Delivering a Secure, Sustainable Electricity System (DS3)

Programme Overview - 2015

1 Context

1.1 Background

In order to facilitate the successful transition towards increasing levels of renewable generation on the power system, a number of interrelated studies have been undertaken. The first of these - the All-Island Grid Study - was published in 2008. The All-Island Grid study concluded that up to 42% of renewable generation could be accommodated on the power system of Ireland and Northern Ireland. This was subject to the delivery of the necessary infrastructure and further investigation into the underlying technical aspects of a power system operating with large amounts of variable, non-synchronous generation sources. Since the publication of this study, the System Operators have been working to integrate increasing levels of renewable generation. In 2008, the Grid25 programme was launched to ensure Ireland will have the necessary infrastructural elements in place to enable this transition. In Northern Ireland a similar programme has been put in place to ensure the development of the required network infrastructure.

In June 2010, EirGrid and SONI published the findings of the Facilitation of Renewables (FoR) suite of studies. This publication was an important step towards providing a more complete picture of the operational implications of managing high levels of variable renewable generation on the power system, and provided the basic foundation of understanding the power system in this new context. This was followed in 2011 with a more in-depth analysis which is outlined in the report "Ensuring a Secure, Reliable and Efficient Power System in a Changing Environment"[1].

In 2011, EirGrid and SONI embarked upon a multi-year programme "Delivering a Secure, Sustainable Electricity System" (DS3). The programme was designed to ensure we can securely operate the power system with increasing levels of variable non-synchronous renewable generation over the coming years. Together with the on-going work on infrastructure development and the addition of renewable generation capacity, the DS3 programme is critical to meeting the 40% renewable electricity targets by 2020.

1.2 DS3 – Delivering a Secure, Sustainable Electricity System

The DS3 programme was launched in August 2011 as a multiyear programme of work. At its core, DS3 is designed to ensure the secure and safe operation of the power system in Ireland and Northern Ireland with increasing levels of variable renewable generation. In order to achieve the renewable targets, the generation plant portfolio on the island will be transformed from the traditional mix of conventional generation (mostly of gas and other thermal plant), to a portfolio where in 2020, variable non-synchronous wind generation will account for 37% of all electrical power generated on the Island.

The power system is currently operated at a maximum SNSP (System Non Synchronous Penetration) level of 50% in real-time. However in order for the Transmission System Operators (TSOs) to efficiently achieve the 40% RES-E targets by 2020 the system will need to be operated in real-time with SNSP levels of up to 75%. Operating the system in this manner creates a range of technical challenges that are being managed by the TSOs through the DS3 Programme.

[1] http://www.eirgrid.com/media/Ensuring_a_Secure_Reliable_and_Efficient_Power_System_Report.pdf

The focus over the past four years has been on creating the correct technical standards and commercial mechanisms to incentivise and improve system performance and capability. In 2014 the main focus shifted towards the implementation of increased performance capability for the generation portfolio, and developing the required system policies and tools needed to meet the 2020 targets.

1.3 Cross Cutting Nature of the Programme

The DS3 programme is made up of 11 workstreams which fall under three main pillars: System Performance, System Policies and System Tools. Each pillar is fundamental to the success of the DS3 programme and the delivery of the 40% renewable electricity target. The DS3 programme brings together many different strands, including development of financial incentive products for improved plant performance, and the development of new operational policies and system tools in order to accommodate increasing levels of renewable generation on the grid in a secure and sustainable manner. Standards for wind farms and conventional plant are also being reviewed to provide enhanced operational flexibility for the future. The programme involves many different stakeholders, including the Distribution System Operators (DSOs), Regulatory Authorities, Conventional Generators, Renewable Generators, as well as the TSOs.

As part of the DS3 programme, EirGrid and SONI are committed to engaging with all our customers and stakeholders. Given the scale, extent and impact of the programme, there is a major role for other stakeholders in ensuring the success of the DS3 programme. The TSOs are cognizant that this programme has the potential for far-reaching financial and operational impacts. Therefore, a cross-industry Advisory Council has been established to ensure appropriate engagement across the industry. The Council is comprised of experts from academia, industry and research centres across the island. The Advisory Council, which convenes approximately every four months, has met eleven times since it held its first meeting in October 2011.

2 Policy Background

Under the EU Renewable Energy Directive 2009/28/EC, the system operators (TSO and DSO as appropriate) are obliged to "take appropriate grid and market related operational measures in order to minimise the curtailment of electricity from renewable sources on the electricity system." In addition, if significant measures are taken to curtail the renewable energy sources in order to guarantee the security of the electricity system and security of energy supply, the TSOs shall report to the Regulatory Authorities on those measures and indicate which corrective measures it is intending to take in order to prevent inappropriate curtailments[2].

Ireland has set a target of 40% from renewable resources by 2020. Northern Ireland has set a similarly challenging policy goal of 40%. The actual amount of renewable energy this requires will depend on the demand in future years, the forecast of which has decreased due to the economic downturn. With these uncertainties in mind, not one figure but a band between about 4,400 and 4,900 MW has been estimated for wind capacity in 2020[3]. This level of renewable penetration into a synchronous system is unprecedented and poses significant challenges to the real time operation of the power system. To mitigate these challenges, in line with European requirements to minimize curtailment, EirGrid and SONI have carried out comprehensive studies to better understand the changing behaviour of the power system with increasing volumes of renewable plant. These studies, which are reported in the Facilitation of Renewables (FoR) studies and the follow up "Ensuring a Secure, Sustainable Power System", indicate that efficient management of the power system with large volumes of renewable generation is possible. In particular, the FoR studies confirmed that it was possible to securely operate the power system to 50% SNSP (System Non Synchronous Penetration[4]) [Green Zone - Figure 1]. In addition, the studies indicated that it was possible to operate the system up to 75% SNSP [Amber Zone - Figure 1] but mitigating actions would be required to resolve a number of technical challenges. The studies indicated that secure operation beyond a 75% SNSP level was not possible given known technology capabilities.

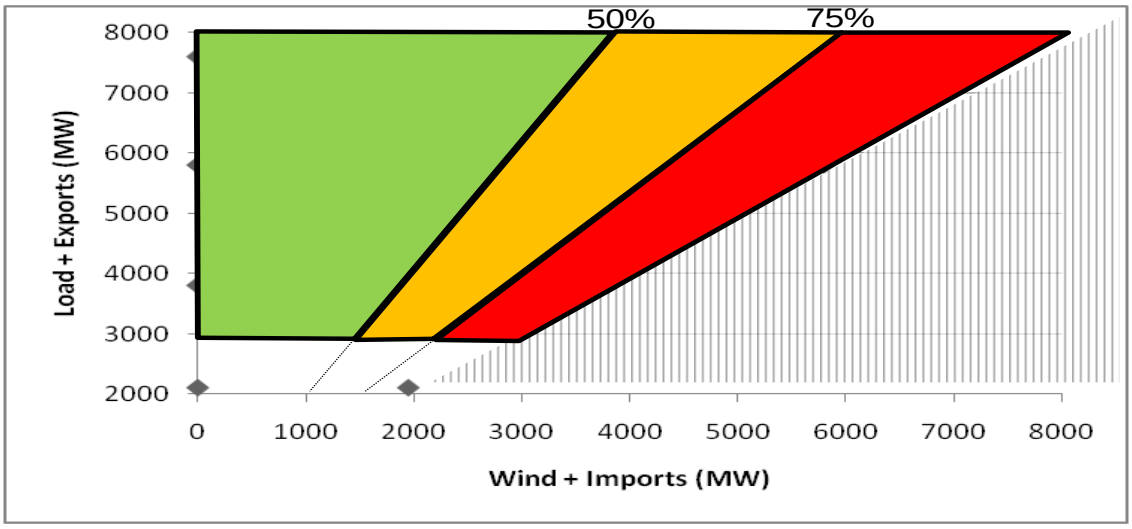


Figure 1: Operating Zones in the Ireland and Northern Ireland Power system (FoR Studies, 2010)

[2] SEM Committee Decision Paper (SEM-11-062) on the Principles of Dispatch and the Design of the Market Schedule in the Trading and Settlement Code: *"In the context of Article 16 of Directive 2009/28/EC the TSOs shall report on a quarterly basis to the respective Regulatory Authorities on incidences of curtailment of renewable generation in order to guarantee the security of the electricity system and security of energy supply indicating corrective measures employed to prevent inappropriate curtailments."*

[3] All Island Renewable Connection Report 36 month forecast (Q4 2013). http://www.eirgrid.com/media/Generation%20Capacity%20Statement%202014.pdf

[4] System Non-Synchronous Penetration (SNSP) is a real-time measure of the percentage of generation that comes from non-synchronous sources, such as wind and HVDC interconnector imports, relative to the system demand.

3 Programme Objectives

Over recent years the electricity sector has entered a period of considerable change. This change has been characterised by a drive toward increased environmental sustainability, energy security and economic competitiveness, and is being delivered primarily through a commitment to increase the level of renewable generation on the power system. In that context, the key objective of the all island DS3 programme is:

- to meet the challenges of operating the electricity system in a secure manner while achieving the 2020 renewable electricity targets

There are three main work areas within the DS3 programme and their objectives are outlined below:

System Performance

- To provide certainty around current and future plant performance capability and to ensure the continued reliable performance of all plant connected to the power system in Ireland and Northern Ireland
- Enhancing existing performance monitoring processes and highlighting Grid Code compliance
- To ensure the development of a portfolio of plant aligned with the long term needs of the system
- Review standards for Rate of Change of Frequency (RoCoF) for plant connected to the system

System Policies

- Adapting and refining system operational policies to assist in securely managing the voltage and frequency on the Ireland and Northern Ireland power system
- Collation and analysis of data relating to renewable generation and using this to inform system operational policy development

System Tools

- Design, development and implementation of enhanced system tools in order to manage the increased operational complexity
- Provide decision support tools to assist the operators in the Control Centres (e.g.) stability analysis tools such as the Wind Security Assessment Tool (WSAT) and forecasting tools.
- Updating system models with actual plant performance capability and carrying out further studies to investigate a secure system with high levels of non-synchronous penetration.

4 Programme Workstreams

In order to achieve the deliverables in the DS3 programme, the programme can be further broken down into 11 workstreams [Figure 2]. Details of the content of each of these workstreams are published annually in separate workstream plans and these can be found here.

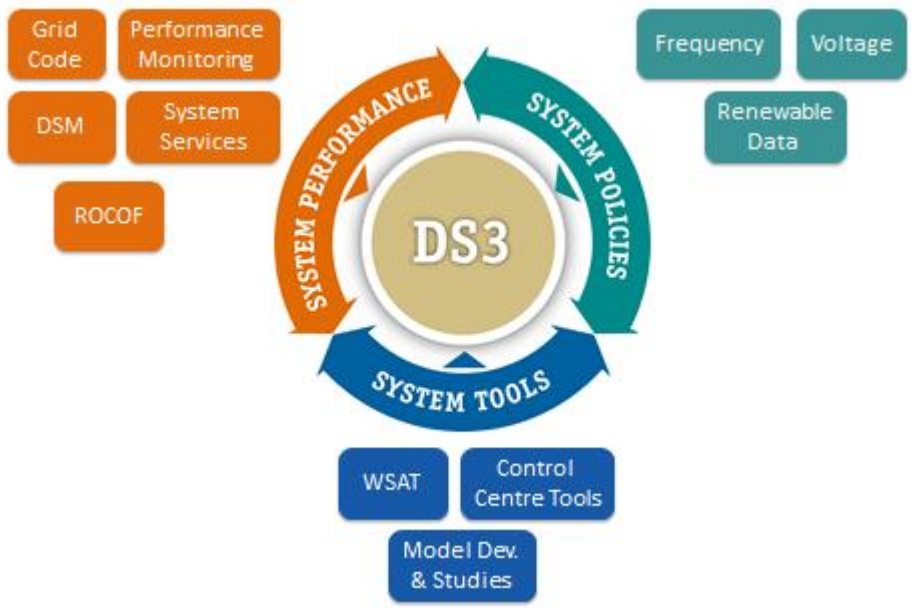


Figure 2: DS3 Workstreams

4.1 Workstream: Frequency Control

In a synchronous AC power system, such as Ireland and Northern Ireland, all of the conventional generating units are synchronised together, producing electricity at a nominal frequency of 50 Hz. When supply and demand are in balance, the frequency will be static. If there is excess generation, the frequency increases; conversely, if there is insufficient generation, the frequency will decrease. The normal operational frequency range is 49.8 Hz to 50.2 Hz. EirGrid and SONI have a primary duty to manage the frequency in real-time. Frequency excursions outside these limits can occur if there is a sudden change in demand, generation or interconnector flow. This is managed by maintaining operating reserves, both spinning and static, on the system that can be used to correct energy imbalances when they occur.

A power system with a high penetration of variable non-synchronous wind generation poses significant challenges for frequency control over multiple timeframes. These challenges can be categorised as follows:

a) Rate of Change of Frequency (RoCoF) issues – ensuring that post-event system RoCoF values are managed to avoid excessive rates which come about because of the reduced system inertia in a system with high levels of non-synchronous penetration. This issue is being addressed separately in a dedicated DS3 RoCoF workstream;
b) Frequency Response to Large Disturbances – ensuring adequate system inertia and fast-acting response to minimise chances of excess frequency deviations from the loss of large in-feeds or large exports;

c) Voltage Dip-Induced Frequency Dips – coping with transmission faults that lead to reduced power output from wind farms, leading to a frequency dip;
d) Frequency Regulation – maintaining system frequency within its normal limits, and coping with fluctuations in demand and generation particularly with increased penetration from wind farms;
e) Ramping Capability – ensuring that the generation and demand side portfolio response is able to cope with changes in demand and wind generation over periods from minutes to hours. This is often referred to as "flexibility" of plant;
f) System Inertia – ensuring the TSOs' unit commitment programme takes account of any system inertia constraints when economically dispatching / committing generation; and
g) Over-Frequency Generation Shedding – developing a schedule of generator/wind-farm shedding which will mitigate high system frequencies caused by, for example, a HVDC trip whilst heavily exporting.

4.2 Workstream: Voltage Control

The system voltage is determined by the balance of reactive power production and absorption. Conventional generators have traditionally been a primary source of reactive power, which compensates for the reactive power produced and absorbed by consumers and by the lines and cables on the network itself. Reactive power, unlike active power, is predominately a local phenomenon, (e.g.) reactive power cannot be transmitted over significant distances.

The management of voltage requires a co-ordinated approach for reactive power control throughout the whole system, both transmission and distribution in Northern Ireland and Ireland, as deficiencies in a local area at a certain point can have an inordinate impact on other voltages, potentially leading to voltage collapse.

The management of system voltage needs to evolve due to the changing nature of the portfolio of plant connected to the power system. Key changes relate to the type of generation connecting to and being decommissioned from the system, the location of said generation and the reactive power capability of connected plant. The report published by the TSOs in July 2011[5] (hereafter referred to as the DS3 Report) outlined the current issues relating to voltage control and the likely challenges that will emerge out to 2020.

4.3 Workstream: System Services Review

The nature of the all island power system is changing to meet Government policies with respect to renewable energy. This has significant implications for the needs of the power system, particularly with respect to system services. System Services are those services, aside from energy, that are necessary for the secure operation of the power system. A central aspect of the DS3 programme is the System Services Review which was carried out to:

- clarify system needs – now and projected for the future,

[5] http://www.eirgrid.com/media/Ensuring_a_Secure_Reliable_and_Efficient_Power_System_Report.pdf

- review effectiveness of existing services and payment structures,
- develop new services, determine appropriate valuations of these services and develop new/revised payment structures that foster a continued focus on performance and where appropriate drive investment,
- develop and implement an appropriate timetable for the implementation of any new arrangements in order to provide early signals to investors.

In December 2014 the Regulatory Authorities published a decision paper on DS3 System Services which will:

- Increase the annual cap from €60m to €235m
- Double the amount of System Service products from 7 to 14
- Move to a hybrid regulated tariff/auction procurement strategy

Following the decision from the SEMC, the System Services Review will now enter an implementation phase. In phase 2, the details of the products will be developed and transformed into business rules and functional specifications, which will be implemented in the settlement system. Rates for the System Services products will be developed and consulted on with industry. This phase will also involve the operational readiness including the development of System Services Agreement, documentation describing the new arrangements and processes, training, execution of contracts and having a period of parallel running before go-live. It will also contain a number of further industry consultations

4.4 Workstream: Demand Side Management (DSM)

Demand Side Management will play a key role in facilitating the management of increased levels of renewables. In addition, the future role of domestic appliances, electric vehicles, heat pumps, storage and other technologies will need to be factored into the DS3 programme.

For example, Demand Side Units (DSU) and Aggregated Generator Units (AGU) are units that are the aggregation of small loads/generators by an intermediary actor in the market. These units operate commercially within the SEM and are centrally dispatched. Units like these can assist with the operational integration of renewable generation by providing flexible system services.

At present (late March 2015), there are 3 AGUs (89MW) and 10 DSUs (209MW) operational in the SEM and there is substantial interest from industry in the development of further DSUs. As the level of interest from potential DSUs to provide System Services continues to grow, the TSOs are conducting a demonstration project on the possibility of supplying both fast acting frequency response and ramping services from distributed demand side loads.

4.5 Workstream: Grid Code

The purpose of the Grid Codes in Ireland and Northern Ireland is to set the (minimum) standards relating to the operation and use of the Transmission System and to define material technical aspects relating to the use of plant or apparatus connected to the Transmission or Distribution system. The Grid Codes are active documents that are continuously under review and modification.

This reflects the dynamic nature of the power system where technology is continuously evolving and operating practices and procedures are updated in tandem. There is a process in place for modifying the Grid Codes via the Grid Code Review Panels. Common sections of the codes can be modified via the Joint Grid Code Review Panel. The Grid Codes have already undergone many changes to incorporate and reflect the particular technical characteristics of wind generation.

Considering that the majority of the modifications related to the DS3 programme have been approved or are under consideration by the regulator it is envisaged that this workstream will begin to conclude. Over the next twelve months Grid Code modifications relating to DS3 will decline.

4.6 Workstream: Performance Monitoring

The nature of the all-island power system is changing to meet both Governments' policies with respect to renewable energy. At the core of this change is the replacement of large thermal synchronous plant with variable non-synchronous renewable power plants. To manage this transformation it is essential that a detailed understanding of the changing characteristics of the power system is developed. At the core of this understanding is the need to systematically monitor the actual performance of all users over a wide range of operating conditions and disturbances. Performance monitoring, including both commissioning and on-going testing of generators, needs to evolve in the coming years to meet these challenges.

The Performance Monitoring aspects of the workstream have the following objectives:

- standardise the existing performance monitoring processes on an all-island basis;
- develop the business processes and operational policies required for an enhanced performance monitoring process;
- develop requirements for and build an IT system to monitor the performance of users of the system;
- engage with stakeholders throughout the project to ensure their requirements are captured; and
- investigate the use of improved data such as high speed data recording devices.

The testing aspects of the workstream have the following objectives:

- carry out a review of the existing testing processes with stakeholders;
- develop and implement recommendations to improve and standardise the testing processes; and
- develop standardised testing processes arising from new Grid Code modifications.

4.7 Workstream: RoCoF

The "Facilitation of Renewables" report indicated that one of the key limits to increasing the real time penetration of renewable power plants on the all island system was the Rate of Change of Frequency (RoCoF). From operational experience and analysis, RoCoF in excess of 0.5 Hz/s are likely to be encountered when the system exceeds a 50% system non-

synchronous penetration (SNSP) level or the synchronous inertia falls below 20,000 MWs. In recognition of this, the Ireland and Northern Ireland Grid Codes are being changed to a 1 Hz/s over 500 ms RoCoF standard.

Without this higher RoCoF standard, the curtailment of wind will be higher (SNSP cannot exceed 50%, a threshold which is being hit with increasing regularity as more wind connects to the system) and the overall 40% target may not be achieved by 2020. Therefore the realisation of the objectives of DS3, of which RoCoF is an integral work stream, is important in terms of meeting the obligations under Directive 2009/28/EC and taking appropriate measures to minimise curtailment.

In 2014 both Regulatory Authority decisions approved the TSOs' proposed RoCoF Grid Code modification in principle. However, application of the new standard in the Grid Codes will only come into effect following confirmation from the TSOs that, from a system security perspective, it can be implemented. To determine this, an industry implementation project which will run until 2018 has begun. The implementation project consists of three strands:

- TSO & DSO Implementation;
- Generator Implementation;
- Alternative/Complimentary Solutions

4.8 Workstream: Model Development & Studies

The main aim of this workstream is to inform future operational policies related to the integration of large amounts of wind onto the Ireland and Northern Ireland system. In order to do this a range of technical studies and analysis is to be performed. This analysis includes steady-state load-flow, quasi steady-state PV load-flow, short-circuit, dynamic stability, transient stability and frequency response analysis. A significant factor in this is to develop and validate the dynamic model of the Ireland and Northern Ireland system so that the TSOs have confidence in the results of the studies carried out using those models. Another aim is to streamline and automate the study process, so that extensive studies on different aspects of power system operation can be carried out more quickly. This may involve using scripting tools to provide a control layer above the actual simulation tools, into which information on dispatches, sensitivities, and key outputs can be fed.

4.9 Workstream: Renewable Data

Meeting the 40% renewable electricity targets in Ireland and Northern Ireland will require power system operators to manage the power system with increasing levels of variable non-synchronous renewable generation progressively to 2020. As the level of variable non-synchronous renewable generation increases year-on-year, EirGrid and SONI need to have sufficient clarity as to how this development is impacting the characteristics of the power system. Thus the objective of the Renewable Data workstream is to develop a detailed library of information associated with the integration of renewable generation on an all-island basis. This information feeds in to a range of both internal reports and external publications – both technical and non-technical.

At this stage, the majority of the reports produced under this workstream have been completed for a number of years and as such the processes and procedures behind these reports are largely established. In this context, a number of deliverables which were previously apart of this workstream can be considered as business as usual and thus will no longer be reported specifically as part of the DS3 Programme. However reports such as these will continue to be published per existing arrangements.

4.10 Workstream: Wind Security Assessment Tool (WSAT)

The stability of the power system is affected by wind generation, and so to study this in real-time, an online Wind Security Secure Level Assessment Tool (WSAT) was introduced. WSAT provides a real-time assessment of transient stability, voltage stability and frequency stability assessment of the current state of the power system. This allows the Grid Controllers to monitor system stability in real-time and take appropriate corrective or preventative actions. Further extensions of WSAT will include calculation of security based regional wind curtailment amounts, and look ahead capability.

WSAT has been in operation in the Dublin Control Centre since September 2010 as a Phase 1 of the system roll-out. The tool was initially developed for the power system of Ireland and was utilized by Grid Controllers for guidance in operating the system securely in terms of voltage and transient stability. Phase 2 of the project involved developing WSAT for the all-island power system – this version was launched simultaneously in both the Dublin and Belfast Control Centres on 19th November 2012. Phase 3 of the project involved further developing all-island WSAT as a core on-line tool in the Control Centres through maintaining its reliable and efficient operation, on-going model validation and an enhancement process. As part of this process, frequency security analysis was included in WSAT in December 2014 in the Dublin and Belfast Control Centres.

Work will continue on WSAT to further improve the accuracy of the WSAT real-time model and extend the functionality of on-line WSAT. This will involve the use of newer data sources i.e. PMU records. In addition, a specification of further software enhancements to include overload analysis, on-line calculation of the amount of constrained and released wind will be developed. Also new near-real time Forward-looking WSAT will be developed. It will assist in increasing the amount of renewable energy in the total energy mix by ensuring operational security through a more accurate assessment of day-ahead system operational security conditions.

4.11 Workstream: Control Centre Tools and Capabilities

The evolving power system requires new principles and operational practices. This, in turn, means new and updated system tools must be developed and implemented. As an example, the projected increase in electricity production from renewable sources, in particular wind energy, will have significant implications for the control of system voltages in steady-state and transient scenarios. Similarly, the future generation portfolio will create considerable challenges for system frequency control. New and modified operational policies and tools may be required to meet these challenges. Furthermore, enhanced staff capability will be required to manage the power system in this changing environment.

There are two transmission system control centres on the island of Ireland; the Dublin and Belfast Control Centres. As part of this workstream, the tools available to the operators in both Control

Centres will be reviewed and modified where necessary. In some cases new tools will be developed to enable the implementation of new operational policies. In keeping with the natural flow of DS3 from system performance to system policies to system tools, much of the activity in this workstream will be driven by the outputs of other DS3 workstreams, especially those in the policy area. Notwithstanding this, the anticipated Control Centre environment with the expected level of renewable generation will be examined to highlight requirements which may not be generated by other workstreams. It is important to note that the future requirements for the Control Centres are not yet fully defined and will continue to evolve.

Work has already been completed in many areas associated with this workstream. The Wind Dispatch Tool and Wind Forecasting projects have both been delivered successfully. The development of new functionality within the existing Energy Management System (EMS), including online inertia and rate of change of frequency (ROCOF) monitoring is also complete. Other work areas where significant progress has been made to date include the continued development of the Reserve Constrained Unit Commitment (RCUC) software and overlaps with the Wind Security Assessment Tool (WSAT) workstream.

5 Communications/Stakeholder Engagement

As part of the DS3 programme, EirGrid and SONI are committed to engaging with all our customers and stakeholders. Given the scale, extent and impact of the programme, there is a major role to play for the other stakeholders in ensuring success.

EirGrid and SONI hosted a DS3 Industry Forum in August 2011 to mark the launch of the DS3 programme. This was the first of a series of Industry Forums to be held where recent findings and developments are presented. To date 12 Industry Fora have been hosted by EirGrid and all have been very well attended by delegates from across the energy industry. These forums will be continuing as part of the on-going DS3 Programme.

An Advisory Council was established to provide a forum to discuss views and concerns on those issues which impact on the successful implementation of the programme. The Council is comprised of experts from academia, industry and research centres across the Island. The Advisory Council, which convenes approximately every four months, has met eleven times since it held its first meeting in October 2011.

To ensure the successful delivery of the DS3 programme, the system operators are working closely with the DSOs, the regulators, government departments and all relevant industry stakeholders. The objective of all parties is to ensure that the 40% 2020 renewable policy targets are delivered in a cost efficient manner without adversely affecting security of supply of the all-island power system. Further information on the DS3 programme can be found at http://www.eirgrid.com/operations/ds3/.

6 Programme Management

To ensure the successful delivery of the DS3 programme, EirGrid and SONI will work closely with all industry stakeholders including the Department of Communications, Energy and Natural Resources (DCENR); the Department of Enterprise, Trade and Investment (DETI); the Commission for Energy Regulation (CER); the Utility Regulator (UR); the Single Electricity Market Committee (SEMC) and wider stakeholders in the electricity industry.

The TSOs and RAs will hold a monthly meeting to discuss the programme and workstream progress; deliverables, issues, risks and constraints. The TSOs and DSOs will schedule regular meetings to work through the key issues per their programme plans.

The Programme Manager, on behalf of the PMO, will advise the Programme Board of issues arising as appropriate. The Programme Manager, on behalf of EirGrid and SONI, will inform the Advisory Council of key developments.

The Programme Management Office shall overall responsibility for

- day to day management of all aspects of the Programme
- monitoring progress of the Project against the Programme Plan
- reporting to the Programme Board
- providing recommendations to Project Board where adverse developments occur in relation to the Programme

The programme and the interactions between the various workstreams are illustrated in section 6.2 below. This graphical illustration simply provides a high level overview of the DS3 project and its dependencies and should not be used to analyse the programme in detail.

It is important to note that the delivery of the key parts of this programme will only be achieved with the full engagement and support of all stakeholders across the electricity sector.

6.1 DS3 Key Deliverables

At a high level, the key enablers for the DS3 Programme are:

- System Services Implementation Project
- RoCoF Implementation Project
- Development of Operational Policies
- Launch of new Control Centre Tools

Further commentary on these is included in the annual update of the Operational Capability Outlook document.

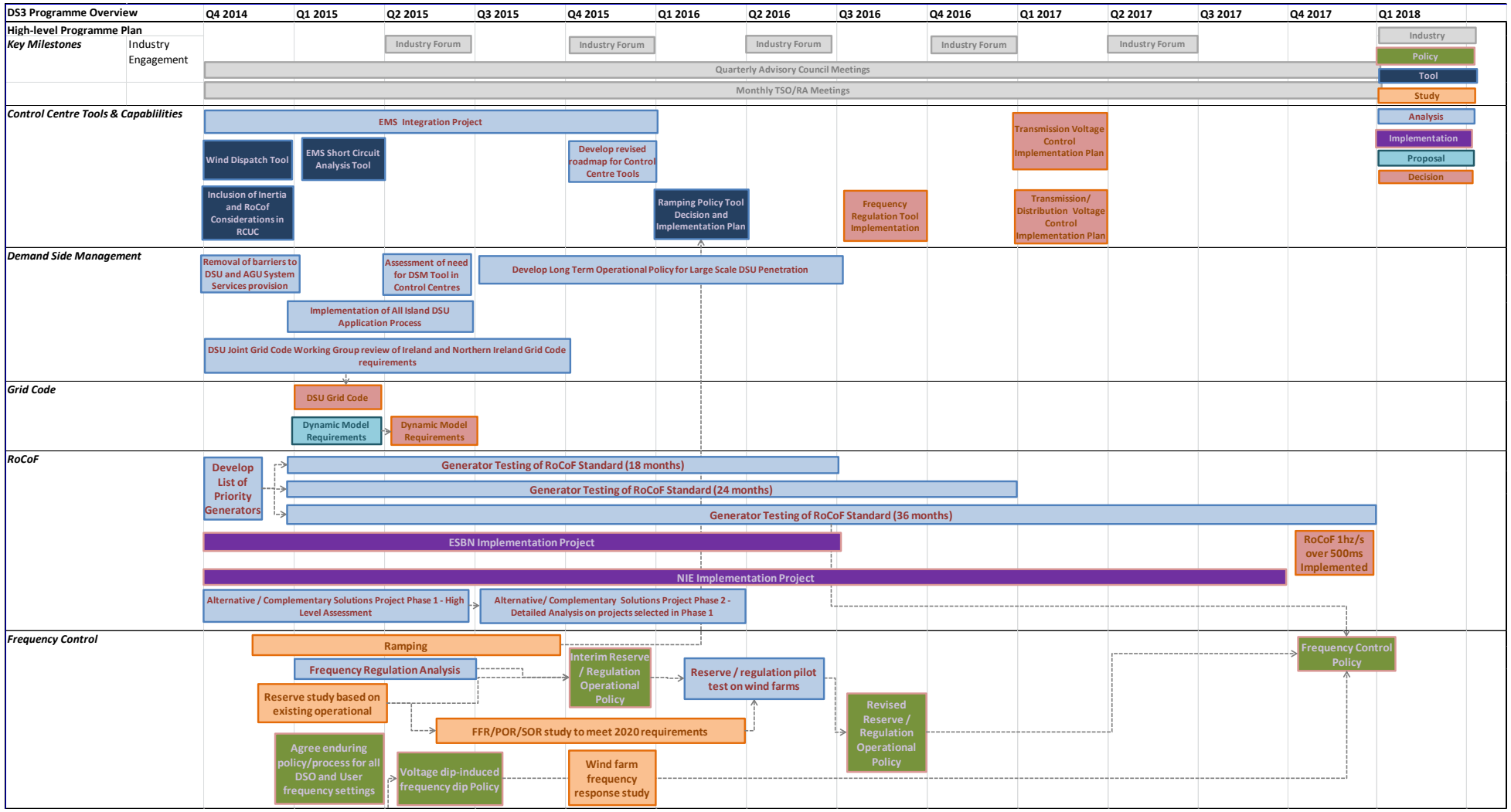
The System Services and RoCoF Implementation Projects, and subsequent response by industry to commercial incentives, largely determine the DS3 Programme critical path and subsequent achievement of the objective of increasing the SNSP from 50% to 75%.

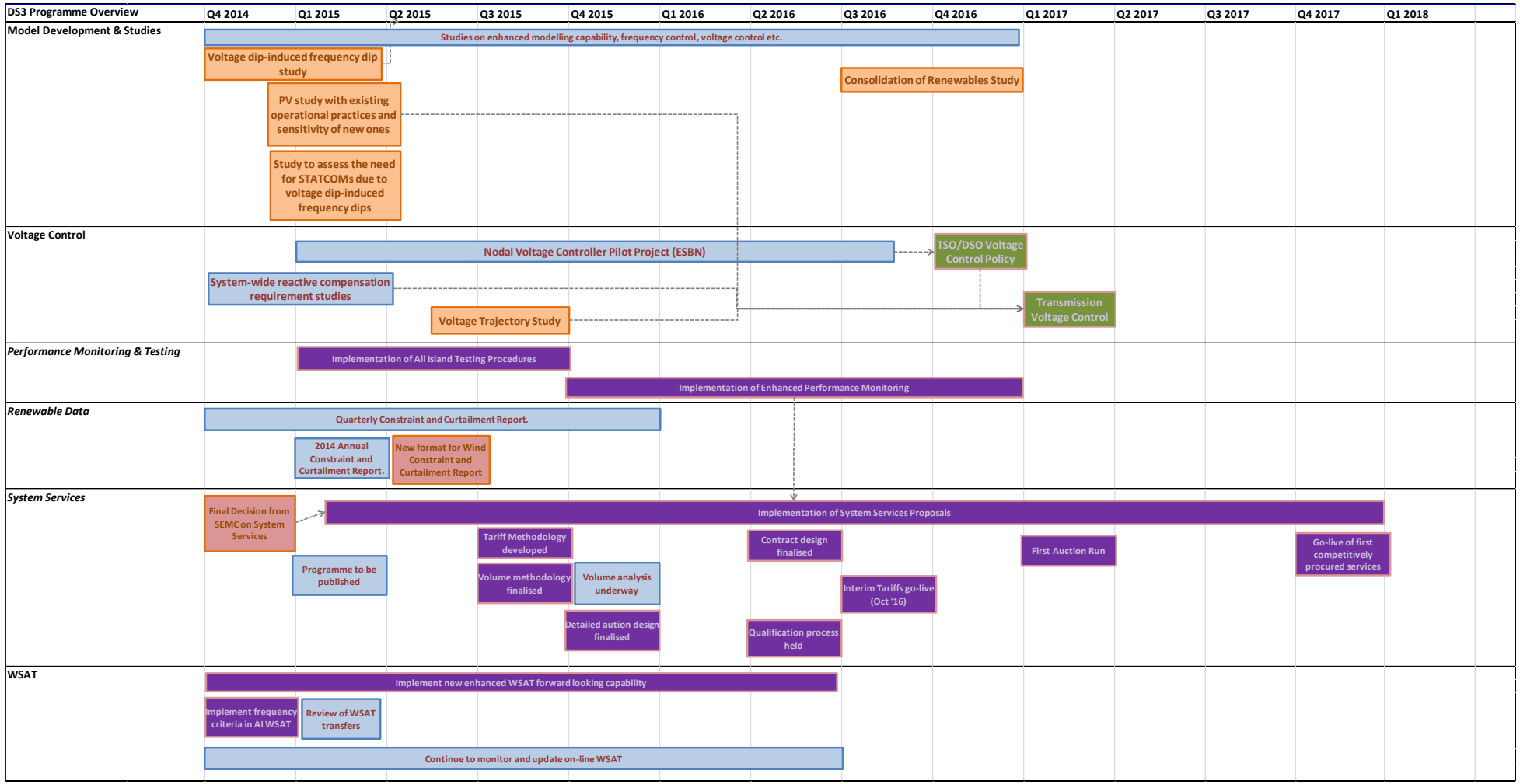
However, to maximise the benefits from these projects, complementary delivery of operational polices and Control Centre tools are essential. In 2015, the most significant deliverables relate to:

1. Frequency regulation review
2. Development of ramping policies and tools
3. Development of Voltage Dip Induced Frequency Dip operational policy
4. Formulation of WSAT Transfers in weak areas of the network

6.2 Overview of Programme and Workstream Interactions

The following table provides a high level overview of the main tasks within the DS3 programme and the various interactions between workstreams.

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Q1 2018
Model Development & Studies
Studies on enhanced modelling capability, frequency control, voltage control etc.
Voltage dip-induced frequency dip study
Consolidation of Renewables Study
PV study with existing operational practices and sensitivity of new ones
Study to assess the need for STATCOMs due to voltage dip-induced frequency dips
Voltage Control
Nodal Voltage Controller Pilot Project (ESBN)
TSO/DSO Voltage Control Policy
System-wide reactive compensation requirement studies
Transmission Voltage Control
Voltage Trajectory Study
Performance Monitoring & Testing
Implementation of All Island Testing Procedures
Implementation of Enhanced Performance Monitoring
Renewable Data
Quarterly Constraint and Curtailment Report.
2014 Annual Constraint and Curtailment Report.
New format for Wind Constraint and Curtailment Report
System Services
Final Decision from SEMC on System Services
Implementation of System Services Proposals
Tariff Methodology developed
Contract design finalised
First Auction Run
Go-live of first competitively procured services
Programme to be published
Volume methodology finalised
Volume analysis underway
Interim Tariffs go-live (Oct '16)
Detailed aution design finalised
Qualification process held
WSAT
Implement new enhanced WSAT forward looking capability
Implement frequency criteria in AI WSAT
Review of WSAT transfers
Continue to monitor and update on-line WSAT