STANDARDS FOR ELECTRONIC DATA INTERCHANGE (EDI) IN A COMMON NORDIC RETAIL MARKET

A Position Paper from the Nordic TSOs

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## CONTENT

1 INTRODUCTION

1.1 REFERENCES

1.2 CHANGE LOG

2 TECHNICAL STANDARDS AND ORGANISATIONS

2.1 ORGANISATIONS

2.1.1 UN/CEFACT

2.1.2 IEC

2.1.3 ebIX®

2.1.4 ENTSO-E

2.1.5 Relationship between ENTSO-E and ebIX

2.1.6 National “Ediel Groups”

2.2 ELECTRONIC DOCUMENT STANDARDS

2.2.1 EDIFACT

2.2.2 XML

2.2.3 Implementation standards

2.3 MODELLING STANDARDS

2.4 COMMUNICATION PLATFORMS

2.4.1 SMTP

2.4.2 Web services

2.4.3 ECP

3 USAGE OF TECHNICAL STANDARDS IN THE NORDIC RETAIL MARKET

3.1 DENMARK

3.1.1 Electronic document standards

3.1.2 Communication platform

3.1.3 On-going developments

3.2 FINLAND

3.2.1 Electronic document standards

3.2.2 Communication platform

3.2.3 On-going developments

3.3 NORWAY

3.3.1 Electronic document standards

3.3.2 Communication platform

3.3.3 On-going developments

3.4 SWEDEN

3.4.1 Electronic document standards

3.4.2 Communication platform

3.5 CONCLUSIONS

3.5.1 Electronic document standards

3.5.2 Communication platform

4 RECOMMENDATIONS

4.1 ELECTRONIC DOCUMENT STANDARDS

4.1.1 Upstream electricity market

4.1.2 Recommendation

4.2 COMMUNICATION PLATFORM

4.2.1 Recommendation

4.3 MODELLING STANDARDS

4.4 MIGRATION AND MAINTENANCE

4.5 ITEMS TO BE AWARE OF

4.5.1 ebIX® and ENTSO-E Interface

4.5.2 Customisation of the chosen standards

4.5.3 Identification schemes
1 INTRODUCTION

This position paper is made by the Nordic TSOs after a request from NordREG TF NBS, which follows the Nordic Balance Settlement from the Nordic regulators. Note however that it is Energiateollisuus ry (Finnish Energy Industries) that is the responsible body for the retail market data exchange standards (Ediel standards) in Finland. Fingrid has today has no authority to make recommendations on the behalf of the Finnish retail market participants.

A common Nordic end user market requires efficient electronic data exchange standards to ensure an efficient market with equal conditions for the market players. The change in the structure of the market and the new legislation needed will increased the need for a standardised electronic data exchange. This includes both transaction data, such as time series with production and consumption figures between the different parties, and master data.

This document lists possible technical standards that may be used as basis for a Common Nordic End User and wholesale Market. In addition the document gives recommendations for which standards to be used for a future common Nordic end user market.

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1.1 References

[1] ENTSO-E, ebIX® and EFET Harmonised Electricity Role Model, see https://www.entsoe.eu/resources/edi-library/
[5] IEC, see www.iec.ch
[7] W3c, see http://www.w3.org/

1.2 Change log

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2 TECHNICAL STANDARDS AND ORGANISATIONS

This chapter gives a brief introduction to the technical standards used in the Nordic energy market and the organisations behind the standards.

2.1 Organisations

This chapter lists some organisations responsible for data exchange standards, or parts of such, that are used in the Nordic electricity industry.

2.1.1 UN/CEFACT

The United Nations Centre for Trade Facilitation and Electronic Business, UN/CEFACT, is a worldwide and industry independent organisation that aims at facilitating the development of e-business standards that can cross all international boundaries and help lower transaction costs, simplify data flow and reduce bureaucracy.

UN/CEFACT is the responsible body for the basic technologies used by many international standardisation organisations, such as SWIFT in the banking industry, ODETTE in the automotive industry and GS1 within trade. UN/CEFACT is the basis for the standards used in the Nordic electricity market.

2.1.2 IEC

International Electrotechnical Commission is among others working with data exchange standards for the international electricity industry. One of the cornerstones of this work is the CIM (Common information model) that defines the physical objects of the energy market. Traditionally the CIM has been used for technical purposes by TSOs and DSOs, but currently the CIM model is being extended to also cover the wholesale energy market processes, CIM market extension. The latter is developed in a close cooperation with ENTSO-E. In addition to the modelling work, IEC has developed rules for how relevant parts of the CIM can be converted to electronic XML documents to be exchanged between the actors of the electricity market, CIM-XML. Currently CIM-XML documents are exchanged between SCADA systems of the European TSOs.

However these documents are not candidates for documents for the common Nordic end user market, and will not be further discussed in this document.

2.1.3 ebIX®

To deal with the increased need for information exchange between different parties in the Nordic energy industry related to the deregulation of the energy markets, Ediel Nordic-Forum (ENF) was established in 1995. ENF created several Implementation Guides (IGs) describing data exchange for metered data, settlement, reconciliation, change of supplier, exchange of master data etc. that still are in use in the Nordic countries.

After some years, more European countries where interested in the work done within Ediel and, to disconnect the name from a Nordic context, ebIX® (European forum for energy Business Information eXchange ) took over the responsibilities for the Ediel standards in 2003 and ebIX® is still continuing this work. ebIX® has today members from Austria, Belgium, Denmark, Germany, Netherlands, Norway, Slovenia, Sweden and Switzerland.

ebIX® is cooperating with several other European and international organisations and have a Memorandum of Understating (MoU) or similar agreements with organisations such as ENTSO-E, Eurelectric and IEC.

As a consequence of the move from Ediel to ebIX® and to be able to harmonise and deal with Nordic data exchange questions, Nordic Ediel Group (NEG) was established in 2003 by the four Nordic TSOs. NEG is the responsible body for this document.
The name Ediel is also used by national Nordic organisations as a term for electronic data exchange in their respective energy markets, in the Nordic countries.

2.1.4 ENTSO-E

ENTSO-E (European Network Transmission System Operators for Electricity) has members from 41 TSOs from 34 countries. ENTSO-E is the successor of ETSO and has recently replaced 6 European TSO associations, including Nordel. ENTSO-E has important roles in the 3rd EU Energy legislative package.

ENTSO-E is among others developing and maintaining standards for data exchange for the European wholesale electricity market and are cooperating with ebIX®, among others through a common harmonisation group.

2.1.5 Relationship between ENTSO-E and ebIX

ebIX® and ENTSO-E have in a MoU agreed that ebIX® shall focus on the retail (downstream) market, such as metered data and change of supplier, while ENTSO-E shall focus on the wholesale (upstream) market, such as scheduling, capacities, bids to different markets and settlement. ebIX® and ENTSO-E have, together with European Federation for Energy Traders (EFET), made a harmonised role model that defines the roles exchanging information in the European energy market and the related domains.

2.1.6 National “Ediel Groups”

Today the Nordic countries have national groups that discuss and agree changes to the national data exchange standards.

In Norway, NEE (Norsk Ediel Ekspertgruppe) joins 6-8 times a year, with around 20 representatives from the actors and the software vendors, to discuss changes and improvements to the Norwegian standards. In addition smaller project groups are established when larger issues needs to be discussed.

In Sweden there is a similar organisation as in Norway except that it is split into two groups; one technical group (Ediel teknikgrupp (ETG)) and one process related group (Elmarknadsutveckling).

In Denmark the group ”Ekspertpanelet” takes care of the market issue having about 6 meeting per year.

In Finland the development of data exchange in retail market is co-ordinated by Finnish Energy Industries. There are two work groups of which another focuses on business and data exchange processes and the other one on more technical issues of data exchange. The process group consists of representatives of market actors and the technical group consists mainly of system providers and EDI operators. Both groups gather around 5-8 times annually.

2.2 Electronic document standards

When talking about electronic document standards it is important to be aware of the difference between syntax and semantics:

The syntax is a sort of “grammar” for the document in question, i.e. the syntax defines the technical rules for the document, such as delimiters between the data elements to be exchanged. There are basically two syntaxes to choose between for the Nordic electricity market; EDIFACT from UN/CEFACT and XML from w3c.

The semantics is the “language” of the document. The semantics defines the structure and the content of the document, such as the names of the data elements and its format.
2.2.1 EDIFACT
EDIFACT from UN/CEFACT combines syntax and semantics in the same framework. EDIFACT encompass a set of predefined business documents to be used in different business processes, such as order, order response and invoice. These EDIFACT messages are frameworks that must be tailored to the actual need by defining Implementation Guides (IGs) showing how to use them in the relevant context. The first EDIFACT message, invoice, was launched in 1989.

In the Nordic energy market the EDIFACT messages PRODAT and UTILMD (e.g. used for change of supplier), and MSCONS and UTILTS (e.g. used for time series) are heavily used. Implementation guides, defining how to use the messages in the Nordic countries have been developed by Ediel and ebIX®.

EDIFACT messages are still being maintained by UN/CEFACT, but XML based documents have, during the last few years, taken over as the leading syntax for electronic data exchange worldwide.

2.2.2 XML
XML from w3c is a syntax for electronic documents, which during the last decade has taken over as the leading data exchange syntax that EDIFACT had in the 1990s.

Since end of 1999 UN/CEFACT has been working with semantic standards for the usage of XML syntax, such as:

- **CCTS, Core Components Technical Specification**, which encompass a set of rules for naming, format and structure for the basic building blocks of electronic documents (entities).
- Based on the CCTS, UN/CEFACT has made a **Core Component Library (CCL)** that defines a set of entities to be used in data exchanges. CCL is defined in a way that the CCs (entities) can be used by all kind if industries. Examples of CCs are Name, Address and Location, and the relation between them.
- **NDR, UN/CEFACT XML Naming and Design Rules**, defines a set of rules for how to use the CCs in a business document.

2.2.3 Implementation standards

2.2.3.1 ebIX®
Ediel and ebIX® have made a set of Implementation Guides (IGs) for the usage of EDIFACT messages in the Nordic energy market. IGs have been made for all common usages of data exchange, such as change of supplier, master data, metered data, schedules, settlement, reconciliation and trade on the power exchange (Nord Pool Spot) etc. These IGs are today partly maintained by NEG and partly by ebIX®.

However, the main work within ebIX® has been the development of a common process and information model for the retail European energy market; structuring (change of supplier, master data etc.) and metered data, and related XML documents.

The ebIX® model and related XML documents are made according to UMM (see 2.2.2), CCTS and NDR (see 2.2.2).

2.2.3.2 ENTSO-E
ENTSO-E has developed a set of IGs for the wholesale European electricity market. These IGs cover among others the following processes:

- Scheduling System (ESS)
- Settlement Process (ESP)
- Reserve Resource Planning (ERRP)
- Capacity Allocation and Nomination (ECAN)
In addition related supporting documents have been developed for areas like publishing, status requests and acknowledgments.

The ENTSO-E documents have only been developed for the XML syntax and the semantics of the ENTSO-E documents must be recognised as a proprietary standard, only used in the European wholesale electricity market.

The different IGs are neither based on a common process model. However, the NEG project for Nordic (TSO) Energy Market Model for data exchange (NEMM) are currently making UMM (see 2.3) requirements views for the Nordic usage of the ENTSO-E IGs. The NEMM project has also sent (and continues to send) change requests to ENTSO-E, to make the ENTSO-E IGs compatible with the Nordic wholesale electricity market rules.

### 2.3 Modelling standards

The exchange of information within a common Nordic end user market regards a large number of participants in many-to-many relationships. To make sure that the electronic data exchange standards are efficient and coherent the use of a common business information model can be useful. Such a model is important for having a common and agreed understanding on how the exchange of data in the Nordic energy market works.

UMM (UN/CEFACT Modelling Methodology) is the only international modelling standard that combines business process modelling with an international data exchange standard. UMM is a profile for UML (Unified Modelling Language), i.e. restricted UML rules for modelling of processes and information to be used for data exchange processes.

The only body within the European energy market that today uses a UMM model as basis for the business documents is ebIX®.

One of the advantages of using UMM is that the model created is independent of the syntax to be used for the actual data exchanges. In other words; an UMM business process model may be used to generate both EDIFACT and XML documents.

### 2.4 Communication platforms

The term communication platform is used for the means by which the electronic documents are exchanged, e.g. e-mail systems, such as SMTP or file transfer, such as FTP.

#### 2.4.1 SMTP

SMTP is the most used e-mail protocol in the world, defined by w3c. SMTP is today used as the main transport platform for data exchange in the Nordic countries, except for Finland where the main transfer protocol is FTP. In Finland EDI-messages are sent as text files that are carried from market actor via message operator to other market actor by FTP-transfer. Note however that also for Denmark, Norway and Sweden there are some national flavours that make it impossible to do cross border exchange of electronic documents without doing modifications to the mail-systems.

Note also that the main reason for difficulties in cross boarder data exchange is different business processes in different countries, not the communication protocol.

SMTP is widely used for exchange of electronic documents in a many-to-many relationship.
Standards for Electronic Data Interchange (EDI) in a common Nordic retail market

2.4.2 Web services
Web services are software components that often communicate using the open protocol HTTP from w3c. The HTTP protocol is the most used Internet protocol (used when you surf on the Internet). The normal way of exchanging information with Web services is by packing the information in XML syntax.

Web services are currently used by the Norwegian NUBIX platform and in the Danish wholesale market, and will be used as platform for the new Danish data hub.

Web services are a preferred platform in one-to-many or few-to-many relationships, e.g. when the communication is going through a data hub.

Note that there are many ways of implementing Web services and further investigations are needed if Web services shall be the common communication platform.

2.4.3 ECP
ENTSO-E Communication Protocol is a specification and a software tool developed and maintained by ENTSO-E. The primary goal of ECP is to establish a decentralised common communication platform based on international standard protocols to accelerate the use of the ENTSO-E standards in Europe and to provide a number of services as directory services and storage solution for off-line connections.

The communication platform, which will be a software package every market actor can install, should solve the data interchange issues with the large and the medium market actors (DSOs, Balance responsible etc.). For other actors a smaller, and less expensive, but also secure and reliable system is planned.

If ECP is an alternative as a communication platform for the Nordic energy market must be further investigated.
Standards for Electronic Data Interchange (EDI) in a common Nordic retail market

3 USAGE OF TECHNICAL STANDARDS IN THE NORDIC RETAIL MARKET

3.1 Denmark

3.1.1 Electronic document standards
In the retail electricity market (change of supplier, metered data etc.), Denmark is currently using national implementations based on the ebIX® EDIFACT IGs for UTILMD and MSCONS.

3.1.2 Communication platform
Denmark is currently exchanging documents based on traditional e-mail, SMTP from w3c in the retail electricity market.

3.1.3 On-going developments
Denmark is currently developing a Danish data hub that will be the hub for all data exchange between the Danish actors in the retail electricity market. When the Danish data hub goes on the air, the actors may choose between Danish customised XML schemas or EDIFACT documents, both based on the ebIX® model. EDIFACT documents are offered of political reasons and will only be available for a limited migration period. The communication platform will be based on Web Services (WS).

3.2 Finland

3.2.1 Electronic document standards
In the retail electricity market (change of supplier, metered data etc.), Finland is currently using national implementations based on the Ediel EDIFACT IGs for PRODAT and MSCONS.

3.2.2 Communication platform
Finland is currently exchanging documents based on File Transfer Protocol. Market players mainly use a message routing operator, so messages are not usually sent directly between players via public network.

In addition there is an online service for suppliers to search metering point identification numbers. The service can be used with internet browser or through a web service interface.

3.2.3 On-going developments
Finland will implement hourly based metering by 2014. Meter readings will be transferred daily from DSOs to suppliers and balance responsible parties by Ediel MSCONS-messages.

3.3 Norway

3.3.1 Electronic document standards
In the retail electricity market (change of supplier, metered data etc.), Norway is currently using national implementations based on the Ediel (PRODAT and MSCONS) and ebIX® (UTILTS) EDIFACT IGs.

3.3.2 Communication platform
Norway is currently exchanging documents based on traditional e-mail (SMTP) from w3c.

In addition Norway has developed the NUBIX platform, which is a Web Services based data hub for routeing of pre-switch information (Metering point information).
Standards for Electronic Data Interchange (EDI) in a common Nordic retail market

3.3.3 On-going developments
Norway will implement AMR from 2015 (central part of Norway) and 1016 (full implementation).

3.4 Sweden

3.4.1 Electronic document standards
In the retail electricity market (change of supplier, metered data etc.), Sweden is currently using national implementations based on the Ediel (PRODAT) and ebIX® (UTILTS) EDIFACT IGs.

3.4.2 Communication platform
Sweden is currently exchanging documents based on traditional e-mail (SMTP) from w3c.

In addition Sweden has developed the EMIX platform, which is used as a data hub for routing and verification of EDIFACT documents. EMIX is only used by a part of the Swedish actors.

3.5 Conclusions

3.5.1 Electronic document standards
All the four Nordic countries; Denmark, Finland, Norway and Sweden are today using electronic documents based on the same framework, defined by Ediel and its successor ebIX®. All countries base today’s data exchange on EDIFACT documents defined by UN/CEFACT.

However all countries have adapted the documents to fit their national rules and legislation. In addition the different countries have implemented and upgraded the electronic data exchange standards at different times, for instance resulting in different document types for the same purpose. For instance is Norway still using the EDIFACT message MSCONS for some of the metered data exchange in the retail market, while Sweden has migrated to the newer EDIFACT message UTILTS for all metered data.

In 2012, when the Danish data hub goes on the air, also XML documents, based on the ebIX® process and data model will be used in the retail market.

In the wholesale electricity market the status today is more diverse, i.e. in addition to messages based on the framework defined by Ediel and its successor ebIX®, also XML documents based on the ENTSO-E IGs are in used, for instance in Denmark. Also in the wholesale electricity market all the four countries have adapted the documents to fit their national rules and legislation, in addition to implementations and upgrades at different times.

3.5.2 Communication platform
Today Denmark, Norway and Sweden are using SMTP as communication platform, while FTP is the main transfer protocol for Ediel messages in Finland.

In addition Norway is using Web Services for the NUBIX platform and Denmark is using Web Services for the wholesale market, and will migrate to Web Services also for the retail market when releasing the data hub.

In Finland FTP is the main communication platform for all message based data exchange in retail electricity market.
4 RECOMMENDATIONS

4.1 Electronic document standards
The only available standard for the retail energy market, which can be implemented with only smaller adaptations to new common Nordic market rules, is the one from ebIX®.

There are however other possibilities, such as making a new Nordic standard based on the same principles as the ENTSO-E IGs, or UBL (Universal Business Language) that is the basis for electronic invoices to the Danish, Norwegian and Swedish governments. However, such alternatives are not recommended, since it will be far more work to adapt these standards to the Nordic energy markets needs and in addition this will become a proprietary Nordic solution. We are not aware of any advantages with such a solution.

When it comes to the syntax to be used both EDIFACT and XML are possible. However the general impression is that most standardisation organisations tend to migrate to XML. XML is more widely used, XML-parsers (software to verify and convert electronic documents) are cheaper and gives direct cost reduction for the actors, and more software vendors uses XML as internal data format. In addition the recommended standard for the wholesale electricity market is the ENTSO-E IGs that only are available in XML syntax.

All actors in the Nordic energy market must change the way they exchange electronic document when migrating to a common Nordic end user market. This means that this is a good timing for a migration to XML.

4.1.1 Upstream electricity market
Also in the wholesale electricity market there is only one available standard, which can be implemented with only smaller adaptations to new common Nordic market rules, i.e. the one from ENTSO-E.

Also for the wholesale electricity market there are the same possibilities to make a new Nordic standard based other standards, such as ebIX® or UBL, but also here such alternatives are not recommended, of the same reasons as for the retail energy market.

When it comes to the syntax to be used, the only possible syntax is XML for the ENTSO-E alternative.

4.1.2 Recommendation
NEG recommends using ebIX® XML documents for the Nordic retail energy market and ENTSO-E XML documents for the Nordic wholesale electricity market

4.2 Communication platform
Today Denmark, Norway and Sweden are using SMTP as communication platform, while FTP is the main transfer protocol for Ediel messages in Finland.

In addition Denmark is implementing a data hub where and Norway is using the NUBIX platform where Web Services is used as the communication platform.

4.2.1 Recommendation
NEG recommends continuing the use of SMTP for those processes where this is used in a many-to-many exchange of documents.

For countries implementing a data hub, such as Denmark, Web Services are the recommended platform.

It must however be further investigated how to solve the interaction between countries using different communication platforms, i.e. SMTP, FTP and Web services.
In a well-functioning Nordic market all the shared processes (business processes and data exchange) must be congruent. There cannot be major differences in the data exchange models between the countries.

Every actor should be able to operate in the common market with just one information system. If there are different processes in different countries this objective would not be achieved. Hence, the most important matter is to harmonize the business processes. Meaning that, between the Nordic countries, the same information should be exchanged in the same processes (e.g. change of supplier).

4.3 Modelling standards
It is recommended to make a common Nordic model based on the UN/CEFACT Modelling Methodology for the retail energy market. This model should be based on the ebIX® model that already is available.

For the wholesale energy market it is impossible to make a complete UMM model, since the ENTSO-E IGs not are compatible with UMM. However the NEMM project should continue making the UMM requirements views for the Nordic usage of the ENTSO-E IGs

4.4 Migration and maintenance
Since we must expect that all the actors in Nordic energy market will have to do pretty large modifications to their software systems when migrating to new common Nordic rules and legislations, the recommendation is to do a complete change of data exchange standards at a given date.

It is important that a common test facility is established in due time (at least 1/2 year) before the migration date. This test facility should be a permanent facility that can certify actors, both for the first time they enter the Nordic energy market and later on when the rules, legislation or data exchange standards are updated. It must be further investigated if this test facility should be based on the Norwegian/Swedish test facility, the new test facility that is implemented related to the new Danish data hub or something else.

Also a Nordic maintenance organisation is needed, but how to organise such a body must be further investigated. Today the Nordic countries have national groups that discuss and agree changes. How to organise the interface between the national groups and a common Nordic group needs investigation. It is however pretty clear that there should be one common Nordic group, which is responsible for the technical documentation.

4.5 Items to be aware of
4.5.1 ebIX® and ENTSO-E Interface
It should be noted that the recommendation to use ebIX® XML documents for the retail electricity market and ENTSO-E XML for the wholesale electricity market will imply that the Nordic energy market will use two standards having different semantics.

There are grey zones on the border between the wholesale and the retail energy markets. It is for instance not clear which organisation (ebIX® or ENTSO-E) that is responsible for aggregated data used for settlement. This will have to be clarified during specification of the Nordic data exchange standard.

The ambition should be a solution where the main actors in the retail market, such as DSOs and Balance Suppliers only need to handle ebIX® messages. Then most companies will only need to have solutions covering one message standard. This means that we will need to investigate when DSOs and TSOs are exchanging messages, i.e. when the TSO has exactly that role and no other role covered by flows described by ebIX®. For the DSO-TSO-flow we would then need to make a Nordic extension to ebIX® and not use the corresponding (maybe not yet described) messages from ENTSO-E.
4.5.2 Customisation of the chosen standards
The recommended standards will have to be adapted or customised to fit the needs for the Nordic energy market. This includes change requests to the relevant bodies (ebIX® and ENTSO-E) that will have to be handled as far as possible within the time limits available. It is with other words essential to have as much time as possible to agree the new Nordic standards, which have to be done after, or maybe partly in parallel with, the harmonisation of the Nordic rules and legislation. Harmonisation and changes to international standards is a time consuming task.

4.5.3 Identification schemes
A prerequisite for a well-functioning data exchange system is having common identification schemes, which is reliable and uniquely identifies the entity. Among others the following items are important for an identification scheme:

- Identification numbers should not have any other meaning than the unique identification. All semantics (characteristics) should be stored as attributes to the object being identified.
- Identification numbers should not need renumbering when companies merge or split.
- Identification numbers may have a check digit to avoid typing errors.

The four Nordic countries are all using GS1 GSRN identification scheme for the consumption- and production Metering Points. Denmark and Norway are using GS1 GLN identification scheme for identification of parties. For other entities, such as Metering grid areas, Market balance areas, Station groups, Products; several national identification schemes are used. These must be harmonised.

The recommended identification schemes are ETSO Identification Code (EIC) and the GS1 coding schemes. These identification schemes have a format that makes them suitable for general electronic data interchange.