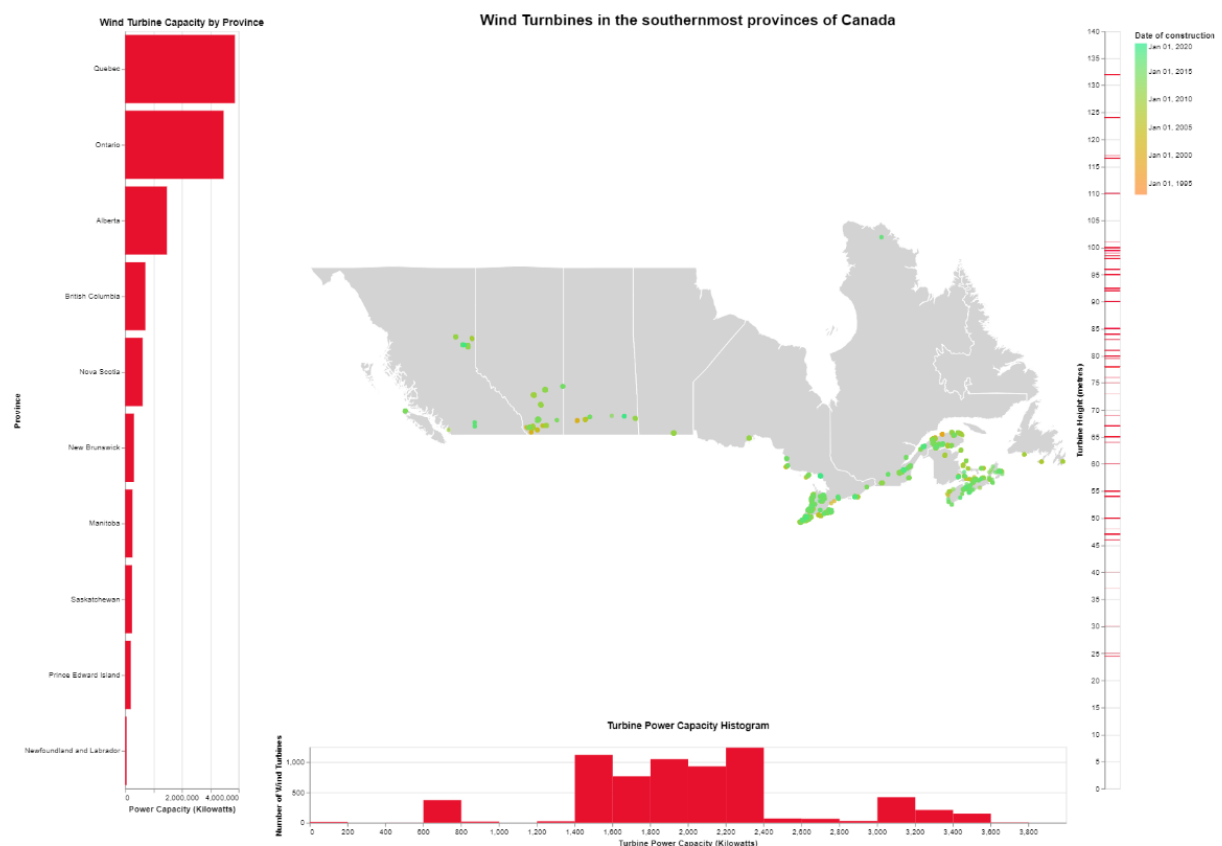


COMP30750 Visual Exploration Tool Design Document

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Title:

Canadian Wind Turbine Explorer



Dataset overview:

These graphs are derived from a [dataset](#) provided by the Government of Canada. The dataset is a conclusive list of all the wind turbines in Canada. The dataset provides information about each turbine. The dataset includes latitude and longitude of each turbine, power capacity of each turbine, height and rotor diameter of each turbine, manufacturer, age and information on the project it was built as part of. I limited the dataset to only the most southern provinces of Canada as fitting the full map of the country was awkward and there was a negligible amount of data from the northern provinces. I also had to remove one datapoint due to an indexing error.

Design considerations

Overall goal: My overall goal of these visualizations was to explore the location, the size, capacity of wind turbines in Canada and the relationship between these features.

Having visited Canada in the Summer I was shocked by the amount of open space and the relatively small number of wind turbines.

Bar Chart: This is a bar chart that shows the capacity of wind power generation by province. The bar chart is sorted by the capacity of wind power generation in each province. As there are only 10 provinces in the chart it is easy to look up individual provinces so there is no advantage from sorting alphabetically. We see that Québec and Ontario have the largest capacity by some distance. From the map we can approximate that these are the two biggest provinces in the country but otherwise we cannot see why these provinces have the largest capacities. From external sources we can attribute this to the fact that they are huge lakes in Ontario which provide wind and that Québec is a coastal province which is hit hard by wind from the Atlantic Ocean.

Histogram: This is a histogram that shows the distribution of turbine power capacities. We can see that this vaguely resembles a normal distribution. We have the vast majority of all turbines in the 1,400 - 2,400 KW range and a few are on each extreme with a high or low capacity. At first, I thought that the grouping of high capacity turbines could be attributed to offshore wind turbines but from using the interactive features of the visualisation we can see that this is not definitively the case.

Map: This is a map of all the wind turbines in the southern provinces of Canada. Each dot represents one wind turbine, and the colour of this dot represents the age of the turbine. As said, I had to limit the data to the 10 southern provinces in Canada as there are very few wind turbines in the northern territories. Including these territories made it harder to see any detail in where most turbines are located. In this map we can see that the vast majority of turbines are on the southern border with the USA and on the east coast. There are few turbines located inland and away from the border. A disadvantage of this map is that it suffers from overplotting. It is difficult to make out detail in the large concentrations of turbines in the South-East. Wind turbines also tend to be built as part of wind farms with up to 200 turbines. This also leads to overplotting as many turbines beside each other appear on top of each other on the map. An interesting alternative to this map would be to show a histogram of the number of wind turbines by bands of latitude.

1-dimensional strip plot: This is a graph that shows the hub height of wind turbines. The height of the wind turbine is represented by its location on the y-axis. The opacity of each rule shows the amount of wind turbines of that size. This chart is primarily designed to be used as an interactive filter to show statistics of wind turbines grouped by height. Apart from this, we can see a distribution of turbine heights similar to the distribution of power capacity. This makes sense as you would expect that the taller the turbine the more powerful it would be. Having the height on the y-axis is very intuitive for the user to see.

Interaction consideration: The main interaction in this graph is cross-filtering. Data in each graph can be selected and this data will be shown on all other graphs. In the bar chart the user can select the bar and filter by province, whereas in the histogram and strip plot the user can select a range of data and filter by each respective feature. These

tools allow the user to investigate the relationship between each different feature of wind turbines. I would have liked to be able to select a subset of turbines from the map, but it seems that is not possible in Vega-Lite.