TEMPLATE AND GUIDELINES FOR THE PREPARATION OF THE FINAL PAPER

Dr Peter Bauhofer
A&B Austria
Peter.bauhofer@aundb.at

INTERNATIONAL TRENDS IN METERED DATA EXCHANGE AND PRACTICAL EXPERIENCE

ABSTRACT

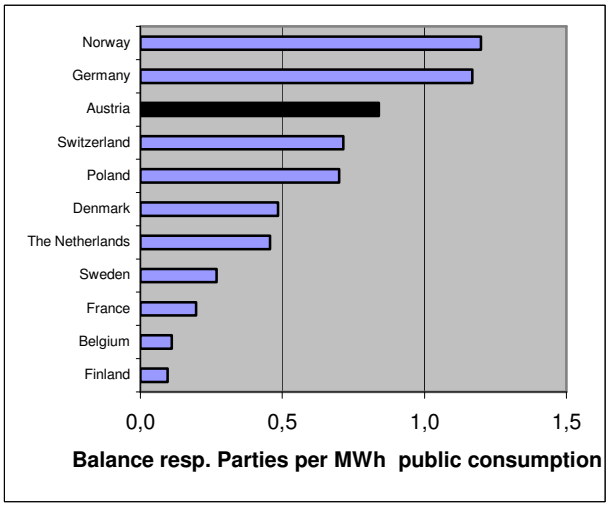
Harmonised rules of metered data exchange are one of the basic preconditions for the creation of a pan European electricity market. International organisations like ETSO, ebIX and EURELECTRIC have developed a set of strategically important key documents that will harmonise core processes and data contents for data exchange and customer switching meeting ERGEG's intention to create market rules on best practice conditions. This article gives brief overview how modelling works, which projects are relevant and which results are ready for use.

CHANGES

Presently, the energy market is going through a change process in most of the European countries. These changes include new legislation and a deregulation of the market. Earlier the participants in the market were in a monopoly situation. Today the participant companies are being split into different companies fulfilling different roles, such as Metering point administrator, Balance supplier, Balance responsible party, etc. Further more these new companies are being merged into larger companies, often as international companies with subsidiaries in different countries. The reasons for the deregulation process are, among others, to make the energy companies more efficient by having a free market competition where the market will decide prices, products etc. The change in the market structure and the new legislation has increased the need for electronic business tremendously (e.g. today the exchange of electronic documents in the upstream energy market in Sweden is about 40 million documents a year). This includes both, transaction data, such as time series with production and consumption figures between the different parties, and master data. The exchange of information will concern a large amount of participants in many to many relationships. The number of parties which exchange information in the upstream energy market is today from a few hundred companies in the smaller countries up to more than thousands companies in the larger countries (Germany or Switzerland for instance have approx 900 Grid operators each, Austria not less than 120).

Since 2001 Austria has become an international market place. Meanwhile approx. 50 Balance responsible parties acceded our market while approx. 70 % of these parties are from abroad. Related to the 55 TWh early public consumption Austria faces one of the highest densities of Balance groups European wide (Fig. 1) . Therefore it has always been of major interest, that Austria's market system is compatible with international needs and the internal development of advanced data processes has been as important as the forced introduction of international market tools such as the ETSO-scheduling system (ESS) or ETSO identification scheme (EIC) for balance groups.

Fig. 1: Market Density



MODELLING DATA EXCHANGE

A deregulated European energy market consists of several different business process areas operated by a number of parties with different roles. Each of these business process areas has their own business experts with an in-depth knowledge of the business process within their area. Making common electronic data exchange standards for these different business process areas, involving different business experts, requires a common methodology to assure that standards are made in a harmonised way. The objective of ETSO, ebIX and to a certain extent EURELECTRIC is to model precisely these different business process areas and to define appropriate electronic data interchange standards for the different business process areas. Accordingly, this has led to the development of a methodology, which defines

the rules for how to make business information models and related technical documents for specification of the exchange of electronic documents.
The objective is to define and describe a methodology for running modelling projects and to produce standardized business information models for a defined business process area, or part of a business process area, within the energy market. The aim is to enable the project groups in national and international organizations, vendors or IT-experts of the electricity branch, with different participants and different business experience, to produce harmonised descriptions for the implementation of information exchanges. Having a common methodology as the basis for the projects will make it possible to implement different business process areas in a harmonised way.

The central tool of the methodology is the **UN/CEFACT Modelling Methodology (UMM).** The description of UMM in ETSO/ebIX-papers is meant as an introduction to UMM for business experts from the energy market, participating in IT projects, without a profound knowledge of UMM. Note that these descriptions are not a complete description of UMM and it is expected that business modellers with a deeper foundation in UMM will be responsible for the layout of the business information models. Core elements of UML modelling are

- use case diagrams
- sequence diagrams
- activity diagrams and
- class diagrams

Tab. 1: Syntaxes Used for Metered Data Exchange

	EAR-XML	internal XML	EDIFACT/ MSCONS	EDIFACT/ UTILTS	X400/ SMTP
Austria			■		
Belgium				■	
Denmark			■		
Finland					
France	■				
Germany			■		
Netherlands				■	
Norway					■
Poland		■			
Spain					
Sweden			■		
Switzerland			■		
Sum	**1**	**1**	**6**	**2**	**1**
percentage	9%	9%	55%	18%	9%

ETSO1 and ebIX consider it important, that all data models may be compatible for national needs. This is guaranteed by the modularity of modelling and a neutral common role model. To get international acceptance of models you have to meet the following basic conditions:

- make the model open for specific national needs
- avoid costs when introducing a model
- keep the things as simple as possible
- a common syntax is no religion

In case of well harmonized processes and data contents data sets should be converted easily from one syntax to another. However, forcing companies to a common syntax (Tab. 1) will produce enormous costs for the market and the model will not be accepted.

A Common Role Model

The European electricity and also natural gas branch is organised in a different way. Different ways of interpreting EU unbundling rules and different degrees of realisation of national an international legislation make the structured modelling of energy data exchange a challenge. The definition of a common role model is a generic need for modelling. The role model reduces all processes of companies to "process-owners" that are defined on a neutral basis.

As the role model tries to cover all needed roles European wide it includes a vast number of roles. However, a single country in particular at the beginning of market liberalisation may only use a small part of the parties and roles that are described and some 10 elements may be enough. For better understanding it is important to know that parties always imply legal persons (e.g. grid operators, TSO's, suppliers, imbalance settlement responsible parties, …) that may operate a more or less great number of roles (meter reading, imbalance settlement, data collecting, billing, …) depending on the business case of each company and the national legislation. This role model originally was developed by ETSO in particular for the ETSO Scheduling System (ESS) as well as at ebIX in particular for metered data exchange approx. five years ago. Meanwhile these two role models are harmonised.

It is intended to make this role model to an IEC standard.

UseCase

In a UseCase stylized descriptions of the working fields in the sector are presented. This is done in a hierarchy of linked UseCases. Each working field specifies the roles active in this field.

1 Remark: As ETSO covers TSO needs, implementation guidelines are specified for XML only.

Sequence diagrams

The next step is to define the information exchange relations in the lower level UseCase diagrams. In this step we have to define the business documents to be exchanged between roles. The business documents and roles are only identified, but not specified.

Activity diagram

The next step is to describe how the roles act in the sequence diagram. Naturally, the description of the activities shall be limited to the handling of the information exchange, since the main objective of standardising the interface between parties or roles is not to interfere with the processes "inside the party".

Class diagram

The last step in modelling according to the present methodology is the specification of the class diagram for each business document exchanged in the sequence diagrams. In more familiar terms this means a data model for each business document type exchanged. Looking at the new **German DUM-guideline** or the drafts for **SWISS VSE-Codes** as a preparation for SWISS's market liberalisation one may get first impressions how useful these modelling tools are also for electricity branches purposes. EbIX, ETSO and EURELECTRIC have developed strategic papers and data models for

- metered data exchange,
- imbalance settlement/reconciliation and
- customer switching

as core processes of a liberalised electricity world. Most of the papers are already finalised and some of them are going to be finished. All in all the papers mentioned above meanwhile contain some hundreds of pages. By the example of the imbalance settlement mechanism the principle of process definition should be described in the following. For more details please have a look at the web-sites mentioned in the references.

IMBALANCE SETTLEMENT

System stability is the basis of every energy exchange within a connected grid, either electricity or natural gas. Has it been a complex process to keep up system stability in a monopolistic system the more it is complex to keep it up in a liberalised one, were everybody should be able to make his energy business by physical transfers at least all over Europe.

For system monitoring and out of commercial reasons imbalance settlement is a core business of a balance group system. An imbalance responsible party moreover is a central counterpart for data flows generated by a vast majority of market participants in particular by distribution grid operators. Any malfunction of data transfer causes data errors and in the end great commercial damage. Therefore accurately defined data processes and data contents are the core elements to run the business at all.

The liberalized system has caused an "explosion" of data transfer between the roles involved. Well defined processes and data contents are the life belts of a liberalized market as it should be able at least theoretically that a producer in the northern part of Europe may supply a customer in the southern part at the same transparent, objective and non discriminatory conditions like everywhere in Europe. While bookkeeping and money transaction is the basis of money business, imbalance settlement and energy transmission is the daily life in energy business. This sort of energy accounting has to be done for every balance group as the smallest process unit and on a higher aggregation level for control areas and control blocks. To enable electricity market liberalization, meanwhile the balance group system has been successfully introduced in almost all European countries. Austria and Germany also use it for their natural gas system. In the case of electricity, frequency is the main stability indicator, gas pressure does it for natural gas supply. To keep up system stability control blocks and control areas had been defined and organized within the several interconnected energy systems such as UCTE, NORDEL, etc. . If you want to keep frequency stable you need a well- defined energy exchange between the systems at any time. In the balance group system energy suppliers have to gather their customers and producers (respectively the metering points) within a fictive energy account called balance group as a market role that is organized by a party called balance responsible party. The tool to fulfill this conditio sine qua non is the (power) schedule, currently sent in XML-format on the basis of ESS definition. It is used in almost all European countries. The simultaneous sum of all schedules2 shall be used to find the setpoint of load frequency control of every control area.

As nominative schedules have to be sent one day before action latest it always is a prognosis. A prognosis of energy production or consumption is always incorrect, so the setpoint for load frequency control mainly defined by the schedules departs from physical reality. This failure would cause system imbalances (energy deficit or surplus) and in the end frequency deviation. In the UCTE system and in a similar way in the NORDEL system load frequency control causes power plants (pump storage power plants, fast gas turbines, steam power plants, …) to compensate this system deviation.

Finally, this system deviation, which is usually less than 1 to 1,5 % of the system load, is caused by the simultaneous imbalances of each balance group that may compensate each other to a certain extent. However, balancing the system costs a lot of money that should be paid by the

2 Remark: TSO-TSO-schedules

balance responsible parties that cause this deviation. It is the core business of an imbalance settlement responsible party to calculate for every balance group for every (!) balancing period (usually 15 minutes) the imbalance energy for this balance group using an energy account (see also Table 2) and calculate the invoice figures for imbalance energy that are sent to the role "billing agent".

Tab. 2: Energy account of a balance group

Direction/Energy	Import	Export
Schedules	Buy	Sell
Metered Values	Production	Consumption
Imbalance	**Sum 1**	**Sum 2**

Ideally, both columns should result in a balanced energy account, meaning sum 1 is equal to sum 2 . In reality it does not. The difference between sum 1 and sum 2 is called imbalance energy. The raw material to calculate imbalance energy are schedules and aggregated metered data at balance group level. Metered data aggregation is based on a chain of data processes starting at meter reading, aggregation per balance group by the grid operator and ending at the aggregation over all grid operators per balance group by the imbalance settlement responsible party for every balancing period for supply and production.
ETSO and ebIX succeeded in defining all relevant data processes and data contents. Facing the high complexity of these processes every main and subprocess contents a security system for quality management that was previously developed and successfully applied within the ESS-Scheduling process:
Step 1: Data generator sends data
Step 2: Receiver acknowledges data
Step 3: In case of anomalies the receiver generates an anomaly report.

Austria has preliminary introduced these well working quality tools in a slightly different manner in 2002 as it was a preliminary self-development.

Except Italy and in future some Scandinavian countries the vast majority of European energy systems use load profile meters only for high energy customers or producers. In case of mass customers (households, small industry, …) standardized load profiles are used. If you use load profiles you're able to calculate a balance group's imbalance at a more or less accurate level after meter reading. In Austria this is done after 14 month.
The repetition of imbalance settlement on the basis of finalized data sets is called reconciliation. This process in principle is quite the same as imbalance settlement. As imbalance settlement and reconciliation cause billing processes, ebIX is also developing billing models for that certain case.

EXPERIENCE AND SUMMARY

As our daily experience shows, ETSO and ebIX models are complementing each other. While ETSO focuses on TSO needs ebIX mainly focuses on distribution grid operators' needs up to the data input for imbalance settlement. The imbalance settlement process itself is left to national rules. Customer switching processes and data contents are well defined in EURELECTRIC and ebIX papers. A number of experts join both, EURELECTRIC and ebIX working groups. Hence, it may be assumed, that the main results of these organisations to identical topics should coincide. However, it should be aimed for, that future strategic orientation of projects will be synchronised from the very beginning of work. This should also be guaranteed by a number of memorandums of understanding that were exchanged between these organisations in 2006.
The ETSO-ebIX role model takes into account a vast spectrum of all possible market roles used in the European electricity industry. Together with the modularity of the data models it guarantees a successful use within the common European electricity market system. It is important to know that these data models are no theoretical work but a specified, harmonised and optimised, well structured description of the state of the art. Experts, that put in their experience out of daily work have created it.

As the Austrian market system and regulatory mechansism has been well working since 2001 our market rules and process definitions have reached an advanced status. Austria was one of the first European countries that solved the reconciliation and quality management problem successfully. So it was a great pleasure for us to give some essential practical input to ETSO-, ebIX- and Eurelectric-modelling with particular respect to customer switching -, imbalance settlement/reconciliation processes and .the data quality management needed.

As it was already successfully done with creating a common scheduling system (ESS) and coding scheme (EIC) for balance groups the electricity branch will also be able to introduce a well working data model for all basic data (metered) exchanges needed for a common market in the near future. Facing ERGEG's activities on creating European wide harmonised market rules via guidelines on good practice, it may be suggested that regulators should not invent new process definitions but make these models to international market rules.

REFERENCES

www.ebix.org
www.edi.etso-net.org
UN/CEFACT Unified Modelling Methodology, see http://www.untmg.org/
UN/CEFACT Core Component Technical Specification, see http://www.untmg.org/