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The authors gratefully acknowledge the comments received by all interview partners of the companies mentioned in the appendix!
WHAT EVERY DSO SHOULD KNOW ABOUT DIGITAL: TRANSFORMATIONAL PERSPECTIVES

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The Vlerick Energy Centre is proud to present the results of our interviews with the leading Distribution System Operators (DSOs) in Europe. This research project – christened ‘Rising to the power grid challenge’ – has been conducted within the collaboration of the KPMG Research Chair at Vlerick Business School.

In the first step (2015), we conducted a web-based survey with 108 executives from 24 countries on changes in the industry landscape by 2020. They represent up to 70% of the European customers. The survey was supported by the European sector organisations CEDEC, EDSO, Eurelectric and GEODE.

In the second step (2016), we organised workshops and conducted in-depth interviews with 6 progressive DSOs on digital transformation: Alliander from the Netherlands, Eandis from Belgium, e-distribuzione from Italy, Enedis from France, ESB Networks from Ireland, and Innogy SE from Germany.

In this report, over the course of 5 themed research-based sections, you will gain insights regarding anecdotal variations between digital leaders among Europe’s DSOs. This is the essence of what every DSO should know about the future of their digital enterprise. Each of the insights is illustrated with the experience and views of one of the leading DSOs on which we focused.
DSO INDUSTRY BACKGROUND

We leveraged exclusive access to Europe’s grid managers to conduct research on digitisation in this particular part of the power industry’s value chain. A series of interviews with digital experts – either at the C-level or in senior middle management positions – led to nuanced and compelling, yet relatively simple, insights regarding how companies engage with digital business.

LEGACY OF REGULATION

In the European regulatory frameworks, the vertically integrated value chains have been broken up, such that the networks function as natural monopolies with licensed public service companies separated from the competitive activities of energy generation and retail to final customers. Furthermore, these network operators are distinguished according to the voltage level they serve: either the so-called transmission network (which is usually in charge of the high and extra-high voltage levels, the highways of electricity transport, more for industrial consumers, if any); or the distribution system (medium to low voltage levels, either side of the step-down transformers and switching gear of primary and secondary substations, including the last mile of electricity delivery, connecting businesses and homes). The distribution system part of the value chain is the focus of this study.

One could argue that these distribution system operators (DSOs) are fairly safe companies, entitled to regulated returns, remunerated with reasonable weighted-average costs of capital, providing reasonable returns on equity. DSOs have close ties to consumers (residential and SMEs) and state institutions (including regulatory commissions in charge of overseeing the allowed revenues). These ties ideally position DSOs to facilitate the transition from passive to active consumers. DSOs are usually organised as private corporations with public shareholders, and institutional and private investors provide the equity. Despite regulated returns, the industry seems to be undergoing an extraordinary wave of change, which increases the risk profile of necessary investments. Funding for both equity and loans is not an issue today – but perhaps in the future it may become more difficult to attract the right amount of funds needed to cope with the challenges ahead.

The truth is that innovation in digital technologies is advancing at an ever-increasing pace. This is relevant to all companies, but perhaps most particularly to technical companies. The question is: which companies are preparing well for the future, and which companies see the fundamental shift that may be happening right under their nose?
HOW TO REACT?
If DSOs are to react to these influences, how should they? Is there any way to turn your back on them or make them go away? That seems rather unlikely. A natural first step would be to set up a monitoring system to start tracking the rate at which digital trends are overwhelming the traditional business. This could help alert businesses if and when a major technological change alters their competitive landscape. And then, of course, they would need to shift gears and step up their adaptation to the situation.

This report will help you prepare your organisation to transform digital into an opportunity. To delve deeply into the matter, we ask key thought-provoking questions such as:

How should a DSO remake itself into an agile digital business?

We also report the relevant insights to be gained from our study – to serve as invaluable sources of information to the industry’s leading managers as they tackle the challenges ahead.

WE HAVE ORGANISED OUR FINDINGS AROUND 5 THEMES:
1. Transformation of the DSO core business
2. New customer experiences, new processes and IT experiences
3. Transformation means cultural change
4. Reaching out to the entire energy ecosystem, including new players
5. Data governance

This report primarily looks at digital transformation from the C-level and Head of Digital point of view. ‘Case in Point’ sections add the perspectives of several business leaders regarding the content developed in the report. Challenging questions are complemented by ‘My Take’ viewpoints from senior advisers in the Vlerick Energy Centre.

Business leaders of all kinds will find this report revealing and compelling.
THE END GAME OF DIGITAL IS A TRANSFORMATION OF THE DSO CORE BUSINESS

When entering into the age of digital, the first important strategic decision to make is whether to approach the change by creating a completely new venture or by transforming the core of the enterprise.

BUT HOW?

Let’s assume for a brief moment that awareness and a sense of urgency to act quickly have been established. Even if the entire management team is acutely aware of the approaching storm, is it that easy to do something about it? Perhaps not, but understanding what can be done is eye-opening.

Over the course of more than a century, DSOs all over the world have developed and refined processes to manage electricity distribution, which is an extremely technical operation to master. Electric power systems – the backbone enhancing social welfare, economic prosperity and ultimately the well-being of the population – are often underestimated. Besides being an essential, integral – and even constituting – element of modern industrialised societies, it is a challenging task to plan, operate and maintain contemporary electric power distribution systems. These systems may well be some of the most complex engineering projects ever successfully executed by mankind. Active and reactive power flows must be managed such that all devices connected to the system are able to operate without damage. Frequency and voltage have to be kept within technical limits at all nodes of the network, at all times.

Focusing on the core while adapting to digital trends means improving the planning and operation of distribution networks beyond traditional measurement and control actions. In a very first step, this could require some DSOs to become digital industrial companies, deploying low-cost sensors in the field on valuable assets (such as transformers, switching gear, secondary substations and critical line segments) to connect them to the cloud, primarily to minimise downtime and ensure maximum productivity when scheduled maintenance is impossible to postpone. The flow of information and recording is crucial for the success of digital endeavours. It may not be sufficient to use old technology – such as sensors that measure operational performance in real-time – where data are not structured and stored in a systematic way for reuse in analytics. This means that massive data sets need to be secured for a long time, which requires top-notch up-to-date database platforms.

The resulting data flow can be important in maintaining the quality of service, as interruptions may be costly and penalised by the regulator. Time is money for DSOs too, especially when valuable equipment is unable to operate due to a malfunction (and this is true for urban as well as for more rural and remote locations). If an entire sub-network feeder goes down for even a single afternoon, the result can be significant loss-of-load penalties, welfare loss for society, bad press, adverse publicity and frustrated customers. Advanced asset health indicators, prediction techniques, artificial intelligence and advanced algorithms can localise and minimise the impact of potentially costly malfunctions.

In some European legislations where DSOs are in charge of the metering process and smart meters have been rolled out, there are additional opportunities to digitise many downstream processes such as meter readings and disconnections, voltage quality measurements, etc. This has tremendous benefits compared to using analogue systems.
It may be a matter of putting sensors on all types of machines, connecting them to the cloud and analysing the resulting flow of data. It goes beyond identifying ways to improve machine productivity and reliability of certain assets. Enel is an uplifting example of what can be done. The Italian-based, now highly international company, put all of the options on the table – but it quickly decided that digital has to be about transforming the core.

Enel views digital as an essential part of its duty as a harmoniser across different geographical contexts: the company deploys standardised and highly advanced technologies, which constitute an essential part of its core business. But this is only the first step of transformation, which will later empower Enel to become an enabler of multiple services.

DR ROBERT R. DENDA, Head of Network Technology, Enel, hits the nail on the head:

As a grid operator, we believe that the DSO is ultimately an enabler for electricity markets and the transport of electricity. This is not possible without having an advanced infrastructure in place linked to every house. In some countries, we are also an enabler for the telecommunications market. We see ourselves as an enabler for the transportation sector as well – especially with regard to e-mobility. And when you consider the importance of data, we also see ourselves as an enabler at the end of the chain, assisting the provision of data services.

This leads to the first key insight. Of course, DSOs can venture out into new digital businesses, but the biggest potential lies in their core business. It’s the difference between becoming a platform or being platformed! In the digital era, the DSO core business is a dormant asset that can be used in many ways. And tapping into this dormant asset is only possible when companies manage to transform their core business.

Q? WHERE IS DIGITAL IN YOUR ORGANISATION? AT THE CORE OR PERIPHERY?

However, to fully capture the value of digital, companies need a programme (see next insight).
INTERNATIONALISATION

We have over 61 million customers at ENEL – half of them are in Italy; we have 12 million in Spain; nearly 3 million in Romania; and the rest are in Latin America: Argentina, Brazil, Chile, Peru and Colombia.

We’ve had a very strong digitisation programme from the very beginning. In terms of digitisation of the grid, Enel was a frontrunner with the smart meter in Italy 15 years ago. We have over 150,000 substations in our grid in Italy that are already fully remotely controlled and automated with self-healing.

Of course, this has had a big impact on the business. To give you just one figure, taking the Italian example during the last 15 years again: digitisation has helped reduce the portion of the tariffs that correspond to the DSO by 32%.

In pursuing this digital trend, it’s the technology that changes over time. We now have more capabilities than we did 15 years ago, and meanwhile other issues have arisen like cyber security and new communication solutions. For example, one important point is we offer solutions in the cloud – with a new type of infrastructure that simplifies management, even for large complex structures, with theoretically unlimited scalability. At the same time, putting more and more sensors in the field that generate huge amounts of data makes real-time data processing the biggest challenge.

While digitizing the grid, we are concurrently improving the quality of service to our customers. For example, we are reducing the time of self-healing (the detection and complete automatic recovery of faults). We are in the process of reducing this time to a minimum – less than 1 second – in the Italian case, resulting in a further improvement of the quality of service country-wide. Those types of technologies are really the digitisation of the grid operation at its core.

So, all the trends mentioned in the introduction of this document are not merely buzzwords. They reflect today’s understanding of what has already been done in the past and what we continue to do today. Furthermore, we are leveraging a specific country experience and sharing it with all the other countries in which our Global Infrastructure and Network business line is present. This also holds for our company’s strategic plan, as there are huge investments in this field, which is a fundamental part of the Group’s strategy. To sum up, I would fully agree that Enel is highly involved in this digitized world.
Investments are needed for maintenance as well as for economic, strategic or geographic growth. These growth numbers amount to billions of euros over the next few years. A big part leverages technology. For example, after 15 years of smart meter operations in Italy, we will roll out the new generation of metering infrastructure this year and over the next several years we’ll replace 32 million meters with an overall investment of nearly €3 billion.

We continue to roll out smart meters in Spain – by next year, we will have rolled out almost 12 million. In Romania, we have deployed 150,000 so far. In Latin America, we started several different pilots this year – in addition to smart metering, IT and OT convergence are also on the roadmap to offer the same solutions in the cloud to various countries. Finally, there are also big projects on the grid side – remote control, grid automation and self-healing – those kinds of grid activities in basically all the countries in which we are present.

Regarding the transformation of our core operating model: we created the area that I lead: Global Network Technology Function, which is responsible for developing our grid technologies in all of the countries. This unit did not exist at a global level 2 years ago. Through this unit, we facilitate the digitisation of the grids with innovative technologies and embrace the convergence of OT and IT solutions while assuring convergence among our companies.
Transforming the core of any enterprise is about creating value for the customers with an enhanced experience. As the DSO business is process-oriented, value can only be captured if these processes are also transformed. Of course, the technology will also need to evolve, especially in the IT department.

THE CREATION OF AN UMBRELLA REFERENCE: A DIGITAL PROGRAMME

If you want to aim high and strive for real impact, then there is very little room to manoeuvre. In many cases, a variety of efforts already exist and are dispersed all around the company that can be related to digital. Streamlining them is key. In that sense, it’s not enough to focus on the operational and have several projects running in parallel. With one overarching programme – called something along the lines of ‘Digital DSO’ or ‘Data-Driven System Operator’ – much more can be achieved. Everything needs to come together: from the smart grid architecture to the grid components, the communication layer, the information layer, and the business system layer … to finally arrive at the process capability layer. Only then is it a real umbrella reference.

The creation of a programme that serves as a real umbrella reference is never easy and needs proactive engagement from the highest level. Especially because it’s quite likely that the various members of the management team hold differing opinions. Not everyone can be convinced to support such a bold plan that requires such a large budget. Executives are usually faced with the difficult task of explaining to everyone that investing a euro in digital is a euro well spent. Enthusiastic pitching is key, however challenging the long-established and traditional way of calculating business return is crucial as well. Discussions with domain experts from innovation hubs can provide support and create consensus to move forward. The goal should be boisterously flexing a muscle to align thoughts among the leadership team members with a feeling of brotherhood, partnership and conviction.

The challenge is well summarised in the words of CHRISTIAN BUCHEL, Deputy CEO & Chief Digital and International Officer, Enedis:

In our case, we had to confront our board members with the exciting but brutal reality of how much more advanced California was compared to France, compared to Europe. That’s why we went to LA to start a conversation with the brilliant people working at the cutting-edge of the digital world. All of the other DSOs known to us were simply not a benchmark.
We especially enjoy referring to the transversal digital programme of the French distribution company Enedis, as it incorporates all of the above dimensions. They succeeded in creating an elaborate programme management structure to direct and coordinate the execution of the strategy, without giving the impression of forcing anyone into a governance straightjacket that was not conducive to the overall goals.

From the director and his communicators, to 4 sub-groups organised as departments – the ATELIER, or workshop; the DATA governance; the FABRIQUE, or factory; and the CAMPUS – everything was in order. The programme is combined with a maturity assessment that allows the company to check its progress.

From this point, we derive our second main recommendation: Companies need a programme and a clear leader of the programme who reports to the highest level. It’s not enough to have R&D projects related to digital. The first step is to assign an important leadership responsibility to a new and dedicated role. A high-profile individual at the top level of management needs to be appointed. This means having a single person fully committed to digitisation that could eventually radically transform the world in which the companies are currently living. This also entails growing sustainably and profitably, a comprehensive and strategic answer that can lead to a continuous transformation, not just a disruptive one.

Q?

IN TERMS OF BUSINESS GOALS, WHAT KIND OF PROCESSES AND CAPABILITIES ARE NEEDED TO CREATE VALUE?
WHAT INFORMATION IS REQUIRED AND WHICH GRID COMPONENTS (I.E. SENSORS) ARE NEEDED TO GENERATE IT?
FULL COVERAGE OF DIGITAL

Enedis manages the distribution grid across 95% of Metropolitan France, ensuring continuity and quality of service with a non-discriminatory access to the network, regardless of the electricity supplier (the company that sells the commodity product of electricity). Enedis is responsible for operating, developing and maintaining the technical infrastructures: in particular, medium-voltage and low-voltage power grids, including transformers and substations. With 35 million end-customers, the company’s network requires investments on the order of €3 billion annually. This, together with 38,000 committed employees, ensures a total of 1.3 million kilometres of power lines, 42% of which are underground cables and around 750,000 transformers.

The digitisation efforts have contributed to the fact that Enedis’ entire system is one of the most reliable in the world – with the quality of service measured at an average of 60 minutes of outage time per year. This is sustained with an organisational structure that breaks down into 25 regional directions and 1,000 offices distributed all over France – true proximity to the customers.
CUSTOMER FOCUS WITH A SOCIAL DIMENSION

Enedis is a young company. In the years subsequent to its founding in 2008, it has traditionally taken action according to its legacy of public service missions. These actions have always focused on local support as well as social and environmental benefits through strategic partnerships with regional organisations. Through sponsorship activities, the company has communicated its vision of solidarity, environment and culture: a service for all, available everywhere and anytime. This has been complemented by the societal and environmental initiatives that Enedis has traditionally conducted in the normal course of its business.

In addition to being a public service utility, Enedis has long considered itself an industrial and social project – with a commitment to sustained investment, an active industrial policy, a company built around its staff, in close dialogue with the local authorities, committed to its local offices in all territories. However, a big part of its vision for the future is to live up to the responsibility of being a major player in Europe – advancing the topics of digitisation beyond smart grids to decarbonise the power sector with ambitious goals.

UNDERSTANDING THE DRIVERS OF CHANGE

It seems more and more likely that DSOs will become the central hub and backbone of future intelligent, digital power systems. The new context is not only changing the business model of power generation, but network companies – foremost, the DSOs – will have their investments and their grid operation significantly impacted. Yet, Enedis has chosen its own path: a path from smart product (i.e. the metering devices), to the smart grid infrastructure with industry applications, to finally become the fully digitized DSO. The idea behind the whole effort was to strengthen core capabilities while leveraging open data assets.

When I became CDO in May 2014, I was one of the first in the history of the energy industry. In fact, most people did not understand why I adopted this title, which was basically unheard of at that time. I accepted the appointment on the condition that I would get substantial support and be free to allocate significant resources and engage experts from outside the company.

I realised that the smart metering projects which started almost a decade earlier, generated massive amounts of valuable data that improve power systems in general and network operation in particular. But the company must continue to structurally adapt to develop the necessary skills and to deliver benefits to the end-customer as a neutral market facilitator.
But having a programme and a programme leader are not enough. It’s absolutely crucial to get everybody on board – from the top executive level all the way down the organisation. Digital is a new way of thinking, a new way of working, that does not function well in traditional organisations. As a consequence, the organisation itself needs to evolve, along with the people in it.

Beyond Recruitment of External Innovators

To create a band of brothers, a company’s management board can take an inspirational trip to Silicon Valley or Dublin. (This obviously is not always an option for the rest of the organisation.)

How can an organisation really change? It all starts with the right change management – and developing an advanced digital culture is a compelling way to start. This includes risk tolerance for change affinity, more agility and more entrepreneurial spirit among many leaders, while still having a clear spearhead. Because, as is so often the case, it’s impossible to overestimate the cultural dimension. Technology is only part of the digital transformation (“One Weird Trick to Digital”, MIT SMR Blog, August 2016).

Right up at the top of the list connected to culture, bringing in new people for the new kinds of tasks – to automatically import a new culture – seems only natural. Human resource experts say that bringing in new skills is paramount. Which sounds like a very straightforward claim, but in reality this logic doesn’t always manifest as desired. Inertia may constrain the human resource department’s reality, and letting go of experienced, proven employees is never easy. But for cultural change, it may help to bring in some newly skilled people from outside the sector. Hires from new economy tech firms with international backgrounds should be the norm more often.

Innogy seems to have found a promising formula, as PROF DR MICHAEL LASKOWSKI, Head of R&D Projects at the corporate holding level, Innogy, reports:

We want a mixture of employees between digital natives and experienced seniors. Today, we have to divide the development into the old-boys business (which has to work), and then we need the digital natives who think disruptively. This mindset is challenging to the experienced staff. To them it may seem too risky, our grid needs to be safe and secure, etc. But of course, having new ideas and thinking about apps doesn’t need to endanger existing security.
A cultural change programme will need to be developed, innovative means of collaboration leveraged and new types of skills recruited. It is crucial to involve HR very early on. Another key point is that a common understanding of the world needs to be established – and that people need to speak the same digital language.

Q?

WHAT HAVE YOU DONE FOR THE SOFT EMOTIONAL SIDE OF DIGITAL TRANSFORMATION?
WHAT HAVE YOU DONE TO RECRUIT MORE DATA SCIENTISTS?
I have a good overview on digital trends and on the transformation they are conducting in our subsidiary companies on smart grids and ICT issues at the corporate level. Not long ago, we converted our company into innogy SE. Now we are in a change process. My division of Innogy is focused on grids and my internal customers are the grid companies like Westnetz (Dortmund), Mitnetz (Halle, East Germany), Lechwerke (Augsburg), VSE (Saarbrücken) and Syna (Frankfurt). We deliver a strategy for the digital side. The implementation lies within the competence of the individual companies − they decide which tool to use, etc. − but we usually have convincing arguments on both sides.

We maintain a really good exchange with Silicon Valley where we are working with different companies on prospective products. This is only a small portion of our plans.

Naturally, the collaboration is not always frictionless because of the inherent difference in approaches. The start-ups have a new, different way of thinking, which is sometimes too disruptive for our day-to-day operational lives. In my department, we develop applicable ideas quite close to their implementation. The disruptive things that the colleagues from the innovation hub develop are really necessary and advanced.

For example, in my department we are developing R&D applications that give the colleagues from Westnetz a real impact in their day-to-day use. We do not think very disruptively, but we are inspired by the ideas of our younger generation. That’s the big difference − and both sides are necessary. It’s a big challenge to work together, but it’s fulfilling. Quite often we exchange our projects in this innovation hub, and I think that’s very enriching for both sides.
DSOs have traditionally focused on relations with the regulator rather than with their customers. The regulators represent the interests of the customers, but DSOs also need to create a more direct link with their customers.

**COLLABORATION BEYOND THE IMMEDIATE CIRCLE OF KNOWN PARTNERS**

DSOs are usually rather large organisations with century-old, established structures. The top executives tend to be very technical people, excelling at quantitative analysis. Sometimes these are electrical engineers who understand the physical workings from Maxwell’s equations to the dualism of particles and waves important to electro-magnetism. Recent research suggests that executives in large organisations may have a bias for doing – i.e. getting things done – rather than for thinking and strategic planning (“The Lost Art of Thinking in Large Organisations”, Duncan Simester, MIT SMR, Summer 2016). However, such introspective thought processes could well lead to a new approach to the ecosystem, including opening up to the inclusion of new partners and collaborating with the outside world of stakeholders.

The emphasis on doing is inherent to the merit structures of companies – including DSOs – and the time constraints on achieving goals. If business models persist, it’s sometimes not because they have been the most innovative but rather because they worked once and they were scalable and maintainable over time.

However, the drivers of change and the digitisation trends as outlined in the introduction above, might bring about new players that change the name of the game and create new business models that are also scalable and ultimately capable of replacing the existing models. Even more so in light of the classic argument for the existence of corporations – i.e. the cost of doing things through them is lower than through the market – which is losing ground because advances in technology have reduced the cost of transacting through the market.

**A WHOLE NEW WORLD OUT THERE:**

There is a ghost wandering around the industry, threatening that tech giants might take over the infrastructure business with which DSOs feel so comfortable. Apple, Facebook, Amazon, Google and their peers dominate today’s economy. In this age of corporate consolidation, the most valuable companies in the world come from Silicon Valley and are equipped with enormous cash piles, equivalent to 10% of America’s GDP (The Economist).

It seems wise to look up to the potential new entrants of this world, even though at first it may not seem to be a fair comparison. Nevertheless, it is too easy to fall into the trap of claiming that the type of complexity to be handled in the electricity business is just different. Admittedly, DSOs have to deal with an asset base that is sometimes up to 80 years old – whereas tech companies that accelerate don’t have to deal with anything like that. Naturally code developers depend on hardware infrastructure such as servers, and they are software-based companies. But are they really that different from the electricity sector? Wouldn’t they be perfectly suited to making the best of an aged, huge and diverse infrastructure asset base? Unless there is an unforeseen technology breakthrough, it doesn’t necessarily have to be simply replaced – rather, it should be integrated within the new world of digitisation.

Most certainly we are talking about critical infrastructure here. So, of course, when a large internet firm is hacked, one way or another we will notice,
because service is interrupted or sensitive data is made public — but that’s different from a power outage. When the grid is out, everything stops. That’s why DSOs have a very unique stakeholder position. DSOs are also well positioned to work together with other kinds of companies. The small, agile, audacious and daring start-ups. As large partners, DSOs can provide the stability that small endeavours need.

**BRIAN TAPLEY, Manager Transmission & Distribution Regulation Networks, ESB Networks, summarises his company’s efforts to reach out as follows:**

ESB Networks’ Strategy for Innovation ensures that we look at new concepts and products to enhance how our DSO offers value to our customers. For example, concepts such as network flexibility, electrification of heat and transport and network congestion management are receiving increasing attention. We bring an innovative approach to what we do and to growing our business for the benefit of our customers.

DSOs need to be more open towards their customers and their community. They need to evolve towards ecosystem thinking, in which co-creation and collaboration are more important than a do-it-yourself attitude. DSOs can become digital orchestrators that interact closely with the community around their core business. Relations with smart cities will be crucial.

**Q?**

**HOW MANY PARTNERSHIPS DO YOU HAVE WITH DIFFERENT ACTORS IN DIGITAL PROJECTS?**

**HOW STRONG ARE THESE PARTNERSHIPS AND TO WHAT EXTENT ARE THEY JOINT VENTURES?**
NEW ARCHITECTURE FOR NEW APPROACHES

ESB Networks is currently focusing a lot of attention on the future challenges impacting DSOs over the next 10 years. Particular attention is being focused on innovation and digitisation. ESB Networks is part of ESB Group – a vertically integrated company with generation, transmission/distribution and supply businesses. ESB Networks is the only DSO licence holder in the Republic of Ireland. Within ESB Networks, we have set up a smart networks function supporting ESB Networks’ strategic objective to operate a world-class network. A separate ESB Innovation Business Line has been established within ESB Group and is supported where possible by ESB Networks Innovation. Therefore, big data and data analytic projects take place within ESB Group and also within ESB Networks. Our IT structures are similar, with a centralised IT function supporting all of ESB Group and then a specific IT function within ESB Networks.

Traditionally, the DSO’s vision would have been along the lines of constructing, maintaining and operating distribution assets to support the requirements of the customers and the users of the electrical system in Ireland. However, this is changing as the traditional users have ever-changing expectations of the system. We see the existing energy value chain at the point of change driven in part by increasing levels of distributed energy resources and by the introduction of many new innovative types of system services. So, the historical role of the DSOs – which has not really changed in the last 100 years – is at a point of inflection. We see that new DSO role being enabled through a successful digitisation strategy.

TWO PRONGS OF DIGITISATION

This digitisation is probably 2-pronged. A lot of the projects within our portfolio are looking at assets and electrical functions within the network and how we can help them work in a smarter fashion. We are seeing totally new use cases in terms of bi-directional flow of electricity as opposed to a singular flow, which is driving the whole smart agenda. And on the other side, we are looking at how to interact with other players outside the energy value chain – such as the market, the TSO, aggregators, prosumers, etc. – in a more flavour-some feature-rich fashion. A significant number of projects that we have underway are specifically for that.

It’s important that we work to ensure that regulation and policy move at the same pace as this change. Effective digitisation, supported by progressive regulation and policy, will leverage the benefits associated with a smarter active network, increase the efficiencies of our networks, and unlock capacity and flexibility. This is why our focus is on Innovation and Digitisation.
LEAN START-UP PERSPECTIVE FOR SOME INNOVATIVE GROUPS

Driven initially by ESB Innovation, we are starting to use a rapid type of SCRUM development methodology.

ESB Innovation moved some of its staff off-site to a start-up hub in Dublin City centre. There, the teams work on innovation projects like a start-up company does. They work in an environment where other start-up companies work as well, and they share ideas. And the reason is: if my idea doesn’t work, so what – you’ve tried it. You couldn’t really do it as quickly in a regulated environment or within the walls of ESB. By moving into this new place, both physically and conceptually, we have adopted an agile approach.

Everything is open in this environment – no competition, but rather collaboration. That’s the concept behind it anyway. People should be willing to talk to each other and learn new techniques. It’s a facilitator for start-ups. We usually work on 2 or 3 viable projects down there at one time, but there are many more in the pipeline. Although this approach steps away from ESB’s core business, it’s very important to understand that these projects – and indeed, this concept – only work if there is support back at ESB Networks. After all, it’s the regulated DSO that will ultimately enable this innovation.
THE QUALITY OF DATA GOVERNANCE WILL DETERMINE A DSO’S SUCCESS

If DSOs get the role as data hub operator, they will gain a lot of experience in opening up customer data to market parties. How available that data will be is a trade-off between customer data protection and market innovation which will be made by the legislator. The DSO’s data is another story – the companies can decide to be more or less open.

THE OPPORTUNITY OF DATA PLATFORMS

Many regulatory experts report observations that policy makers and governmental stakeholders are likely to increase pressure and raise the expectations regarding European DSOs becoming neutral market facilitators of energy services like customer data access, flexibility products and other new services. For this to function, DSOs will assume the role of a central data hub for local energy markets. But how to go about this? Is it enough to map all the data used within different domains of the company and assign roles of data ownership? Could this be enhanced by highlighting the benefits of open data to various power systems agents? Most certainly.

It may, however, require substantial resources to supply the public and an ecosystem of stakeholders with meaningful information regarding the DSOs’ core activities in distribution network operation, as well as enhanced user consumption data. As already seen in some European legislation, it appears that upcoming laws are likely to demand top-notch levels of data security and unprecedented data quality. A DSO’s ambition should be a decisive positioning in front of the digitisation trends, while importing specific outside skills in algorithms, applications and licenses to live up to the expectations of neutral market facilitators and data hubs.

RUUD BERNDSEN, Director of Regulatory Affairs, Alliander, brings it to the point:

We have the first interest in getting these processes up and running in good coordination. We have to strike a balance between the efficiency of these processes functioning as a data hub while also being aware (in a timely manner) of all the other interests at stake. This includes public perception and the consideration of the regulator, which we intend to have built-in from the very start as we construct this from scratch.
By offering their data, DSOs can invite others to do the same; and by combining datasets, more value can be created. Instead of charging money for their data, DSOs could be rewarded with more data or innovation based on their data.

Q?

HOW TRANSPARENT ARE YOU ABOUT YOUR DATA?
HOW DO YOU INVOLVE OTHER ACTORS TO ENRICH YOUR DATA?
Digitisation is very important to us at Alliander in particular, but also generally in the Netherlands. It’s probably fair to say that you have to invest in it or it will overcome you. We at Alliander very much want to be ahead of these developments – so we are investing heavily to advance our grid management. That means mainly in the digitisation of our substations and in the roll out of the smart meter. To get well connected to the smart meters and the substations, we have implemented CDMA connectivity. We are getting on the right footing for the next decade.

**EDSN TODAY, USEF AS A VISION FOR THE FUTURE**

But it’s not only a matter of investing in grid management but in the market model as well. Since the establishment of NEDU as a joint platform of market parties and network companies, and EDSN as a central data hub of the DSOs, there has been a coordinated effort for market facilitation in the sector. We have a clear and strict distinction between the ‘what’ and the ‘how’. The how is the clear responsibility of the DSO because this data emerges from our infrastructure; whereas the what – i.e. what kind of information is needed with respect to the customer relationship – is determined in close coordination with the market parties.

The decision of grid operators regarding centralised market facilitation has worked out effectively, and we have a stable administrative model ready for future developments. We ensure that our market facilitation platform serves metering point data, energy usage data, and data for energy allocation and reconciliation to be complete and accessible for the parties that have correct access rights.

All of this is carried out with our vision in mind that easy access for existing and new markets creates a level playing field to facilitate competition and innovation, and prevents a lock-in with data aggregators. Nevertheless, the model is always under a lot of pressure because of changing circumstances, and in particular, the energy transition process, which is really getting underway. All these developments have large effects on the relationships with market parties and make the current agreement subject to continuous debate.

I am pointing this out to emphasise that new parties are entering the sector. So there are a lot of dynamic developments. The USEF model might be an answer to the changes, being a platform for building new relationships in the market of the future. It presents a market model format for the trading and commoditisation of energy flexibility, and the architecture, tools and rules to make it work effectively. It is not as of yet part of current legislation, here – it’s under construction and is being tested and further developed with various market parties.
CYBER SECURITY AND DATA PRIVACY ARE SERIOUS CHALLENGES

This is the most important issue to be addressed when talking about digitisation at Dutch DSOs: we value the interests of our customers in the domain of privacy and security very highly. Our regulators are also closely watching to get things right. This is clearly one of the current and future challenges that we face. At EDSN, we maintain and operate different kinds of databases. This is data that is being exchanged between DSOs and suppliers. There are many current discussions (and there will probably be many more) about how you get an efficient market facilitation but also maintain the required levels of privacy while handling large personal datasets.

So, if you continue along the lines of data hubs and neutral market facilitation, every DSO should prepare itself for these kind of issues. Admittedly, this is a huge challenge, but not impossible to master. As we are striving towards the implementation of the energy transition, and we have a clear vision of what it means to realise neutral market facilitation at DSOs, this also means being earnest about potential hurdles along the way.

As a consequence, we do have risk assessment and classifications of data processes implemented, but we also acknowledge that things are getting more and more stringent in order to comply with the requirements of the regulators. So, at the moment, we are implementing a number of additional measures. We are following a joint market facilitation roadmap 2020, which also covers questions like which data to publish, which data to protect, and how to manage the data quality of everything. The lesson here is to not only focus on the efficiency of operational processes, but also to keep all the customers’ interests in mind from the start, and to be very clear about the responsibilities of each party that serves them.
The 5 most important distribution system operators in Belgium (EANDIS, INFRAX, ORES, RESA and SIBELGA) decided a few years ago to create a common platform, called ATRIAS. This company, which is owned by these 5 DSOs, was founded on 9 May, 2011. The main office is located in Brussels.

The goals of the collaboration between the DSOs are: to streamline the market processes, to simplify the operation of the market for all stakeholders involved, to increase cost-effectiveness – and all of this independently. Therefore, we are working on a Central Market System, an application that will support these processes in an efficient IT way. The DSOs constantly strive to facilitate and support the energy market in an independent, proactive and professional way.

But how did it all come about?

HISTORY OF CLEARING HOUSES IN BELGIUM

In 2001, at the start of the liberalisation of the energy markets, we began to focus on the neutral and independent role of the DSO. This was brand new as we unbundled from supply and production. One must understand that, in Belgium, we are more unbundled than any other European DSO. We are unbundled in every possible aspect with regard to ownership, legal form (not part of a holding), ICT systems, business development, etc.

Initially, we were part of an integrated group, which unbundled fast. As soon as possible, we started a programme to build up our own ICT infrastructure. Our regulator watched this process very carefully.

The transition phase – during which we were split as a company due to unbundling – was the birth of the data hubs as clearing houses. But already at that time we had 5 clearing houses in Belgium, because we were in charge of metering. I mean the same thing by ‘data hub’ and ‘clearing house’.

There were 2 in Flanders (1 of which was ours), 2 in Wallonia, and 1 in Brussels. So, 5 in total – which we still have; but from 1 January 2018 – just over a year from now – we will only have 1 data hub for all of Belgium.

A COORDINATED IMPROVEMENT EFFORT BY THE ENTIRE SECTOR IN BELGIUM

Around 5 years ago, we started the initiative as EANDIS – but from the very beginning we made it clear that the data hub should be for the whole market, not only for us as a DSO. We thought it would be better if we combined our forces. Also, because of the unbundling, there are huge data-flows between the different parties to keep the market going. One example is the switching of suppliers: your meter index is forwarded to the supplier to facilitate and support the energy market in an independent, proactive and professional way.

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was hard to advance at the same time and decide on measures together. At every moment in time, they were almost the same but never exactly the same. Some started a bit earlier, some started a bit later due to implementation problems with their ICT systems. The joint effort helps in standardising how to handle data and treat missing values, and ensures that the quality of the information is maintained. This was a challenge for the users of the clearing houses, such as suppliers, that were active on all 5 platforms. Sometimes they had to deal with different timings and depending on the data set also with slightly different interpretations. This was not an optimal solution. So now they will be confronted with 1 implementation, 1 timing and 1 version, because it is only 1 system. This is also less complex to manage than before. So, this is a huge benefit for the market – and for the DSOs too.

The new version of the Message Implementation Guide is also smart meter ready. The introduction of the smart meter will entail new business processes and huge volumes of data that have to be managed. The new MIG version 6 and the new Central Market System are designed to deal with these challenges. They are compatible with older version technology, but also support the new business processes with the upcoming technology improvements to meters.

**NOT JUST AN ICT-DRIVEN INITIATIVE**

The DSOs are not only driven by efficiency improvements in the way the market interacts with DSOs. As neutral and independent actors, the DSOs, along with all involved regulators, organise a platform where all stakeholders can come together regularly and discuss future evolutions and developments. The DSOs use ATRIAS as the space for this platform. The different regulatory bodies of Belgium, differing in geographical scope and reach, are present in the structure organised by the DSOs, the energy suppliers are there, and of course the DSOs as well. This enables us to think ahead and exchange ideas about future possibilities. Not only about smart meters – because smart meters are already built into the functionality of the clearing house – but also about new products such as flexibility. Questions that we ask ourselves include: How to handle new stakeholders like aggregators? How do we want to deal with storage in distribution grids? Not all of this will be implemented on 1 January, 2018, but at least we’re already jointly conceptualising these potential future applications.

**STAKEHOLDER EXPECTATIONS**

We have our own control centres to monitor and manage our grid in real-time, and we exchange this data with the TSO for operational use.

We use this online data to operate our grids and manage assets. But if there are moves from customers, which we can measure in 15-minute intervals or, in the future, perhaps even (near) real-time, implying data-transfers between stakeholders, then we will use our Central Market System. The Central Market System is the place where we exchange data between stakeholders to facilitate the functioning of the energy market.

We see that the stakeholders have different and evolving needs and expectations depending on their market role (Supplier, Flexibility Service Provider, Esco, ...) and that, for example, the speed of getting data available is increasing (from ex-post 15 minute values to more near-real-time). Our role as DSO is to handle these data flows as independent data manager, taking into account all data privacy and cyber security rules.

Ex-post calculations are always possible. If a market party, such as a supplier or an aggregator, needs data after the event to make his bill, then the data flow will pass through the Central Market System. For example, if an aggregator gives commands to contracted customers to fulfil bids taken in the balancing market, and he would like to know the reactions of the customers to his control signals there, then he needs access to the actual recorded consumption pattern before and after the event to have visibility.

In that case, the Central Market System is perfectly suited to be used for delivering and transferring the data.

The Central Market System of the DSOs in Belgium is not only driven by efficiency improvements in the way the market interacts with DSOs. It also represents a platform where all stakeholders can come together and discuss the future. The different regulatory bodies of Belgium, differing in geographical scope and reach, are present in this platform, the energy suppliers are there, and of course the DSOs as well. This enables us to think ahead and exchange ideas about future possibilities.
EXPERT TESTIMONIALS

With the intent to enrich and challenge the preceding themes, here are some ‘my takes’ from Vlerick Energy Centre’s senior advisors and KPMG:

**PROF DR RONNIE BELMANS**
Executive Director, Global Smart Grid Federation

Digital means communication, 2-way, not broadcasting. DSOs have to change from the attitude of ‘we will teach the grid user how he has to react’ to ‘we will enable the grid user to do what he wants to do by picking up his service requests and living up to them.’

**JEAN-ARNOLD VINOIS**
Advisor, Jacques Delors Institute

The energy sector has long been dominated by a very simple pattern: a vertically integrated company mastering the whole chain: from generation, to transport and distribution, to the electricity taker, a subscriber. The new pattern that is emerging is another animal: it is mixing centralised and decentralised generation, consumers becoming producers, and data exchanges between all these players that are bringing new opportunities. The digital intelligence offers to all players – and particularly the DSOs – the discovery of new roles and responsibilities that it is up to them to exploit. But they are not the only ones concerned, and we may expect a dramatic change in the energy sector, whose beneficiary is not yet known. This study sheds some light on the challenges and opportunities for DSOs.

**JORN DE NEVE**
Jorn De Neve, Partner KPMG Advisory & Head of the Energy Sector

We believe that DSOs will be key actors in a power sector that is subject to unprecedented changes and new trends. At KPMG, we are at the forefront of these new evolutions, so that we can help our clients navigate through the transformation successfully.
Starting in the 80s, major companies worldwide experienced a significant impact on their business processes and structure with the inroad of enterprise software to manage business operations and customer relations. Moving to such software implied a fundamental review of how a company was doing business, interacting with its customers, managing its purchasing and inventory, and even rewarding its employees. I would dare to say that the ‘web-digitisation’ of the power sector will have the same intense impact within each element of the value chain, including grid companies. Too often, digitisation for grids is reduced to the cost of smart meters and the large amount of data to be collected and managed. Without neglecting their importance, the real impact will be much wider.

On the asset side, a greater digitisation of sub-stations, lines and cables will open the door for self-diagnosis and self-healing in case of disturbances, as well as operating closer to the limit of the technical specifications of each component of the grid. This evolution will dramatically change the way grids are planned, designed, maintained and operated, and induce the re-engineering of decades-old business processes. The business case is straightforward, as only 1 party is in charge – DSO or TSO (under the scrutiny of a regulator) – and the advantage in terms of lower costs and fewer (or at least delayed) investments are to the benefit of the society as a whole.

On the side of each individual grid user, the business case is less straightforward. Firstly, web-digitisation is an enabler for variable decentralised generation (such as wind and solar) and active demand participation (for balancing and reserve). Extracting the most efficient pattern for demand-side participation requires a (very) good understanding of each customer requirement in terms of active/reactive energy and power demand, flexibility and reliability, by the hour and for even smaller time frames. The same holds true when aiming for the integration of the forecasts for solar or wind generation with storage and active demand-side participation. This integration can be seen differently when dealing with a home, a street, a suburb, a municipality, a distribution grid, or the power system as a whole. Besides the customer, different parties will also be interacting:
the (residual) supplier(s), the aggregator, the balancing responsible, the DSO(s) and the TSO(s). Finally, the ownership of the data, the usage of the embedded information about each user, and the issue of cyber-security contribute significantly to the complexity of the business case. Driven by the European Union’s carbon policy, the first step of the digitisation – i.e. the rolling out of 2-way metering devices – is on-going, albeit at different speeds, among the member states. New market actors are entering the fray with web- and cloud-based applications to attract customers, mostly at SME level.

Once started, web-digitisation of the consumer side will not be stopped, as technology, such as storage and electric cars, will inevitably enlarge the number of grid users aiming for a more active role. DSOs are at the forefront of this battle for the new power prosumers. Trained staff, flexible structures, some appetite for risky initiatives, and being technology savvy are among the tools that are needed to win this battle. Dramatic change of their business operations and customer relations may be expected … the same way it happened in the 80s with the inroad of enterprise software.

VLERICK ENERGY CENTRE

The Vlerick Energy Centre is a platform for discussing the future of energy, focusing on the roles of Distribution System Operators (DSOs) & Transmission System Operators (TSOs). Our flagship international executive education programme – The Future Grid Managers Programme – is a joint initiative with the Florence School of Regulation, which tackles the management challenges and opportunities specific to DSOs and TSOs in the energy industry in Europe.

For more information on the study or to explore the Vlerick Energy Centre activities, please contact:

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