# Power Curve Working Group Open Source Tool Overview

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### **1** Licence

The PCWG tool is released under the MIT Software License.

The MIT License (MIT)

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### **2** Installation

There are two ways to run the PCWG code:

- 1. Running the standalone .exe
- 2. Running from the source code

#### 2.1 Installing PCWG Executable

To run the PCWG .exe the following steps should be completed:

- Download the latest release from: <a href="https://sourceforge.net/projects/pcwg/files">https://sourceforge.net/projects/pcwg/files</a>
- Save the zip file to a local folder

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Organize 🔻 Include in library 👻	Share with 🔻 Burn New folder				
🔆 Favorites	Name	Date modified	Туре	Size	
🥞 Libraries	Z pcwg-tool-0.5.0.zip	02/10/2014 13:21	zip Archive	31,478 KB	
🖳 Computer					
🙀 Network					
🔊 Livelink					

• Extract the contents of the archive pcwg-tool.zip to a local folder e.g. D:\PCWG\PCWG-Tool. Note: you may wish to download 7zip from <u>http://www.7-zip.org/download.html</u>



• Double-click on the local executable D:\PCWG\PCWG-Tool \pcwg-tool.exe

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👉 Favorites	Name	Date modified	Туре	Size
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	numpy.linalg.lapack_lite.pyd	20/05/2012 12:41	PYD File	751 KF
	numpy.random.mtrand.pyd	20/05/2012 12:42	PYD File	478 KF
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	pandassparse.pyd	22/04/2013 22:23	PYD File	173 KE
	pandas.algos.pyd	22/04/2013 22:23	PYD File	1,214 KE
	pandas.hashtable.pyd	22/04/2013 22:23	PYD File	143 KE
	pandas.index.pyd	22/04/2013 22:22	PYD File	118 KB
	pandas.lib.pyd	22/04/2013 22:23	PYD File	423 KB
	pandas.tslib.pyd	22/04/2013 22:23	PYD File	446 KB
	Pcwg-tool.exe	02/10/2014 13:20	Application	6,755 KB
	pcwg-tool.exe.manifest	02/10/2014 13:20	MANIFEST File	1 KE

### 2.2 Installing PCWG Source Code

To run the PCWG source code the follow steps should be completed:

- Install python:
  - There are several Python distributions available. One particularly convenient distribution is called Anaconda which contains all necessary libraries to run the PCWG code.
  - To download Anaconda Python go to: <u>http://continuum.io/downloads</u>

#### • Install GitHub Source Control:

- Go to https://windows.github.com
- Download the GitHub client for your operating system

#### • Clone the PCWG Repository

- Go to https://github.com/peterdougstuart/PCWG
- Click on "Clone in Desktop" (see Figure 1)
- $\circ$   $\;$  Select the local directory where you wish to store the PCWG code

This repository Search	This repository Search Explore Gist Blog Help 🔛 pr			
peterdougstuart /	PCWG		⊕ Unwatch ▼ 1	★ Star 0 ¥ Fork
Power Curve Working Gro	pup — Edit			↔ Code
② 27 commits	🖓 1 branch	📎 0 releases	1 contributor	
25 Roberts	PCWC / I			U issues
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Results	Additional user interface added		a day ago	III Graphs
.gitattributes	added basic read me		6 months ago	
.gitignore	add pyc files to ignore list		5 months ago	X Settings
Analysis.py	Improved handling of relative pa	aths	a day ago	
Gettings Started.docx	New user interface + bug fixes		7 days ago	https://github.com/j
LICENSE	added MIT License		5 months ago	You can clone with HTTPS, SS
README	added basic read me		6 months ago	or Subversion. (9)
UserInterface.py	Improved handling of relative pa	aths	a day ago	Clone in Desktop
binning.py	initial commit		5 months ago	Download ZIP
Colour.py	initial commit		5 months ago	
configuration.py	Improved handling of relative pa	aths	a day ago	
dataset pv	Improved handling of relative of	aths	a dav ano	

Figure 1. PCWG page on Git Hub

- Start Integrated Debugging Environment (IDE):
  - Anaconda comes with a IDE called Spyder which can normally be found in C:\Anaconda\Scripts\spyder.exe.
  - Start Spyder
  - When prompted create a new workspace
  - Goto File > Open, browse to your local PCWG Git folder and open "pcwg-tool.py"
  - Press F5 to run the tool.

# **3 Getting Started**

Once the tool is running you should see a screen similar to Figure 2.

76 PCWG	-					
	Calculate	Export Report	Export Time Series	Benchmark	Clear Console	
Analysis File					Load	Edit New
						<u> </u>
						•

Figure 2. PCWG Tool Home Screen

• To run an example analysis click on the Load button and browse to "Data/Dataset 1 Analysis.xml". You should see that the file has successfully loaded via the message in the output console (see Figure 3). Note: this example file has been configured to reproduce the results of the PCWG Round Robin Exercises on Dataset 1.



Figure 3. Confirmation of file load in output console

• Once the file has loaded you can inspect the settings by clicking "Edit" (see Figure 3)

% PCWG				-		×
General Settings:						
File Path:	D:/Git-PCWG/PCWG/Data/Dataset 1 Analysis.xml					
Time Step In Seconds:	600					
Power Curve Minimum Count:	10					
Filter Mode:	All					
Base Line Mode:	Hub —					
Power Curve Mode:	Specified 🛁					
Datasets:						
Dataset 1 config.xml			+ New			
Inner Range Settings:						
Inner Range Lower Turbulence:	0.1					
Inner Range Upper Turbulence:	0.14					
Inner Range Lower Shear:	0.15					
Inner Range Upper Shear:	0.25					
Turbine Settings:						
Cut In Wind Speed:	3.0					
Cut Out Wind Speed:	25.0					
Rated Power:	2000.0					
Hub Height:	96.0					
Diameter:	90.0					
Specified Power Curve:	PowerCurve.xml		Edit			
Correction Settings:						
Density Correction Active						
Turbulence Correction Active	<b>v</b>					
Density Correction Active	<b>v</b>					
	OK Can	cel				

Figure 3. Analysis Settings Dialog

- From the Analysis Settings Dialog click "Cancel" to return to the Home Screen
- To run the calculation click "Calculate". Note: the calculation currently takes several minutes to complete. As the calculation progresses message will be written to the output console.

7∕≰ PCWG	1.1	-		-		_ 0	23
	Calculate	Export Report	Export Time Series	Benchmark	Clear Conso	ole	
Analysis File	D:/Git-PCV	NG/PCWG/Data/D	Dataset 1 Analysis.xml		Load	Edit	New
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							-

Figure 4. Progress messages displayed in output console

- Once the calculation has completed you can either review the results printed in the output console or export files as follows:
  - Click "Export Report" to export an excel spreadsheet summary.
  - Click "Time Series" to export a ".dat" text file of the calculation results per time step.

# 4 Benchmark versus Excel Consensus Analysis

For convenience the main menu contains a button "Benchmark" which will rerun all PCWG Round Robin Exercises using the tool and compare the results to the Excel consensus analysis.

7% PCWG	and the des	aless participal	and up cares,	to estimate to 1	te marrier i		×
	Calculate	Export Report	Export Time Series	Benchmark	Clear Cons	sole	
Analysis File					Loa	d Edit	New
Executing Ben	chmark 1 of 3	3					
Calculating Da	ta\Dataset 1	Analysis.xml (plea	ase wait)				
Benchmark To	lerance: 0.01	%					
Hub Delta: 0.0	0% (expected	l) vs 0.00% (actua	l) => passed				
REWS Delta: 0.	51% (expecte	ed) vs 0.51% (actu	al) => passed				
Turbulence De	elta: 0.01% (e)	xpected) vs 0.01%	(actual) => passed				
Combined Del	ta: 0.53% (ex	pected) vs 0.52%	(actual) => passed				
Benchmark Pa	ssed						
Time Taken: 74	45.163000s						
Executing Ben	chmark 2 of 3	3					
Calculating Da	ta\Dataset 2	Analysis.xml (plea	ase wait)				
Benchmark To	lerance: 0.01	%					
Hub Delta: 0.0	0% (expected	l) vs 0.00% (actua	l) => passed				
REWS Delta: -0	.24% (expect	ted) vs -0.24% (act	tual) => passed				
Turbulence De	elta: 0.58% (e)	xpected) vs 0.58%	(actual) => passed				
Combined Del	ta: 0.35% (ex	pected) vs 0.34%	(actual) => passed				
Benchmark Pa	ssed						
Time Taken: 64	46.708000s						
Executing Ben	chmark 3 of 3	3					
Calculating Da	ta\Dataset 3	Analysis.xml (plea	ase wait)				
Benchmark To	lerance: 0.01	%					
Hub Delta: 0.0	0% (expected	l) vs 0.00% (actua	l) => passed				
REWS Delta: -0	.34% (expect	ed) vs -0.34% (ac	tual) => passed				
Turbulence De	elta: -1.24% (e	expected) vs -1.24	% (actual) => passed				
Combined Del	ta: -1.58% (e	xpected) vs -1.589	% (actual) => passed				
Benchmark Pa	ssed						
Time Taken: 3	12.149000s						
All benchmark	cs passed						

