

## THE BENEFITS



• **MIGRATE** has a focus on contributing to the progressive move to a low carbon future within Europe. The project will facilitate the integration of large scale low carbon technologies, such as wind and solar renewable generation. This will provide a positive environmental impact resulting in the reduction of CO2 levels.



• **MIGRATE** will support Transmission System Operators by providing economic solutions which make use of their existing infrastructure.



• The project results from **MIGRATE** are supported by free market players, technologies supporting the grid connections, power system monitoring tools to measure the distance of instability and protection mechanisms. These results will help to validate new business opportunities that work towards increased benefits to customers and create new business and employment opportunities within Europe's economy.



• **MIGRATE** is supporting innovative approaches that are helping to ensure a safe, reliable performance of the electricity network when generated from low carbon technologies.

## PROJECT PARTNERS

### Project Coordinator:

TenneT

### Project Partners:

Estonia – TTU, Elering

Iceland – LANDSNET

Finland – FINGRID

Germany – TenneT, amprion, Leibniz Universität Hannover, TU Berlin

Scotland (UK) – SP Energy Networks

England (UK) – University of Manchester

Ireland – EIRGRID Group, University College of Dublin

Netherlands – TenneT, Delft University of Technology

France – Schneider Electric, ECOLE NATIONALE SUPERIEURE DES ARTS ET METIERS, RTE

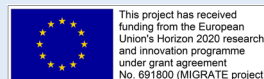
Switzerland – ETH Zürich

Slovenia – ELES, University of Ljubljana, ELECTROINSTITUT MILAN VIDMAR

Italy – TERNA S.P.A., ENSIEL

Spain – RED Eléctrica De España, Circe

A more detailed description of the project members can be found at:  
[www.h2020-migrate.eu/members.html](http://www.h2020-migrate.eu/members.html)



## CONTACT US

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[www.spenergynetworks.co.uk](http://www.spenergynetworks.co.uk)



[facebook.com/SPEnergyNetworks](https://facebook.com/SPEnergyNetworks)



[twitter.com/SPEnergyNetwork](https://twitter.com/SPEnergyNetwork)



[spinnovation@spenergynetworks.co.uk](mailto:spinnovation@spenergynetworks.co.uk)



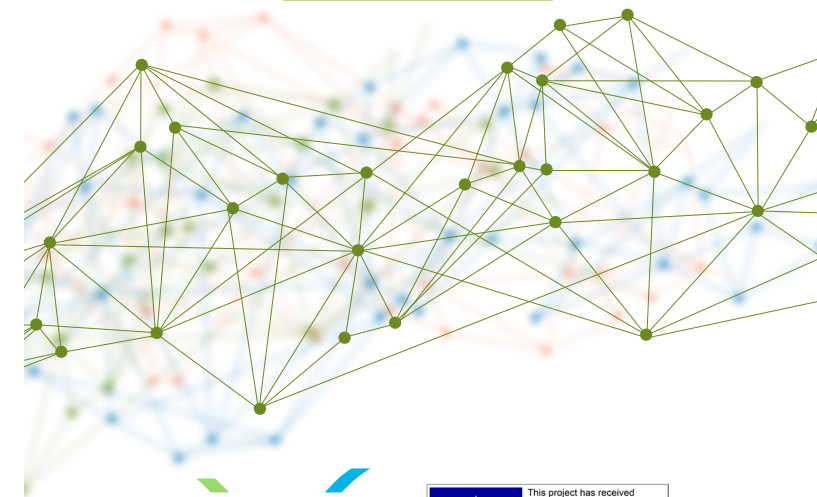
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# MIGRATE



## WHO ARE WE?

We are SP Energy Networks, part of the Iberdrola group, leaders in sustainable innovation. As a Transmission and Distribution Network Operator (DNO) we keep electricity flowing to homes and businesses throughout Central and Southern Scotland, North Wales, Merseyside, Cheshire and North Shropshire.

We do this through the network of overhead lines and underground cables which we own and maintain.

Our three regulated electricity licences are:

**SP Transmission (SPT)**

**SP Distribution (SPD)**

**SP Manweb (SPM)**

Our aim is to deliver a safe and reliable electricity supply **24 hours a day, 365 days a year** whilst providing exceptional value for money for all customers and contributing to a more sustainable future.

## MIGRATE

By 2020, we expect a number of transmission systems to experience a high penetration of power electronic interfaced generators as a result of the growing uptake of low carbon technologies, such as wind and solar generation. At certain times, this growing penetration could mean that networks are only supplied by low carbon technologies.

This will result in:

- Dynamic stability issues
- A need to upgrade protection schemes
- A need to address resulting power quality degradation (including harmonic propagation)

European Transmission Operators (TO) have come together to address these challenges and propose solutions to progressively adjust transmission systems accordingly.

MIGRATE is the only TO-led project under the European H2020 framework, supported by Academics and Industrial partners. There have been investigations into a number of key factors stemming from the transition to the low carbon network, including the impact on stability, protection and harmonics in an electricity network with high penetration of power electronics.

SP Energy Networks is leading Work Package 2 (Wide Area Monitoring, Protection and Control) as part of the project consortium.



## SAFEGUARDING THE STABILITY OF A LOW CARBON NETWORK

MIGRATE's Work Package 2 has been investigating how we can monitor and forecast Key Performance Indicators (KPIs) that will indicate the system stability.

The two factors we have been studying has been Area Inertia and Short-Circuit Capacity (or Grid Strength), where we have produced tools to monitor and forecast these KPIs.



**Area Inertia** – MIGRATE has identified that power systems can no longer be considered to act as a single centre of inertia, but should rather be considered as several interconnected clusters of regional inertia.



**Short-Circuit Capacity** – MIGRATE has identified that there is a growing difference between the system impedance during a fault and at near nominal voltage conditions.

We have deployed the **world's first live trial** of Wide Area Monitoring, Protection and Control in the Icelandic network to demonstrate solutions to maintain stability in low inertia networks.

This approach has addressed the following issues:

- Frequency containment within load and generation shed limits
- Angle swing stability, islanding avoidance and islanding ride-through
- Excessive Rate of Change of Frequency (RoCoF)

Synchrophasor-based wide area control is operating live in the Icelandic grid, in a world-first practical approach for dealing with the problems of weakly coupled areas with low inertia.

The wide area control approach delivers triggering signals to responding services to the required locations, in proportion to the changes in the system state, in less than 0.5s from the disturbance.

A generalised system-responsive approach was taken that can readily be adapted to other systems, where the measured frequency and phase angle relating to regions of the grid drive a locational and proportional response.

