

WELCOME



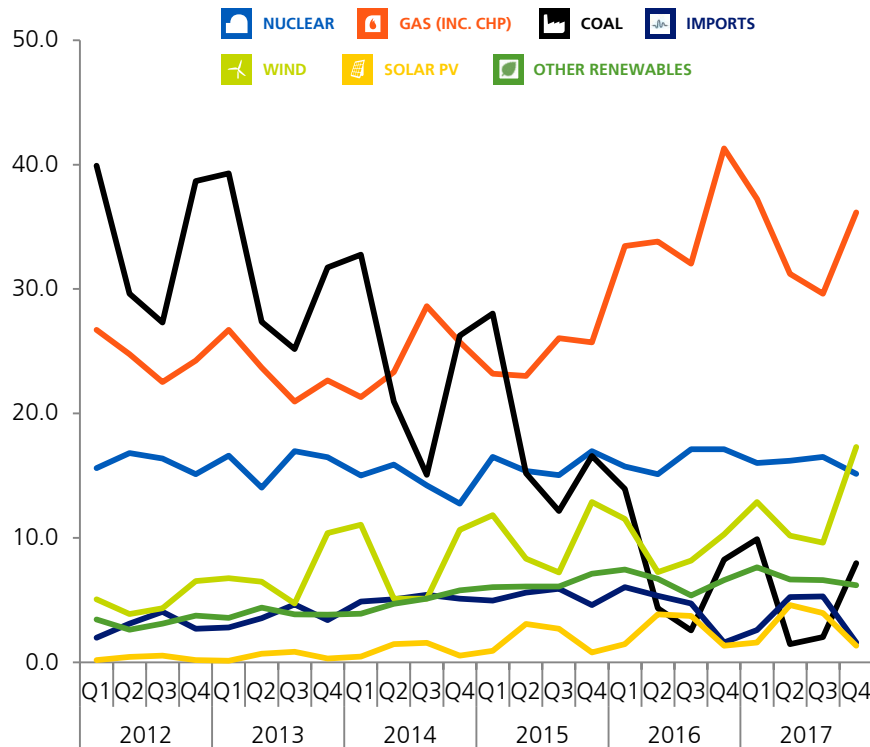
RENEWABLE ENERGY FOCUS: CALCULATING THE CARBON CONTENT OF POWER IMPORTS

ALASTAIR DAVIES, EDF ENERGY



Our energy mix is changing rapidly...

Coal is no longer providing the majority of power

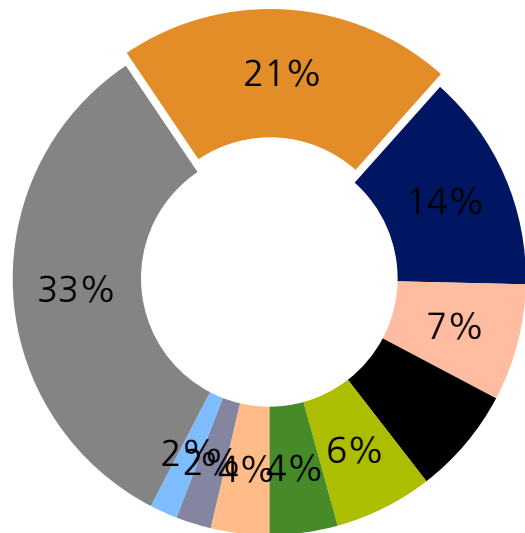


- Since 2012 there has been a dramatic decrease in the contribution of coal to our energy mix
- This has mostly been replaced by lower carbon gas, increased output from wind, alongside more imports and reduced demand
- Nuclear is now the second largest contributor, supplying around 20% of our energy annually
- The Grid is already having to adapt to increasingly variable output from solar and wind

Source: Department for Business, Energy & Industrial Strategy, Energy Trends, June 2018

...and EDF Energy is playing its part in every aspect of the transition

EDF Energy is the UK's largest electricity generator

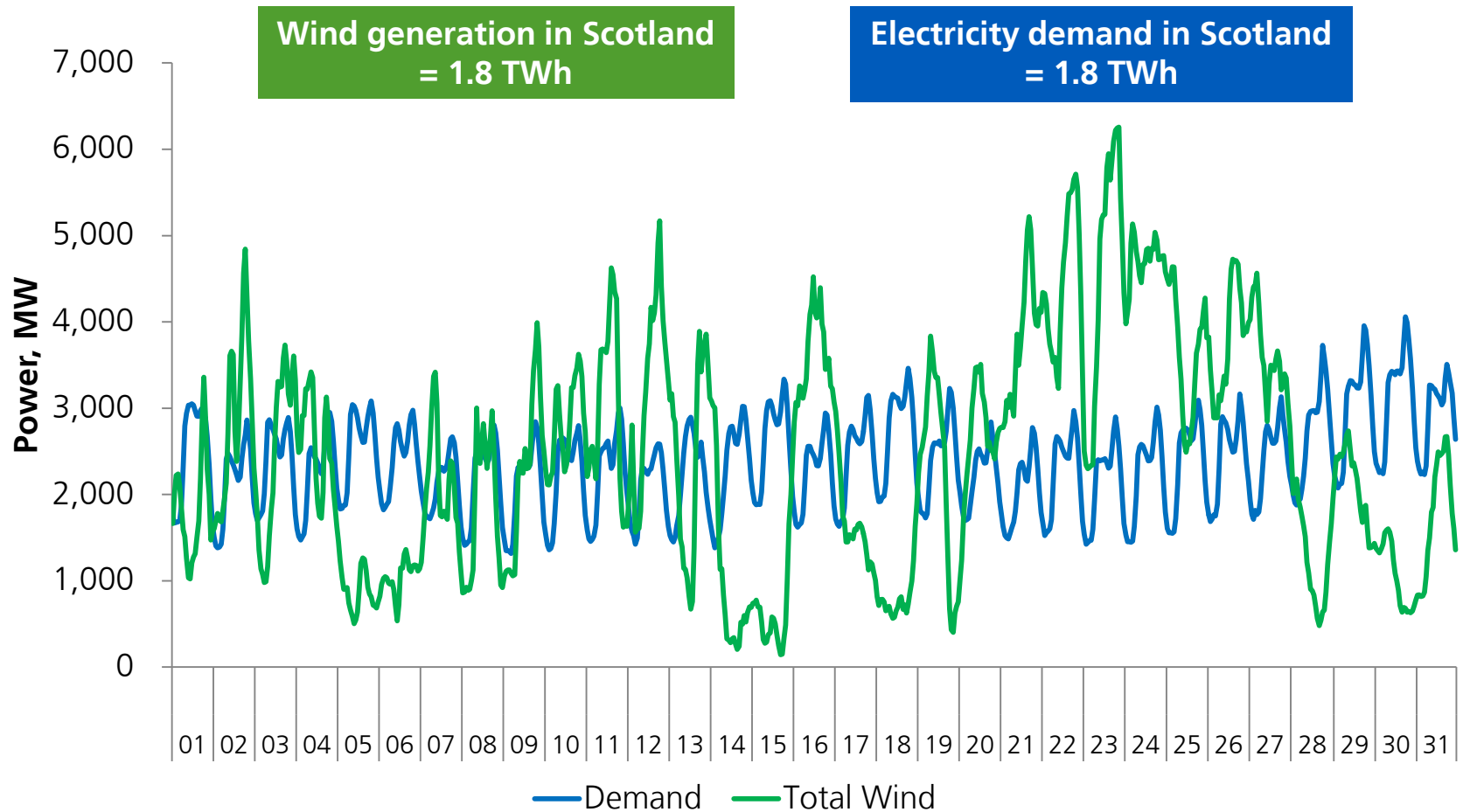


- EDF Energy is the UK's largest electricity generator – operating nuclear, coal, gas and renewables
- We are part of this change and are adapting how we operate
- Our 4GW of coal stations now only operate during peaks of demand, and we are investing across a range of technologies, including renewables, gas and battery storage
- Our investment in the UK's nuclear power stations has resulted in improved performance and an output that is now 60% higher than a decade ago
- Our ambition is to double our installed capacity of renewables over the next five years – for example we have recently acquired a large offshore wind project in Scotland

WIND POWER IN SCOTLAND

APPROACHING 100% RENEWABLES?

In aggregate, over the month of October 2018, wind generation matched Scottish electricity demand



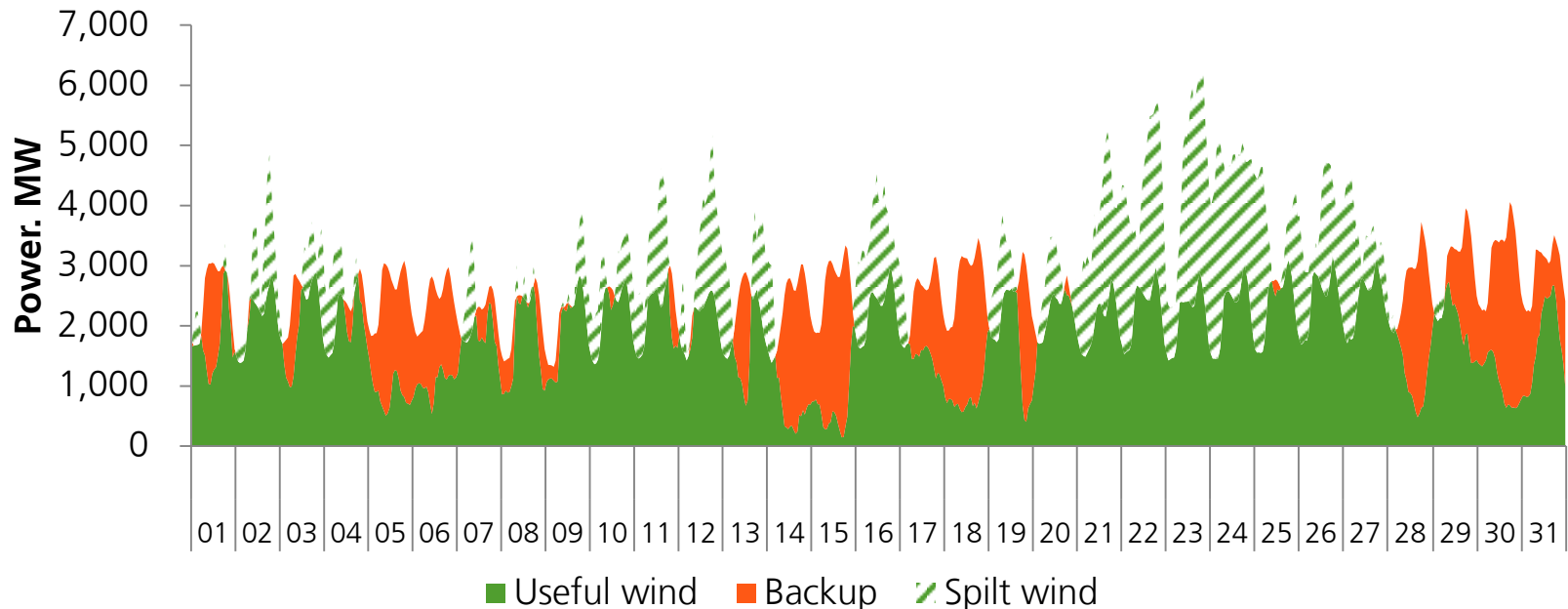
Hour by hour 25 % of the wind power exceeds the demand at the time it is generated.

Back-up generation could fill the gaps, but would limit the reduction in carbon intensity to no better than 100 g/kWh

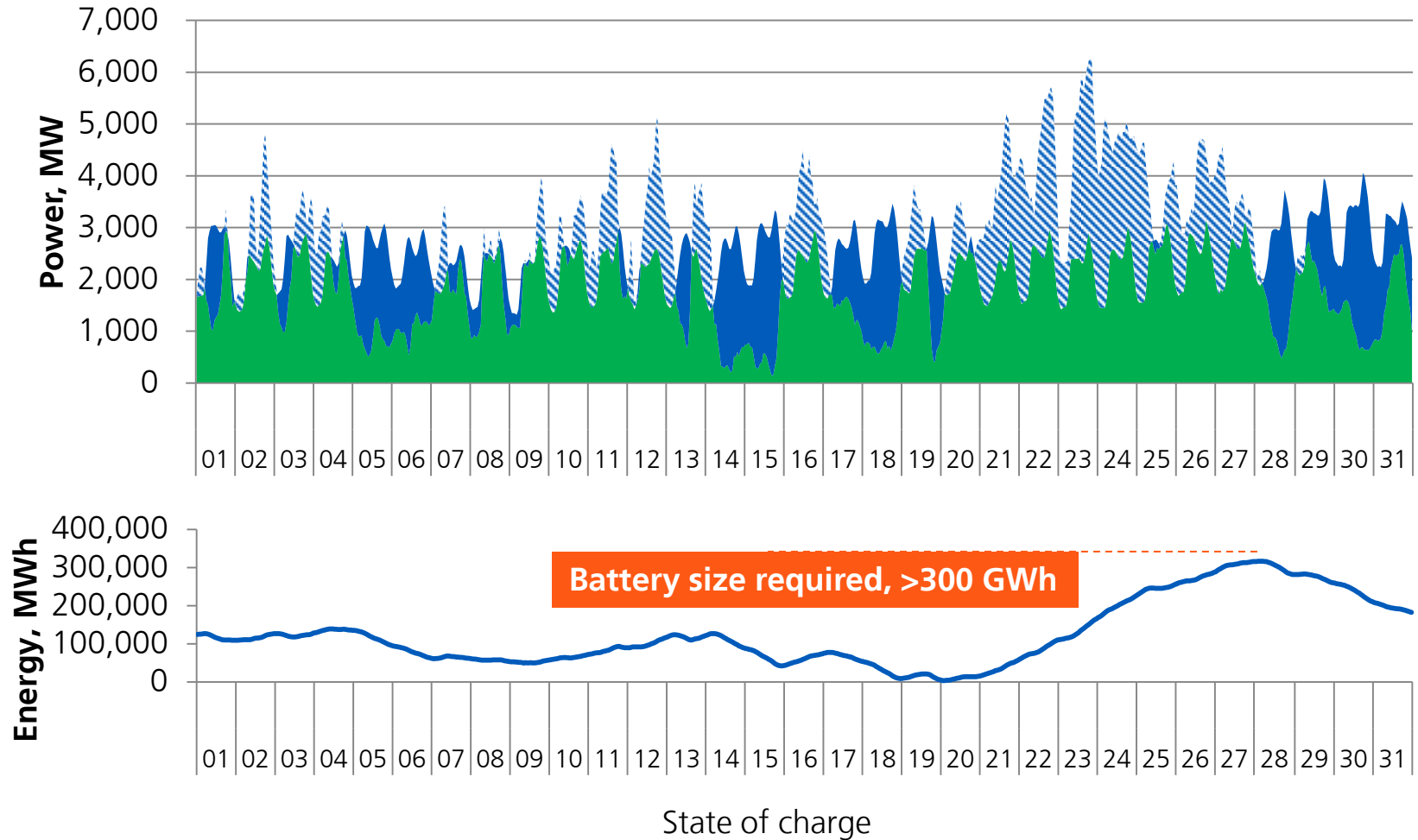
Useful wind generation
= 1.3 TWh

Back-up generation needed
= 0.5 TWh

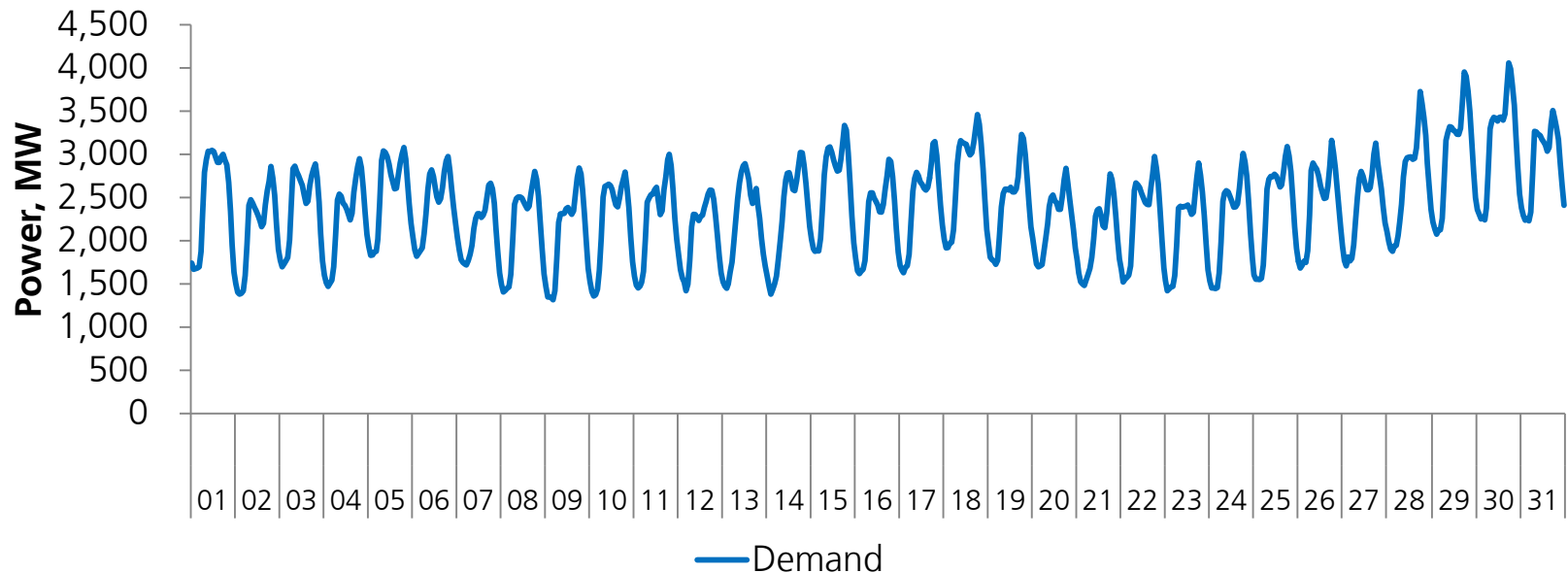
Electricity demand in Scotland
= 1.8 TWh



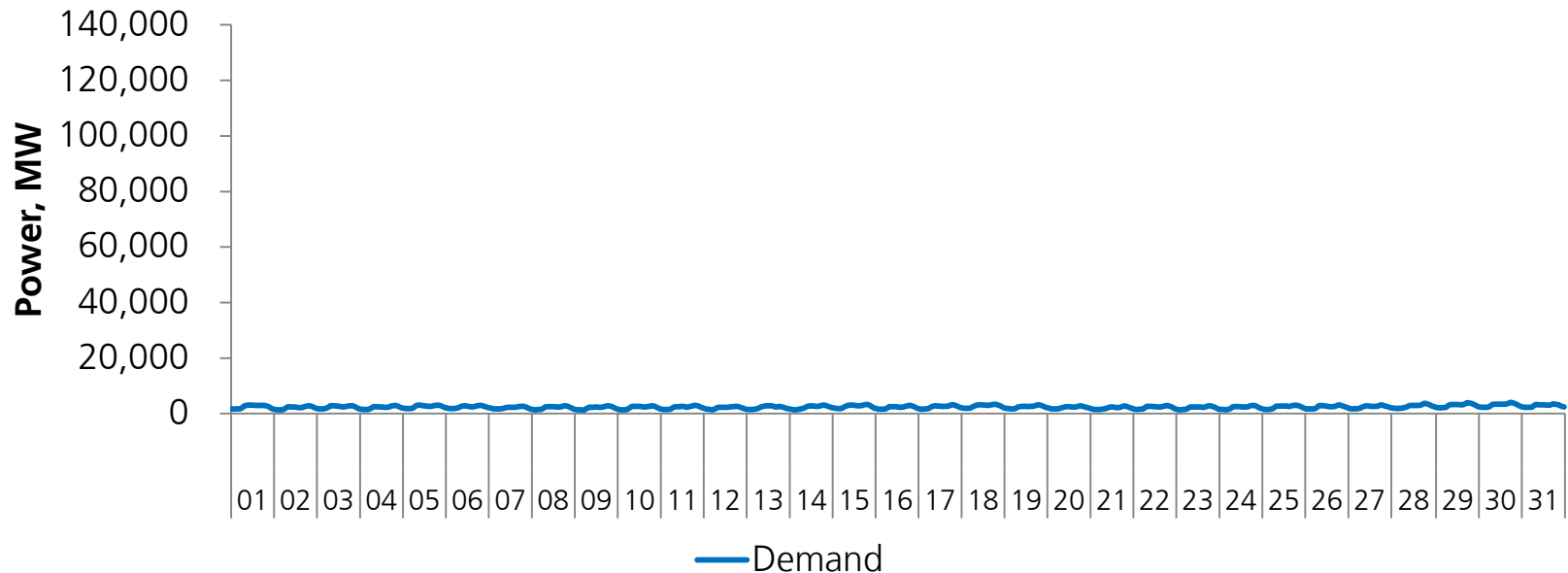
Li-ion battery storage could be used to balance supply and demand, but at a cost of £78 billion



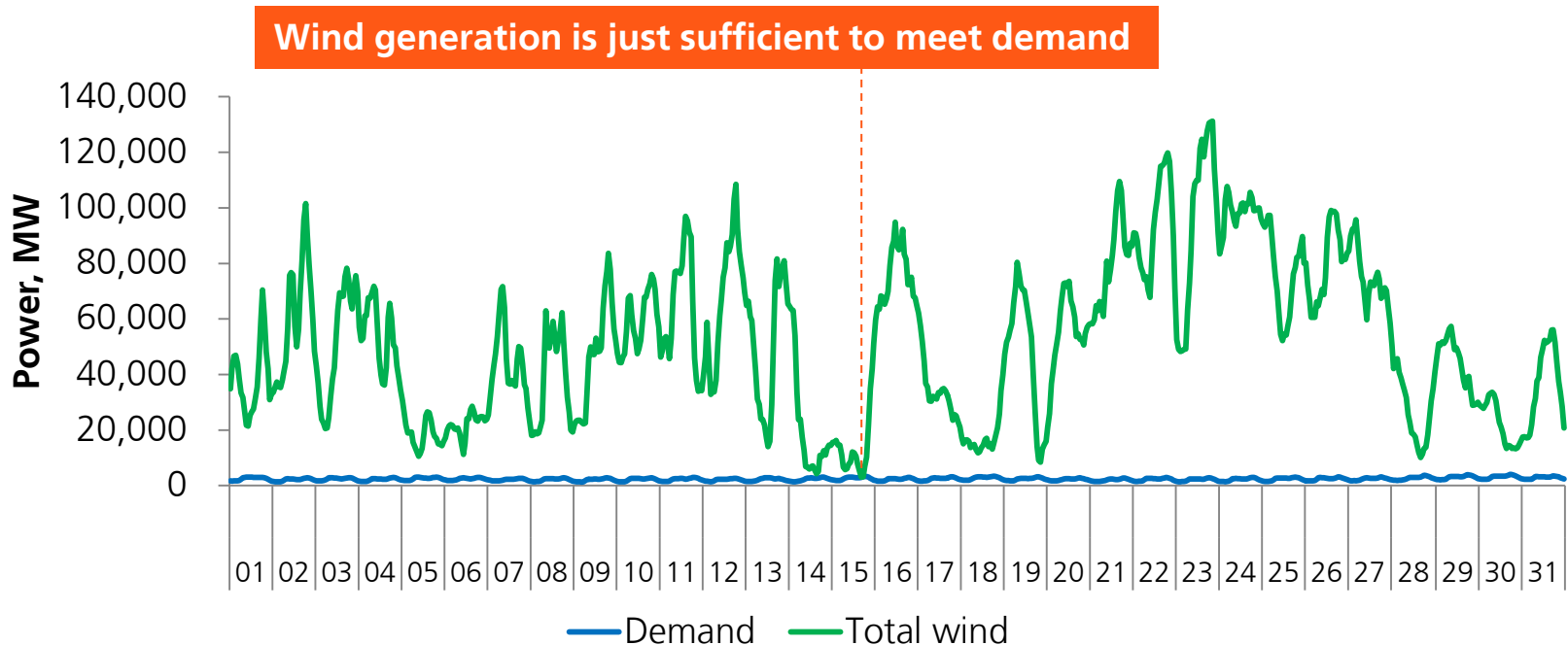
How much wind capacity would be needed to meet every last MWh of demand?



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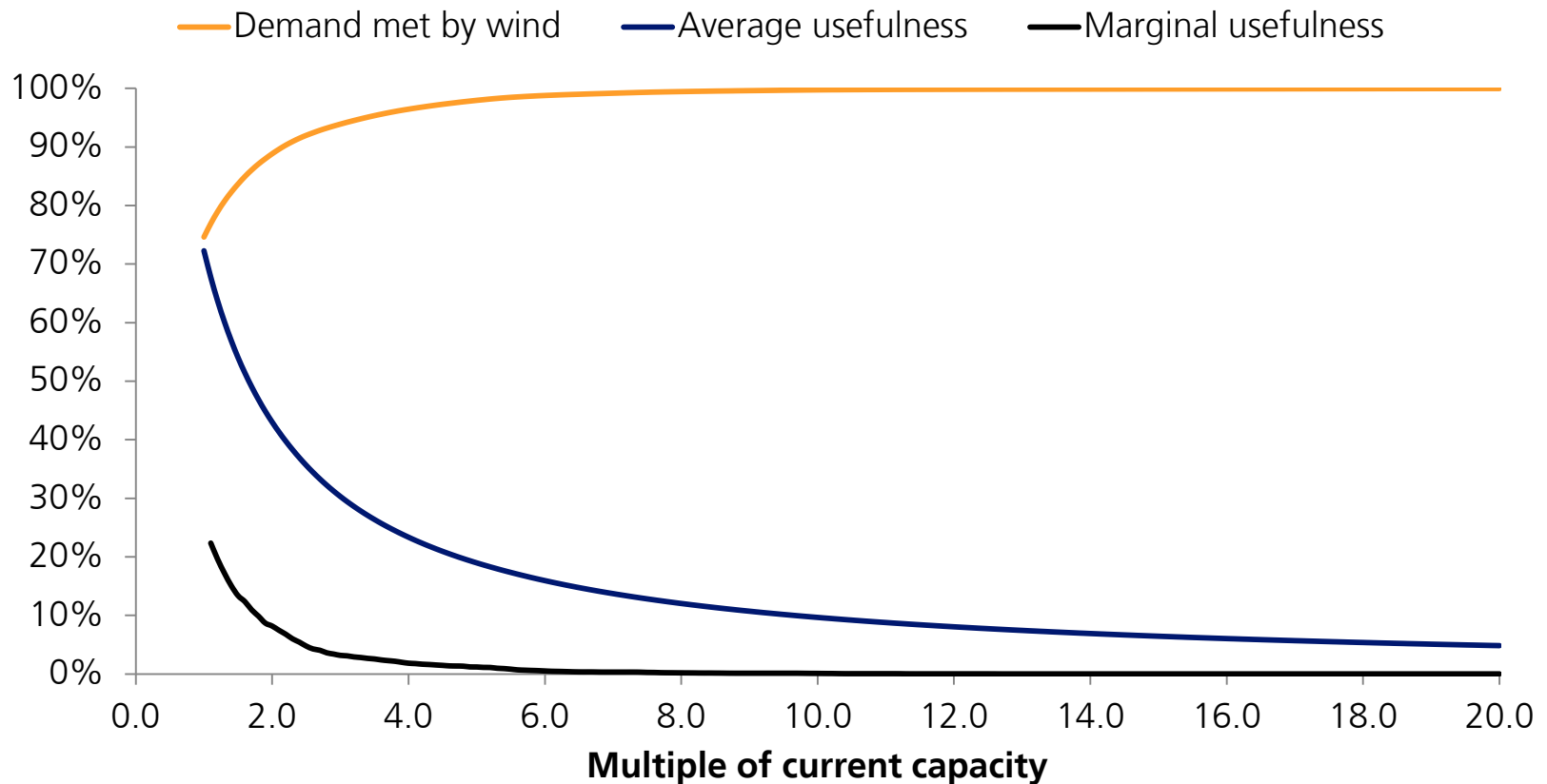


It becomes incrementally less and less useful to add wind to reduce gas use – because gas is used when wind speeds are low

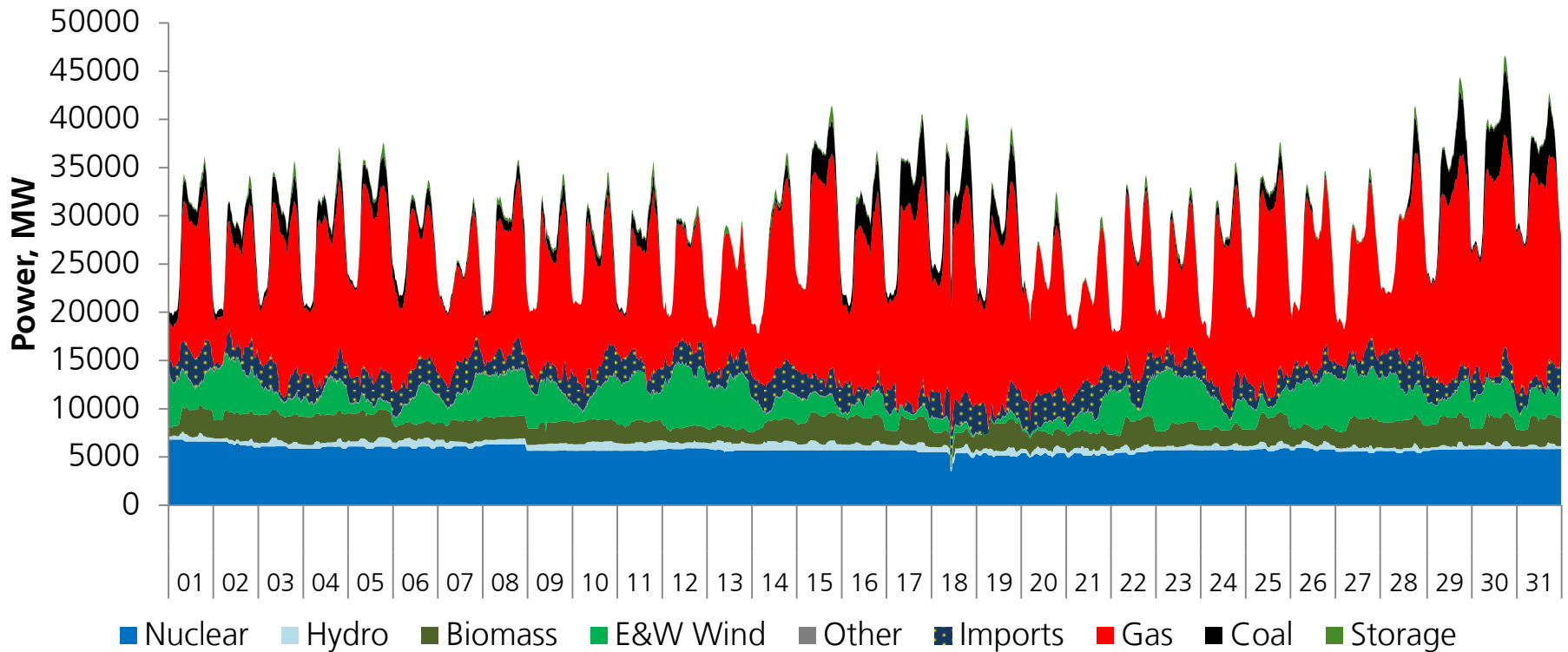


Twenty times the current wind capacity would be required to provide sufficient power at all times.

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Trade with the rest of the UK is another (better) answer



CALCULATING THE CARBON CONTENT OF POWER IMPORTS



Carbon accounting can be on the basis of either production or consumption and both are important

Extract from CCC "Carbon footprint report", 2013, exec. summary

Carbon accounting. It remains appropriate to account for carbon budgets on the basis of production emissions given accounting conventions and available policy levers.

However, consumption emissions should be monitored to check whether these are falling in line with global action required to achieve the climate objective, or whether further action is required. Input-output analysis remains the best option for monitoring consumption emissions, as there are no regular updates of lifecycle emission estimates of products.

Extract from CCC Progress report, July 2018, box 1.2

The internationally agreed standard for reporting greenhouse gas emissions to the UN covers emissions from activities within the GB. This approach does not include emissions embedded in the goods and services the GB imports, nor exclude those in exports; therefore it is not a good indicator of emissions related to final consumption in the GB. [...]

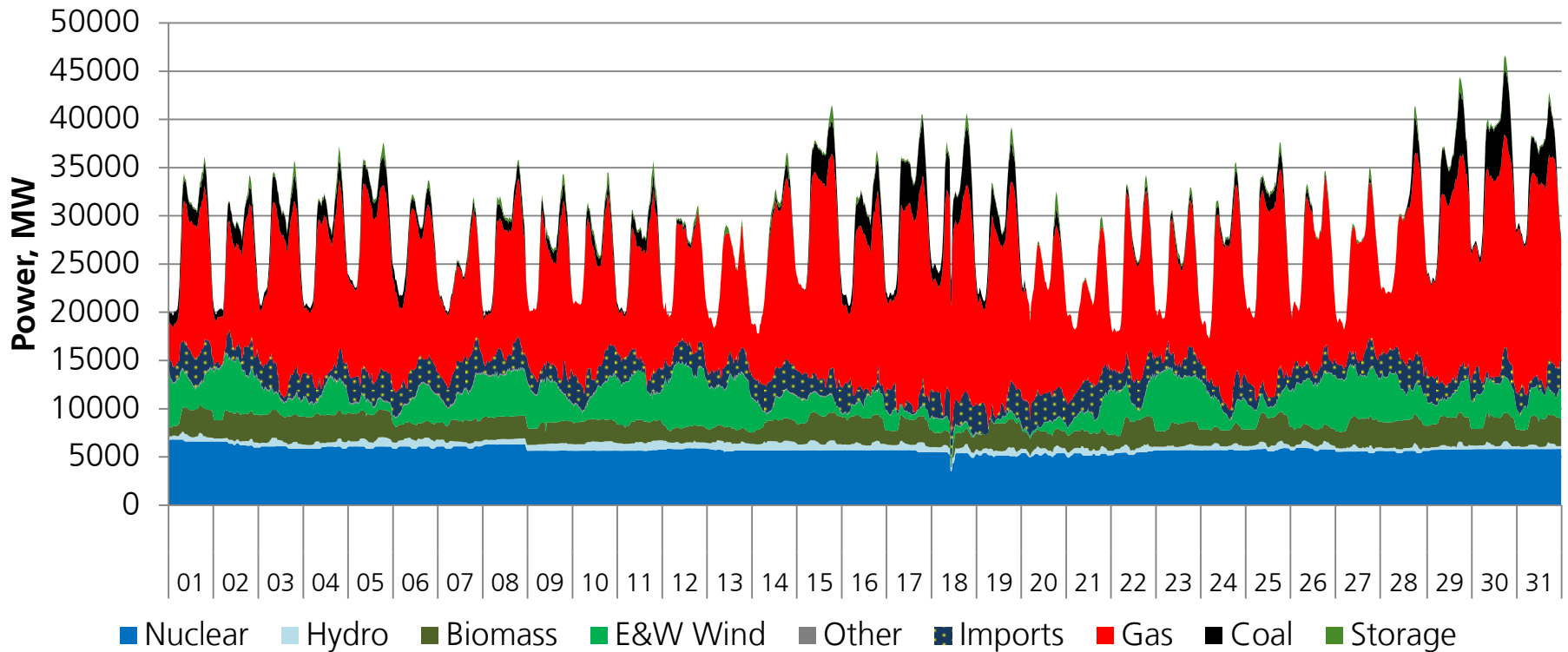
Comparing GB production and consumption-based emissions shows that more action is needed in the GB and globally to reduce these emissions:

- **GB emissions measured on a consumption basis are higher than on a production basis.**

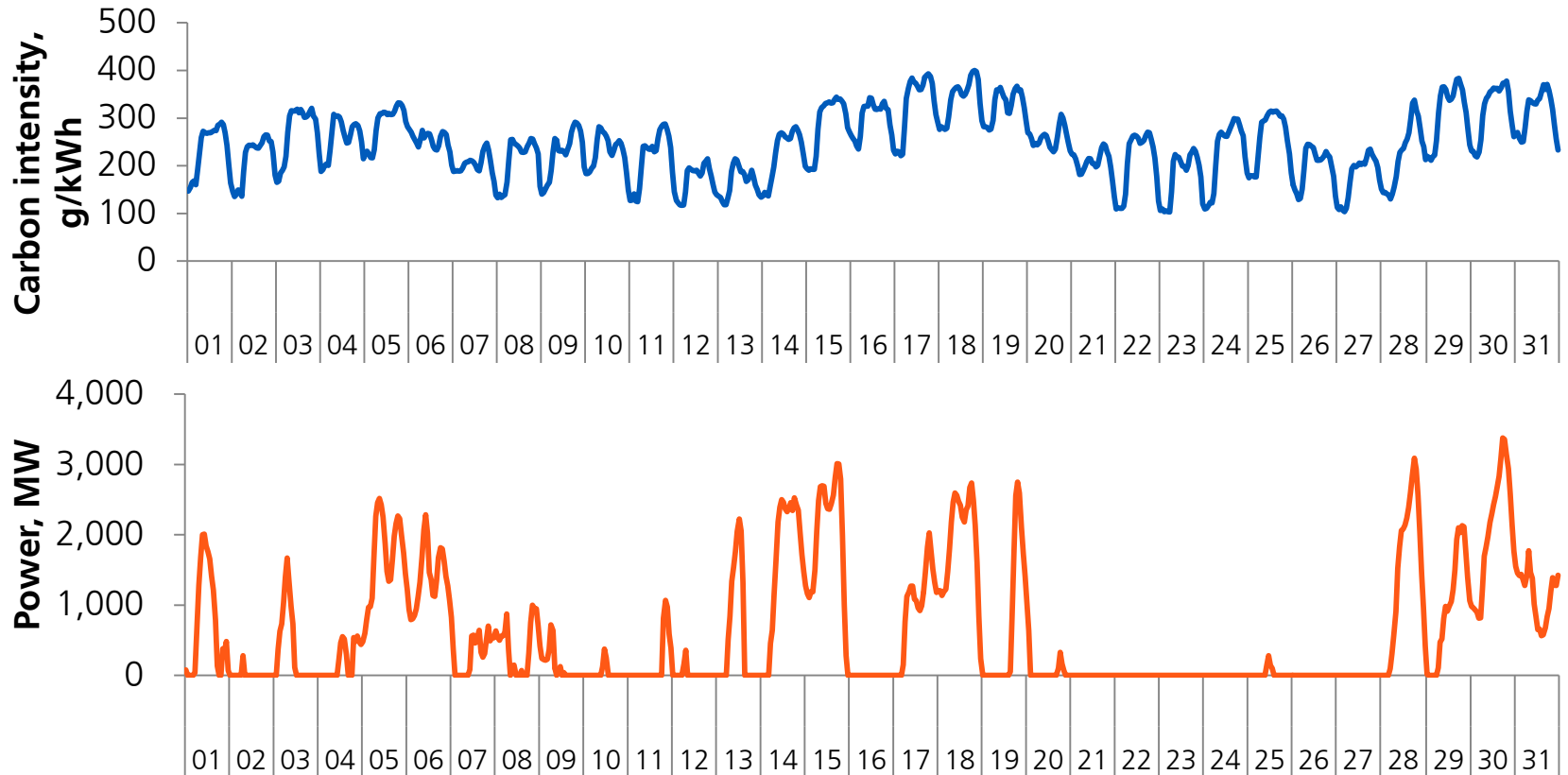
For instance, in 2015 (the most recent available data) they were 13 tCO₂e per person compared to 8tCO₂e on a production basis.

- A combination of GB and global action, as envisaged in the Paris Agreement, is required to cut both GB production and consumption emissions in the future.

UK electricity generation (other than Scottish wind) shows varying levels of carbon intensity



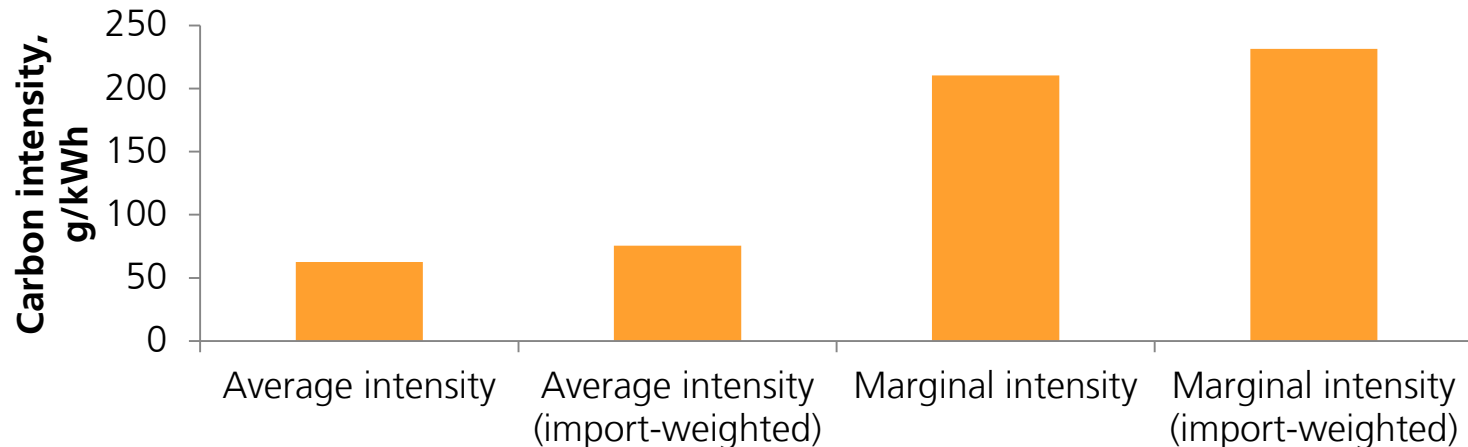
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We identify four methods for assessing the impact of imports on the carbon intensity of electricity consumption

	Carbon intensity of RUK imports	Impact on carbon intensity of Scottish consumption
Average intensity (time-weighted)	246	63
Average intensity (import-weighted)	298	76
Marginal intensity (time-weighted)	829	210
Marginal intensity (import-weighted)	912	232

Carbon intensity of Scottish electricity consumption based on four methods for assessing imports



THANK YOU

