TRANSFORMATIONAL PERSPECTIVE

DATA AS CRITICAL ASSET FOR THE ENERGY TRANSITION

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The Union of the Electricity Industry – EURELECTRIC – is the sector association representing the common interests of the electricity industry at pan-European level. Our work covers all major issues affecting our sector, from electricity generation and markets, to distribution networks, customers, as well as environment and sustainability issues. Our current members represent the electricity industry in over 30 European countries, including all EU Member States. We also have affiliates and associates on several other continents.

Our structure of expertise ensures that input to our policy positions, statements and in-depth reports comes from several hundred active experts working for power generators, supply companies and distribution system operators.

We have a permanent Secretariat based in Brussels that is responsible for the overall organisation and coordination of EURELECTRIC’s activities.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

- **ECONOMIC DEVELOPMENT**
  > GROWTH, ADDED-VALUE, EFFICIENCY

- **ENVIRONMENTAL LEADERSHIP**
  > COMMITMENT, INNOVATION, PRO-ACTIVENESS

- **SOCIAL RESPONSIBILITY**
  > TRANSPARENCY, ETHICS, ACCOUNTABILITY

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With the increase of decentralised generation across Europe, DSOs are moving away from their traditional role of passive network operators towards active system managers. New technologies are emerging, the relation between DSOs and TSOs has changed and the current regulatory framework is rather fragmented. Given the changes that the sector is facing, DSOs are transitioning from a traditional role of “building and connecting” to a new “connecting and managing” business model.

DSOs have often been labelled as “neutral market facilitators”, but they are also managers of smart networks responsible for handling large amounts of meters and grid data. They therefore play a pivotal role in empowering the customers by contributing to the creation of new services in a timely, cost efficient and reliable manner.

Proper data handling and data management models are needed to support the future energy market design. However, we question the feasibility of the European Commission’s proposal to develop a common data format at European level. We believe that proposing a common data format model at this stage will not trigger better cross border harmonisation. Also, many Member States have already made significant investment and development into future national data management models and it would prove very costly to introduce a new data format after the implementation of a national one.

1 By ‘customers’ we mean all network customers who have a contractual relationship with the distribution grid operator – whether producers, retailers, aggregators, energy service companies connected to the distribution network, end-consumers (connection contracts), or prosumers (those who both produce and consume electricity).
CASE IN POINT 1

UNITED KINGDOM (SCOTTISH POWER ENERGY NETWORKS)
ARC PROJECT

DESCRIPTION

Accelerating Renewable Connections (ARC) was an initiative implemented in 2013 by SP Energy Network to continue the growth in new green energy projects connecting to the local distribution power network earlier by working with local communities and electricity consumers.

The fundamental challenge was that traditional network planning methodologies were being undertaken with limited or no real time network visibility, that led to overly conservative network planning assumptions with respect to true network capacity. For example, the use of traditional network solutions resulted in delays in time to connect, expensive connection costs, challenges in managing the connection application process and satisfying licence obligations against a significant volume of applications, while ensuring that all users of the system were provided with access to a secure, safe and reliable distribution network.

ARC assisted 13 renewable connections projects including community groups to develop ways of using locally produced energy, allowing generators to produce more and helping all parties benefit from reduced costs. It also facilitated a greater penetration of distributed generation (DG) accessing the network ahead or in some cases negating the requirement for network reinforcement. The project has to date accelerated over 100 MW of new renewable generation to connect at a more efficient cost and in a timeframe much quicker that what would have been achieved by waiting on completion of major network reinforcements. The techniques used to facilitate more economic and quicker connections was; application of both wide-area and standalone Active Network Management Schemes, managing both thermal and voltage constraints; use of Virtual Private Wire etc. Smart grid, real time data was the foundation used throughout the project which had a capital investment of around £8m.

Figure 1: Innovation elements – Top-Down Active Network Management
**BENEFITS**

1. Acceleration of connection of approximately 100 MW of distributed generation (DG) with a total of 150 MW of DG currently managed today.
2. Reduction of aborted connections with nearly 100% of connection applicants realising a connection to the distribution network from a conventional position of only 10%.
3. Deferred or mitigated the cost of connection for customers by £33 million.
4. Paved the way for future DG customers to be managed against local and wider transmission constraints.
5. Implementation and delivery of new commercial mechanisms to support rollout of managed connections.
6. Facilitated around £283 million of customer investment in renewable generation projects, which are directly responsible for the creation of in excess of 55 full-time jobs.
7. Facilitated the connection of Europe’s largest Community Owned Wind Farm, the 7.5 MW Hoprigshiels Wind Farm development, that will support the building of 500 new socially rented new homes based upon the income from the site over its lifetime.

**NEXT STEPS**

The techniques developed by the ARC project are now being applied across the SP Energy Networks electricity network as well as being deployed throughout the wider UK network.

More information:

www.spenergynetworks.co.uk
CASE IN POINT 2

NETHERLANDS (ALLIANDER)
OPEN DATA FORMULA

DESCRIPTION

The “Open data” formula, which consists in publishing smart meters and grid data on a website, helps Alliander to be transparent about the data collected, to stimulate innovation and obtain feedback on inaccuracies in the data (consumption, outages and other smart meter data). Such data can also be useful for other parties.

The ‘open data’ approach encourages the development of innovative applications, in combination with the smart meter. Reliable metering data that cannot be traced back to individuals is made publicly available to help market parties devise smart energy solutions.

Figure 2: Energy overview – CO2 emissions from electricity and gas.

This picture shows how the amounts of CO2 emissions produced in specific areas of a particular municipality in the Netherlands. This information helps municipalities to monitor the effects of the emissions in the environment and take appropriate action in line with their climate policies. The legend to the right shows the various CO2 Energy Kg bands (with the darkest showing the highest values, light grey - lack of data, dark grey - unavailable information).

On the left side the user can filter the data according to its nature: consumption, production data, CO2 emissions produced and location (province, municipality, neighborhood or zip code).
BENEFITS

1. Other stakeholders: Research institutions use data and municipalities to get a better understanding of the opportunities for sustainability policies in a specific area.
2. The initiative triggered the inclusion of open data in the energy covenant between the government and the industry.
3. Alliander receives feedback from market participants on its data and learns what information is relevant to customer.
4. Enhancement of the National Energy atlas (platform run by the municipality of Amsterdam where a great deal of energy related information is being visualised in maps).

NEXT STEPS

The information developed by this tool is now increasingly used by other public stakeholders. Together with expert parties such as Delft University of Technology and Wageningen University, Alliander is continuing to refine the open data approach, an initiative that is attracting global interest.

More information:
www.energieinbeeld.nl
Enedis’s ambition is to be a key player for Open Data development and the energy transition at the local and European levels. The “Open Data” project has already published 22 data sets (smart grid and smart meter data) around the following key issues: consumption and generation, supply quality, electricity balance, electrical losses, flexibility, new consumers, producers’ data and profiles.

Enedis is using a SaaS solution (Software as a Service) and buys other services such as development of data visualisations. The global cost of the project is €2.5 mln over 5 years.

The main users are:
1. Market players who forecast the consumption of their consumers and the generation of their plants;
2. Local authorities who are key actors of the energy policy;
3. Regional observatories who establish reports;
4. Startups innovating in the field of energy and develop services based on data analysis.

Figure 3: Overview of different energy sources connected to distribution grid.

This figure provides an overview of the different energy sources (in MW) connected to distribution grids operated by Enedis over the last few years, and highlights its proactive role in supporting the development of renewable energy sources.

It shows that wind is the primary energy source connected to the Enedis distribution grid, representing more than 11,000 MW in 2017. Solar panels are the second energy source with almost 6,000 MW. Both wind and solar energy have been increasing constantly since 2012.
BENEFITS

1. Better understanding of consumption and production units connected to the network at different scales (regions, city, street...).
3. Easy access to different sets of data via a mobile application (production, consumption...).
4. Improvement of data exchange interfaces with our customers and partners.

NEXT STEPS

• Enlarging the sets of data published.
• Publishing real time data sets in the future.
The aim of the Data Discovery project is to apply a powerful analytic toolset to the advanced metering system data and additional data sources such as data with GIS and customer information. By using this toolset, NRGi has explored opportunities and ideas to leverage smart meter data beyond their standard use. Smart meter internal measurements and events are used to detect and resolve anomalies in the low voltage distribution grid.

**Figure 4:** One year load profile at a transformer connected to 600 metres.

The image at the top of Figure 4 provides a summary of the distribution nodes in KW over a given timeframe. The bottom image shows the average load per day, with the red line mapping the average load over such period.
**BENEFITS**

1. *Cost efficiency improvements and costs reduction.*
2. *Validation and correction of the grid topology.*
3. *Ability to aggregate meter load in order to compute the load of unmetered transformers.*
4. *Extent of reverse power flow on specific transformers during the summer months.*

**NEXT STEPS**

The information can assist DSOs more generally to maintain safe and reliable grid operation. As of December 2016, NRGI has decided to implement Siemens EnergyIP applications tailored towards specific use cases such as equipment load management, load forecasting and revenue protection.

More information:

- [www.nrgi.dk](http://www.nrgi.dk)
- plb@nrgi.dk
CASE IN POINT 5

FINLAND (CARUNA)

NETWORK CALCULATION IMPROVEMENT

Caruna improved their network calculation by utilising Advanced Meter Reading (AMR) hourly measurements and by presenting solutions that can be applied with the current load flow calculation routines. The smart meter data was the same as data used for customer billing, therefore no additional costs were incurred.

The network calculation was improved on several different levels. The effect of temperature on electricity consumption was studied, and models to simulate electricity consumption on different temperatures were created. The load curve selection and creation was completely redone in such a way that the customer’s actual consumption becomes the only criterion for curve selection. New methods to calculate the probable peak power of the year was created and loss calculations were improved to include deviation’s effect. The optimising on-load tap charger on transformers was analysed as an alternative against network strengthening to improve the voltage of the customers.

Figure 5: Power curves of customer connection points between 2 and 8 January 2017

Axis x: dates
Axis y: power (as per power type measure: kW, kVar or kVA)
Red line is real power (kW), green line reactive power (kVar) and blue line the apparent power (kVA)
BENEFITS

1. More reliable and cost effective networks.
2. Customer’s actual consumption becomes the only criterion for curve selection.
3. Improvement to loss calculations and more accurate simulation.

NEXT STEPS

Results are partly implemented into CARUNA’s IT-systems, because some of the results have low impact to business processes.

More information:
CASE IN POINT 6

FINLAND (ELENIA)
SMART METER DATA FOR GRID OPERATION

DESCRIPTION

The integration of the Smart Meter data collection system with the Distribution Management System (DMS) offered new possibilities to monitor low voltage network. This has expanded automatic network supervision to the whole network. This real time network monitoring application is called AMR-DMS integration.

AMR-DMS integration has been indicated as essential tool in network operation. Numerous spontaneous alarms have been received and, for example, over one million meter queries have been performed since 2010 to establish snapshot from the faulted areas. Integration support shortens outage duration and improves efficiency, improves customer service and reduces unnecessary visits to customer sites.

![Figure 6: Smart Meters for Low Voltage Network remote Monitoring](image)

Figure 6 demonstrates how smart meters enlarge automated monitoring also to Elenia’s low voltage network. Previously, smart meters only monitored medium voltage network remotely at all times. Now Elenia can implement the same functionality to the low voltage network utilising smart meter functionality.
BENEFITS

1. Verification of power supply at customer premises.
2. Recognition of neutral current faults in low voltage network, phase faults and faults in customer network.
3. Location of broken MV conductors.
4. Reduces unnecessary visits to customer sites.
5. Reduced power outage duration.

NEXT STEPS

The application was implemented in 2009, and has been in permanent production since.
CASE IN POINT 7

SPAIN (UNION FENOSA)
DISTRIBUTION INITIATIVES

DESCRIPTION

These initiatives make available real time detailed information about network disruptions to customers via a dedicated website and app.

a. provision of online service disruption information about unplanned and planned outages;
b. provision of energy consumption data;
c. network infrastructure supervision;

Customers can also consult daily, monthly and hourly consumption figures with one day of delay. This toolbox, available to customers since 2015, analyses and filters smart meter data, smart grid data and telecommunications data and set rules to determine if a smart meter or data concentrator is functioning, and it extracts patterns for equipment operation.

Figure 7: Information regarding consumption data.

*Figure 7 shows a practical example of how consumption data can be filtered according to timeframes (hours, days and months). The image on the left shows consumption data per day/hours/month. The image on the right shows the status of incidents and planned works in the network.*
BENEFITS

1. Better service to customers.
2. Decreased number of calls to DSO call centres.
3. Increased perception of transparency towards customers.
4. Optimisation of customer consumption habits.
5. Decrease of operational costs (still in implementation phase).
6. Allow for better maintenance planning (still in implementation phase).

NEXT STEPS

The current app and website are being reviewed to introduce improvements. In the coming months, a private area will be developed to offer a better service to customers, providing proactive incident management through configurable alerts and notifications. The tool is also expected to increase information about the contract supply available for customers when they enter the app or private area of the website. In view of that, the tool offers advice about tariffs, contracted power and other services.

More information:
http://www.unionfenosadistribucion.com/es/1297313995394/tuluz.html (in Spanish);
https://areaprivada.unionfenosadistribucion.com/ovde-web/Login.gas
SINAPSE is an innovative approach to outage detection and management using a big data stream processing system. This system enables customers to send power-related events in electricity-powered assets over the internet, correlates such events in space and time to detect grid outages, and provides real-time feedback to customers on known outages. SINAPSE was developed in Portugal by EDP Distribuição and three major Portuguese TelCo companies (Meo, NOS and Vodafone). SINAPSE implements a set of web services that are available for registered partners to use, enabling them to:

- Communicate georeferenced power on/off events.
- Request the status of previously communicated events, namely confirmation on whether they are related to an ongoing network incident, and if so, what is the estimated repair time.

SINAPSE also implements a call-back function that can invoke an external web service when an event status changes, avoiding the need for partners to poll the system to inquire for event status updates. The incoming stream of georeferenced events is processed in real-time, through an event correlation engine using a sliding window that clusters together events occurring within a given time window (currently 15 minutes) and contained in a predefined geographical radius (presently set at 1 Km). Depending on the diversity of customers communicating these events, the rule-based engine determines whether the clustered set of events configures a probable outage situation.
**BENEFITS**

1. *Reduction of outage times.*
2. *Reduction of losses associated to regulatory penalties and complaint compensation.*
3. *Optimisation of call center operations through the integration of information collected from external sources.*
4. *Improvement in workforce management through near real-time mapping of outage areas based in georeferenced data.*
5. *Improvement in overall customer satisfaction.*

**NEXT STEPS**

The pilot case studies which initiated the project have been closed. However, more case studies have emerged. Furthermore, other stakeholders with slightly different needs (e.g.: electrical vehicle charging networks) have already contacted EDP Distribuição to get involved with SINAPSE.

*Nest steps are the following:*

1. *Deployment in production type platform.*
2. *Implementation of further use cases.*
3. *Incorporation of other stakeholders.*
CASE IN POINT 9

PORTUGAL (EDP DISTRIBUIÇÃO)

E-rede: ONLINE NETWORK INFORMATION TO SUPPORT FIELD OPERATION

DESCRIPTION

Dispatch Departments generally work in close collaboration with field teams. To execute the requested field operations, field teams are strictly dependent on MV network single-line schematic diagrams, which represent the status of network grids. These diagrams are updated manually and are distributed (hardcopy) to the field teams to support them in their daily work. This procedure is expensive and does not guarantee that the manually updated diagrams are always “synchronised" with the latest network information.

EDP Distribuição developed a pilot mobile device with the objective to overcome and improve this issue. The device provided easy and fast online access to schematics concerning the network grid updates and additional and useful information (e.g. such as Geospatial network representation, feeder highlight, etc.).

The main features of this project are:

1. Provide access to field teams to the HV, MV and LV network information in order to support operation in the field, guarantee that the information provided is accurate and synchronous with the one that the dispatch uses.
2. Access to equipment information and installation’s internal scheme.
3. Field teams have access to the current operational configuration of the network (switching operations). This information is directly obtained from the OMS system.
4. Main channel to obtain information from field, to report damage or collect evidences to prove a third party responsibility in an outage. Field crews can easily take photos with GPS location and timestamp embedded and e-mail them in a timely fashion.
5. This solution can be used in offline mode, ensuring the main features and with minimum functionality loss in order ensure that even in absence of GPRS communication it is still feasible to have access to the network information.
**BENEFITS**

1. Enhancement of accurate and synchronous network data.
2. Improved reliability of the interaction between dispatch operators and field teams.
3. Significant reduction of operational costs.
4. Easy and fast access to information.

**NEXT STEPS**

E-rede is up and running and fully integrated in the DSO business.