# Innovation Projects 2018

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# Innovation 2018

This report sets out EirGrid's pipeline innovation projects for 2018. The basis for this report follows a decision paper from the Commission for Regulation of Utilities (CRU) titled "Reporting and Incentives under Price Review 4" (CER/18/087). Decision 11 sets out CRU's objective in putting in place a more formal process to track the use of innovation projects, to help support and accelerate progress against the strategic objectives.

While we continually seek out innovative ways of solving the challenges we face, for example the development of the DS3 programme, we feel that those works are adequately funded and incentivised under PR4. This report focuses on the innovation projects that were not originally considered under PR4 and that support the progress against the strategic incentives. The innovation projects are:

- The Power Off and Save Trial
- The QTP (Qualifier Trial Process)
- Control Centre Tools Project
- Voltage Uprate Project
- Composite Pole Project
- Pilot Tower Router Project
- Project Management - Innovation & Research Fund

# Introduction to Innovation

As an organisation we recognise the need to anticipate, shape and facilitate the direction of the industry. In doing so we can ensure we are fully equipped to deliver on our licence requirements of the safe secure economic planning and operation of the transmission system.

Fulfilling our responsibilities of planning and managing the transmission system will continue to become increasingly complex with further evolution of the energy industry. Among these challenges is the anticipated increase in the level of distributed generation, with ongoing connection of wind and the growth of new technologies such as PV and storage. Demand is also set to be more active and dynamic with ongoing drive for energy efficiency through demand side participation.

We continue to seek out innovative ways of solving some of the problems we face today and in the future.  As an organisation we believe we can deliver greatest value and benefit for our customer by identifying innovative solutions to real challenges and delivering these into our business activities. We believe that by focusing on how we can use our existing grid better, enable sustainable energy users and reduce the impact our infrastructure has on the environment we can drive positive change. To fully realise the benefits of our focus we must ensure we can translate solutions into workable models, policies and procedures for both the organisation and industry. With this in mind our Innovation Focus Areas have been identified in the following section.

# Innovation Focus Areas

## Evolving User Facilitation

As the power system becomes increasingly dynamic we must ensure we are positioned to both facilitate new types of users and manage their impact on the system. We will proactively drive policy both internally and externally to enable business model development for new user types that support energy efficiency and sustainability such as active demand, PV and Storage. By ensuring we are equipped to manage such users we can be positioned to utilise them in managing intermittent generation and network congestion amongst other issues.

## Enhanced Grid Utilisation

This area focuses on how we can get more out of our existing infrastructure. This includes both the application of devices which can be added to the network along with changes in operational and planning practices which enable the efficient use of existing infrastructure. Such technologies and practices would drive greater utilisation work by redirecting power flow from heavily loaded circuits to circuits that are less loaded. This would provide EirGrid with greater ability to manage system congestion and has the potential to suppress the short term need for infrastructure build, reduce constraint costs and facilitating connection to the grid.

## Reduced Community & Environmental Impact

We must be mindful of the impact we have on the environment and we seek out innovative ways to adapt how we approach the deployment of infrastructure so we can minimise the impact on the local environment.

## Control Centre Evolution

The All-Island system is undergoing a paradigm shift in terms of the technologies connecting to the system, the services they provide and the real-time operation required to maintain a safe, secure system that is operated economically. In order to deliver value to the customer it is essential that the control centre is identified as a strategic asset and is equipped with the tools necessary to enable real-time operational change. As a result the objective of DS3 Control Centre Tools (CCT) project is to deliver a suite of state of the art control centre tools that will facilitate the operational changes required to integrate and operate in real time the highest levels of renewable energy anywhere in the world. The control centre evolution plan focuses on delivery of tools to facilitate all major work areas including, DS3, Innovation, DS3 System Services and Operational requirements.

# Innovation Projects

## Projects that have been completed

### Power Off and Save

**Scope:** Investigate if a test group of some 1,500 residential consumers could significantly reduce their consumption on request to allow for the management of the grid at peak times. This scheme was a pilot to demonstrate “proof of concept” of potential participation of such schemes in the provision of System Services.

**Rationale:** The rationale for this trial was to enable residential consumer participation in forthcoming System Services processes and it is EirGrid’s belief this would ultimately drive down the cost of System Service provision through increased competition.

**Cost:** €300,000

**Project Partners:** Electric Ireland

**Impact:** Over 18 months 1,400 homes took part in the trial and have shown that they are willing to give over control of their energy consumption and not feel an impact on their comfort of living. Over the project timeframe, customers reduced their consumption by over 560kW in total. This is the equivalent to switching off over 14,000 light bulbs or the carbon emissions of a flight from Dublin to London. The focus of the trial was to gauge the willingness of consumers to provide DSM (demand side management) services to the grid and to understand customer behavior. In terms of percentage of reduction, we observed a 17% demand reduction for the evening peak and 15% reduction from the morning peak at the times of a Demand Response Event.

**Future Potential:** Existing and future home automation systems along with the adaption of electric vehicles can be harnessed to deliver services required to operate the grid at high levels of renewable generation. Future Heat Pump potential in Tomorrow's Energy Scenarios 2017[1] are for between 100,000 to 340,000 homes in Ireland. The draft National Energy and Climate Plan 2021-2030[2] calls for 170,000 homes with oil boilers to be retrofitted with heat pumps and Solar PV by 2030**.**The SEAI Electric Vehicles Roadmap[3] indicates that by 2020 the EV contribution to the passenger car segment is 10%, growing to 60% by 2050 (EV Mean Deployment scenario 2010-2050). As part of EirGrid's Tomorrows Energy Scenarios[4] the Consumer Action scenario forecasts approximately 560,000 electric vehicles on the road in 2030.

Further information on the Power off and Save project can be found **here**.

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[1] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Tomorrows-Energy-Scenarios-Report-2017.pdf

[2] https://www.dccae.gov.ie/en-ie/energy/consultations/Pages/Ireland%E2%80%99s-Draft-National-Energy-and-Climate-Plan-2021-2030.aspx#Default=%7B%22k%22%3A%22%22%7D#d95551b5-0105-4ca0-9bfa-43fb1f4cb05f=%7B%22k%22%3A%22%22%2C%22s%22%3A31%7D

[3] https://www.seai.ie/resources/publications/Electric-Vehicle-Roadmap.pdf

[4] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Tomorrows-Energy-Scenarios-Report-2017.pdf

## QTP 2017

**Scope:** The QTP trials ran for 6 months with two core objectives:

1. To identify if the trialists' technologies could provide a response to an event in line with the DS3 System Services definition of the Service they were trailing; and
2. To identify any operational complexities driven by the provision of Services from these technologies, and provide suggestions on how to approach or resolve them.

Summary of DS3 System Services Products:

| Service Name | Acronym | Short Description |
|---|---|---|
| **Synchronous Inertial Response** | SIR | Provision of Inertia from synchronous machines that can operate with low minimum generation point. |
| **Fast Frequency Response** | FFR | MW delivered between 2 and 10 seconds in response to automated frequency trigger |
| **Primary Operating Reserve** | POR | MW delivered between 5 and 15 seconds in response to automated frequency trigger |
| **Secondary Operating Reserve** | SOR | MW delivered between 15 to 90 seconds in response to automated frequency trigger |
| **Tertiary Operating Reserve 1** | TOR1 | MW delivered between 90 seconds to 5 minutes in response to automated frequency trigger |
| **Tertiary Operating Reserve 2** | TOR2 | MW delivered between 5 minutes to 20 minutes in response to a control / dispatch instruction |
| **Replacement Reserve – Synchronised** | RRS | MW delivered between 20 minutes to 1 hour in response to a control / dispatch instruction |
| **Replacement Reserve – Desynchronised** | RRD | MW delivered between 20 minutes to 1 hour in response to a control / dispatch instruction from a zero megawatt starting position. |
| **Ramping Margin 1** | RM1 | The increased MW output that can be delivered with a good degree of certainty for the given time horizon. |
| **Ramping Margin 3** | RM3 | |

| | | |
|---|---|---|
| **Ramping Margin 8** | RM8 | |
| **Fast Post Fault Active Power Recovery** | FPFAPR | Active power recovery within 250 ms of a voltage fault |
| **Steady State Reactive Power** | SSRP | Reactive power response within 40ms of a voltage fault |
| **Dynamic Reactive Response** | DRR | MVAr capability during large (>30%) voltage dips |

**Rationale:** Facilitating new technologies to provide System Services on the system will increase competitive pressures on the long-term costs of System Service provision to the consumer by expanding the range of Service Providers.

**Spend:** Total payment for the trials amounted to €365,522[5] over the trial duration.

**Impact:** The trials consisted of fifteen individual technology trials across twelve separate Providing Units. The breakdown of trial technologies is shown in table below.

List of 2016/17 DS3 Qualification Trial Categories

[5] The total amount of €365,522 refers to the volume of services and one off payments to the trial participants in the 2017 trial during the period from March to October 2017 .

| Provenability | | | Measurability | | |
|---|---|---|---|---|---|
| **DS3 System Service**[2] | Technology Category[1] | Number of Trialists | **DS3 System Service**[2] | Technology Category[1] | Number of Trialists |
| **POR** | Wind | 2 | **FFR** | CDGU | 1 |
| **POR** | Wind (with Emulated Inertia) | 3 | **FFR** | Wind | 1 |
| **POR** | DSM | 2 | **FFR** | DSM | 1 |
| **POR** | Sync Comp (Energy Storage Unit) | 1 | **FFR** | HVDC Interconnector | 2 |
| | | | **FPFAPR/DRR** | CDGU | 1 |
| | | | **FPFAPR/DRR** | Wind | 1 |

Eight trial categories were assessed in total:

| # | Technology Class | Trials Applicable |
|---|---|---|
| **1** | CDGU | FFR |
| **2** | Wind (WFC) | FFR / POR |
| **3** | Wind (EI) | FFR / POR |
| **4** | DSM | FFR / POR |
| **5** | Synchronous Compensator and Flywheel (ESU) | POR |
| **6** | IC | FFR |
| **7** | CDGU | FPFAPR / DRR |
| **8** | Wind | FPFAPR / DRR |

### 1. Centrally Dispatched Generating Unit (CDGU) – FFR Trials

The majority of current automatic frequency response System Services (POR, SOR and TOR1) procured on the system today is from CDGU type units such as Combined Cycle Gas Turbines (CCGT). Therefore, the main purpose of this trial category was to better understand whether CDGUs can effectively provide this type of service within the shorter horizon window required of FFR between 2 – 10 seconds (or quicker). Two units qualified under this trial category to respond. Both units were set up to provide a dynamic response as part of the Qualification Trials as detailed below.

Operational Characteristics of CDGUs throughout trials

| Unit | Droop % | Trigger-point |
|---|---|---|
| **Unit #1** | 3.4% | 49.8 Hz |
| **Unit #2** | 4% | 49.985 Hz |

## 2. Wind Farm Controller (WFC) – FFR / POR Trials

Wind Farm Power Stations (WFPS) currently provide EirGrid with frequency response by feathering their blades to reduce the output. Then there is a difference between the maximum output available and the actual output of the WFPS. This difference can be utilised by the WFPS to increase its output when the system frequency falls. When the WFPS is in frequency response mode it automatically increases its output to a drop in system frequency and therefore reduces this difference.

In total, five WFPS with the required capability to provide frequency response services were contracted through the trials. Only two were specifically trying to prove this mode of the response from this technology class. Both WFPS were set up to provide dynamic responses as detailed in the table below.

Operational Characteristics of Wind Farm Power Stations –Wind Farm Controllers throughout trials

| Unit | Droop % | Trigger-point |
|---|---|---|
| **Unit #1** | 4% | 49.985 Hz |
| **Unit #2** | 4% | 49.985 Hz |

### 3. Wind – Emulated Inertia (EI) Response – FFR / POR Trials

In addition to Wind providing frequency response through offering headroom, they can also provide a response through the provision of Emulated Inertia. This is often also known as "Synthetic Inertia" or "Inertia Emulation". However, it is not to be confused with the DS3 System Services Synchronous Inertia Response as it is in fact considered provision of an operating reserve service to the TSOs (primarily FFR and POR). This is done through controlling the kinetic energy stored within the rotating masses within the turbines, effectively slowing them down momentarily, in response to a frequency detection and control system, resulting in a short burst of increased power output.

As the service is provided on an individual turbine basis, in many scenarios during the trials the service was only available on a subset of turbines. This was declared in advance of real-time but subsequently resulted in the overall expected values being much smaller in some cases, i.e. a wind farm with 5 MW of Emulated Inertia could only provide 2.5 MW if only half their turbines were enabled at a point in time.

Operational Characteristics of WFPS –Emulated Inertia throughout trials

| Unit | Droop % | Trigger-point (On) |
|---|---|---|
| **Unit #1** | 0% | 49.81 Hz |
| **Unit #2** | 0% | 49.81 Hz |
| **Unit #3** | 0% | 49.81 Hz |

### 4. Demand Side Management (DSM) – FFR / POR Trials

As part of the DSM trials, 2 operational Demand Side Units (DSUs) were contracted to provide operating reserve Services. The DSUs provide this response by controlling an aggregate of individual demand sites (IDS) each of which can produce a reduction in system demand levels, either by turning down load on sites or using embedded generation to the same net effect. Currently, there are a number of DSUs registered in the energy market, where they provide dispatch-based services similar to Ramping Margin 1. DSUs dispatch IDSs through a variety of mechanisms under this approach, notifying customers to turn down in some cases and implement direct control in others.

Specifics of both DSUs' operating characteristics can be found in table below. Both trial participants had indicated the capability to provide response durations for either discrete periods of time, until the frequency recovered or a combination of both. During these trials, both trialists were setup to respond for fixed periods of time.

Overview of DSU Operating Parameters during the trials:

| Parameter | DSU #1 | DSU #2 |
|---|---|---|
| **Type** | Stepped-Static | Static |
| $F_{Trigger}$ | 49.8 Hz | Ranged between 49.8 - 49.6 Hz |
| $F_{TriggerRange}$ | 0.5 Hz | 0 |
| **Droop** | 1% | NA |
| $T_{MinON}$ | 90 | 300 |

## 5. Synchronous Compensator and Flywheel Hybrid (ESU) – FFR / POR Trials

The synchronous compensator trial was run under the hybrid technology trials in combination with a WFPS. Both technologies are connected behind a single connection point. However, the WFPS and synchronous compensator were electrically separated and hence the assessment of each component of the trialist’s technology could be undertaken in isolation. The synchronous compensator implemented as part of the trials consisted of a small synchronous generator connected to a flywheel to add mass and therefore kinetic energy. As such the unit is capable of providing inertia to the power system.

The device can also be connected via either a synchronised connection to the grid or it can be electrically isolated via back to back inverters. When electrically isolated from the grid the unit can use its controller to provide Fast Frequency Response in a controlled manner by reducing the speed of the flywheel and transferring this kinetic energy into electrical energy in the process.

The operational settings of the Synchronous Compensator partaking in the trials are detailed below.

| Parameter | Value |
| --- | --- |
| **Trigger On Frequency** | 49.8 Hz |
| **Megawatt O/P Expected** | 0.85 ( 0.95 MW increase) |
| **Max Discharge Duration Expected** | 14.5 seconds |
| **Response Type** | Static |

## 6. HVDC Interconnectors– FFR Trials

Two trialists participated in the HVDC Interconnector FFR trials. HVDC interconnectors already provide POR, SOR and TOR1 to the TSOs. Hence, this trial was specifically focused on proving the technology class is capable of response times in the FFR timeframe. During the trials the two interconnectors were set up to respond to FFR with the following characteristics;

Operational Characteristics of HVDC Interconnectors throughout trials

| Unit | Type | | Droop % | Trigger-point |
|---|---|---|---|---|
| Unit #1 | Dynamic | 50MW | 2% | 49.8 Hz |
| | Static | 25MW | NA | 49.5 Hz |
| Unit #2 | Static | 100MW | N/A | 49.6 Hz |

## 7. Centrally Dispatched Generating Unit CDGU – FPFAPR/DRR Trials

The CDGU trial for FPFAPR / DRR is essentially assessing the fault ride through capabilities of synchronous machines to firstly remain connected during a fault and secondly to provide immediate fault current injections following a fault. Through operational experience, it is assumed that synchronous machines inherently give this type of response immediately following a voltage disturbance. However, in order to contract with Service Providers for the service, it is suggested that performance monitoring and standards should be in place to ensure units are responding accordingly.

<u>Provision of Service</u>

One CDGU was contracted to trial the FPFAPR / DRR Services. However, since the beginning of this trial period, this unit has been predominantly run out of merit. Hence, while some voltage dips were recorded on the local disturbance recorder over the trial period, the unit was not connected at the time of any of these and therefore was not expected to respond.

## 8. Wind – FPFAPR/DRR Trials

The WFPS trial for FPFAPR / DRR is essentially assessing the fault ride through capabilities of this technology class in a shorter timeframe than is required in Grid Code. Unlike synchronous machines, these types of units do not provide immediate fault current injections inherently following a fault. However, via detection in their controllers, generally through the use of a Phase Locked Loop, these units can detect a voltage dip and respond in a very short timeframe. As part of the trials, one WFPS was contracted to trial FPFAPR and DRR from wind.

Provision of Service

Despite being connected and operational for the majority of the trials only two minor voltage discursions were recorded during the trial. Both showed the wind farm respond. However, as these dips were minor (87% and 88% voltage retained respectively) the response shown were minimal and difficult to measure accurately. As a result, it is difficult to take any meaningful learnings.

Overall, the DS3 Qualification Trials 2016 – 2017 achieved the two core objectives set out:

- It was a finding of the 2017 QTP that all technologies participating in the POR and FFR trials should be considered as proven technologies for these Services going forward.
- It was a finding of the 2017 QTP that all technologies participating in the DRR and FPFAPR trials should not yet be considered as proven for the provision of these Services.

**Future Potential:** It is critical that new technologies are enabled to demonstrate their capabilities for providing services and support to the system. The QTP not only gives clear indicators for successful technologies but also informs potential market participants of what technologies will not be capable of providing system services.

The design of the Qualification Trials for 2018 was based on the learnings and feedback obtained from the 2017 QTP

**The published 2017 QTP Outcomes and Learnings report can be found here.**

## Projects that are in progress

# Control Centre Tools

**Scope:** Decision Making Tools to be deployed in the Control Centre include:

- Look-Ahead Wind Security Assessment Tool (WSAT[6]): enables Grid Controllers[7] to analyse the stability of the power system in the near future, facilitating optimal system operation with higher levels of wind integration
- Voltage Trajectory Tool: enables Grid Controllers to assess the impact of varying sources of reactive power across the power system to ensure that local voltage management issues are managed.
- Ramping Tool: enables Grid Controllers to accurately schedule and dispatch the Ramping Margin services, and manage changing demand and generation profiles, with increased wind integration.

**Rationale:** The evolving power system requires new principles and practices of operation, with the resultant requirement for development and implementation of new control centre tools and capabilities. In keeping with the natural flow of DS3 from system performance to system policies to system tools, many of the new tools requirements will be driven by the outputs of other DS3 work streams, especially those in the policy area. The evolving I-SEM design also drives the requirement for new tools.

**Cost:** Zero.[8]

**Impact:** Voltage Trajectory Tool, Ramping Tool and Look-Ahead WSAT tools have been fully scoped and development of the tools has been initiated.

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[6] WSAT is a bespoke software tool, developed for the EirGrid Group, to give a real-time indication of the effect of wind generation

[7] Grid Controllers operate the grid from National Control Centres (NCCs) in Dublin and Belfast. The NCCs, carry out the intricate task of matching electricity production to customer demand.

[8] The Control Centre Tools project is a capital project valued at €3m funded as part of the PR4 DS3 allowance

**Future Potential:** This DS3 Control Centre Tools project will deliver a suite of Control Centre Tools to enhance the stability analysis, voltage control and frequency management capability of the control centre. This capability enhancement is necessary to increase the levels of instantaneous renewable generation on the system (SNSP)[9]. A core objective of the TSO and the DS3 Programme is facilitating levels of SNSP up to 75% in order to meet public policy targets in relation to 40% of electricity from renewable energy sources by 2020. DS3 Control Centre Tools required to enable increases to SNSP are outlined in Figure 3 below:

*Figure 1, SNSP Levels and DS3 Control Centre Tools*

| Control Centre Tools | SNSP >65% | SNSP >70% |
|---|---|---|
| Frequency Management (Ramping) | Y | |
| Enhanced Stability Analysis (Look-Ahead WSAT) | Y | |
| Voltage Control (Voltage Trajectory Tool) | | Y |

## Voltage Uprate

**Scope:** To type test 2 tower types – a single circuit suspension and a double circuit suspension tower to enable the potential conversion of existing 220kV lines to 400kV by replacing the top portion of the suspension towers with an alternative configuration.

**Rationale:** Increasing the capacity of the grid improves the attractiveness of renewable energy developments, reduces the amount of renewable electricity generation that is constrained and will ultimately contribute towards achieving renewable energy targets.

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

**Cost:** €575,000

**Impact:** Successful completion of the Voltage Uprate Trial will result in the addition of the technology to the innovation toolbox t. EirGrid considers technologies for widespread deployment that have achieved an EirGrid- assigned Technology Readiness Level (TRL) of 8 or above. Technologies that have been assigned a TRL of 8 will be added to the toolbox and the technology will be considered for use by our planners for future network development.

**Future Potential:** Increases to grid capacity are required to provide renewable generators access to the grid so that they can supply electricity when it is generated. Adding these solutions to the technology toolbox is the final step in ensuring they can be used in future grid development projects; this will alleviate the need for the building of network infrastructure and lead to savings for customers as a result.

## Composite Pole

**Scope:** Composite poles are made from advanced composite material that combines fiberglass and polyurethane resin. The technology is considered an innovative alternative solution to traditional steel lattice and wood pole strictures. The scope of the project is to type test composite 220kV towers that could provide an additional option in reducing the visual impact of future network build. Composite Poles could be used to replace existing 110kV circuits with 220kV circuits and therefore increase capacity.

**Rationale:** Increasing the capacity of the grid improves the attractiveness of renewable energy developments, reduces the amount of renewable electricity generation that is constrained and will ultimately contribute towards achieving renewable energy targets.

**Cost**: €345,000

**Impact:** On validation of the poles through successful type testing, including destructive testing, the feasibility study will deliver the planning application and design information to allow these structures to be added to the toolbox and used in planning of the transmission system.

**Future Potential:** These innovative infrastructure solutions contribute to delivering a range of potential benefits and efficiencies including better utilisation and enhancement of the existing infrastructure capability.

**Pilot Tower Router**

**Scope:** Demonstration of tower router device as a means of optimising existing infrastructure through redirection of power flows. The trial would explore the benefits of large scale deployment and would be conducted with a device provided on loan by Smart Wires.

**Rationale:** Distributed power flow control devices operate by diverting power flows to under-utilised circuits (overhead lines and underground cables), thereby maximising the use of the existing transmission network and potentially avoiding or deferring network investment.

**Cost:** €143,000

**Project partners:** Smart Wires

**Impact:** The trial carried out with Smart Wires with tower router devices indicated that the technology offers significant flexibility and that there is the potential to deploy these devices to optimize the existing grid and minimise the need for new infrastructure.

**Future Potential:** Distributed power flow controllers could be deployed to alleviate system constraints and allow for increased output from wind generation (or other high merit order generation). EirGrid expects that Distributed Power Flow Controllers will be installed to manage power flow constraint and that project costs[10] will be sought through the Price Review mechanism.

[10] ESB Network cost recovery for storage and re-deployment of the devices will be taken into consideration as part of the project costing.

## Project Management - Innovation & Research Fund

**Scope:** To drive value for customers through RES integration by effectively managing the research and innovation fund.

**Rationale:** Engaging in and focusing innovation and research in the areas of Evolving User Facilitation, Enhanced Grid Utilisation, Control Centre Evolution and Reduced Community & Environmental Impact ensures that EirGrid Group is fully equipped to fulfil EirGrid's duties and broader strategic objectives, to meet public policy objectives as well as increasing the knowledge and expertise of staff. In addition, research and innovation drives value for customers.

**Cost:** €226,000

**Impact:** Through this engagement EirGrid have been able to develop partnerships to advance research in the key focus areas of Evolving User Facilitation, Enhanced Grid Utilisation, Control Centre Evolution and Reduced Community & Environmental Impact. The joint projects and studies have allowed EirGrid to become a world leader in the integration of variable sources of renewables and will be crucial in reaching 75% SNSP and beyond. The following are a list of EirGrid's research partnerships:

Horizon 2020

EU-SysFlex is a consortium of European energy companies, led by EirGrid. It has been awarded over €20 million by the EU to fund research into the development of renewable energy. EU-SysFlex will identify issues associated with integrating large amounts of renewable energy and provide practical assistance to power system operators across Europe. It will also create a long-term roadmap to facilitate the large-scale integration of renewable energy.

EirGrid has also contributed to the RealValue, PROMOTioN and MIGRATE H2020 projects.

ESIPP (The Energy Systems Integration Partnership Programme)

The benefit for EirGrid of being involved in ESIPP is to have insight to the next generation of weather, gas and water related inter-linkages to the electricity system to understand if any improvements or advantages can be availed of. It also allows EirGrid to steer the direction of the research.

EPRI (Electric Power Research Institute)

EirGrid and EPRI have engaged in a strategic research partnership with mutual benefits for both companies through collaborative projects. EirGrid benefits from EPRI's wealth of international knowledge, by allowing staff to draw on industry experts for guidance, support and validation in many areas of work throughout the company. The partnership has allowed EirGrid to access information on a range of topics, such as Data Centre modelling, Risk Based Planning techniques, Blockchain industry developments, Oscillations, ROCOF events and Flexibility. EPRI have benefited from using the All-Island power system as a test case for new modelling tools, and from gaining information from EirGrid on operating a power system with very high instantaneous non-synchronous generation.

MaREI (Centre for Marine and Renewable Energy)

As a strategic Industry partner, EirGrid has the option to be represented on MaREI's Industry Advisory Committee and opportunity for representation on the Governance committee. This allows for input into activities and strategic direction of the centre.  It also allows EirGrid to stay informed of technological progress and gives opportunities to work collaboratively with researchers and in industry supply chains and allows EirGrid to participate in R&D opportunities (through national, EU and international projects). The partnership between MaREI and EirGird allows for important strategic research consideration in relation to transmission on the island.

IRDG

EirGrid is a member of the Industry Research and Development Group (IRDG), a non-profit, business-led Innovation Network of member companies and colleges, working together to drive excellence in Innovation within Ireland's industry to create growth, jobs and prosperity.

Research PhDs

Close collaboration with academia and research institutes ensures that research conducted is relevant and of mutual benefit for EirGrid and our collaborators.
To facilitate this collaboration with academia EirGrid has hosted a number of PhD and Masters Students.

**Future Potential:** By effectively managing the innovation and research fund EirGrid will continue to drive value for our customers by creating opportunities to influence the direction of research and investigate trial projects that solve the increasingly complex challenges associated with an evolving energy industry.

# Projects being initiated

## Qualification Trial Process 2019

**Scope:** The Qualification Trial Process (QTP) 2019 trials will run for 12 months and will be divided into four lots:
Solar Technology, Aggregated Residential Services, Other Technology and Alternative Communication Method.

<u>Lot 1: Solar Technology Trial</u>
Objective of the trial is to prove solar technology capable of providing a range of the DS3 System Service products and identify any operational complexities.

<u>Lot 2: Aggregated Residential Services</u>
Objective is to focus on the provision of DS3 System Services from residential homes.

<u>Lot 3: Other Technology</u>
The objective is to prove “Other Technology” capable of providing a range of DS3 System Service products and identifying any operational complexities.

<u>Lot 4: Alternative Communication Method</u>
The objective is to trial a new telecommunications method which meets the shifting needs of the industry.

**Rationale:** Facilitating new technologies to provide System Services on the system will increase competitive pressures on the long-term costs of System Service provision to the consumer by expanding the range of Service Providers.

**Cost**: In total a budget of 450k was approved for the trials in 2018/19 – 2019/2020. The TSO resourcing of the trial is funded through the EU-SysFlex budget and the participants' payment for the trial period is funded through DS3 System Services.

**Impact:** EirGrid and SONI published the 2019 DS3 System Services Qualification Trial Process (QTP) on the 8th March 2019.

**Future Potential:** The /2019 trial is designed to be bespoke with a focus on innovative technologies and strategy. The 2019 QTP will include Provenability, Distribution Impact and Standard & Compliance trials to demonstrate capability in the reserve, ramping and fast-acting services. The trials will be concluded in December 2019 after which the results will be compiled and published. This will allow new and evolving technologies to demonstrate their capabilities for providing services and support to the system at high levels of renewable generation.

# Future Innovation

We have not submitted a business case for additional funding for new projects at this point in time.

EirGrid's expects that there will be an evolution of the DS3 programme and the associated projects in order to support the energy transition. There will be a continued focus on the innovation areas of Evolving User Facilitation, Enhanced Grid Utilisation, Control Centre Evolution and Reduced Community & Environmental Impact in order to deliver on decarbonisation and the national renewable targets.

Furthermore EirGrid expects that requirements for future innovation and research will be fully realised as part of the upcoming price control review process.