Energy efficiency demand reduction factors for the SSEN licence areas: Executive Summary

Regen has worked alongside SSEN to undertake a high level scenario analysis of the impact of energy efficiency measures in SSEN's Southern England and North of Scotland licence areas, expanding on the recently released 2020 edition of SSEN's Distribution Future Energy Scenarios.

National scenarios, such as those produced by National Grid ESO and the Climate Change Committee (CCC), have a strong narrative around energy efficiency and its impact across all forms of energy consumption. There is a need to understand how these potential outcomes may look at a regional and local level, which this study aims to address. The analysis approach was necessarily high level, focusing on the impact of energy efficiency in terms of a demand reduction factor for the five major demand sources: domestic heat, domestic lighting and appliances, non-domestic heat, non-domestic lighting and appliances and industrial processes.

Headline results – very ambitious targets between 2025 and 2035

In the scenarios that achieve the UK and Scotland's net zero targets, the majority of energy efficiency improvements were projected to occur by the early 2030s, particularly within the non-domestic sector, facilitating low carbon fuel switching and smart, flexible electricity consumption in the later 2030s and 2040s. The concentration of energy efficiency gains within a relatively short timeframe reflects the current slow uptake (also the focus on fuel poverty which tends enable latent demand), followed by a rapid sprint from 2025 to 2035 in order to meet the governments targets, and the 5th and 6th carbon budgets.

There is uncertainty over the level of demand reduction that can be achieved through energy efficiency, which is reflected in the range of scenario outcomes. The impact of energy efficiency was modelled using existing and proposed policies, current trends and abatement measures identified as commercially feasible. By 2035, the impact of energy efficiency on the current baseload electricity demand ranges from **7%** to **29%**, depending on the scenario.

Early demand reduction in the scenarios is driven by the non-domestic sector, with the expectation that private and public sector energy efficiency measures will be complete by the early 2030s in the net zero scenarios, as per the CCC's Sixth Carbon Budget. Domestic heat demand, in contrast, has historically proved more difficult to reduce through energy efficiency measures, and rollout occurs mainly in the later 2020s and 2030s. Across the scenarios, the impact of energy efficiency on non-domestic energy demand by 2030 was projected to be on average 50% higher than the impact on domestic heat demand.

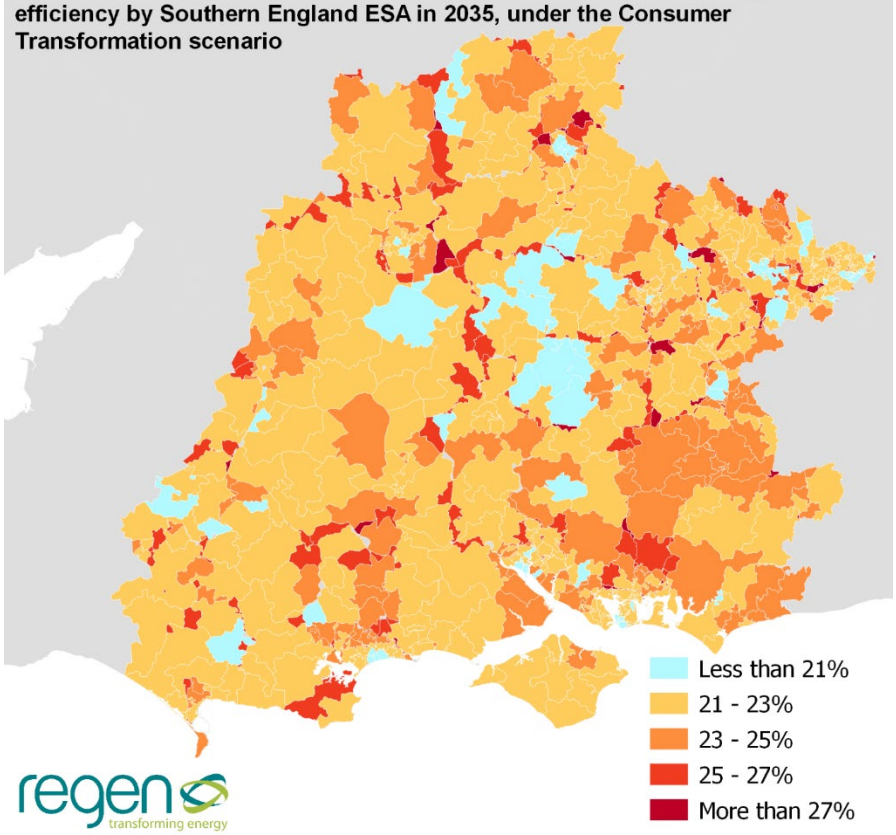
Local impacts and variation

The analysis was undertaken at the level of Electricity Supply Areas (ESAs), broadly primary substations. It showed that, while many aspects of energy efficiency are driven by national policy and trends, the local demand impact can vary significantly depending on the domestic, commercial and industrial building stock and demand sources present in each area.

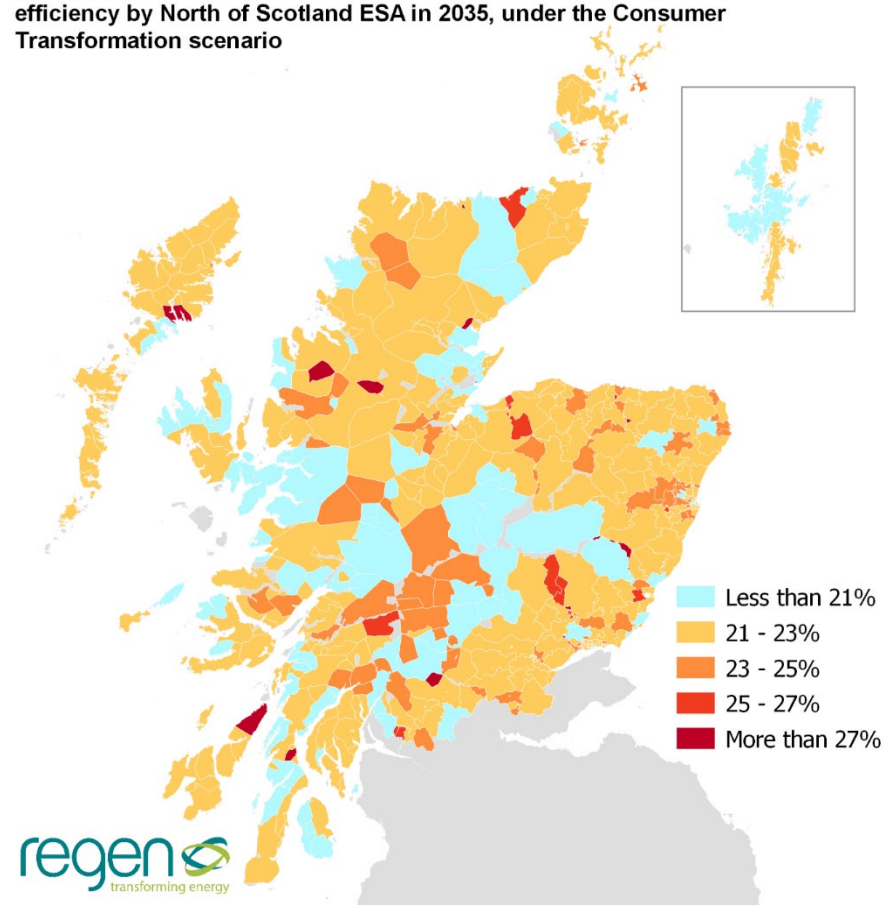
In the Consumer Transformation scenario, in which the UK meets its energy efficiency targets such as those defined in the Clean Growth Strategy, the impact of energy efficiency on current electricity baseload reduction varied between **10%** to **28%** in 2035 between ESAs.

Across all scenarios, the energy efficiency reduction factor (%) on current baseload was less in city and town centres, which typically contain high proportions of office and retail buildings and better insulated dwellings, particularly flats and tenements. Conversely, rural and industry-dominated areas showed higher energy efficiency reduction factor potential, owing to typically less well insulated building stock and the higher potential for industrial buildings and processes to reduce energy demand, compared to office and retail premises. However, due to the concentration of electricity demand in urban areas, the absolute level of demand reduction is greater within urban and city areas, alongside locations with high levels of industrial demand.

Reduction in current baseload electricity demand as a result of energy efficiency by Southern England ESA in 2035, under the Consumer Transformation scenario



Reduction in current baseload electricity demand as a result of energy efficiency by North of Scotland ESA in 2035, under the Consumer Transformation scenario



Local impacts and variation

Local area specific stats – Southern England licence area	
Bournemouth	In Bournemouth, only one in three homes currently meet the Climate Change Committee's checkpoint EPC rating of a C or above, and one in four were rated at an E or lower.
Isle of Wight	On the Isle of Wight almost one in three homes had an EPC of E or below, and therefore have high potential to reduce energy demand and bills over the next decade.
Oxford	In Oxford, less than 40% of homes currently meet the Climate Change Committee's checkpoint EPC rating of a C or above.
Oxford	With around two-thirds of modelled energy use in Oxford coming from non-domestic buildings, energy demand in the city could reduce quickly over the next decade, based on the Climate Change Committee's Sixth Carbon Budget.
Portsmouth	In Portsmouth, only one in three homes currently meet the Climate Change Committee's checkpoint EPC rating of a C or above.
Southampton	In Southampton, only one in three homes currently meet the Climate Change Committee's checkpoint EPC rating of a C or above, and one in four were rated at an E or lower.
Swindon	Swindon has some of the best insulated housing stock amongst the local authorities in the analysis, but would still require upgrades to approximately 50,000 homes, around half of all homes in the city, to achieve in EPC C in a vast majority of houses.
Swindon	Swindon has particularly high levels of industrial energy demand, and sees significant changes in the scenarios where the UK achieves its Clean Growth Strategy targets for industrial energy efficiency.
Local area specific stats – North of Scotland licence area	
Aberdeen	Aberdeen has some of the best insulated housing stock amongst the local authorities in the analysis, but would still require upgrades to over 60,000 homes, over half of all homes in the city, to achieve in EPC C in a vast majority of houses.
Aberdeen	Aberdeen is an area of dense electricity demand from both houses and non-domestic buildings. If Scottish and UK government targets are achieved, current electricity demand in the city could decrease by around 20%, helping the balance the potential increase in electricity use from electric vehicles and heat pumps in the future.
Dundee	Dundee has some of the best insulated housing stock amongst the local authorities in the analysis, but would still require upgrades to approximately 40,000 homes, around half of all homes in the city, to achieve in EPC C in a vast majority of houses.
Dundee	Dundee is an area of dense electricity demand from both houses and non-domestic buildings. If Scottish and UK government targets are achieved, current electricity demand in the city could decrease by around 20%, helping the balance the potential increase in electricity use from electric vehicles and heat pumps in the future.
Highlands and Islands	Well over two-thirds of homes in the Highlands and Islands are below an EPC C, and over a third are below a D. Under Scottish government's current proposals, all of these properties need to be upgraded by 2040.
Highlands and Islands	The Highlands and Islands have high levels of electric heating in both houses and non-domestic buildings. The rollout of energy efficiency could see this substantially reduced over the coming decade, and may facilitate the installation of high efficiency heat pumps to further reduce electricity bills and demand.

Regen quote for press release

Jonty Haynes, Senior Analyst at Regen, led the team that developed the energy efficiency analysis. He said:

The UK in undergoing a major energy transition on the path to net zero carbon emissions, and both the UK government and the Climate Change Committee have put forward ambitious targets for energy efficiency over the next decade, an area that has historically proven challenging to decarbonise. The reasons for these goals are clear; improving energy efficiency directly leads to reduced fuel poverty, improved public health and reduced carbon emissions.

SSEN and Regen's study uses extensive research and data analysis to look at how existing and future electricity demand for heat, appliances, lighting and industrial processes may change in the coming decades across homes and businesses in SSEN's licence areas as a result of energy efficiency measures. Electricity networks are already expecting big increases to demand as electric vehicles, heat pumps and new developments come online - energy efficiency can help to mitigate some of this impact.