

Covid-19 and Social Distancing: Does It Show Up in the Demand for Electricity?

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Empty motorways and airports make it obvious that movement restrictions and stay-at-home regulations have had a big impact on the demand for oil and petroleum products. But what impact have these restrictions had on electrical demand? We examine electrical demand data measured at high voltage transmission grids to assess the impact of Covid-19 social distancing restrictions in Australia, the United States, New Zealand and Great Britain. Interestingly, New Zealand and Australia have had amongst the lowest per capita infection and case fatality rates, while the United Kingdom and United States have had amongst the highest.

We also review changes in mobility as measured in Google's Covid-19 Community Mobility Reports¹. We find a strong correlation between mobility trends and aggregate electrical demand. While apparently similar social distancing restrictions in all four countries might have been expected to show up in similar electrical demand and mobility reductions, in fact the picture is very different: electrical demand (and community mobility) declined sharply in New Zealand and the UK. In Australia and much of the United States, electrical demand has hardly changed. Though mobility reduced in the United States and Australia, the reduction in both countries has been much smaller than in New Zealand and the United Kingdom.

Background

The United Kingdom, New Zealand and Australia introduced social-distancing regulations on 23 March, 23 March and 31 March respectively. In the United States these regulations were established by state governments in California, New York, Florida and Texas on 19 March, 22 March, 30 March and 30 March respectively. Some of the other U.S. states introduced similar restrictions around these dates.

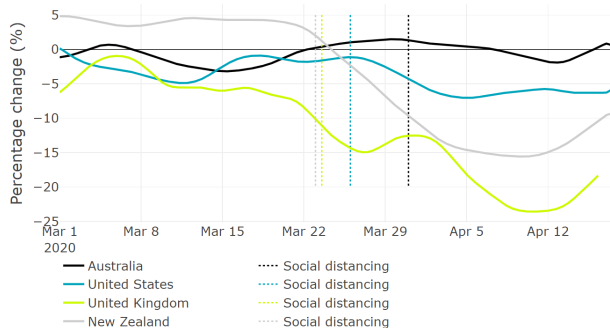


Figure 1 Trend change in aggregate country demand relative to baseline

Source: USA: EIA (US Energy Demand by Region); NZ: Electricity Authority (Latest wholesale trends); UK: National Grid (Data Explorer) and ELEXON (BM Reports), AU: AEMO (NEMWeb). VEPC Analysis

Contemporaneously, border controls and quarantine for international arrivals were imposed in New Zealand, Australia and the United States, but not in the UK.

Change in electrical demand

Figure 1 shows the country-level changes in aggregate electrical demand compared to

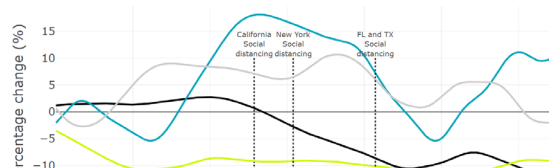


Figure 2 Percentage change in average weekly demand in selected U.S. States, relative to baseline

Source: EIA (US Energy Demand by Region). VEPC Analysis

a historical baseline.² Electrical demand in both the United Kingdom and New Zealand declined significantly after social distancing regulations were imposed while demand has been largely unchanged in Australia and has a declined a little in the United States, relative to the baseline.

Figure 2 shows the weekly average change in electrical demand compared to a historical baseline for New York, Florida, Texas and California, and Figure

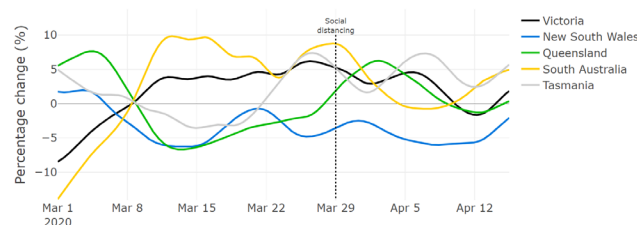


Figure 3. Percentage change in average weekly demand in selected Australian States, relative to baseline

Source: AEMO, NEMWeb. VEPC Analysis

3 shows the same measure in the Australian states of Victoria, New South Wales, South Australia, Tasmania and Queensland.

Figure 2 shows the largest demand reductions occurred in California and New York and that demand increased in Texas and Florida. Figure 3 shows the largest demand reductions in New South Wales, almost

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See footnotes at end of text.

	Country/state	Retail and recreation	Workplace	Average
	New Zealand	-88	-70	(79)
	United Kingdom	-81	-65	(73)
United States	New York	-62	-60	(61)
	California	-48	-55	(52)
	Florida	-45	-40	(43)
	Texas	-40	-42	(41)
Australia	Victoria	-42	-40	(41)
	New South Wales	-40	-40	(40)
	Queensland	-40	-40	(40)
	Tasmania	-41	-38	(40)
	South Australia	-40	-37	(39)

Table 1. Average percentage change in mobility since social-distancing regulations. Source: Google Covid-19 Community Mobility Report, VEPC analysis

no change in Queensland and Victoria and slight increases in Tasmania and South Australia. It is also obvious in these charts that, relative to the baseline, the variation in demand before the social-distancing regulations took effect was at least as large as it has been since.

Change in mobility

The direction of the country and regional demand changes since the introduction of social distancing regulations is consistent with the Google mobility data shown in Table 1. The table shows the average percentage reduction in mobility since the imposition of social distancing regulations.

Table 1 shows that, consistent with the reductions in electrical demand, the biggest reductions in mobility occurred in New Zealand, the United Kingdom and in

California and New York. The smallest reductions in mobility occurred in Australia (approximately the same reduction in all states) and in Texas and Florida.

This analysis suggests that changes in mobility as measured at retail & recreation venues and workplaces, and changes in aggregate electrical demand are strongly associated and that average reductions in mobility above 45% are associated with large (10% plus) declines in electrical demand, but reductions in mobility below 45% are associated with little change in electrical demand.

Of course the specific circumstances (particularly climate), the choice of baseline and the economic structure of economies affect demand. A rigorous economic analysis will unearth additional features and can isolate more precisely the impact of social isolation policies. However this indicative analysis suggests that in developed economies, reductions in social mobility and electrical demand are strongly associated but that reductions in mobility of less than 45% in workplaces and recreational spaces have had little impact on aggregate electrical demand relative to the baseline. Reductions above this level in New Zealand, the United Kingdom, New York and California are associated with reasonably large (10% plus) reductions in electrical demand relative to baselines.

Footnotes

¹ Community Mobility Reports aim to provide insights into what has changed in response to policies aimed at combating COVID-19. The reports chart movement trends over time by geography, across different categories of places such as retail and recreation, groceries and pharmacies, parks, transit stations, workplaces, and residential. The reports can be found at: <https://www.google.com/covid19/mobility/>

² These were calculated by extracting the trend component of the 30-minute aggregate energy demand from 2017 to 2020 using seasonal and trend decomposition (STL) applying locally estimated scatterplot smoothing (Cleveland et al., 1990). The 2020 energy demand trend is compared to the average of the demand trends from 2017 to 2019. No temperature adjustment is applied.