THE TRANSITION TO A DISTRIBUTION SYSTEM OPERATOR

Considerable disruption in the power sector arising from a combination of policy, technological and customer change is transforming how we think about, produce and use electricity. This change towards a decarbonised, decentralised and digitalised system is profound, and Distribution Network Service Providers (DNSPs) are at the forefront of its impacts.

These changes to a more decentralised system introduce increased participation in the marketplace for a range of new business actors. The way these actors engage with both transmission and distribution operators will be key to the successful paradigm shift for energy delivery.

The extent of this change dramatically alters future assumptions about business models and future roles for network companies. Distribution Network Service Providers (DNSPs) need to revisit their current business model, roles, capabilities and skills, and consider their evolution to that of a genuine Distribution System Operator (DSO).

FROM A DNSP TO A DSO

The increase of distributed energy resources in Australia's energy industry has given rise to conversations surrounding how best to manage these new distributed networks as the industry moves away from the traditional linear, one-way flow of power to consumers.

Many in the Australian energy industry are starting to look to new management models, and given the role of the Distribution System Operator (DSO) is prevalent in the UK, it's now starting to stand out as a key way forward for the local sector.

The role of the Distribution System Operator (DSO) includes ensuring reliability and efficiency in the operation of systems that have distributed energy resources (DERs). This can consist of the maintenance and management of the distribution system, with a key factor being the integration of all elements of the system.

*https://ec.europa.eu/energy/sites/ener/files/documents/xpert_group1_reference_architecture.pdf

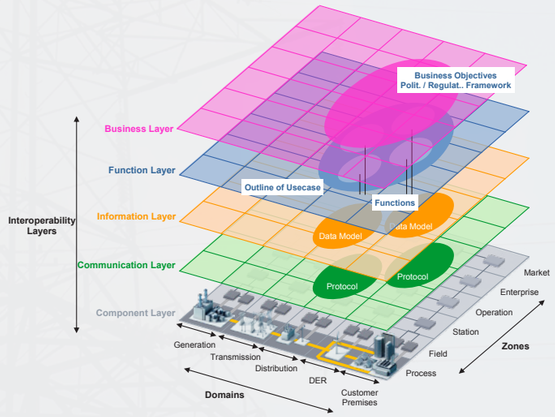

FIGURE 1. FIGURE TAKEN FROM "SMART GRID REFERENCE ARCHITECTURE," CEN-CENELEC-ETSI SMART GRID COORDINATION GROUP, NOV., 2012.*

INTEROPERABILITY LAYERS

Business layer: provides a business view on the information exchange related to Smart Grids. Regulatory and economic structures can be mapped on this layer.
Function layer: describes functions and services including their relationships from an architectural viewpoint.
Information layer: describes information objects being exchanged.
Communication layer: describes protocols and mechanisms for the exchange of information between components.
Component layer: physical distribution of all participating components including power system and ICT equipment.

DOMAINS

The value chain from generation and transmission through distribution, DER to the end customer

ZONES

Hierarchy of power system management from processes, through substations to enterprise and ultimately market-wide

The move to DSOs would mean they undertake the duties of a DNSP but with increased responsibilities bought on by new technologies and flexibility of distributed resources.

THE SMART GRID ARCHITECTURE MODEL (SGAM)

One way in which this dramatic change can be captured and evaluated is through the use of the Smart Grid Architecture Model (SGAM). This is made up of a number of layers, zones and domains as shown in Figure 1.

The SGAM framework allows for the consistent capture of information and the representation of what the future energy system will look like for all key players.

In particular, the framework allows the representation of:

- Who is communicating with the DSO? Identifying which existing and new actors are involved
- What are they saying? Specifying the information exchanges necessary to facilitate the system and the market going forward
- How are they saying it? Describing the communication methods necessary, such as highly resilient SCADA links or electronic signals sent via differing communications media to procure and activate services and inform the market of the status of the system

By using a comprehensive and replicable framework such as SGAM, it is possible to understand how a DSO will deliver the necessary functions in one of many potential futures that might emerge.

It offers a 'market-agnostic' view that can describe who will be involved in the system and how they will contribute to the successful delivery of the various functions across a range of different commercial and market frameworks that could exist with different parties having different responsibilities.

POTENTIAL FUTURES FOR AUSTRALIA'S ENERGY INDUSTRY

This 'market-agnostic' view is key as it helps to drive out the changing requirements for the DNSP as it becomes a DSO, and the SGAM identifies the new skills and technology requirements that will become business as usual.

It also allows for DNSPs to understand how their roles could change in a variety of future worlds, and therefore points to least regrets pathways that can be adopted to manage the uncertainty as the market and commercial frameworks continue to evolve over the coming years.

The DSO transition is potentially the biggest change to happen to networks in decades, but by taking a considered approach with a framework such as SGAM, it is possible to navigate a path that delivers value for all stakeholders.

EA Technology is at the forefront of this challenge and is leading the development of SGAM frameworks for five potential 'future worlds' that could emerge in the UK on behalf of Energy Networks Association.

This collaborative project involving distribution businesses, transmission operators, regulator, government, energy suppliers, aggregators and more, is an example of how it is critical to take a whole system view of the future energy marketplace. U

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