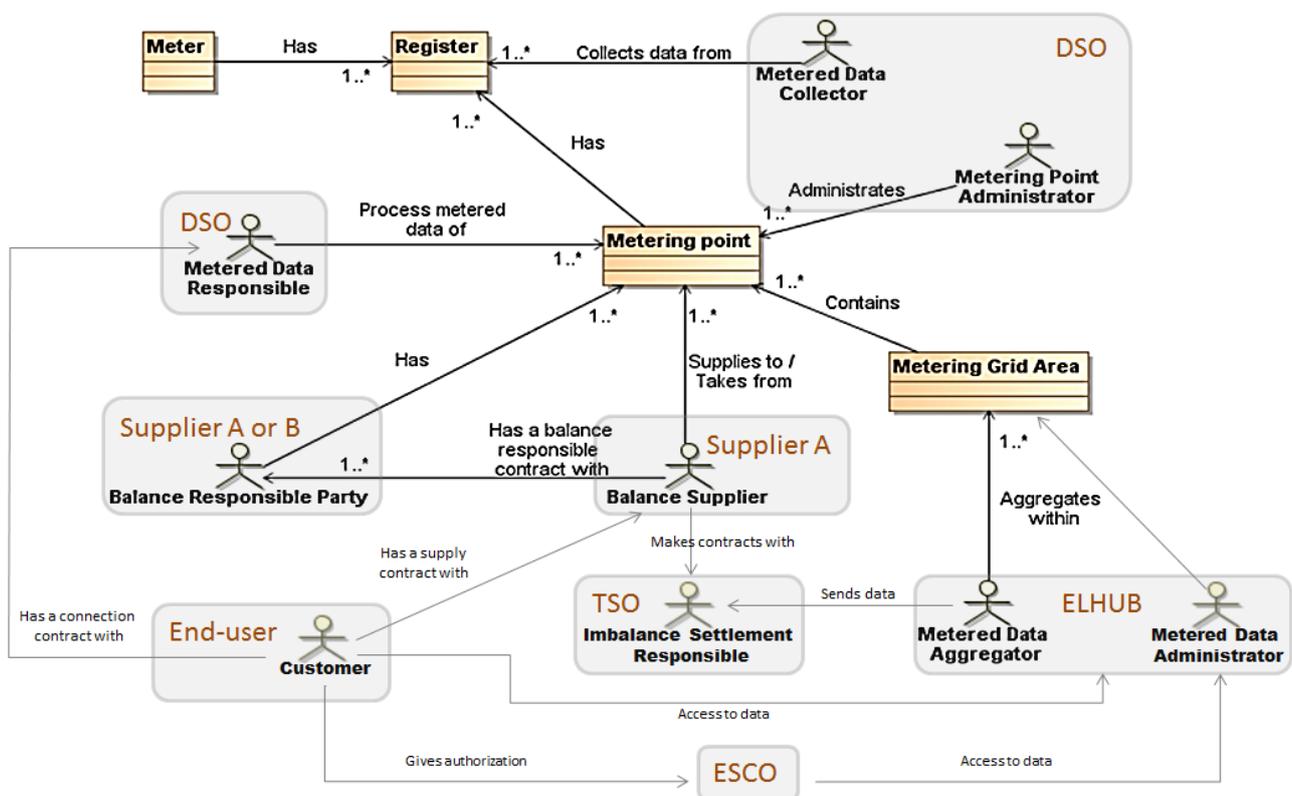
⁵⁰ § 12 Konesjon for avregningsansvarlig, i medhod av energiloven, 20 Desember 2012, NVE 201207726-4.

submitted its report to NVE considering the different objectives, options and methodologies of a data exchange platform.⁵¹ In its report, Statnett recommended establishment and operation of a data-hub; one central portal for all market actors. NVE subsequently requested Statnett to develop ELHUB⁵² that dedicated a working group by the name of ELHUB to its development.⁵³

The development and operation of the ELHUB cannot be seen separate from the roll-out of smart meters (AMS). The deadline for roll-out of smart meters is set for the 1st of January 2019. The ELHUB will start earlier (in 2016) to familiarize procedures, learn from experiences and optimize its usage before full roll-out in 2019. The ELHUB will have historical data stored for (minimally) three years. Market actors (approx. 130 distribution grid companies and 110 suppliers) will have to transfer existing data to the ELHUB. This data is not stored in the same format as the ELHUB-standards. Hence, this data needs to be translated into usable formats before it can be used by ELHUB.⁵⁴

Based on the NHRM and the information available, we have included a draft of the Norwegian Role Model in Figure 5 as we understand it.

Figure 5: Revised Norwegian Electricity Market Role Model



Source: Draft based on the Nordic Harmonized Role Model (THEMA Consulting Group AS (NB this model serves for clarification purposes only and is not an official role model).

3.4.4 Business processes

The revised regulation shifts the responsibility to the ELHUB as central database for the necessary data for supplier switching, moving and other processes, including imbalance settlement data to the TSO (eSett Oy when the Nordic Balance Settlement goes live).

⁵¹ Statnett, Effektivt sluttbrukermarked for kraft, 31 Mai 2012.

⁵² Letter 28 Mai 2013, *Utvikling av datahub for kraftmarkedet*, NVE 201107296-23, <http://www.nve.no/Global/Kraftmarkedet/datahub.pdf>.

⁵³ <http://elhub.no/en/pages>, last visited 25 November 2014.

⁵⁴ The Statnett working group Elhub will be responsible for the implementation of the data transfer.

The TSO will have the responsibility to develop and operate the ELHUB. The ELHUB will then be the Metered Data Aggregator and Metered Data Administrator.

The DSO remains responsible for collection and distribution of data to the ELHUB. As Metered Data Collector, the DSO will be responsible for collection of meter data from the metering point. As Metering Point Administrator the DSO will be administrating (and owning) the meter. This does not differ from the current regulation. And as Metered Data Responsible the DSO will be responsible for validation of metered data. Via ELHUB the DSO has access to client information in its grid area.⁵⁵ The DSO will continue to be responsible to inform end-users on the available suppliers in their metering grid area.

In the revised regulation, a supplier will have a contract with and is the main contact point for the customer. The supplier is the Balance Supplier and can be the Balance Responsible Party that is responsible for the physical balance settlement in its metering grid area. The Balance Supplier pays the Imbalance Settlement Responsible, the TSO, for any imbalance settlement. The supplier will update customer information in the ELHUB.⁵⁶

In the revised regulation, third parties, including ESCOs, can access the ELHUB for customer data. This requires authorization (a power of attorney) by the customer prior to access.⁵⁷ A power of attorney will be acquired via a consumer driven web application (a plug-in) that allows the consumer to access its own data and give authorisation to third-parties to access their data. Via the suppliers' website, end-users (that are customers) will be able to control who has access to their data.⁵⁸ Access to the hub, including third-parties, will require companies to sign a standard set of 'terms of use' and meet certain criteria such as legally established company with a firm address and contact person.

The TSO as Imbalance Settlement Responsible is responsible to ensure protection of data and information of the ELHUB.⁵⁹ This includes *intern alia* the access to ELHUB, protection of data and the physical storage of ELHUB against any unauthorized access.⁶⁰

Data must be accessible in the ELHUB from 9:00 A.M. the next working for all ELHUB users that have prior authorization of the customer.⁶¹ The supplier will have access to its customers collected hourly meter data from 9:00 A.M. the next working day.⁶²

In the current regime interaction between hubs and information exchange systems across borders is not addressed. In the revised regime there is also no direct reference to interaction between HUBs. However, according to Statnett there has been coordination between the Danish and Norwegian HUB initiatives and interaction can be easily facilitated in the future, possibly to the point with a common user-interface across borders.

The hub will be the data management responsible under the data protection legislation ("databehandlingsansvarlig"), and will be responsible for data security with regard to the data collected and stored by the hub. In addition, the hub will be required to carry out risk and vulnerability analysis of the data systems periodically, which is under the domain of NVE.⁶³

3.4.5 Observations

In the following, we sum up our main observations with reference to the questions highlighted in the introduction:

⁵⁵ § 3-3 Am. Regulation 1999/301.

⁵⁶ § 6-18 Am. Regulation 1999/301.

⁵⁷ § 6-18 Am. Regulation 1999/301.

⁵⁸ § 6-18 Am. Regulation 1999/301.

⁵⁹ § 6-22 Am. Regulation 1999/301.

⁶⁰ § 6-22 Am. Regulation 1999/301.

⁶¹ § 6-15 Am. Regulation 1999/301.

⁶² § 6-15 Am. Regulation 1999/301.

⁶³ Letter from NVE to Statnett 28 May 2013.

- The TSO will operate the hub as imbalance settlement responsible. Note that this is a separate licence from the TSO licence.
- The DSO is obliged to deliver data to the hub. Currently, the DSO is also obliged to provide data for suppliers (for billing), customers (on request) and the TSO (for imbalance settlement purposes).
- Third-party access to hub: Possible for ESCOs to gain access to customer data with authorisation from the customer.
- There is currently no regulation addressing interaction between hubs and information exchange systems across borders. The ELHUB is designed to easily facilitate cross border exchange easily in the near future.
- Regulation and monitoring of data security is handled by Datatilsynet. With smart metering and the hub in place, the hub will also need to report to NVE on data security, including carrying out risk and vulnerability analysis.

3.5 Sweden

3.5.1 Overview

The Swedish market is characterised by a high number of DSOs (around 160). In the current Swedish model the DSOs are responsible for collecting and distributing metering data to other actors in the market – suppliers, balance responsible parties, the TSO Svenska Kraftnät and the customers.⁶⁴ Svenska Kraftnät has the role as imbalance settlement responsible.⁶⁵ The information exchange is regulated through the Electricity Act and underlying regulations, of which the Energy Markets Inspectorate's regulation on metering is the most important.⁶⁶

The industry cooperates on the development of standards for information exchange (The Electricity Market Handbook, Elmarknadshandboken), which supplements the laws and regulations.⁶⁷ The Handbook is developed and updated regularly by the organisation Electricity Market Development ("Elmarknadsutveckling"). The handbook is a cooperation between Swedenergy (Svensk Energi, the electricity industry association), Independent Electricity Suppliers (Oberoende Elhandlare) and Svenska kraftnät.

The regulatory authority, the Swedish Energy Markets Inspectorate, has published a report recommending that the TSO Svenska Kraftnät should be given the task of developing and operating a data-hub (or service hub) in order to meet expected stricter market requirements for the information exchange model.⁶⁸ The proposal for a data-hub is being considered by the Ministry of the Environment and Energy at the time of writing. The level of detail regarding the data-hub is therefore necessarily limited at this stage.

Datainspektionen is responsible for regulation and monitoring of data integrity issues, while those handling personal data (such as DSOs and suppliers) are responsible for the actual handling of the data and maintaining security and integrity.⁶⁹

In the following, we describe the current Swedish model for information exchange. We also briefly present the proposal for the data-hub as it has been outlined by the Energy Markets Inspectorate.⁷⁰

⁶⁴ Ei Report 2013:09.

⁶⁵ Electricity Act (law 1997:857) 8 chapter 11 §.

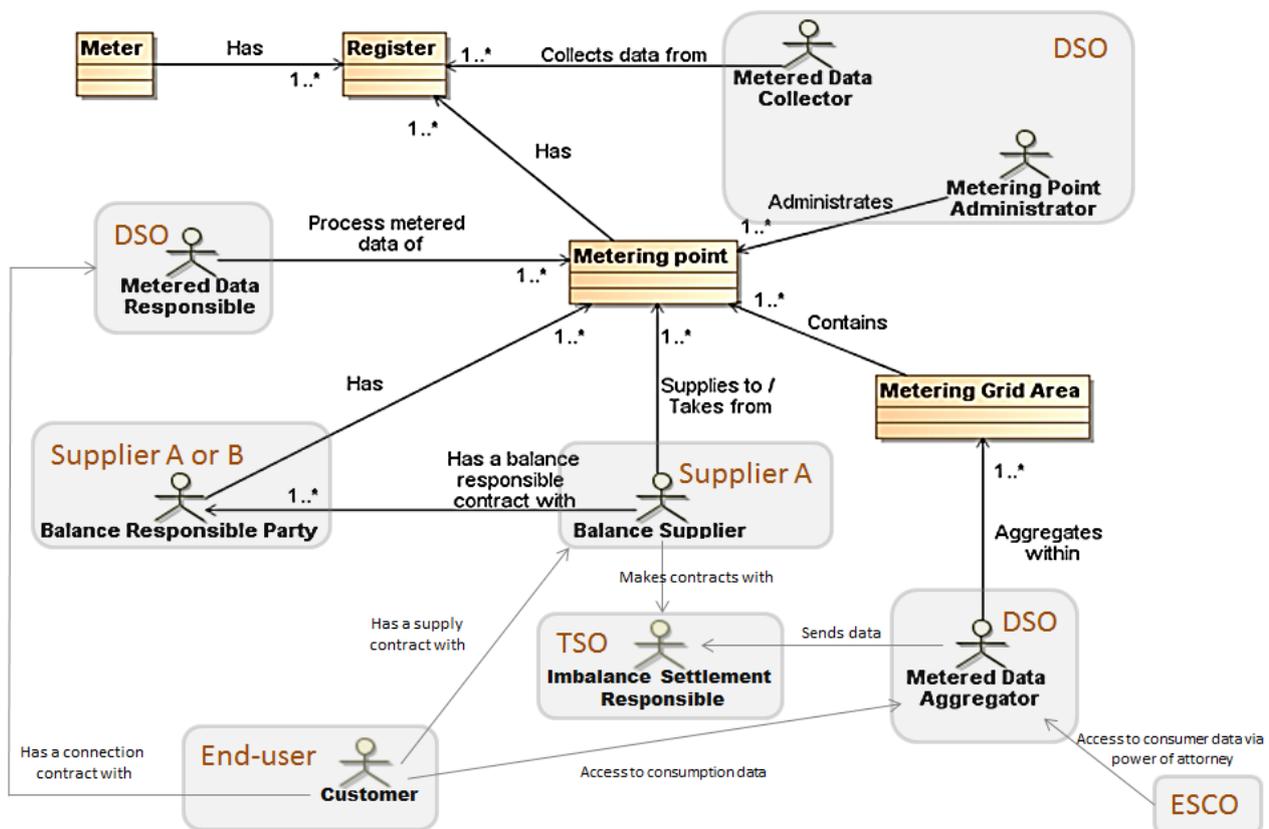
⁶⁶ EIFS 2011:3.

⁶⁷ See www.elmarknadsutveckling.se.

⁶⁸ Ei R2014:16.

⁶⁹ The main law in this area is the Personal Data Act, law 1998:204.

⁷⁰ The description of the hub proposal is based on Ei R2014:16.

Figure 6: Current Swedish Electricity Market Role Model

Source: Draft based on the Nordic Harmonized Role Model (THEMA Consulting Group AS)
 (NB this model serves for clarification purposes only and is not an official role model).

3.5.2 Market players

In Figure 6, we have included a draft of the Swedish electricity retail market Role Model according to our interpretation of the proposal by the Energy Markets Inspectorate.

The TSO is responsible for settling imbalances based on data received from DSOs and suppliers. In that role, Svenska Kraftnät is empowered to set requirements for how information should be exchanged (i.e. the duties of the different market players, message formats etc.).⁷¹

The DSO is responsible for collecting metering data for each customer within the grid area, including data validation and delivery of metered values to the TSO (as imbalance settlement responsible, to eSett Oy when the Nordic Balance Settlement becomes operational) and other market players as necessary, including other DSOs, end-users, generators, balance responsible parties and suppliers.⁷²

Suppliers have the right to receive hourly metering values if the customers' meters are read on an hourly basis.⁷³

ESCOs and other third parties will have access to customer data through power of attorney. In the current model, access is given through the DSO.⁷⁴

⁷¹ Electricity Act 3 chapter 10a § and 8 chapter 4, 4 and 11 §§.

⁷² Electricity Act 3 chapter 10a-10b §§.

⁷³ EIFS 2011:3 6 chapter.

⁷⁴ EIFS 2011:3 11 chapter.

3.5.3 Business processes

Smart meters are standard in Sweden, but not all customers are subject to hourly metering presently. According to the Electricity Act §10, customers with a maximum fuse size of 63A shall be metered according to a standard profile, unless the customer has demanded hourly metering. If a customer below the 63A limit has an electricity supply contract requiring hourly metering, hourly metering should be provided by the DSO without extra cost for the customer (from 1 October 2012). Other customers will be metered on an hourly basis. According to the Energy Markets Inspectorate, a selection of 63 retail companies reported that around 1 million customers below the 63A limit are subject to hourly meter readings as of 2014.⁷⁵

The DSOs are responsible for metering as described above. The DSOs will also provide information to suppliers about their customers' electricity use, and are required to provide monthly metered data and consumption statistics to the customer, as well as report to the Energy Markets Inspectorate on electricity use, outage statistics and other customer-related information.⁷⁶

The DSOs are also responsible for providing the necessary data for supplier switching, moving, end and start of supply.

3.5.4 The Ei's proposal for a data-hub

According to the Ei's proposal, Svenska Kraftnät will be responsible for operating and developing the hub. The hub should be compulsory to use for all market players, including DSOs, suppliers and balance responsible parties. As proposed the hub will have the following functions with regard to information exchange:

- The hub will collect metering values and validate the data (although data quality will still be the responsibility of the DSO).
- The hub will also include customer data, meter data, and handle processes such as supplier switching, new installations, moving.
- The customers will have access to their own consumption and electricity contract through the suppliers' website, which will be directly linked to the hub. There will be no customer interface in the hub itself.
- The hub will include information about powers of attorney given by the end-user to suppliers and ESCOs. ESCOs and suppliers will have access to customer data through the hub.
- The hub will provide data for the Nordic balance settlement (eSett Oy) when it becomes operational) and also statistical data and reports for inter alia regulatory authorities, Svenska kraftnät, Statistics Sweden.

The hub will according to the Energy Market Inspectorate's proposal take over responsibility for most of the business processes.

The Energy Markets Inspectorate underlines the need for data security, and points out that this should be studied in more detail and that Datainspektionen should be consulted in the further process.

Data storage should be studied further according to the report (i.e. centralised vs. decentralised solutions). Also, the hub should have a role in the billing process, but this is also subject to further study.

⁷⁵ Ei R:2014:05.

⁷⁶ EIFS 2013:2.

3.5.5 Observations

Our main observations on the questions raised in the introduction are as follows:

- The TSO's main task with regard to data exchange is currently to handle the financial settlement of imbalances. If the Energy Markets Inspectorate's proposal for a data-hub is accepted by the Government, the TSO will be responsible for developing and operating the hub.
- The DSOs are currently responsible for most of the functions regarding information exchange. Many of the DSO tasks will however be transferred to the hub if the proposal is carried out in practice as it now stands, with the exception of owning and operating the meters themselves and collecting the meter data and sending the values to the hub.
- Under the current system, ESCOs and other third parties have access to customer data through power of attorney via the DSO.
- As the hub proposal stands, customers will have access to their data via the suppliers' website with the hub in operation. The rules regarding third-party access by ESCOs and suppliers in the hub have not been outlined as yet.
- Data integrity will be maintained by the hub and other parties responsible for personal data, under supervision by Datainspektionen.
- We have not found any information on cross-border information exchange.

4 COMPILED TABLES FOR THE NORDIC COUNTRIES

4.1 Overview of roles/responsibilities per country with (type of) legal source

Actor	Denmark	Finland	Iceland	Norway		Sweden
				Current regime	Revision	
TSO is final Imbalance settlement responsible	Yes §27 Electricity supply Act	Yes § 46-47 Elmarknadslag	Yes	Yes Konsesjon for avregningsansvarlig Energiloven	Yes Konsesjon for avregningsansvarlig Energiloven	Yes Ch. 8 § 11 Electricity Act
TSO is responsible for development of a centralized data exchange platform	Yes §28 stk. 2, nr. 7 Electricity supply Act	Yes § 49 Elmarknadslag	No	Yes § 12 Konsesjon for avregningsansvarlig Energiloven	Yes § 12 Konsesjon for avregningsansvarlig Energiloven	No
TSO is responsible for operation of a centralized data exchange platform	Yes §28 stk. 2, nr. 7 Electricity supply Act	No No formal decision taken yet	No	No	Yes § 6-1 Am. Regulation 1999/301	No
DSO is responsible for the Meter, meter reading and validation of meter data	Yes § 1 Regulation A § 3 Regulation I*	Yes Kap 6 § 1 Decree 66/2009	N/I	Yes § 3-3 Regulation 1999/301	Yes § 3-3 Am. Regulation 1999/301	Yes Electricity Act 3 chapter 10 §
Hourly meter reading	Yes § 2.2 Regulation A	Yes Ch. 4 § 1 66/2009.	N/I	Possible § 3-3 Regulation 1999/301	Possible § 3-3 Regulation 1999/301	Yes, with exceptions Electricity Act Ch. 3 §10
Supplier is responsible for customer data (personal data)	Yes § 3 Regulation I*	N/I	N/I	No	Yes § 6-17 Am. Regulation 1999/301	N/I
Supplier can be a Balance Responsible Party	Yes Regulation C1	Yes § 73 Elmarknadslag	N/I	Yes § 5-7 Regulation 1999/301	Yes § 5-7 Am. Regulation 1999/301	Yes Electricity Act 8 chapter

Supplier is the main contact point for the consumer	Yes § 1 Regulation B	No	N/I	No	No	No
Supplier is responsible for billing of all services	Yes Regulation I*	No	N/I	Possible DSO is § 7-1 Regulation 1999/301	Possible DSO is § 7-1 Am. Regulation 1999/301	No
Customer has access to its own consumption	Yes Via supplier (website)	Yes Via DSO website Ch. 6 § 8 Decree 66-2009	N/I	Possible locally and via DSO (website) if AMS is installed § 4-8 Regulation 1999/301	Yes § 6-15 Am. Regulation 1999/301	Yes EIFS 2011:3 Via DSO website
Third party access (incl. ESCOs) is possible via a power of attorney	Yes Regulation H1 Regulation I*	Yes Ch. 6 § 8 Decree 66/2009.	N/I	No	Yes Via a digital empowerment tool § 6-18 Am. Regulation 1999/301	Yes EIFS 2011:3 11 chapter Via a power of attorney
Strict format for power of attorney	Currently Regulation H1 Regulation I*: customer- driven power of attorney	No Just consent	N/I	No	Yes Via a digital empowerment tool § 6-18 Am. Regulation 1999/301	No
Data quality is the responsibility of the DSO	Yes Regulation D1	Yes Decree 66/2009.	N/I	Yes § 3-10 Regulation 1999/301	Yes § 3-10 Am. Regulation 1999/301	Yes EIFS 2011:3
Data security is the responsibility of metered data responsible	Yes Data security is responsibility of TSO	Yes DSO is responsible for data security	N/I	Yes System services include data security (DSO) § 1-3 Regulation 1999/301	Yes TSO is responsible § 6-22 Am. Regulation 1999/301	Yes

*: Regulation I: Master data is not yet in force (Denmark).

N/I: no information available.

	Yes, source in primary legislation		Possible
	Yes, source in secondary legislation		No
			No information available

4.2 Legal source of information exchange responsibilities per country

At what level of legislation are the responsibilities found? (Most relevant documents)	Denmark	Finland	Iceland	Norway	Sweden
EU law	<ul style="list-style-type: none"> EED General data protection regulation 	<ul style="list-style-type: none"> EED General data protection regulation 	<ul style="list-style-type: none"> EED (EEA Relevant) General data protection regulation (EEA Relevant) 	<ul style="list-style-type: none"> EED (EEA Relevant) General data protection regulation (EEA Relevant) 	<ul style="list-style-type: none"> EED General data protection regulation
Primary national legislation	<ul style="list-style-type: none"> Electricity Supply Act 	<ul style="list-style-type: none"> Electricity Act. 	<ul style="list-style-type: none"> Electricity Act 	<ul style="list-style-type: none"> Energy Act 	<ul style="list-style-type: none"> Electricity Act
Secondary national legislation	<ul style="list-style-type: none"> Regulation A: Principles for the electricity market Regulation C1: Terms of balance responsibility Regulation D1: Settlement metering and settlement basis Regulation I: Master data 	<ul style="list-style-type: none"> Decree 809/2008 Ministerial decree on information exchange Decree 66/2009 Ministerial decree on metering of electricity supply 	<ul style="list-style-type: none"> Regulation 1040/2005 on the implementation of the Electricity Act Regulation 1050/2004 on exchanges in electricity and metering GC B2. Terms for Sales Metering and Settlements GC B3. Terms for the procurement of regulating power and settlement of balancing energy GC B6. Terms for Relations between Electricity Market Participants GC B7. Terms for Metering Data, Consumption Profile and Consumption Profile Settlement 	<ul style="list-style-type: none"> FOR-1999-03-11-301 - Regulation on Imbalance Settlement Responsible Licence for Imbalance Settlement Responsible 	<ul style="list-style-type: none"> EIFS 2011:3, Regulation on Metering, Calculation and Reporting of Electricity Ordinance 1999:716 on Metering, Calculation and Reporting of Electricity
Guidelines	<ul style="list-style-type: none"> Energinett.dk, Aktører i Elmarkedet 				<ul style="list-style-type: none"> Electricity Market Handbook
Instructions		<ul style="list-style-type: none"> Finnish Energy Industries, Principles of hourly metering recommendation 			

4.3 Data-exchange platform developments per country

<i>Role</i>	<i>Denmark</i>	<i>Finland</i>	<i>Iceland</i>	<i>Norway</i>	<i>Sweden</i>
Development	<ul style="list-style-type: none"> Yes, currently expanding the roles and services of the data-hub. 	<ul style="list-style-type: none"> Yes, study published December 2014. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> Yes, a study was executed and currently Statnett is developing an ELHUB. Formal decision not yet made, but currently under consultation by NVE. 	<ul style="list-style-type: none"> Yes, proposal delivered by the Energy Markets Inspectorate to the Government, currently being considered.
Responsible actor	<ul style="list-style-type: none"> Energinet.dk 	<ul style="list-style-type: none"> Fingrid 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> Statnett as holder of the licence for Imbalance Settlement Responsible 	<ul style="list-style-type: none"> TSO Svenska Kraftnät as proposed, not decided
Data storage and exchange platform	<ul style="list-style-type: none"> Yes, Data-hub is a data storage and information exchange platform. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> Yes, ELHUB will be a data storage and information exchange platform. 	<ul style="list-style-type: none"> Exchange platform, possibly including storage
Other functions	<ul style="list-style-type: none"> Yes, most business processes in the retail market, 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> Yes, ELHUB will provide additional functions. 	<ul style="list-style-type: none"> Yes, most business processes in the retail market.
Expected operation date	<ul style="list-style-type: none"> Already in use 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> Expected operation 2016. 	<ul style="list-style-type: none"> To be decided

4.4 Authorities and market players per country

<i>Role</i>	<i>Denmark</i>	<i>Finland</i>	<i>Iceland</i>	<i>Norway</i>	<i>Sweden</i>
Ministry responsible for Energy Markets	<ul style="list-style-type: none"> Ministry of Climate, Energy and Building 	<ul style="list-style-type: none"> Ministry of Employment and the Economy 	<ul style="list-style-type: none"> Ministry of Industry, Energy and Tourism 	<ul style="list-style-type: none"> Ministry of Petroleum and Energy 	<ul style="list-style-type: none"> Ministry of the Environment and Energy
National Regulatory Authority (NRA)	<ul style="list-style-type: none"> Danish Energy Regulatory Authority 	<ul style="list-style-type: none"> Energy Authority 	<ul style="list-style-type: none"> National Energy Authority of Iceland 	<ul style="list-style-type: none"> Norwegian Water Resources and Energy Directorate 	<ul style="list-style-type: none"> Swedish Energy Markets Inspectorate
Transmission System Operator	<ul style="list-style-type: none"> Energinet.dk 	<ul style="list-style-type: none"> Fingrid Oyj 	<ul style="list-style-type: none"> Landsnet 	<ul style="list-style-type: none"> Statnett 	<ul style="list-style-type: none"> Svenska Kräfnät
Industry organisation	<ul style="list-style-type: none"> Danish Energy Association 	<ul style="list-style-type: none"> Finnish Energy Industries 		<ul style="list-style-type: none"> Energy Norway, DEFO and KS-Bedrift 	<ul style="list-style-type: none"> Swedenergy

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