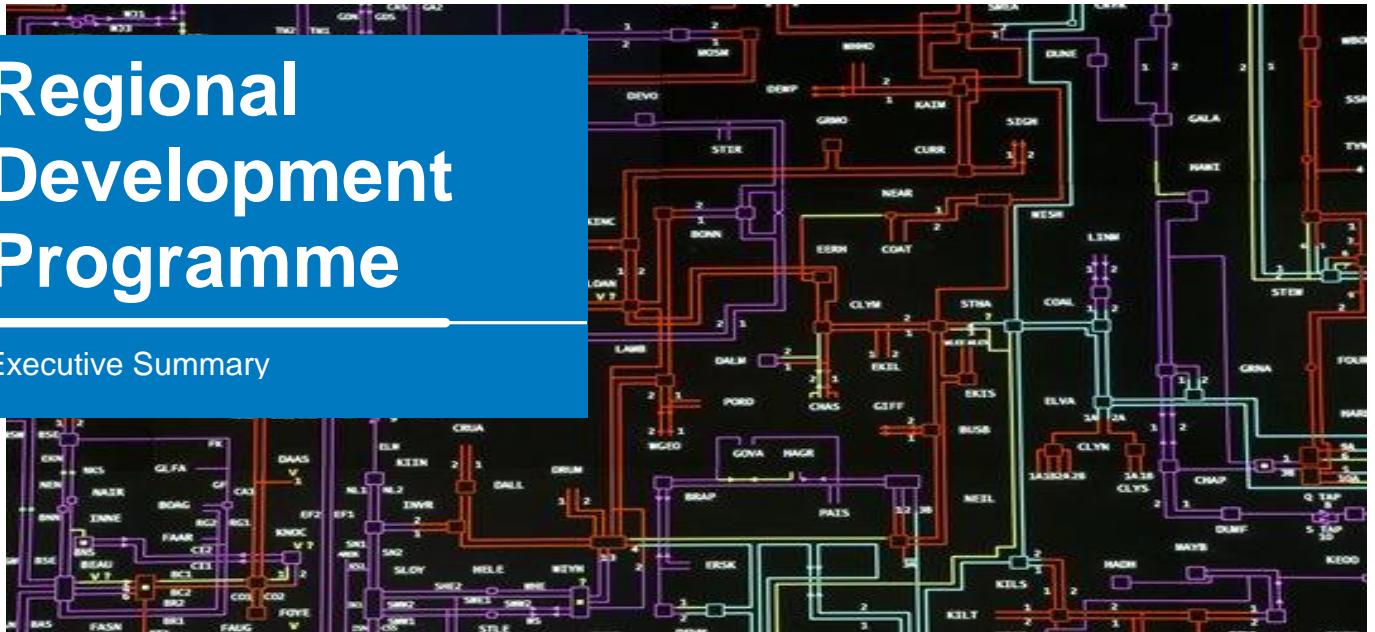


Regional Development Programme

Executive Summary



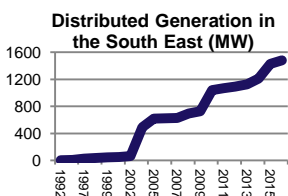
Regional Development Programmes explained

A programme that provides detailed analysis of the 'whole-system' that includes the transmission network as well as areas of the network with large amounts of Distributed Energy Resources (DER) and, as a consequence, associated known transmission / distribution network issues.

The idea is to use this detailed 'whole-system' analysis to innovate and push the boundaries of current thinking, with a "design by doing" approach to resolving the issues - pushing towards more active distribution system operator-type solutions and informing thinking for the Distribution System Operator (DSO) debate.

The growth of DER

The level of DER connected within the South East Coast network has risen significantly, from close to zero MW in 2002 to almost 1600 MW in 2015.



The electricity system is in a period of transition and moving to a lower carbon and more distributed model. There's a shift from energy predominately being supplied by transmission connected generation to a world that includes large volumes of distribution connected generation, flexible demand and storage. This requires a new approach for the commercial and technical operation of transmission and distribution networks.

This transition presents significant opportunities for DER to contribute to the overall system efficiency and reduce costs to consumers. However, we must also be mindful of the technical challenges and ensure we maintain the high standards of reliability and safety that customers expect. To maximise benefits and address challenges, we must adopt a 'whole system' approach that optimises operations and investment across distribution and transmission networks.

National Grid and UK Power Networks are collaborating through a regional development programme for the South East Coast area. This is a ground-breaking whole-system programme, examining the future operability of the South East Coast area over the next 10 years. The aim of the programme is to maximise the opportunities for further efficient deployment of distributed resources and reduce overall system costs for energy consumers.

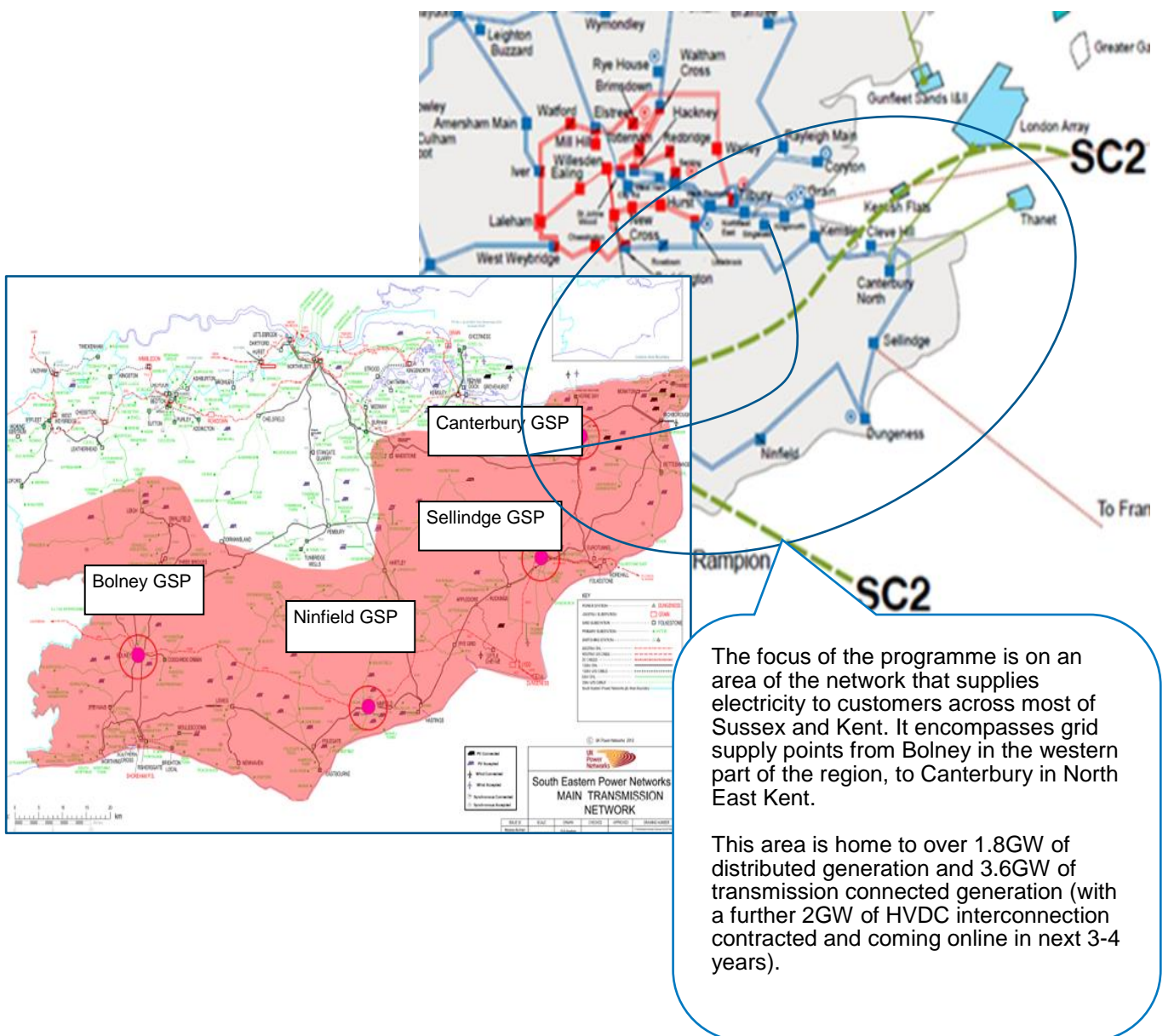
The South East Coast area was the clear choice for this study, as it is one of the most complex network areas in Europe. It has several interconnections to continental Europe, either currently in service or due to be commissioned, a nuclear power station, and a significant volume of renewable and traditional energy resources connected to the distribution network.

The two Companies are working together on a number of initiatives to look at how low carbon technologies can continue to connect to the system without the need for costly reinforcements on both the transmission and distribution networks.

Aim of the Programme

The Regional Development Programme looks across the **whole-system landscape** to identify key areas of development to unlock additional network capacity, reduce constraints and open up new revenue streams for market participants. This project will significantly **enhance transmission and distribution systems coordination and control**, creating whole system efficiencies and providing new tools and resources to manage system constraints – ultimately reducing costs for customers.

The Programme fosters innovation in a ‘design by doing’ environment that supports the effective management of the electricity network on a ‘whole-system’ basis. At the same time, it supports the development of DSO capabilities. Strong working-level relationships and an effective governance structure, form an agile, collaborative environment in which challenges can be carefully considered.



Harnessing DER capability

By taking steps to unlock the capabilities of DER, we can enable and encourage these technologies to offer balancing services. This will broaden the range of providers and help drive down the cost of service procurement.



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Scope of the Programme

In autumn 2016 the two businesses held workshops to identify areas that, through collaborative development, would provide significant benefits in further unlocking network capabilities. The main areas identified –were:

- enhanced network modelling and sharing of data;
- technical and commercial frameworks for active network management;
- optimising the use of flexibility;
- protection system stability; and
- whole system investment and operational planning.

A key focus is to share what we have learnt alongside broader industry initiatives, such as the ENA's Open Networks project, so that we can inform best-practice in industry arrangements.

Challenges to overcome

The **technical challenge** is a complex interaction between transmission and distribution networks, arising from transmission constraints which restrict further distributed energy resource (DER) connections. Options to manage these conditions are limited and heavily dependent on transmission-connected interconnectors. However, there is an opportunity to explore the potential for services from distribution connectees.

This provides a **commercial challenge**, as current arrangements do not make it easy for DERs to provide services to the local or national system operators. Opening markets to new service providers and investigating improving ways of working across transmission and distribution, will help us with the efficient management of transmission constraints and enable more DER connections.

What the programme achieved so far

Since the programme began, we have developed new network models and improved the level of granularity in data exchanges between the two companies. The improved quality and flexibility of power system studies now better informs operability issues and technical risks in the area. These studies revealed the potential for a major increase in use of available capacity.

We have also established a new connections process, which through a streamlined transmission network assessment, provides DNOs with greater certainty regarding the transmission network's ability to accommodate DER connections. Developments in this area have formed the foundation of the revised Statement of Works process, which is being progressed through the ENA Open Networks Project. This streamlined

approach uses flexible connection arrangements, including the ability to control the DER output if necessary, so that new connections can proceed without the need for additional network reinforcement. This has the advantage of levelling the playing field for both transmission and distribution customers, allowing both to provide transmission constraint management services.

To promote efficient management of DER connections, we have revised the approach to procuring transmission balancing services so it considers the potential impact on distribution networks. This work will also help prospective DER connectees to better understand opportunities to connect more quickly and participate in the provision of both distribution and transmission services.

Over the coming months

We will continue to establish stronger interfaces between our transmission and distribution control centres and DERs. This will allow greater visibility and controllability of DER, and allow us to develop ways of better understanding the impact of network limitations on services from DER. An innovative control system is under development to enable DER to participate in both distribution and transmission services markets, which will help to ensure the system remains operable.

DER could potentially provide cost-effective solutions to a range of challenging issues facing the transmission and distribution networks. We are further developing routes to market, including those for balancing services to support efficient management of network issues. Additionally, clear and transparent commercial guidelines will support DER business cases and subsequent investment decisions.

Through the new connections process, customers will have sufficient information within their UK Power Networks connection offer (maximum 90 days) to make an informed decision on their investment. With the development of new control architecture and routes to market, customers at the distribution level will be able to access new revenue streams and at the same time provide the network operators with a wider range of resources and tools to manage the networks. Consumers across the region will benefit from lowest cost solutions.

Sharing our findings with the Industry

We are active partners in the ENA's Open Networks project. Our aim is to transparently share findings to inform broader balancing services and other industry work such as the Power Potential project to avoid duplication, save money and inform the industry.