

PCWG_share_01_main

Andy Clifton

2015-11-30

Introduction

This document contains the results of the Power Curve Working Group's Share_01 exercise, which ran from October to December 2015. The document and results are generated using the programming language R from the *PCWG_share_01_main.rmd* file and can be run by participants themselves.

How to use PCWG_share_01_main.rmd

install R (<http://www.r-project.org>) and Rstudio (<http://www.rstudio.com>), and then create a directory with all of the code and files (see below). When you click the **Knit** button in RStudio a document will be generated that includes text and results from the code embedded in *PCWG_share_01_main.rmd*.

User Inputs

The *project.root* variable defines the location of the files required for this analysis. The *made.by* variable forms part of a label that will be added to the plots. *data.public* is a flag that indicates whether the results of the analysis are intended to be public, or not.

The following user inputs were used in the preparation of this document:

```
# Where can files be found?
project.root <- file.path('/Users/aclyfton/Documents/confidential/projects/PCWG Share 01')

# Who ran this script
made.by = "A. Clifton, NREL"

# Will data be public or not?
data.public = TRUE

# Reanalyze existing data?
data.reanalyze = FALSE
```

Directory structure

The following files should be placed in the *project.root* directory:

- PCWG_share_01_main.Rmd
- /**analysis** directory containing results of the analysis
- /**code** directory containing functions required for the analysis
- /**data** directory containing all data files to be analyzed. This can include further sub directories. All .xls files contained in **data** and sub directories will be used in the analysis.

Packages

This script requires the *ggplot2*, *grid*, *knitr*, *RColorBrewer*, *rgdal*, and *XLConnect* packages to run. These are called from the script but you may need to install them directly. For details of how to install packages, see the RStudio help.

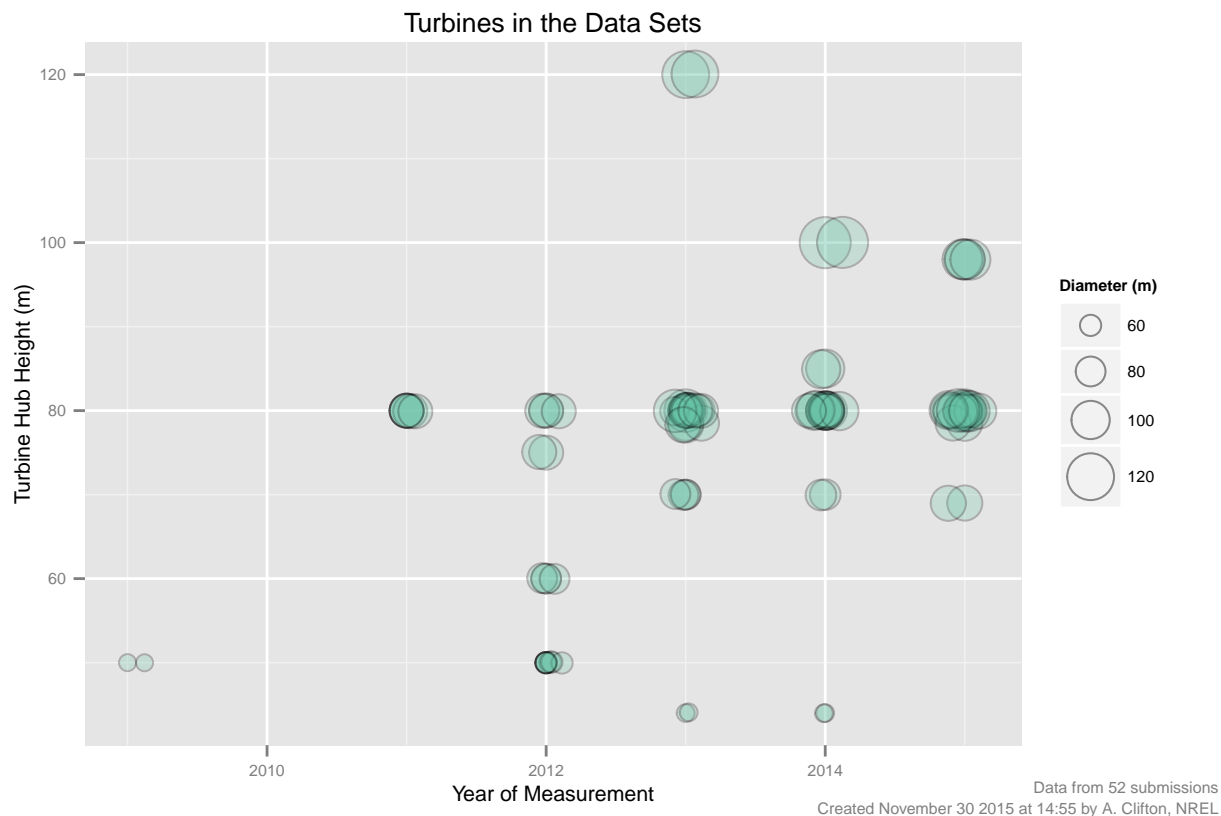
Results from each data set

We now analyse the data from each data set. The plots are saved to their own directories in the *analysis* directory. If *data.public* is FALSE, plots will be created for every data file. If *data.public* is TRUE, only the final, aggregated data plots will be created.

This document was produced from data saved at /Users/aclifton/Documents/confidential/projects/PCWG Share 01/analysis/all/AggregatedData.RData

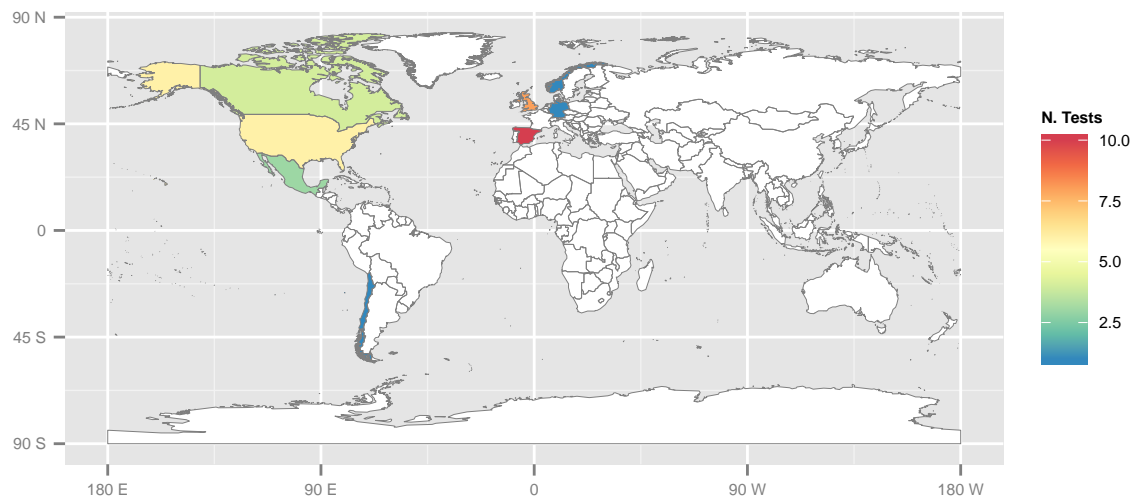
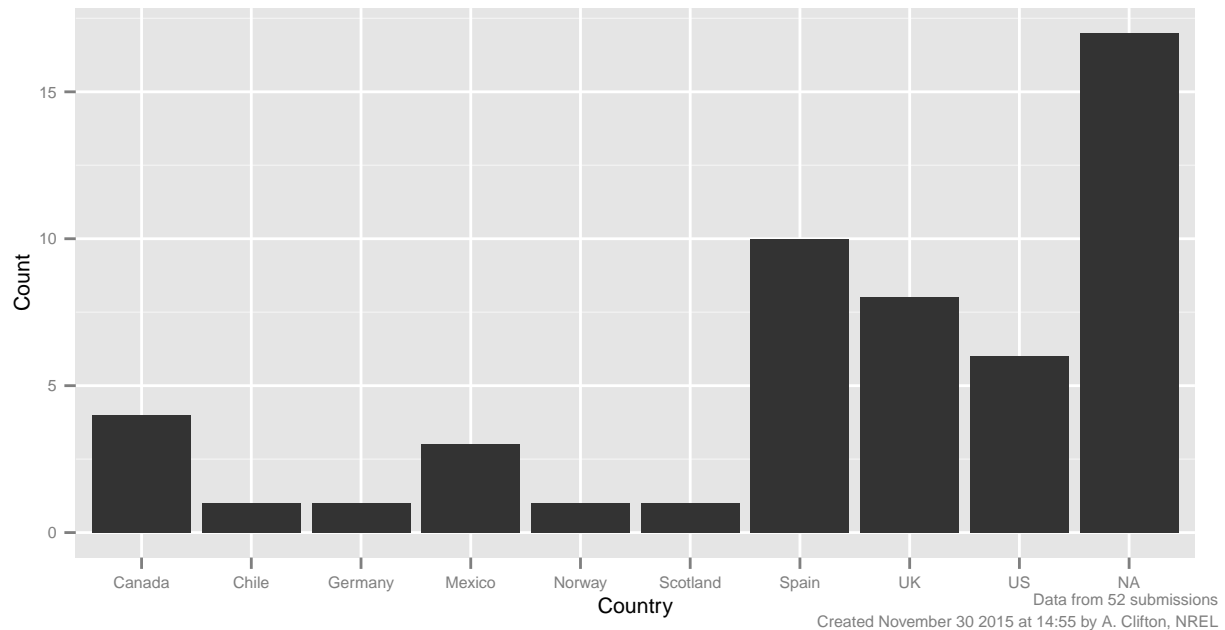
Turbine Sizes

In total, 52 data sets were submitted. The 52 data sets include tests carried out in the period from 2009 to 2015. Turbine diameters range from 50 to 130 m, while hub heights range from 44 to 120 m.



Turbine Locations

The country in which the turbine was located was reported in 35 of the data sets. Data were obtained from turbines in 9 countries including US, Canada, UK, Germany, Mexico, Spain, Chile, Scotland, and Norway.

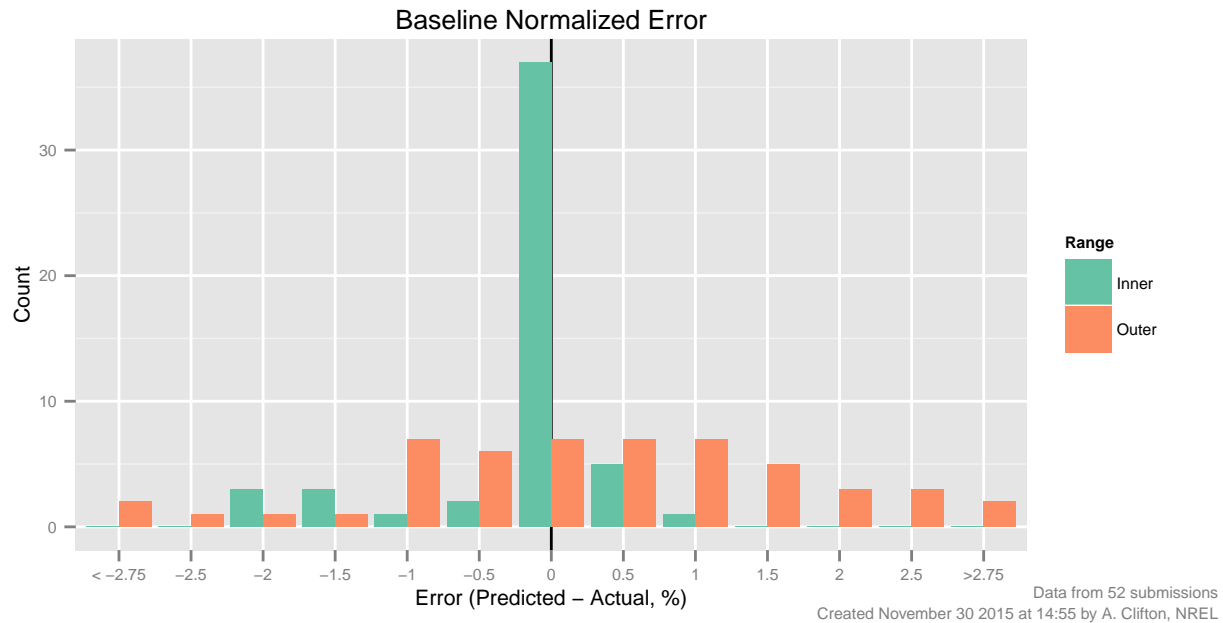


Data from 52 submissions
Created November 30 2015 at 14:55 by A. Clifton, NREL

Aggregated results

In this section, data from all of the individual submissions have been combined.

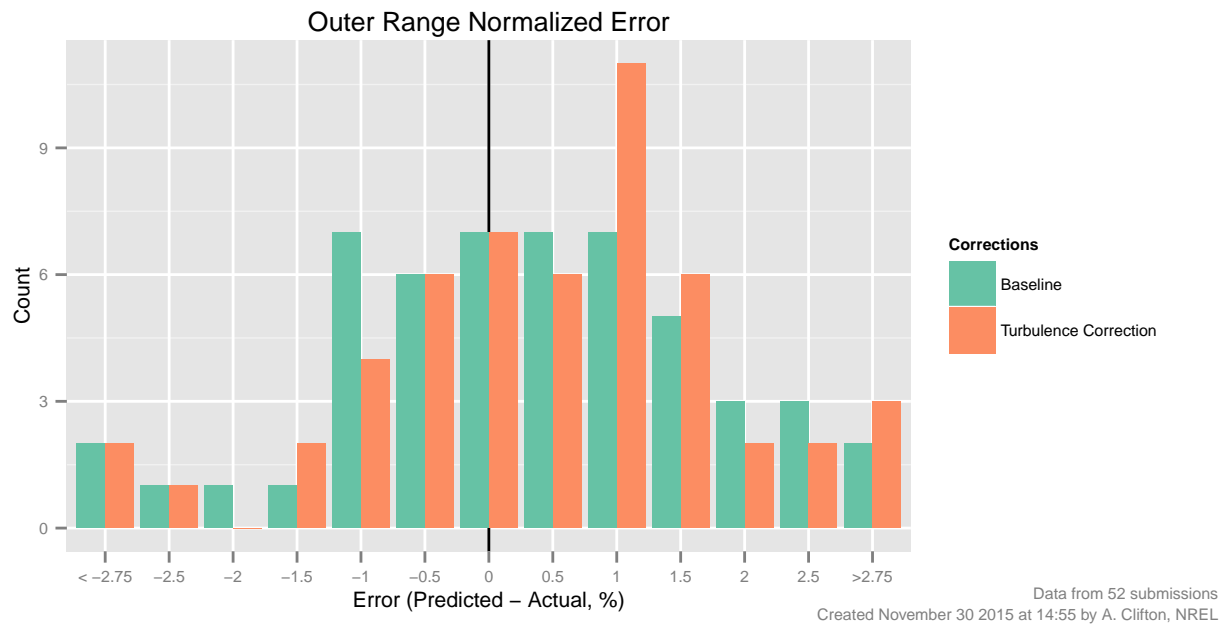
Baseline Inner and Outer Range Error Histograms



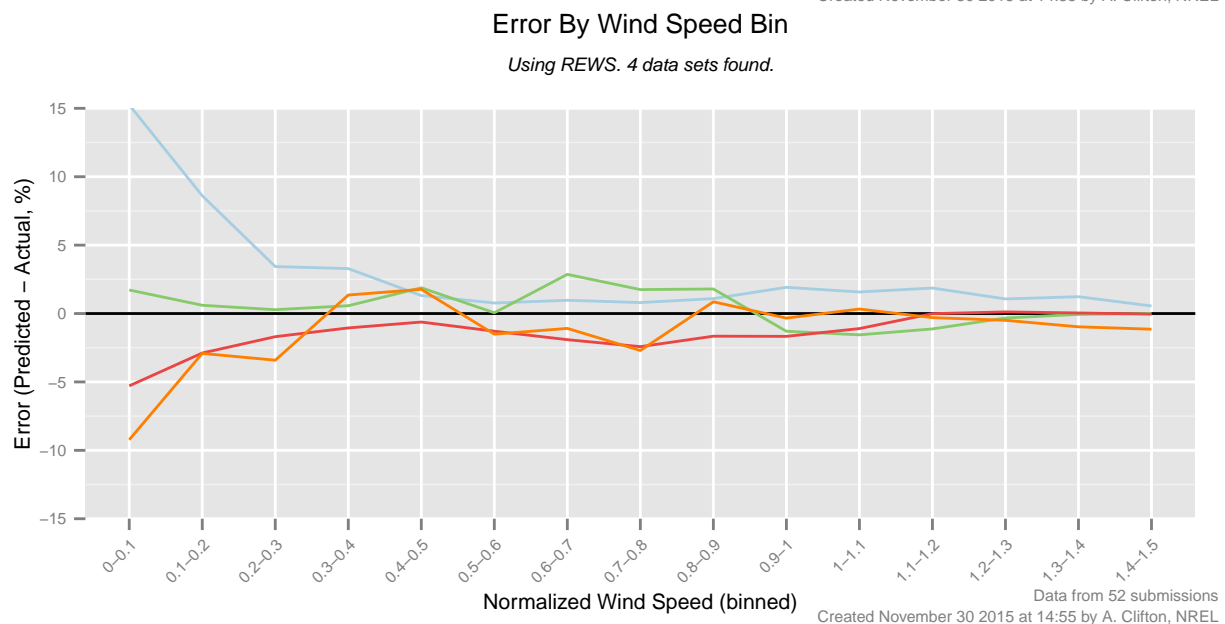
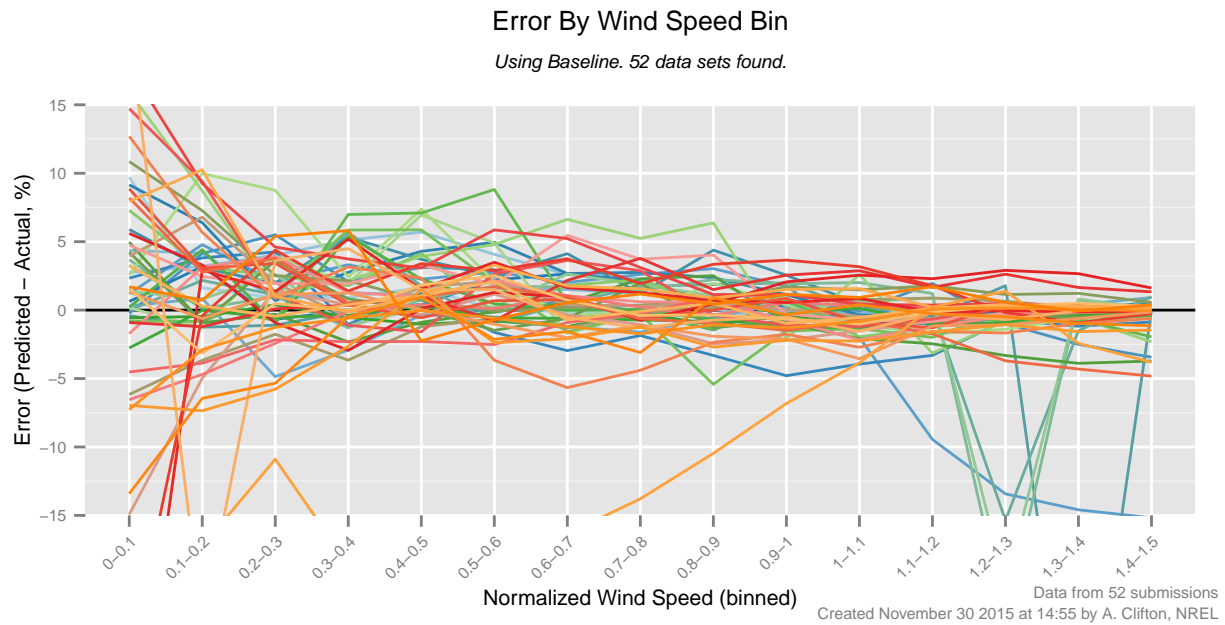
Comparison of inner and outer range errors

plot baseline inner range versus other inner range NME, color by method

The Effect of The Turbulence Correction on the Outer Range Error

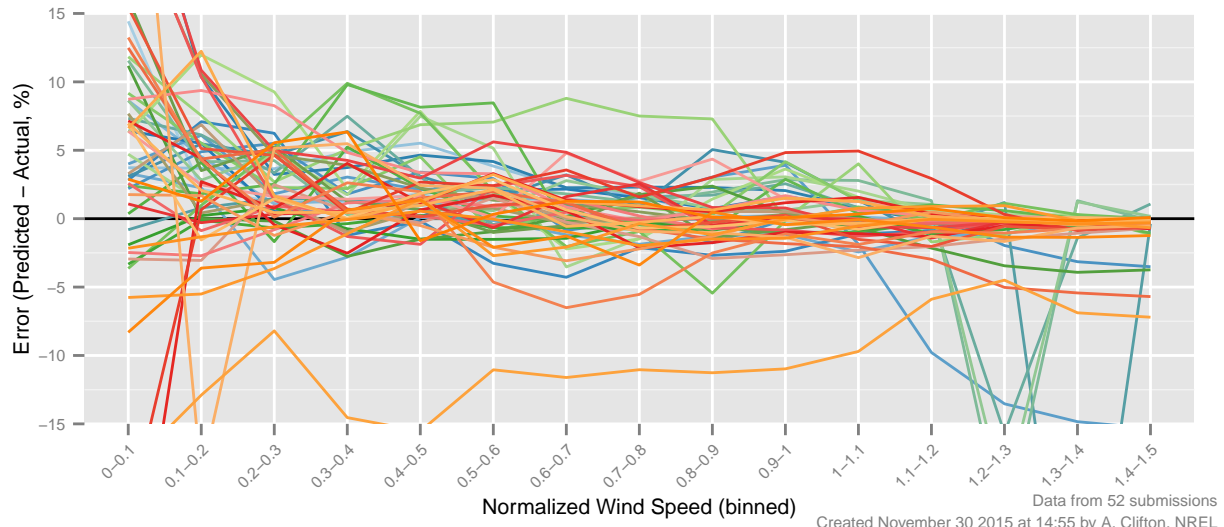


Errors versus wind speed for all submissions



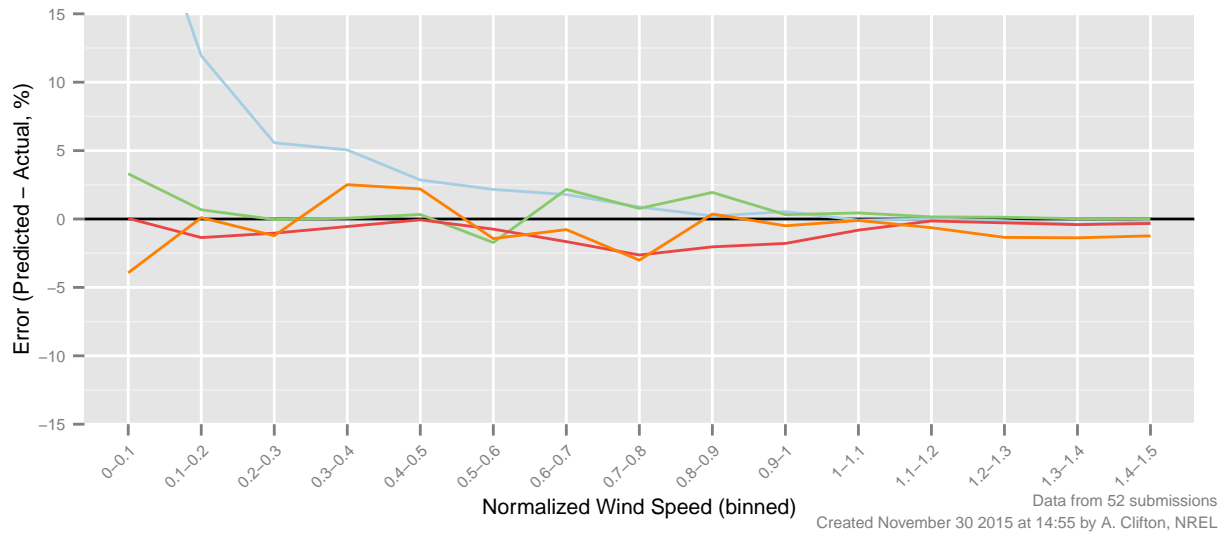
Error By Wind Speed Bin

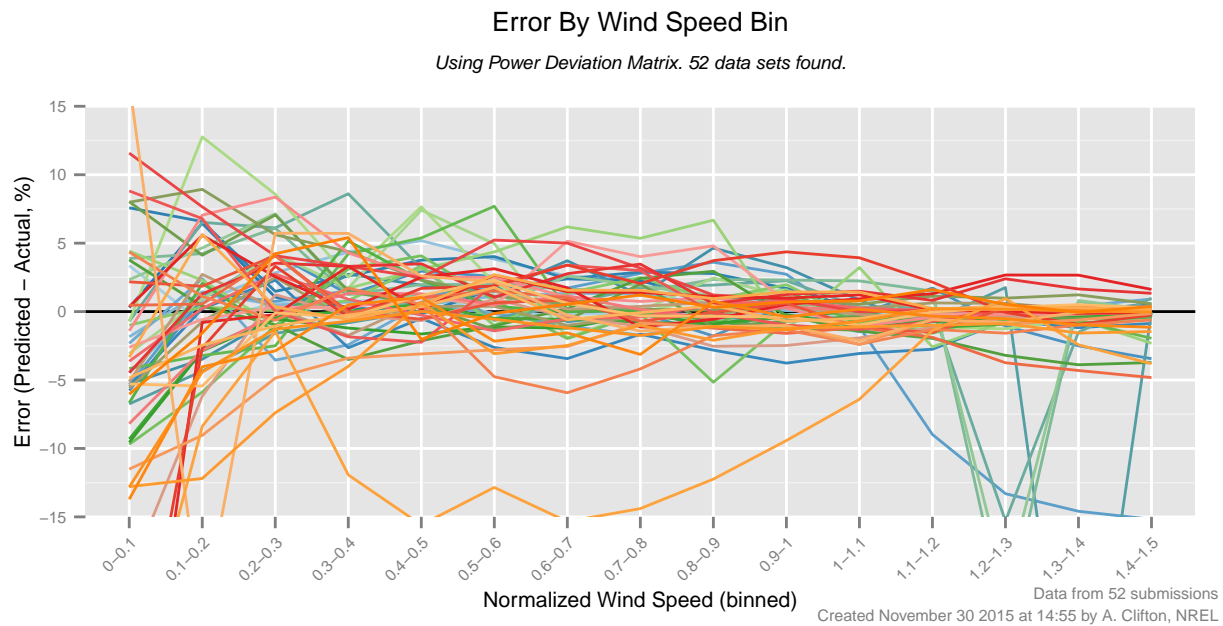
Using Turbulence Correction. 52 data sets found.



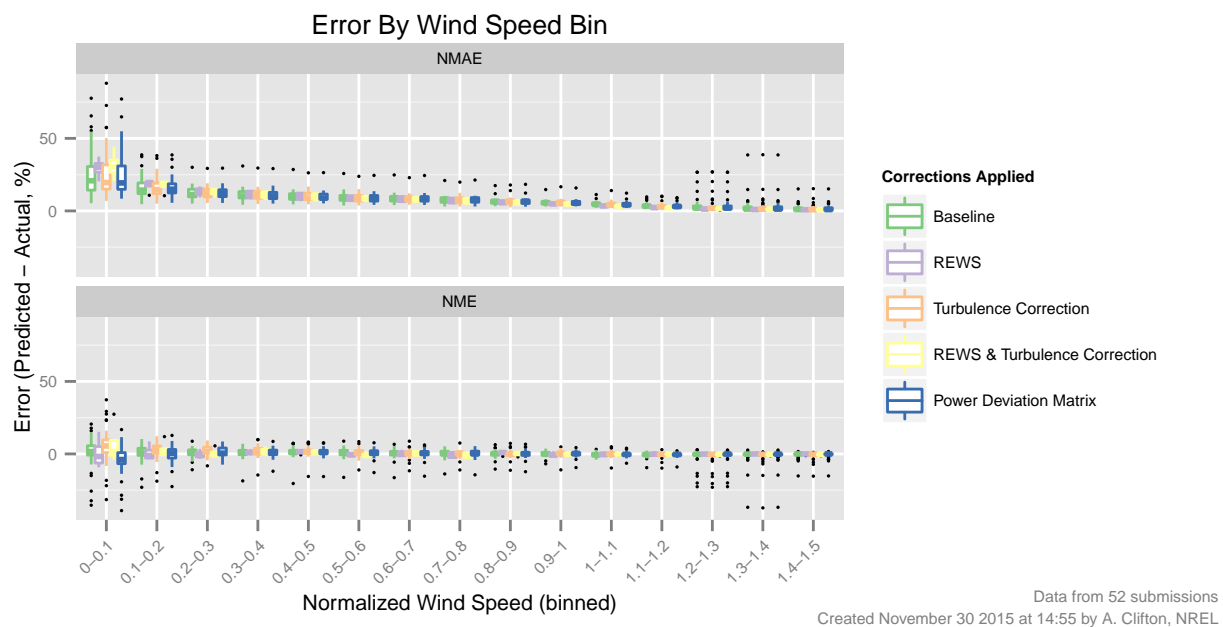
Error By Wind Speed Bin

Using REWS & Turbulence Correction. 4 data sets found.

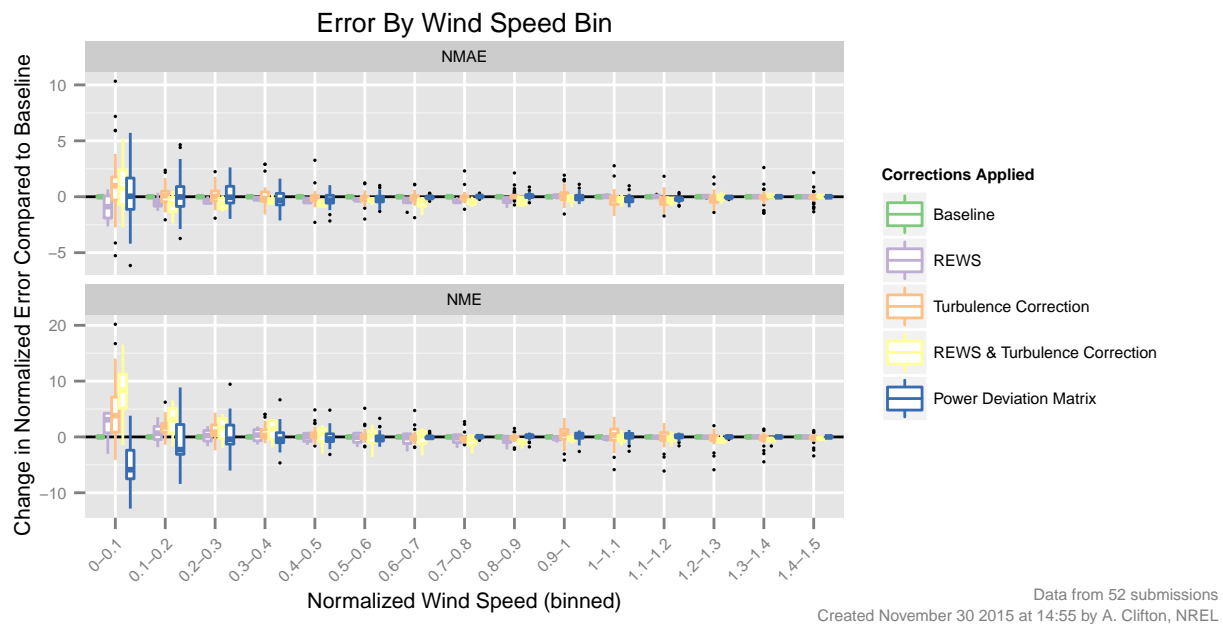




Errors Binned by Wind Speed



Change in errors binned by Wind Speed



Errors Binned by Wind Speed and Ti

The following plot shows how effective each set of corrections is, for each of four combinations of wind speed and turbulence intensity. Data are plotted with respect to the baseline case for that combination, such that a positive change indicates an increase in error, and a negative change indicates a decrease in error.

