

COVID-19 Electricity Demand Analysis

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Introduction

In the search for developing “fast indicators” to help assess the impact of coronavirus in the UK and the wider economy, electricity demand data has been identified as a candidate due to its correlation to GDP.

The [ENTSO-E Transparency Platform](#) hosts a public API that gives access to datasets that record the demand for electricity in the UK and other European countries. Data from the API provided is refreshed continually, in close to real time.

This report investigates the pandemic’s effect on electricity demand, and considers how the API could be integrated into an analytical pipeline for monitoring the data daily.

Method

The following steps were performed to import prepare the data for analysis:

- Imported data into pandas dataframe,
- Converted time column into date time format and made it the table index,
- Extracted year, month, quarter & week as separate features for filtering,
- Used one-hot encoding to extract logical arrays to indicate rows corresponding to a country,
- Trimmed data pre-2015 (3 samples from 2014).

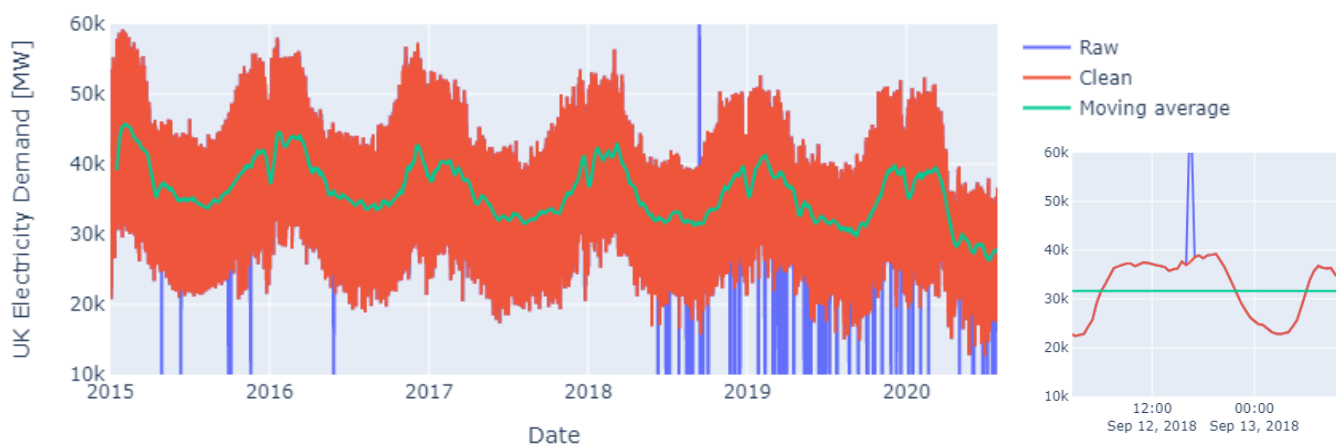


Figure 1 - UK Electricity demand 2015-2020

Figure 1 shows the raw data from the UK vs. that which has been cleaned. The raw data contained many excursions to unrealistically low, or high demand rates considering the context of the surrounding data. These outliers were found using an algorithm that identified samples that were outside of the lower, or, upper fence for a given country and year. The missing values were then interpolated using a PCHIP¹ spline

¹ PCHIP Piecewise Cubic Hermite Interpolating Polynomial

to prevent overshoots around turning points in the data. The inset image shows how data is successfully identified as erroneous and filled with plausible replacements, preserving the shape of the data.

Analysis

A summary of your main findings, illustrated with effective visualisations

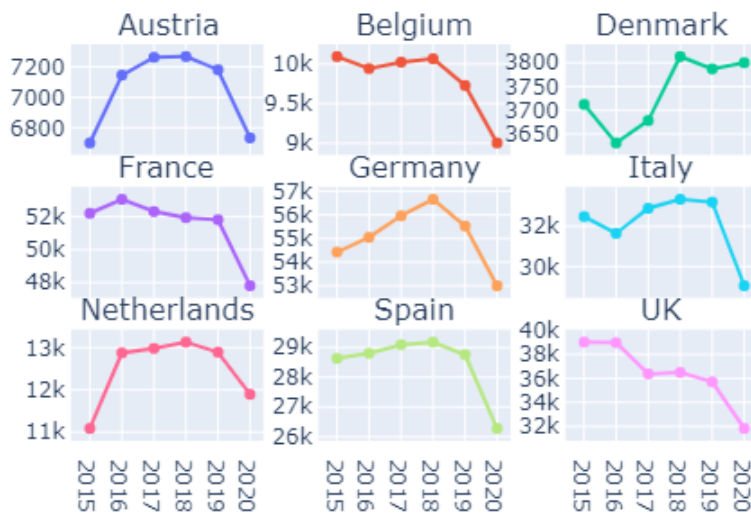
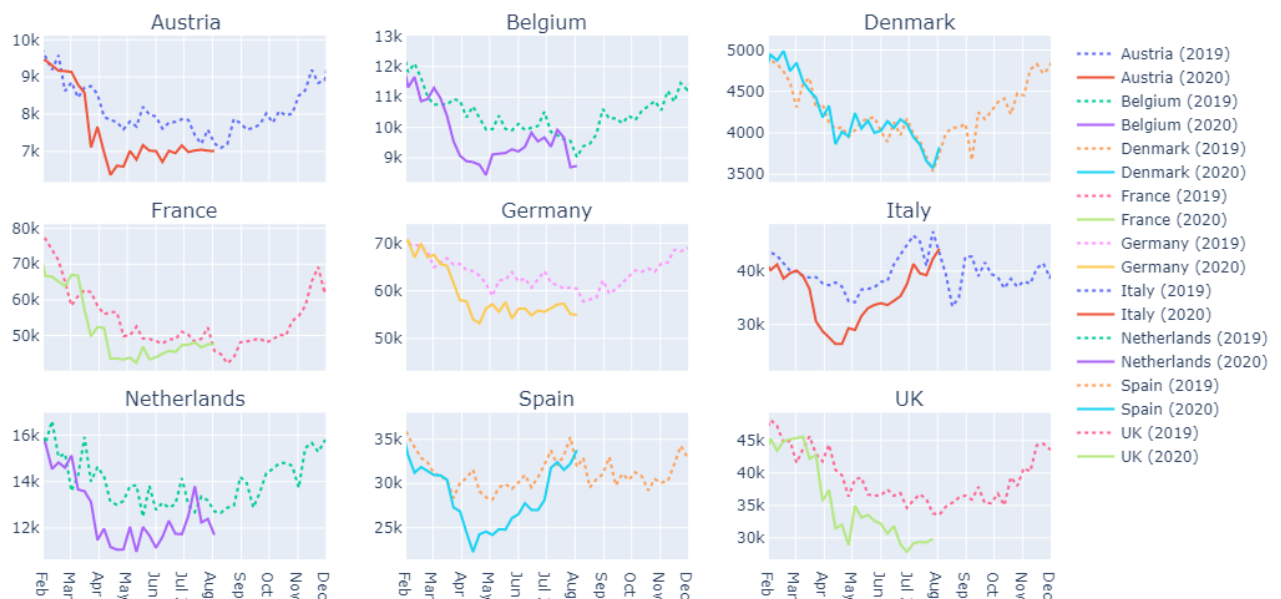


Figure 2 - Median annual electricity demand [MW]



Discussion

- Commentary on any limitations of the dataset and/or your approach, and the steps that could be taken to address these in future

Further Work

An analytical pipeline could be delivered to:

- Query the [ENTSO-E API](#) to acquire the raw XML provided by the web service,
- Use an XML parser to convert the data to a dataframe containing the timeseries data,
- Clean up any outliers using the method developed,
- Compare the actual data to a forecast of the demand and it's confidence intervals,

- Use an anomaly detection algorithm to detect when data falls outside the forecast confidence intervals and raise a notification to the business.

I would go back to the business and ask the following questions:

- Do we have a model that predicts GDP based on electricity demand and other factors?
- What format would the electricity data have to be in to feed into that system?
- The National Grid produces their own projections of electricity demand, could we get hold of their predictions?