# **Laboratory 3 Assignment**

(Due Monday March 8 at 11:59pm)

#### <u> Part 1</u>

Your environmental consulting firm has been hired to assess the wind power capacity of the Block Island Wind Farm, with a focus on the variability and reliability of electricity across an entire year.

Your report should consist of a brief summary that synthesizes the most important results, interprets figures, and also provides some context (include any references). For example, roughly how many homes could these five turbines power? Also remember that an important part of your work is to look at *variability* not just the average power or total energy.

Follow your summary with two figures (below) with proper axis labels and captions ("figure legends"). For all calculations, use the data within **Block Island.RData** and **assume that there are 5** GE Haliade 150 turbines in operation.

### **Important metrics to consider:**

- <u>Total energy</u> produced over the year (in kWh or MWh) and/or the <u>average power</u> produced (kW or MW).
- The fraction of time that the power output is zero or maximum (6 MW).

# Figures to include:

- Power produced (in kW or MW) across the year.
- A histogram showing the <u>distribution</u> of power values.

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(use xlab = "__" and ylab = "__" to label axes when appropriate)
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## Part 2

Choose any location in the world for a wind farm, so long as it's not in deep water (> 30 m) or in an area with complex topography (e.g. mountains). I will provide the data for you and upload to your R project as an RData file, e.g. "Tokyo Wind.RData"

Choose a relatively nearby city for which you can find some useful information on electrical power consumption, e.g. total annual energy, average power, average power per household, etc.

- $\rightarrow$  Show the same two figures from Part 1, but for your location. How do they compare to a turbine off of Block Island?
- $\rightarrow$  Provide a useful metric regarding electrical power consumption for a nearby city. How many turbines would you need to meet this demand and briefly describe the implications of *variability* in electricity produced by the turbines?