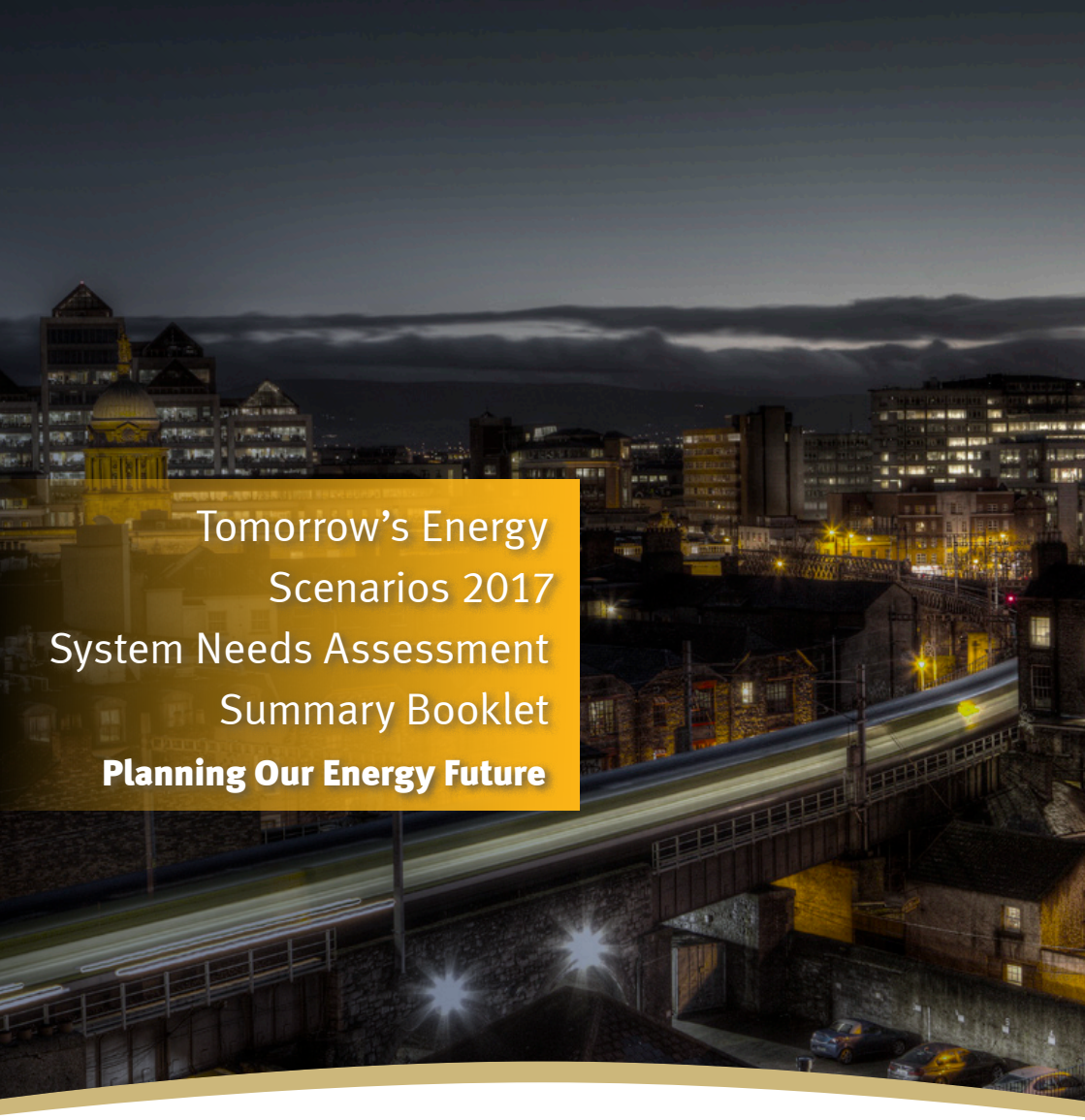


Tomorrow's Energy Scenarios 2017
System Needs Assessment Summary Booklet

Planning Our Energy Future

EIRGRID

The current. The future.

EirGrid is responsible for a safe, secure and reliable supply of electricity – now and in the future.

We develop, manage and operate the electricity transmission grid. This brings power from where it is generated to where it is needed – throughout Ireland.

We use our grid to supply power to industry and businesses that use large amounts of electricity. Our grid also powers the distribution network. This supplies the electricity you use every day in your homes, businesses, schools, hospitals, and farms.

We develop new electricity infrastructure only when it is needed. EirGrid answers to Government and to the regulator. We obey all laws, and meet all applicable health and safety standards. We work for the benefit and safety of every citizen in Ireland.

Looking to the future needs of the grid

The purpose of this document is to highlight the long-term needs of the grid in Ireland out to 2040. These needs are due to forecasted changes in how electricity will be generated, used, interconnected and stored in future.

Our assessments for these future needs are based on scenario planning. Scenario planning allows us to forecast the performance of the grid in different situations. The goal is to give us information we need to maintain the safety, security and reliability of the electricity system over the long-term.

Tomorrow's Energy Scenarios

In July 2017, we published and asked for feedback on Tomorrow's Energy Scenarios 2017. This document outlined four possible futures for the supply and consumption of electricity in Ireland.

1. Steady Evolution

Electricity gradually powers an increasingly larger proportion of energy use. This scenario presumes that there is a steady growth of renewable electricity generation like wind farms. It also sees electricity users becoming more efficient, but still using more electricity for heat and transport. **Both changes, even at a steady pace, will challenge the capacity of the existing grid infrastructure.**

2. Low Carbon Living

Growth in the economy increases demand for electricity by more than 50%. This scenario sees rapid growth in low carbon electricity generation. Combined with a rise in large users of power like data centres, this scenario sees the grid facing two significant increases. Firstly, a rise in demand, and secondly a rise in the proportion of renewable energy carried on the grid. **These changes would place significant stress on existing grid infrastructure.**

3. Slow Change

Economic slowdown sees very little changes in patterns of electricity consumption and generation. This scenario forecasts low economic growth. This slows the adoption of new technologies in both generation and consumption of electricity. The only source of increased demand for electricity comes from a short-term growth in data centres. **Compared to other scenarios, while there will be challenges to grid infrastructure, these challenges will be delayed.**

4. Consumer Action

This scenario shows significant increases in demand for electricity. This is due to a strong economy and fast changes in consumer habits. This leads to a fast changeover to electric vehicles and electricity-powered heating. Equally, it sees rapid growth in households generating renewable electricity. **The accompanying switch to large-scale wind generation will stretch the grid's capabilities.**

Steady Evolution

Onshore wind generation increases to approximately 5,200 MW by 2030

Ireland's 2030 emissions targets are met

New 700 MW interconnector to Europe is in place by 2025

Low Carbon Living

Coal generation is repowered to gas and peat generation is repowered to biomass by 2025

The total demand for electricity increases by 53% by 2030 compared to today

Data centre connections reach 1950 MVA in 2030

Slow Change

Fossil fuel generation capacity remains over 5,000 MW by 2030

The total demand for electricity increases by 22% by 2030 compared to today

Ireland's 2030 emissions targets are missed

Consumer Action

There are almost 560,000 electric vehicles on the road by 2030

17% of residential houses are heated through heat pumps by 2030

Household batteries and solar PV help to increase self-consumption of electricity

What do these scenarios tell us?

Based on these four scenarios, we identified some changes that the grid may need in future. These future needs are based on fixing potential problems identified in the four scenarios. These potential problems were calculated using a series of simulation models. EirGrid created the models using the four scenarios, and on the responses to consultation we received about the scenarios. These models simulate future patterns of energy consumption and production.

We apply these patterns to thousands of grid simulations, using the technical planning standards that we use to develop the grid. The outcome of this process then finds the areas of the existing grid that may need to be further developed or strengthened.

Mapping the areas of greatest need

To show you what this means, we have created a simplified map for each part of the country where we believe there is a potential need to develop the grid.

Our assessment of the scale of the need at each location is based on two factors. Firstly, the cause of the local challenge to the grid, and secondly what kind of problem this creates.

In terms of the cause of the issue in each location, we've identified a range of three possible reasons:

Increased local demand for electricity

New sources of electricity generation in this area

New interconnection near this location

In terms of the potential problems that are created by these causes, there are typically two kinds:

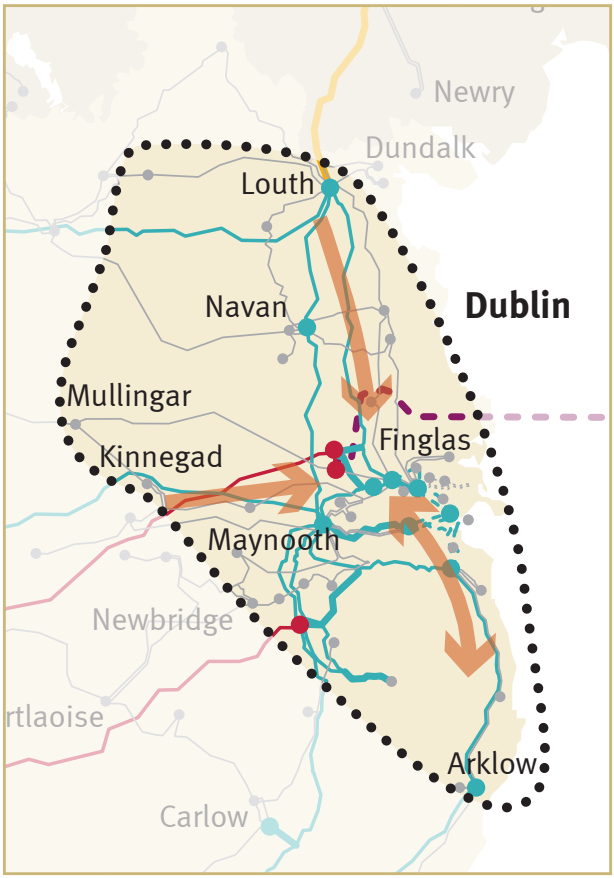
Power Transfer Capacity

This means that the amount of electricity that now has to be carried by local lines or cables is too high for their rated capacity.

Voltage Support

This means that there is not enough capability in the region to control voltage and reliably supply the electricity that is now needed.

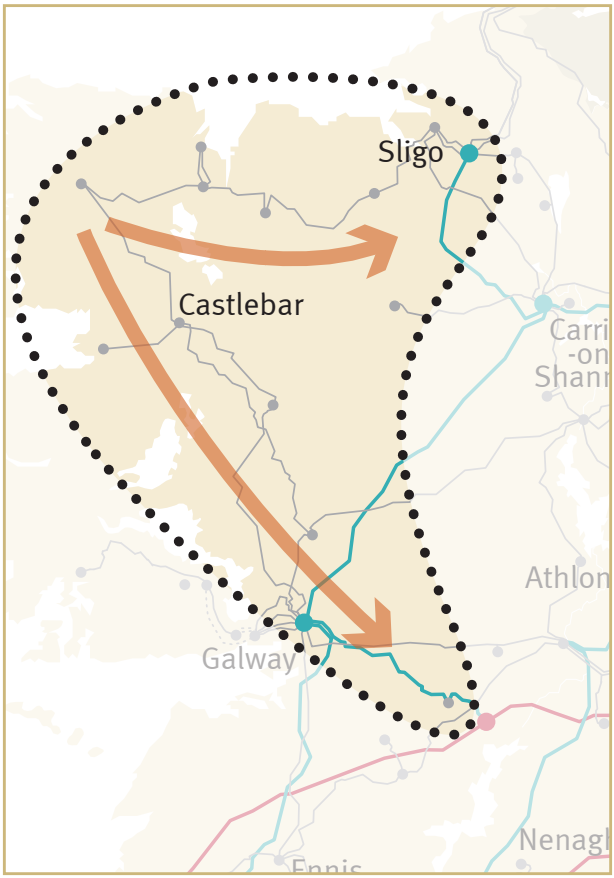
Area 1 - Dublin



The grid in this region is mainly made up of 220 kilovolts (kV) underground cable and overhead lines, with two 400 kV lines connecting to the rest of the country. Although well resourced, the expected growth in onshore and offshore wind generation will be a challenge.

Equally, the anticipated growth in high-volume energy users such as data centres will also be significant. These two factors will create difficulties for this area of the grid. In particular, it will struggle to carry the amount of power we expect, and also to have enough capability to reliably supply the electricity needed. **The need for grid development in this area is very high.**

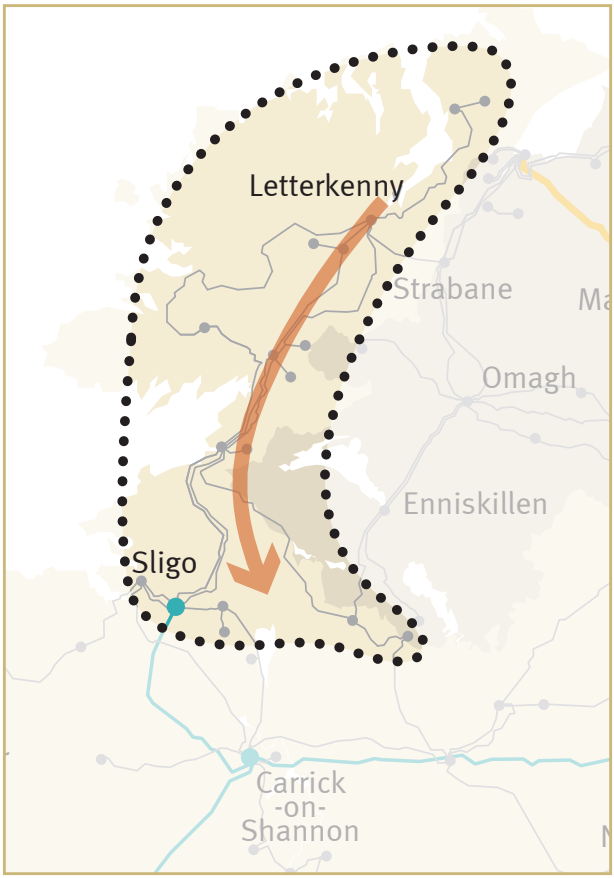
Area 2 - West



Currently this area of the grid relies on low capacity 110 kV, and has some 220 kV connections to the wider grid. All four scenarios will see this infrastructure at potential risk due to growth in renewable energy sources in the area.

The consequences of these new connections will be a lack of capacity to carry this clean energy, and a potential lack of capability to reliably supply the electricity needed. **There is a strong need for grid development in this area.**

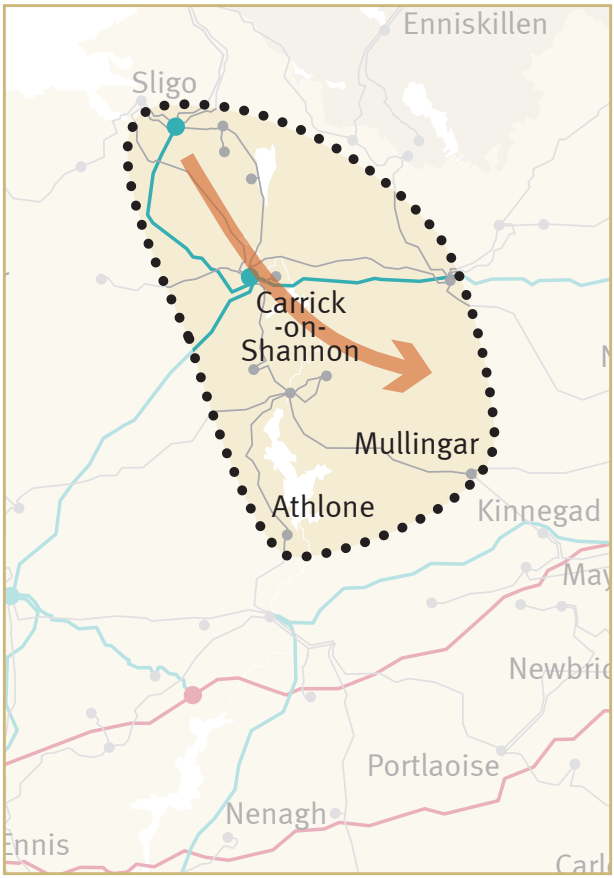
Area 3 - North-West Border



At present, the grid in this area is made up of 110 kV lines – which are low capacity. All four scenarios see the local grid struggling to carry the amount of power required, and to reliably supply the electricity needed.

The cause of these issues is the forecasted connection of new renewable energy projects in this area. **This creates a strong need for grid development in this area.**

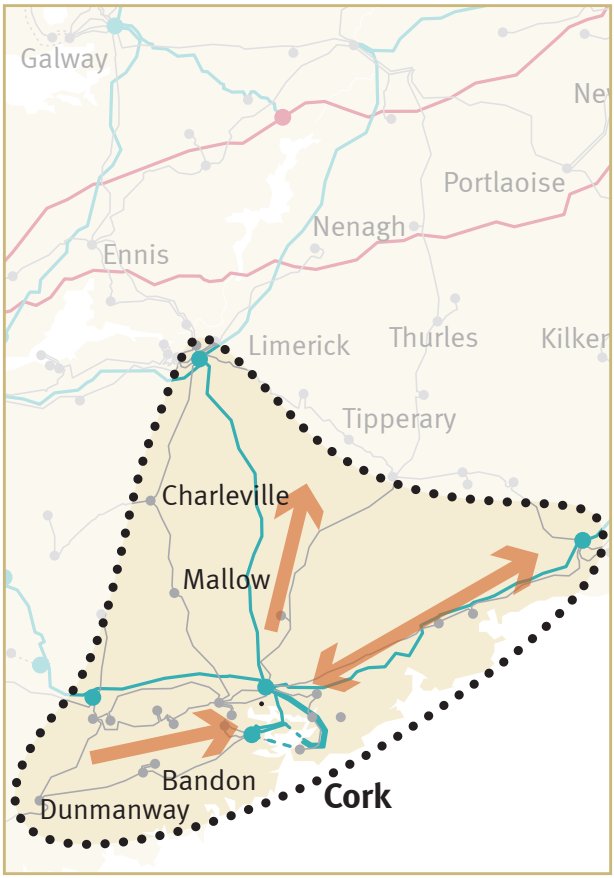
Area 4 - Midlands



The existing grid in this area uses 110 kV and 220 kV lines, with power flowing west to east through this network. We expect that this area will be challenged during high wind conditions, as anticipated wind farms in the west add more power to the grid.

Because of this, the local lines will not have enough capacity to carry the expected amounts of power. **This creates a moderate need for grid development in the area.**

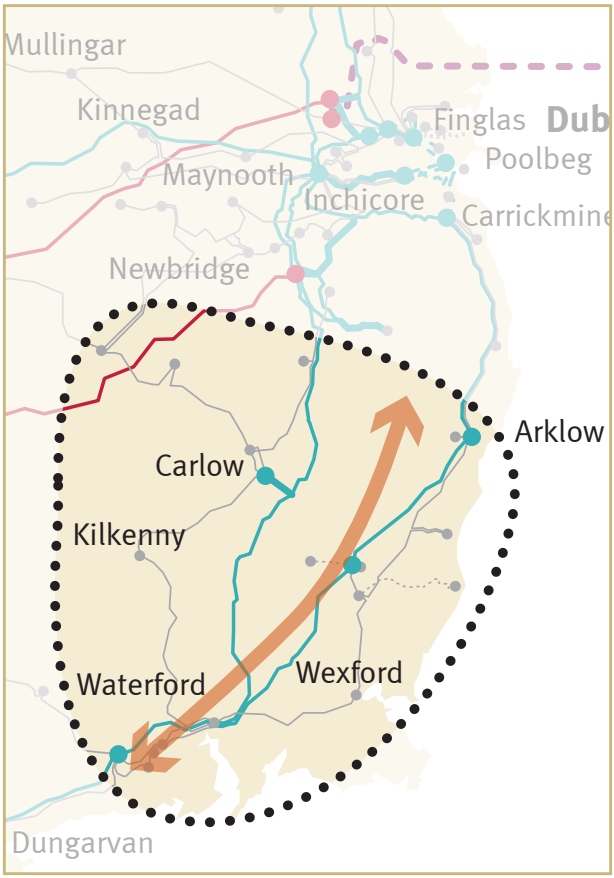
Area 5 - South-West to South-East



This area has an urban centre, but is otherwise dominated by 110 kV lines and 220 kV lines. This area sees a lot of power moving through the region and contains sources of conventional electricity generation.

We expect that growth in onshore wind generation will create a challenge to this area of the grid. In addition, the export of power through new interconnection will also be a factor. Both of these anticipated changes will see the local grid struggle to carry the amount of forecasted power. **This creates a moderate need for grid development in the area.**

Area 6 - South-East



As with other mostly rural areas of the grid today, this area uses 110 kV and 220 kV lines. There is a lot of power moving through this area, with zones of high demand to the north and south of this region. Growth in renewable energy - such as solar and offshore wind - will combine with new interconnection to create a challenge for this area.

In particular, the existing line capacity will struggle to carry and transfer the power forecast in some scenarios. **This creates a moderate need for grid development in this area.**

What happens next?

This report is the end of a process that started with the publication of and consultation on Tomorrow's Energy Scenarios in 2017. We will start a new two-year scenario development cycle, including consultation, in spring 2019.

For more information on Tomorrow's Energy Scenarios and the System Needs Assessment report, please visit our website:

www.eirgridgroup.com/customer-and-industry/energy-future/

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