SMART GRID IRELAND CONTRIBUTION TO UREG NI DRAFT CORPORATE STRATEGY 2019-2024

A STRONG GRID NECESSARY TO POWER THE ECONOMY

Introduction

Smart Grid Ireland is an independent industry led networking cluster influencing government and regulation, promoting good corporate citizenship and actively driving technology solutions that accelerates the cultural and societal changes needed to achieve a **digitalized, decentralized and decarbonized electricity network** and improve the island of Ireland's international competitiveness. Smart Grid Ireland's vision is to contribute to the deployment of highly decarbonised electricity grid in both jurisdictions on the island of Ireland by 2030 that meets the policy targets set by each government.

General Summary

Smart Grid Ireland's response to the Utility Regulator draft corporate strategy 2019-2024 focuses primarily on strategic objectives two and three for the electricity network. The body of this response articulates in more detail our view of the current network capacity and capability and what we believe needs to be considered in terms of investment in the network functionality in meeting 21st century network requirements and consumer needs and wants.

Overall we welcome the document as helpful in giving some direction at a time when there is no energy policy direction coming from Government in Northern Ireland. The document highlights the need for a new energy policy which we would fully support.

We also welcome the UR's second key objective of enabling 21st Century networks, although it would be helpful to give more definitions to what 21st Century networks should look like. We believe the strategy could be more ambitious in terms of the targets and objectives it sets under this heading, and highlighting the link between 21st century networks as an enabler of the low carbon future highlighted in the third key objective.

Smart Grid Ireland also welcomes the UR's third key objective of enabling security of supply and a low carbon future. This has to be at the core of future energy policy in NI and consequently in UR's Corporate Strategy. We are delighted to see the Utility Regulator is taking a lead on this in the absence of a policy framework. The role of electricity to replace fossil fuels in heating and transportation should be more ambitious.

Greater emphasis should be given to the DNO to DSO transition as a key aspect of both 21st century networks and enabling a low carbon future, although it is referenced in the document. The strategy also calls out the need for the new North-South Interconnector, which we fully support.

This and other recommendations are articulated more fully in the body of our submission including the challenges that we see facing the existing electricity grid to having a grid fit-for-purpose. We believe that to achieve the regulators stated goals in parts two and three of the

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UR's corporate strategy of enabling goals in decentralization, decarbonisation, digitization and the democratization of the electricity grid, that we present a response that will address the associated economic need for a strong grid to power the economy.

Economic Success Factors - Infrastructure & Energy

One of the key principles underlying **Competitiveness and Value Creation** is investment in key infrastructure and in those projects that strengthen our ability to compete favourably in international markets. By ensuring the hard infrastructure such as a secure energy supply, ports, roads, rails, airports, broadband as well as the soft infrastructure, a region or nation will attract investment, generate value creation, support economic growth and improve the quality of life for its citizens. While NIE Networks have the responsibility to ensure that the electricity grid is functional and well maintained, Eirgrid & SONI are responsible for operating the transmission system so that electrical energy is available on demand at all times. Eirgrid & SONI are responsible for delivering a Secure Sustainable Electricity System (DS3) while addressing the challenges of integrating renewable generation on to the power system to meet carbon reduction targets.

Connecting Renewable Energy

Achieving this level of renewable integration on a synchronous system is unprecedented and presents significant challenges for the real-time operation of the power system. Much of the renewable capacity is connected directly to the distribution system through clusters of larger wind farms to minimise the construction of transmission circuits. Under DS3; SONI has increased the level of wind generation that can be operated on the system in a secure manner.

During the recent past there has been over 3 Giga Watt (3,000MW) from wind on the island of Ireland. This is the highest output to date. It occurred during a time when SONI had both winter demand levels and the opportunity to export about 600MW to Great Britain. As well as being technically secure and stable the system also delivered reductions in the wholesale price of electricity - a tangible benefit to customers.

Developments in Solar & Wind Energy

There has also been a recent increase in solar connections in NI to take advantage of the Renewable Obligation Certificate (ROC) subsidy with over 246MW of solar capacity now connected including several large scale solar parks. The DS3 programme will continue to push the boundaries of renewable integration with the aim to increase synchronous non-synchronous power to 75% by 2020. In doing this Eirgrid / SONI will continue to move into unchartered waters for transmission system operations.

This journey will require cooperation from generators in making changes to their equipment, entry into the market of technologies that can provide services needed to react more quickly than traditional conventional generation to changes in system demand, to incidents and variations in generations from wind and other generating units. The certainty of service availability will become increasingly important and this will require new standards and processes.

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At the level of renewable integration currently in place, SONI are leading the world in operating a synchronous system with 65%. The intention must be to press forward to achieve the maximum benefits to customers of the natural wind resource available on the island of Ireland. With up to 1650 MW connected, there are further requests in the system to connect another 200 MW of sustainable energy and this will require major investment on the grid infrastructure.

North – South Interconnector
The planned installation of the second North-South electricity interconnector is an extremely critical and strategically important investment for the island of Ireland. The installation will reinforce the existing network and ensure that both the industrial and domestic consumer in Northern Ireland will have access to the LOWEST cost and regionally secure energy supply available on the island of Ireland, through the addition of a new transmission circuit. With a digitized economy moving rapidly towards digitized factories, homes, transport etc., a secure, safe and reliable electricity supply is of paramount importance to a modern economy. The impact of a poor electricity supply with blackouts and electricity shortages in under developed countries is self-evident.

Regulation

The demand for clean, secure and efficient energy (SC3) incorporating distributed electricity will increase significantly longer term with the growth of electric & hybrid transportation, the upgrading of energy performance and smartness in the housing stock, the diversity of energy supply and new industrial drivers such as Data Centre's and digital factory automation. These advances will change the game in how electrical energy is sold and delivered. Accelerating the transition to a low carbon economy is a central challenge of our time taken forward with renewed momentum from the COP21 Paris agreement.

In appraising the extent of grid infrastructure modernisation the Regulator needs to identify those integration measures that are required to support:

- The further integration of variable renewable energy, (VRE),
- The future needs of communities,
- Investment in economic growth and
- Improved services that underpins the transition process enabling smart cities.
- Investment in innovation in new technology solutions otherwise more costly legacy technology solutions will not be commercially efficient.

Challenges to the existing Electricity Grid.

With a century-old by design, existing grids face four main challenges globally:

1) **Electricity demand is rising** faster than any other final-energy source (2% per year until 2040), and intensifying around peak times because of the progressive shift in consumption from steady industrial baseload to variable household and commercial demand. As a result, networks are being both reinforced to increase existing capacity, and extended to reach larger customer bases;

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2) **Existing grid infrastructure is aging**, because of very long return-on-investment cycles. In the U.S., for example, the aging transmission network is causing a decline in power reliability. In some developing economies, such as India, theft and technical losses in inadequate distribution networks result in 20% of transmitted electricity being lost. The global financial impact of such grid issues is growing, as economies are ever-more reliant on electricity; *(source Schlumberger Energy)*

3) **As wind and solar capacity increase**, the penetration of Variable Renewable Energy (VRE) in some regions is reaching levels that are creating difficulties in the balancing of supply and demand at a reasonable cost;

4) **Distributed Generation (DG)** annual capacity addition is set to double in the next 10 years. Yet, in many cases, distributed capacity is either off-grid or merely *connected* to the grid, but not properly *integrated* into grid operation. As a result, bi-directional electricity flows and power-quality issues arise where the penetration of distributed generation becomes critically high.

In response to these challenges, investments in electricity grids are increasing by 4% per year globally, a growing share of which is directed towards smart-grid technologies. Overall, the goal of a power grid is to co-optimize, for a given set of generation capacity and demand patterns:

- **Power reliability** (frequency and extent of outages);
- **Power quality** (voltage signal shape, frequency and phase angle); and
- **Power affordability** for consumers.

How does the NI Grid Measure Up?

The Northern Ireland Grid needs a modernised electricity network that monitors, protects and optimises the operation of its interconnected elements. A mediocre infrastructure will not be able to meet the growing demands placed upon it.

Future energy networks will have to facilitate circumstances which were not in the original design and also cope with increasing demand and consumer expectations. Collectively there is a need to develop appropriate and functional Communications and IT infrastructure for the sensing, analysis and response mechanisms, the related hardware for command and control and the supporting software operating systems.

The wider societal impacts of the interconnected nature of smart energy cannot be ignored and places the electricity grid within the holistic context of “energy “as part of a “smart system.” We would argue that energy, albeit a critical element, is still only one part of the wider development of smarter infrastructures that are underway throughout the developed world with the internet of everything. The NI Electricity Regulator has an opportunity to invest in smart grid technologies through making allowances for Research & Innovation (R&I) and competitiveness.

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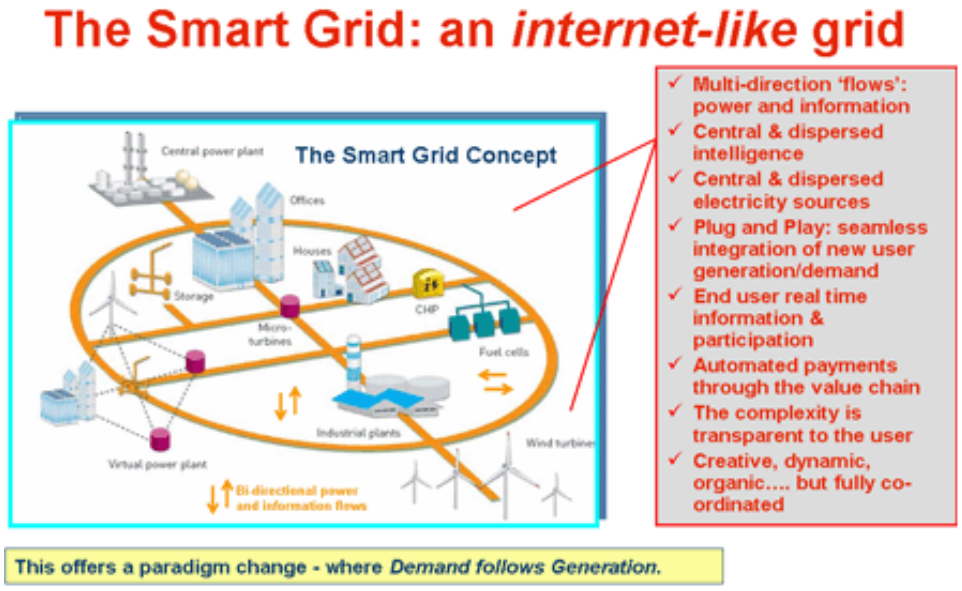
By investing in R & I in line with the Strategic Energy Technology Plan (SET) which aims to accelerate the development and deployment of low-carbon technologies, NIE networks will be enabled to develop technological leadership in low carbon technologies and reduce energy consumption, empower consumers, create huge industrial opportunities and boost growth and jobs. The transition to a smart grid requires the deployment of new power infrastructure, along with various kinds of devices, such as electronic sensors, storage and computer systems, throughout the electricity network and their interconnection via high-speed communications networks using standardized protocols. It is essential that the "power internet" and the "internet of things" (IOT) are integrated.

The strategic needs of the electricity network can be projected through the shift in business models and new technological innovations that support the economic achievement of sustainability enabled in particular through the development of the smart electric grid. The necessary combination of communications and IT networks with the energy network creates new opportunities and thus new innovation challenges to realise these applications. This is specifically relevant when we consider that there will be a new interface between traditional technologies and participants, with new entrants having their own expertise such as communications, software and security.



"In less than a decade there will be millions of smart meters delivering daily and hourly updates, distribution sensors and controls demanding split-second decisions, and back-office analytics to churn all that data into dollars and cents. Utilities are going to have to manage nine times the data they do today if they want to adapt to the smart grid." (Lux research)

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ECONOMICS AND ENVIRONMENTAL BENEFITS

Although impacts are difficult to quantify a smart-grid roll-out is shown to provide net economic and environmental benefits in all regions where studies have been undertaken. For U.S. society as a whole, the direct and indirect benefits of a full roll-out outweigh their costs by a factor of between 2.7 and 6. Restricting the scope to electricity-grid stakeholders, the direct benefits/cost factor is between 2 and 4 in OECD countries, and 3 and 4.5 in China. *(source Schlumberger Energy)*

SOCIAL ACCEPTANCE AND CYBERSECURITY

Social acceptance of smart grids is a prerequisite for active consumer participation in grid management. Clarity in relation to data privacy, sharing and protection will be essential in securing consumer acceptance and grid security. Cybersecurity must be developed to protect technology, processes and people from deliberate attacks and accidents. In Europe, €3 billion of public funds was allocated in 2006 to help companies invest in smart-grid projects.

The new 10 year EU Research & Innovation roadmap 2017-26 provides the system view to the entire energy transition by addressing a scope larger than smart electricity grids: It also encompasses interactions with the gas and heat networks and focuses on integration of all flexibility solutions into the power system, including energy storage technologies. Worth 2.5 billion investment over the next 10 years to help Europe's energy. Smart-grid initiatives continue to expand globally, with increasing momentum all around the world. N.I. needs an energy and regulatory policy that has embedded within it, incentives towards a consumer led, technology enabled supply system that can deliver low cost, low or zero carbon smart energy provision. This can be achieved by strengthening the regulatory framework as outlined to deliver a Digitized, Decentralized, Decarbonized & Democratized supply of electrical energy to consumers.

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