nationalgridESO

Introducing the FES 2020 scenarios

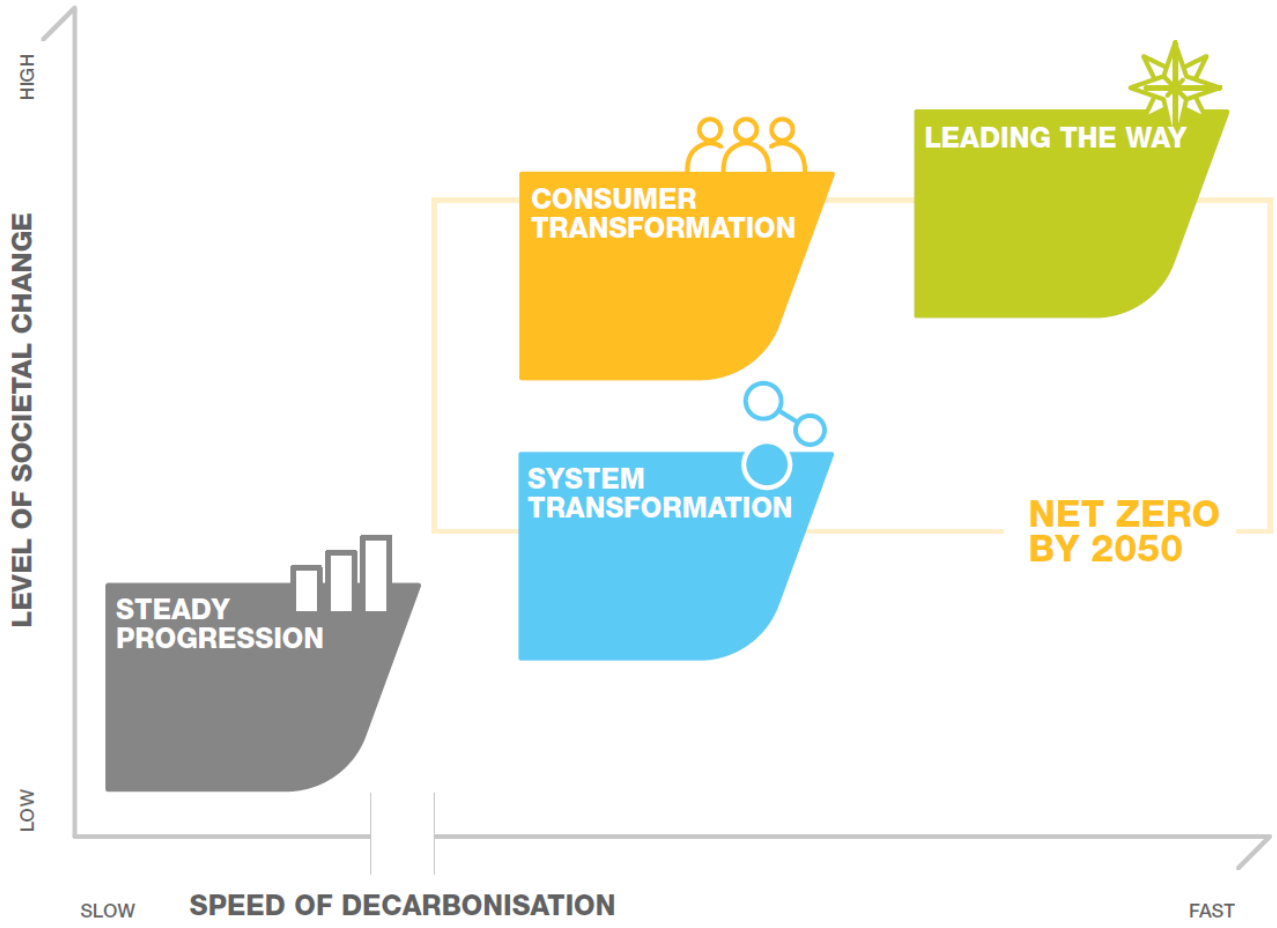
Exploring the scenarios and scenario framework for FES 2020

Every year National Grid Electricity System Operator (ESO) produces the Future Energy Scenarios (FES). These scenarios look at the uncertainty of the future of energy; including the challenge of meeting net zero and the impact of this on future energy supply and demand.

Archie Corliss, one of the ESO's Strategic Insight Leads, explains how we've evolved FES for 2020 to reflect the changes society needs to make to meet the UK Government's ambitious net zero target. Read on to find out more about the updated framework, why we've made these changes and what each scenario means.

The FES 2020 scenario framework

The FES 2020 scenario framework has been designed to explore the most fundamental drivers of uncertainty in the future energy landscape and reflects extensive analysis and consultation with industry. The new scenario framework is shown below.



What changes have been made to the FES framework?

We have kept the *speed of decarbonisation* axis and introduced a new vertical axis: *level of societal change*. We have modelled four scenarios; three which meet or exceed the new 2050 net zero target and one which does not. Two of our scenarios meet the target in 2050: **System Transformation**, which focuses on supply side decarbonisation, and **Consumer Transformation** which relies on more significant changes in society and how consumers use energy. **Steady Progression** does not meet the target, while **Leading the Way** meets the target before 2050 and requires the highest levels of societal change.

What is net zero?

In June 2019 the UK committed to a more ambitious target for reducing the UK's carbon emissions. The target will require the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels. The UK's 2050 net zero target was recommended by the Committee on Climate Change, the UK's independent climate advisory body. Net zero means any residual emissions in 2050 would be balanced by schemes to offset an equivalent amount of greenhouse gases from the atmosphere, such as planting trees or using bioenergy with carbon capture and storage technology.

What uncertainties does the updated framework explore?

The purpose of FES is to explore the uncertainties around the future of energy. We use extensive stakeholder feedback and collaboration to help us decide which uncertainties are the most important to explore. For the past two years we have looked at the speed of decarbonisation and the level of decentralisation (the differences between large-scale centralised energy supply options and small-scale local energy solutions). However, the new net zero target requires fundamental change across all elements of our energy system and society, but there is uncertainty around various paths to achieve net zero, with some paths requiring different levels of societal change than others. So, for FES 2020 we have continued to look at the speed of decarbonisation (how quickly the UK will decarbonise its economy) but added a new axis – level of societal change (how our economy will decarbonise). Read our Stakeholder Feedback document to find out how we worked with stakeholders to agree this change.

An overview of the FES 2020 scenarios

Our four scenarios see high levels of decarbonisation and societal change compared to the present day.

In **Consumer Transformation** the 2050 net zero target is met with measures that have a greater impact on consumers and is driven by greater levels of consumer engagement in the energy transition. For example, a typical domestic consumer will use an electric heat pump with a low temperature heating system and an electric vehicle, they will have had extensive changes to their home to improve its energy efficiency and most of their electricity demand will be smartly controlled to provide flexibility to the system. The system will have higher peak electricity demands that will be managed with flexible technologies including energy storage, demand side response and smart energy management.

In **System Transformation** the typical domestic consumer will experience less disruption than in Consumer Transformation as more of the significant changes in the energy system happen on the supply side, away from the consumer. For example, a typical consumer will use a hydrogen boiler with a mostly unchanged heating system and an electric vehicle or a fuel cell vehicle, they will have had fewer energy efficiency improvements to their home and will have lower engagement with opportunities to use their demand to provide flexibility to the system. Total hydrogen demand is high, and it is mostly produced from natural gas with carbon capture and storage.

In **Leading the Way** we assume that GB decarbonises rapidly with high levels of investment in world-leading decarbonisation technologies. In this scenario our assumptions in different areas of decarbonisation are pushed to the earliest credible dates. Consumers are highly engaged in acting to reduce and manage their own energy consumption. This scenario includes the highest and fastest improvements in energy efficiency to drive down energy demand, with homes retrofitted with insulation such as triple glazing and external wall insulation, and a steep increase in consumer participation in smart energy services. Hydrogen is used to decarbonise some of the most challenging areas of society such as some industrial processes, with this Hydrogen produced solely from electrolysis powered by renewable electricity.

In **Steady Progression** there is still progress made on decarbonisation compared to the present day, however it is slower than in the other scenarios. While home insulation improves, there is still heavy reliance on natural gas in this scenario, particularly for domestic heating. Electric vehicle take-up grows more slowly than in other sectors, displacing petrol / diesel vehicles for domestic use, however decarbonisation of other vehicles is slower with continued reliance on diesel for heavy goods vehicles. In 2050 this scenario still has significant annual carbon emissions, some way short of the 2050 net zero target in UK legislation.

What changes will this mean for GB society?

While there is a wide difference in levels of societal change between the net zero scenarios, all of them will require substantially more societal change than our **Steady Progression** scenario; there is no way to hit net zero without high levels of societal change. Consumers will need greater understanding of how they use energy, the effects of this on our energy system and how to adapt the way they use energy in order to meet the net zero target.

Across all scenarios we see a growth in renewable energy generation, including a significant expansion in installed offshore wind capacity, and a widespread uptake in domestic electric vehicles, with the main difference across the scenarios being the rate of this uptake. For electrification to be a way to decarbonise the transport sector or other sectors, it's essential that the carbon intensity of electricity generation continues to reduce before other sectors increase their reliance on electricity. Otherwise, energy consumers are simply moving from one carbon intensive source of energy to carbon intensive electricity. Other common elements include a greater role for flexibility services to help manage the variable nature of wind and solar generation.

Get involved in the conversation

We'd love to hear your thoughts on the updated framework and what this means for the energy industry and wider society. Get in touch with us at box.fes@nationalgridso.com.