January to March 2006: Comparison of Met Tower Data and Simulation Data

NAU 3TIER Data, NAU MET TOWER Data, and NREL 3TIER Data

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Carson Pete

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Dates of Comparison

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- New dates of spike/ramps occurring in 2006 for comparison with met data and NAU's 3Tier simulation were broken into five different sets, shown below. Set A will be considered in this file.
  - Set A – 1/1, 1/16, 2/3, 2/6, 3/2, 3/26
  - Set B – 5/4, 5/10, 5/16, 5/19, 5/25
  - Set C – 6/9, 6/12, 6/26, 6/28, 7/15, 7/18, 7/24
  - Set D – 8/4, 9/7, 9/16, 9/22
  - Set E – 11/9, 11/15, 11/30, 12/27
- Note: 1/1, 2/6, 3/26, & 11/15 dates have previously been studied in depth.

Information Presented

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- For everyone (14 slides):
  - Summary of most relevant plots showing wind power and wind speed spikes or large ramps
  - Summary conclusion about spikes/ramps
- For those wanting to see the full set of plots generated (106 slides):
  - Description of data sets compared
  - 2-day and 5-day power simulation plots
  - Wind speed plots

Summary Plots

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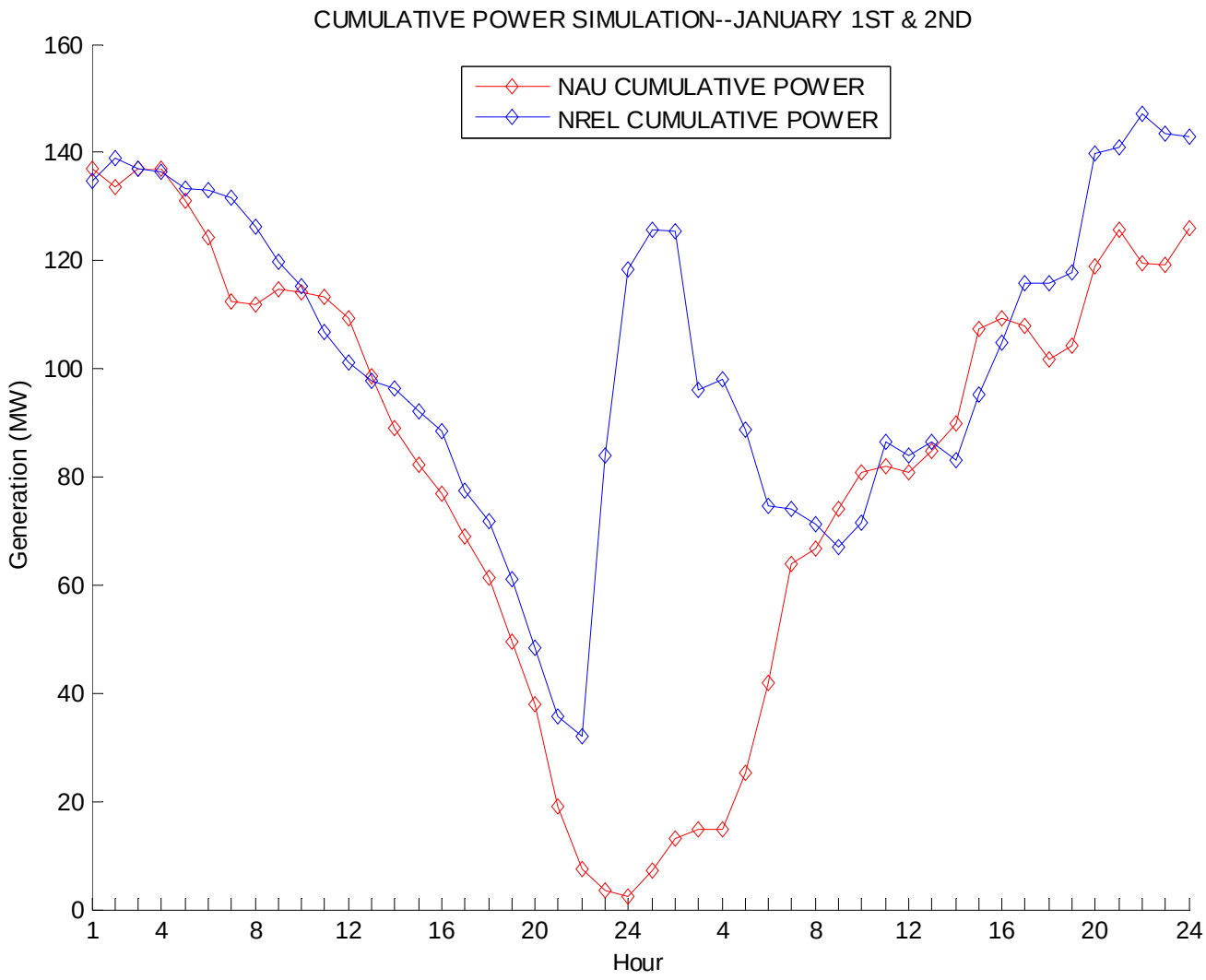
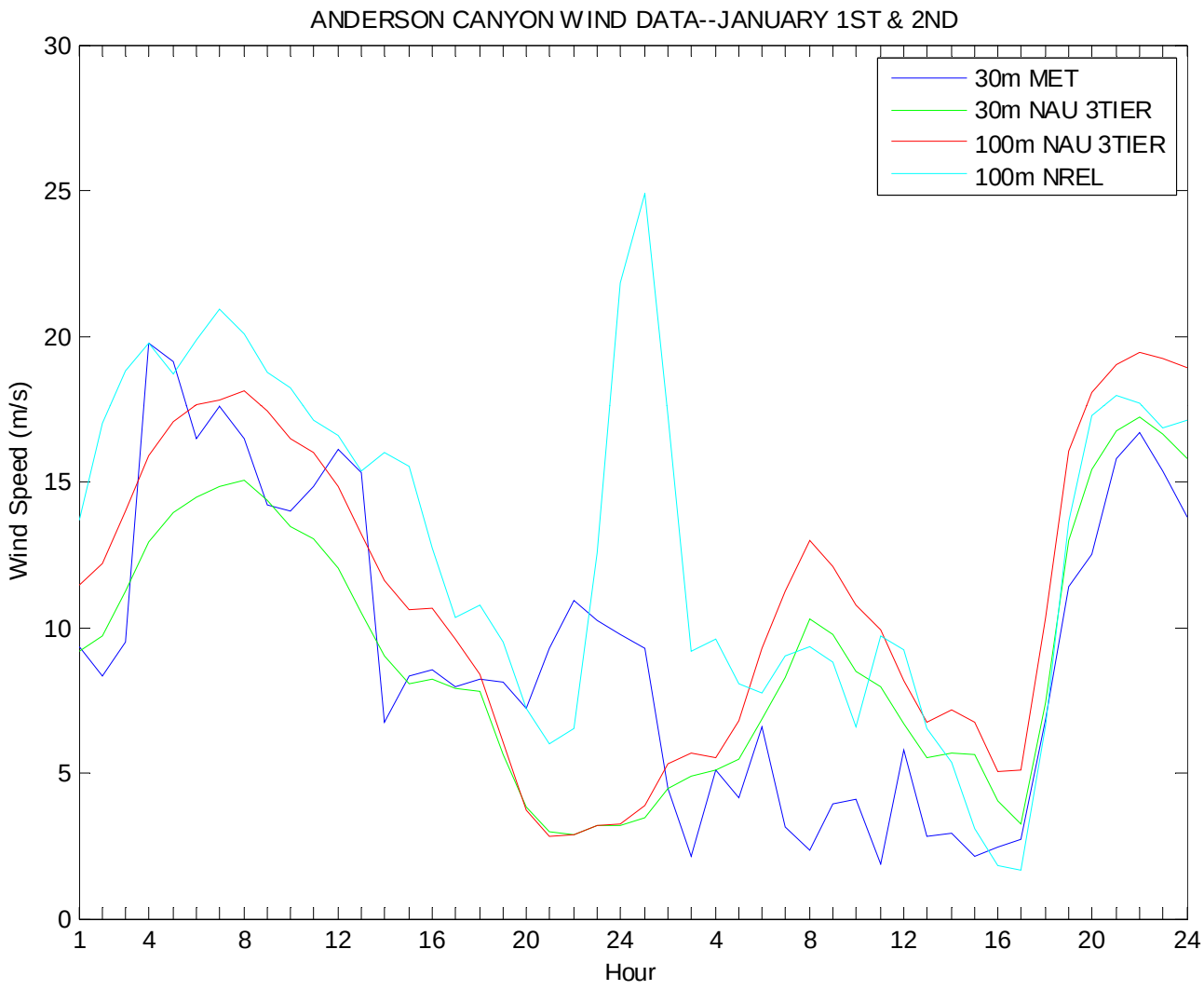
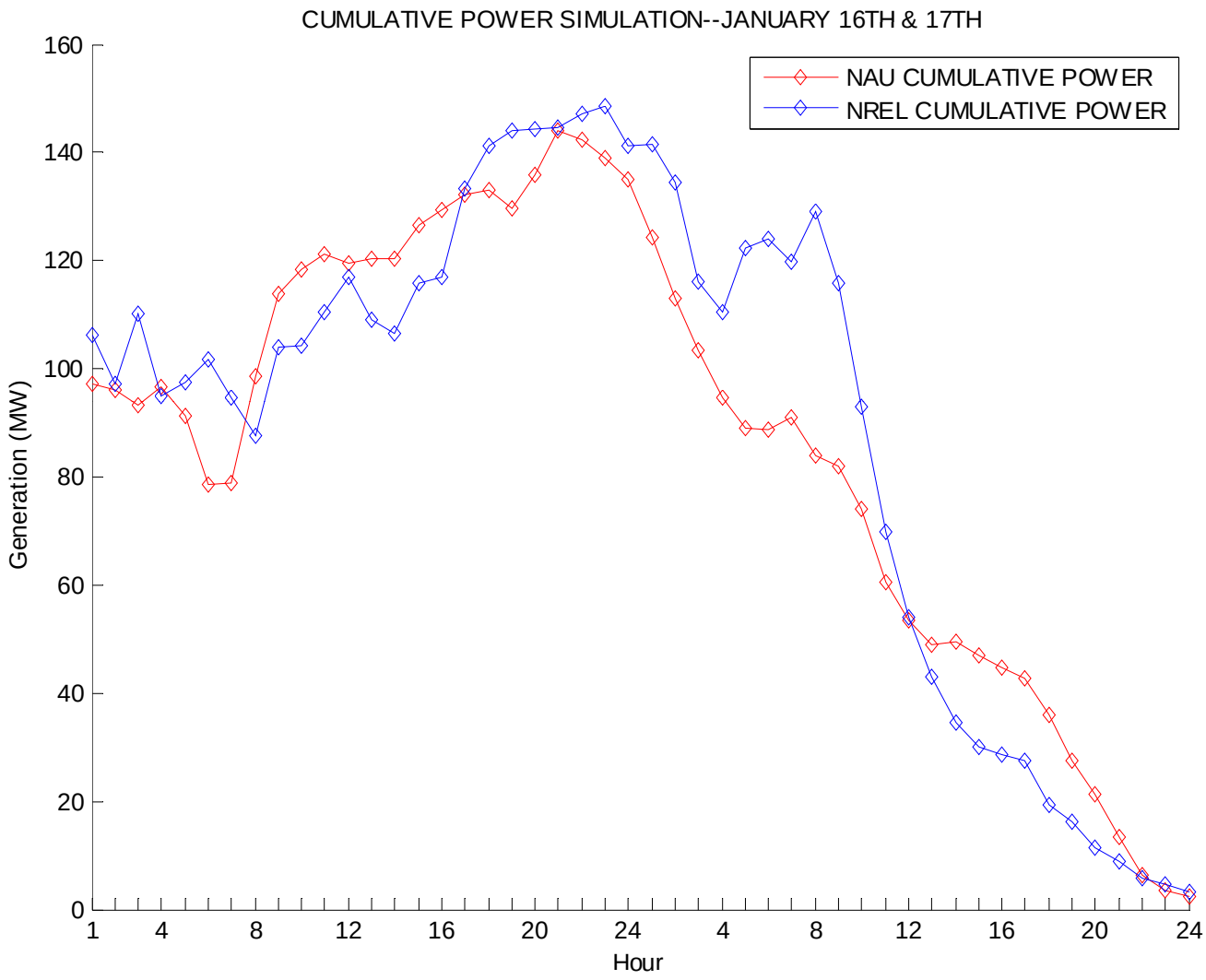
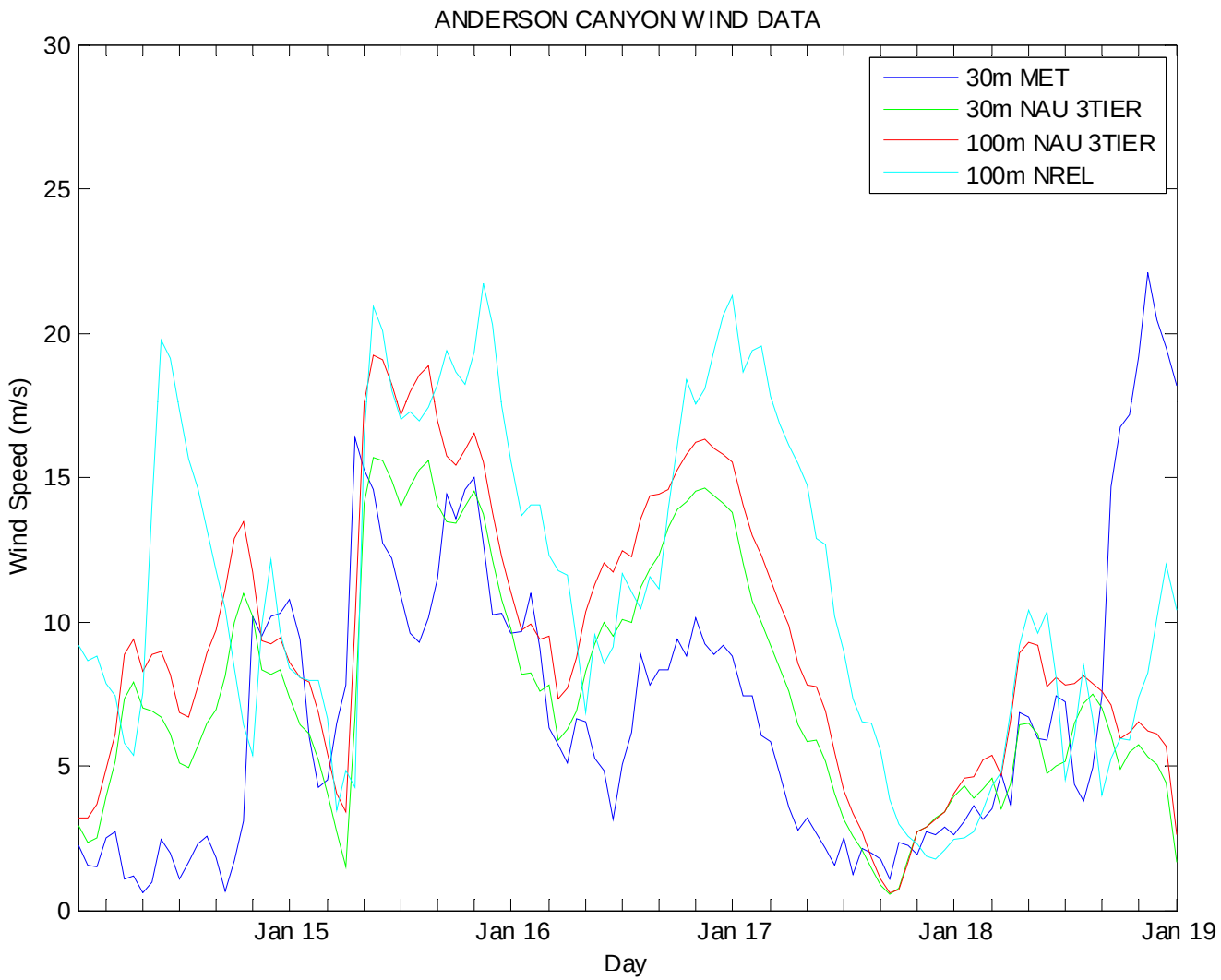
2-day Power Plot – January 1



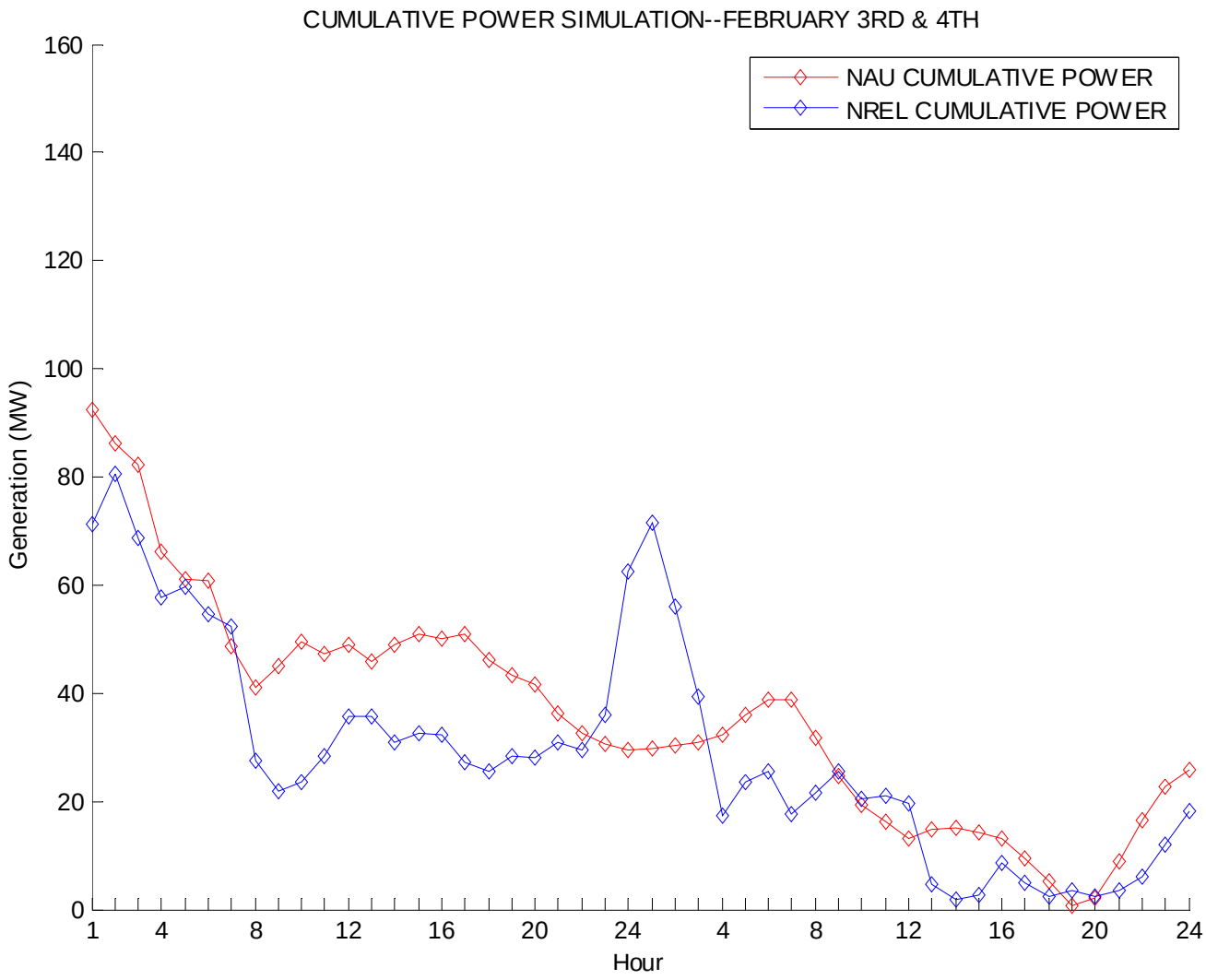

ANDERSON CANYON WIND DATA--JANUARY 1ST & 2ND
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

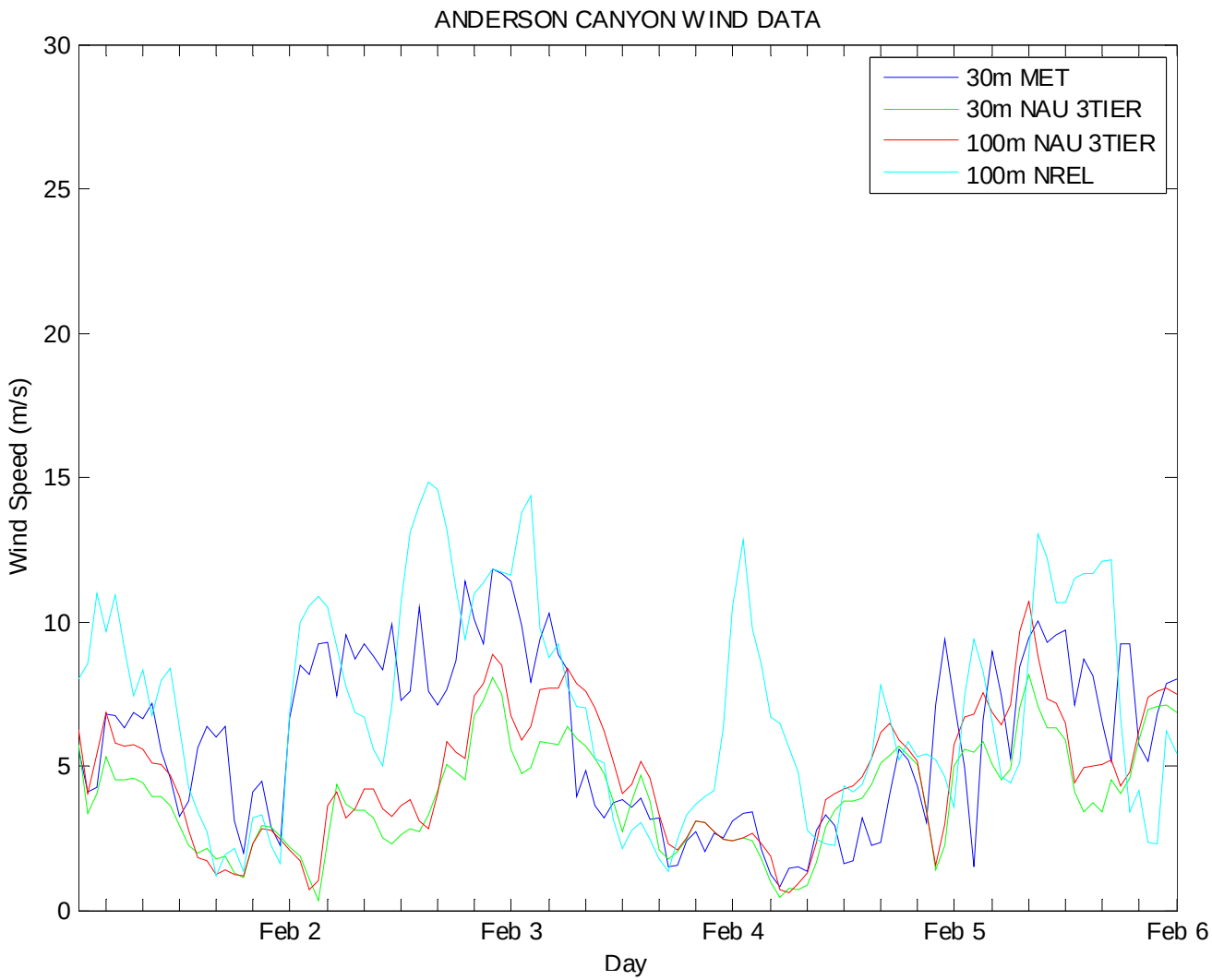
2-day Power Plot – January 16



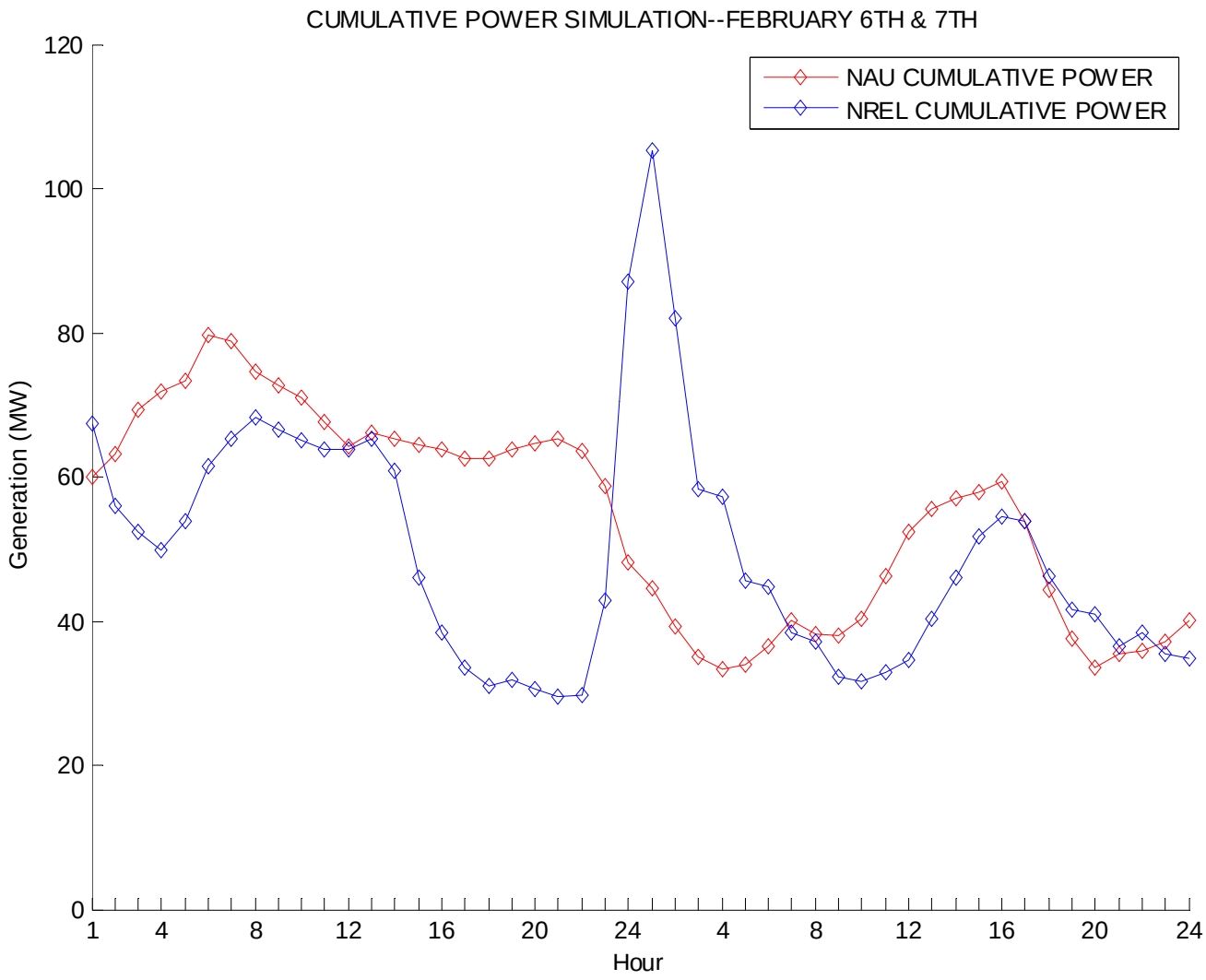

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day

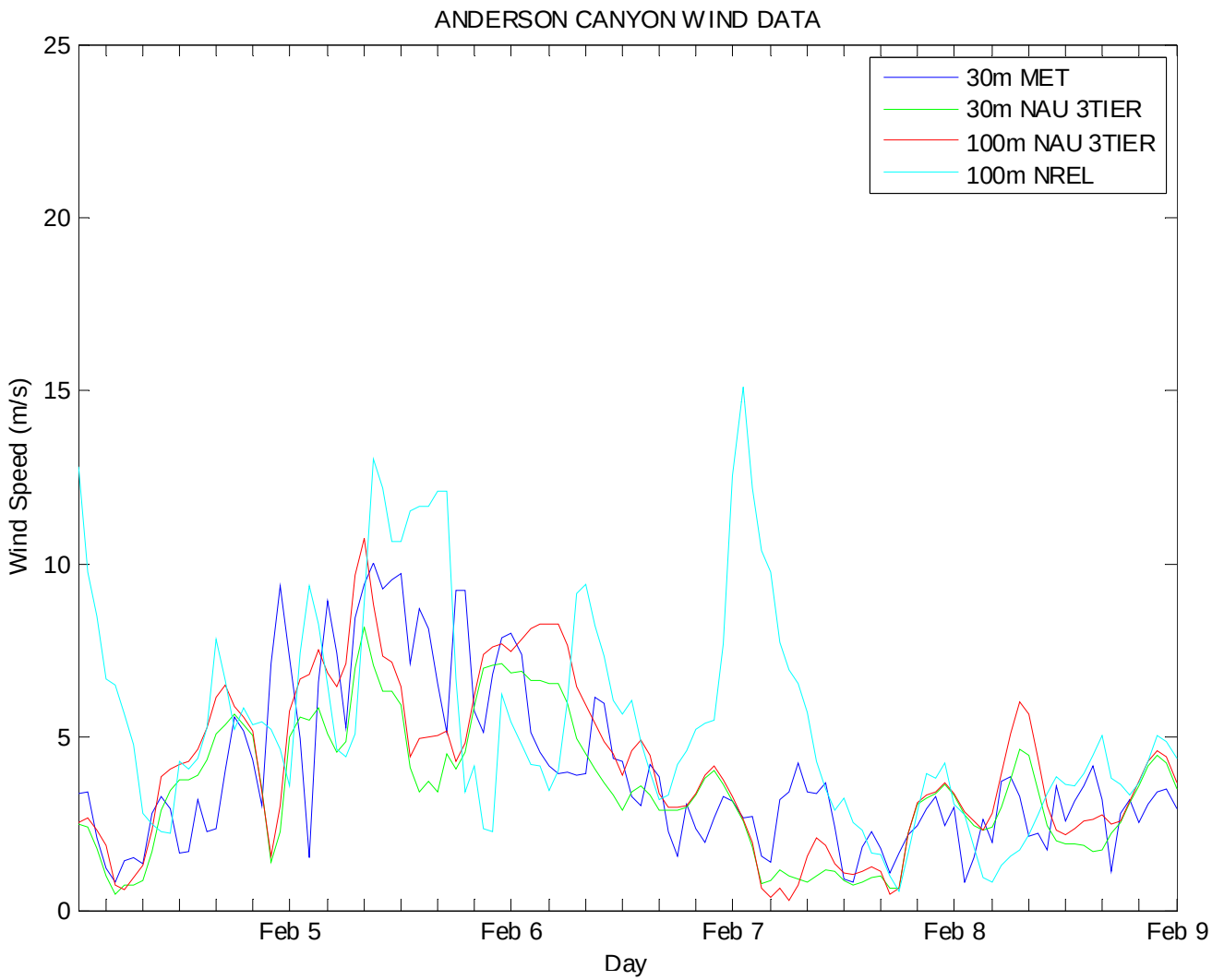
2-day Power Plot – February 3



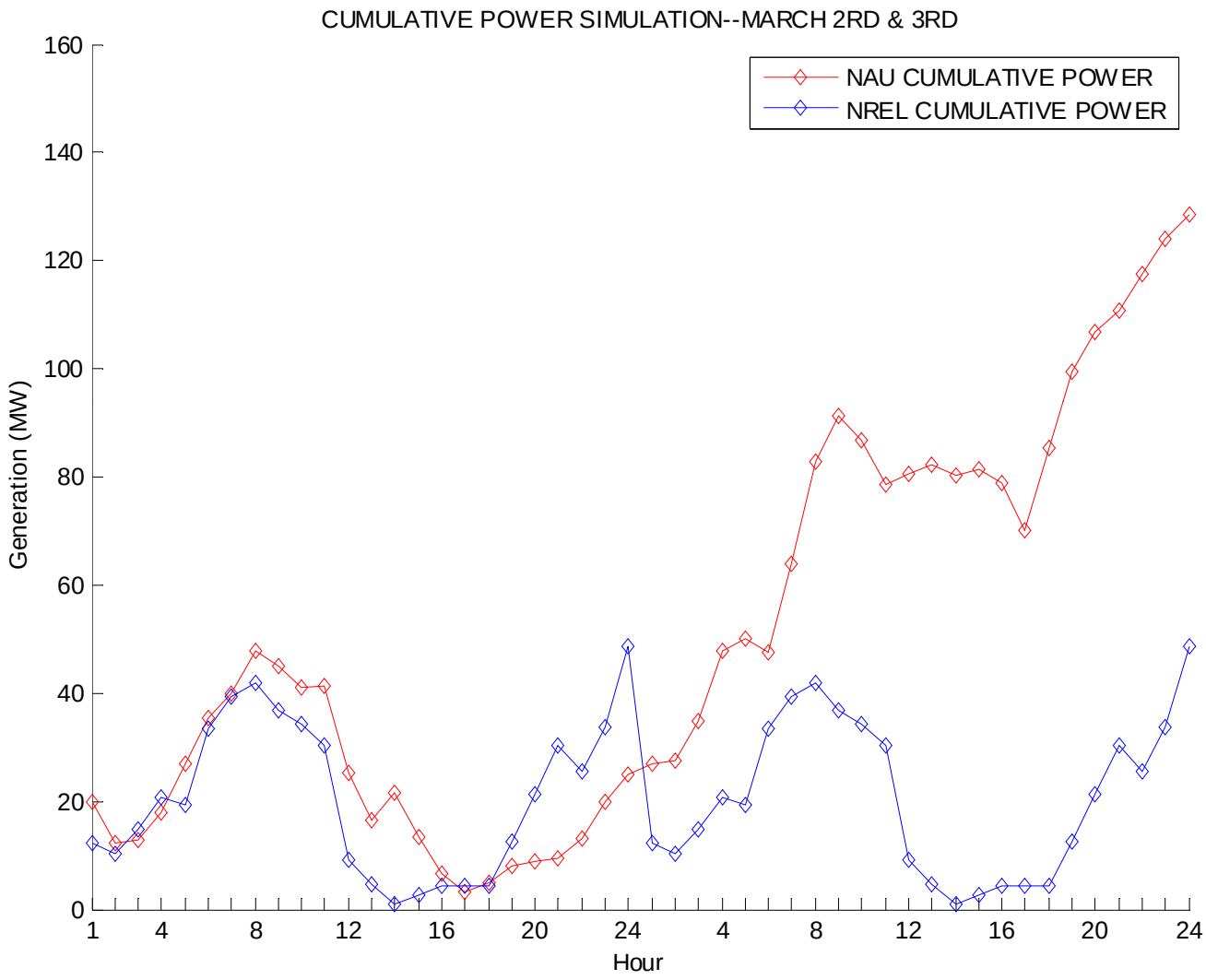

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day

2-day Power Plot – February 6

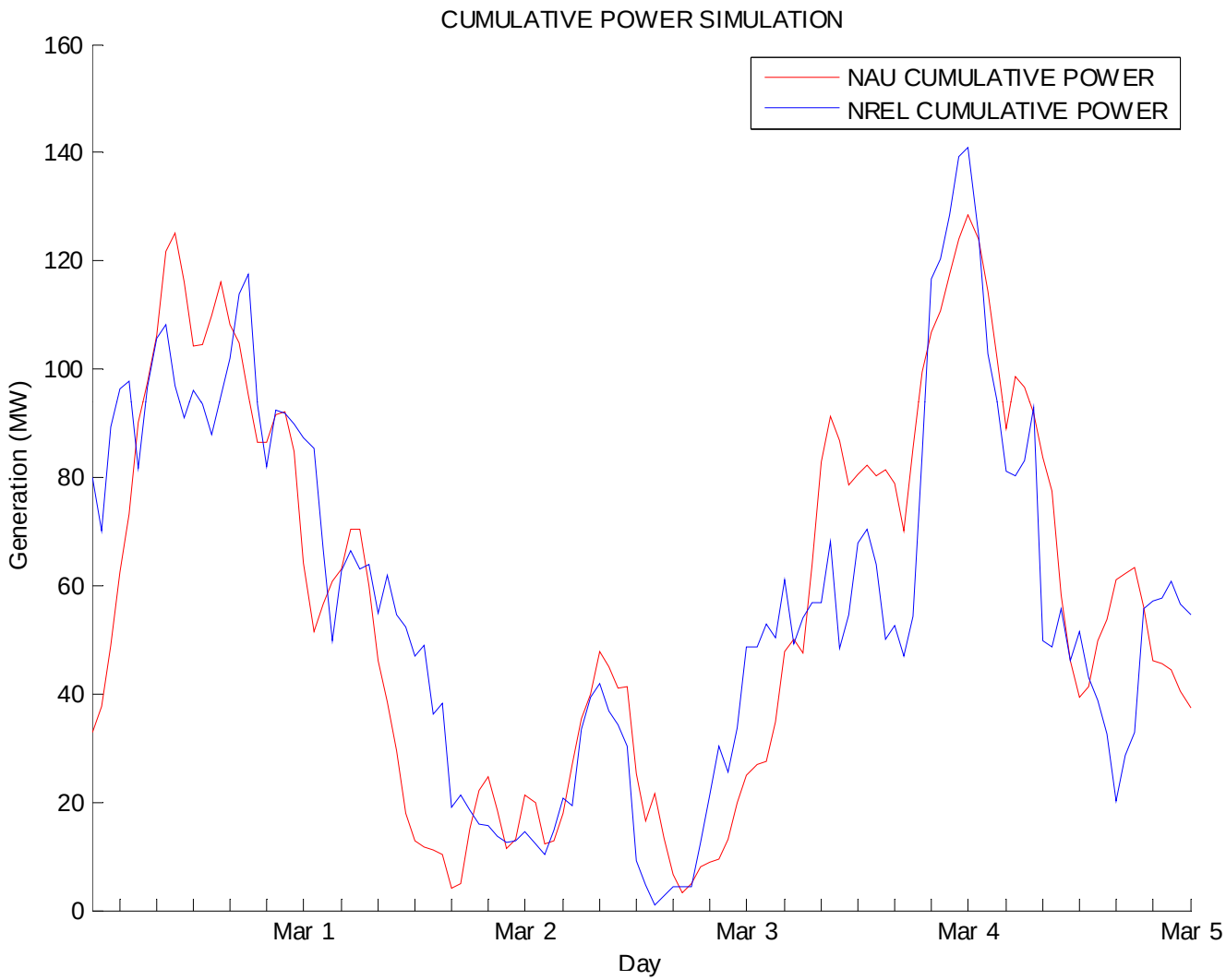


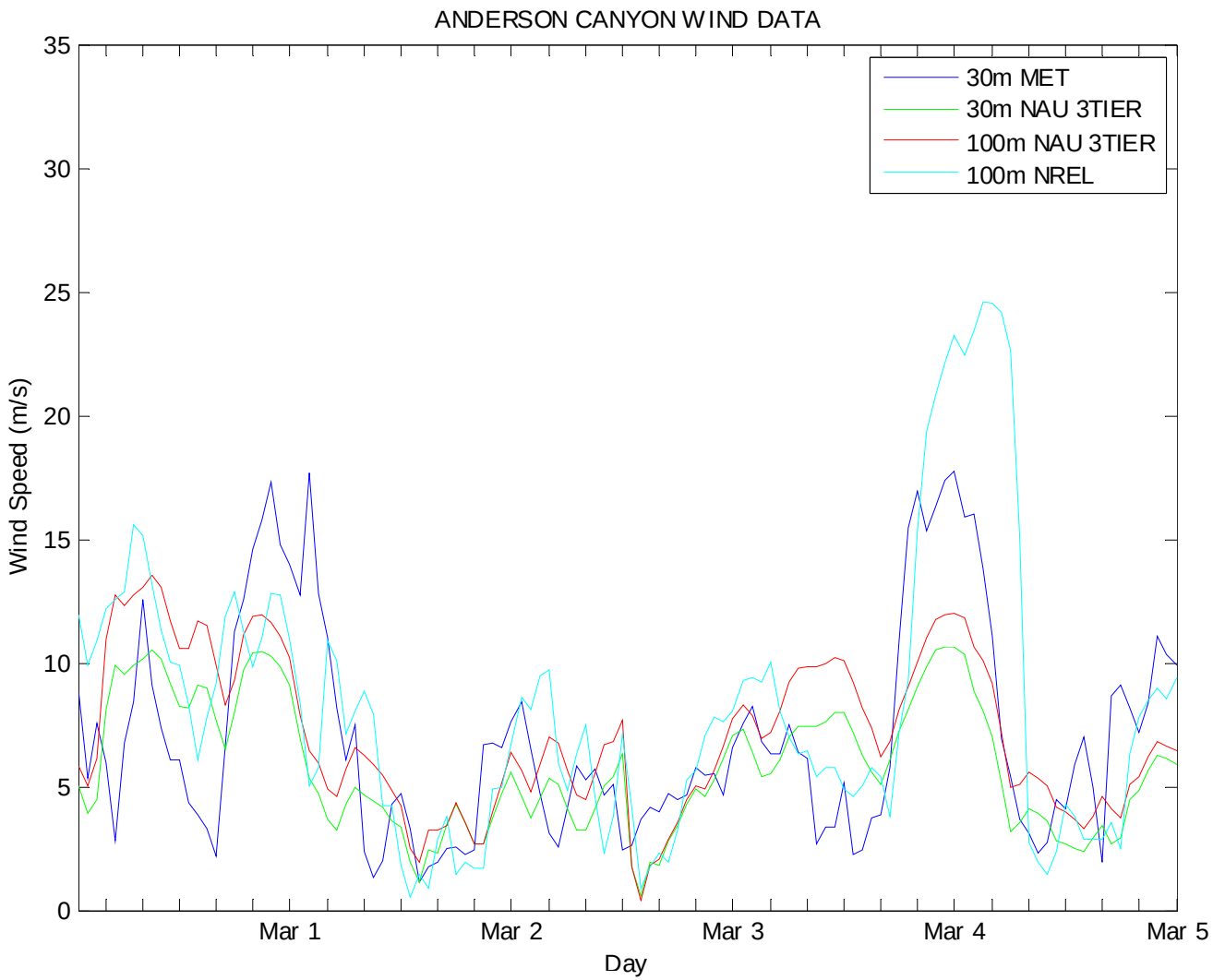

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day

2-day Power Plot – March 2

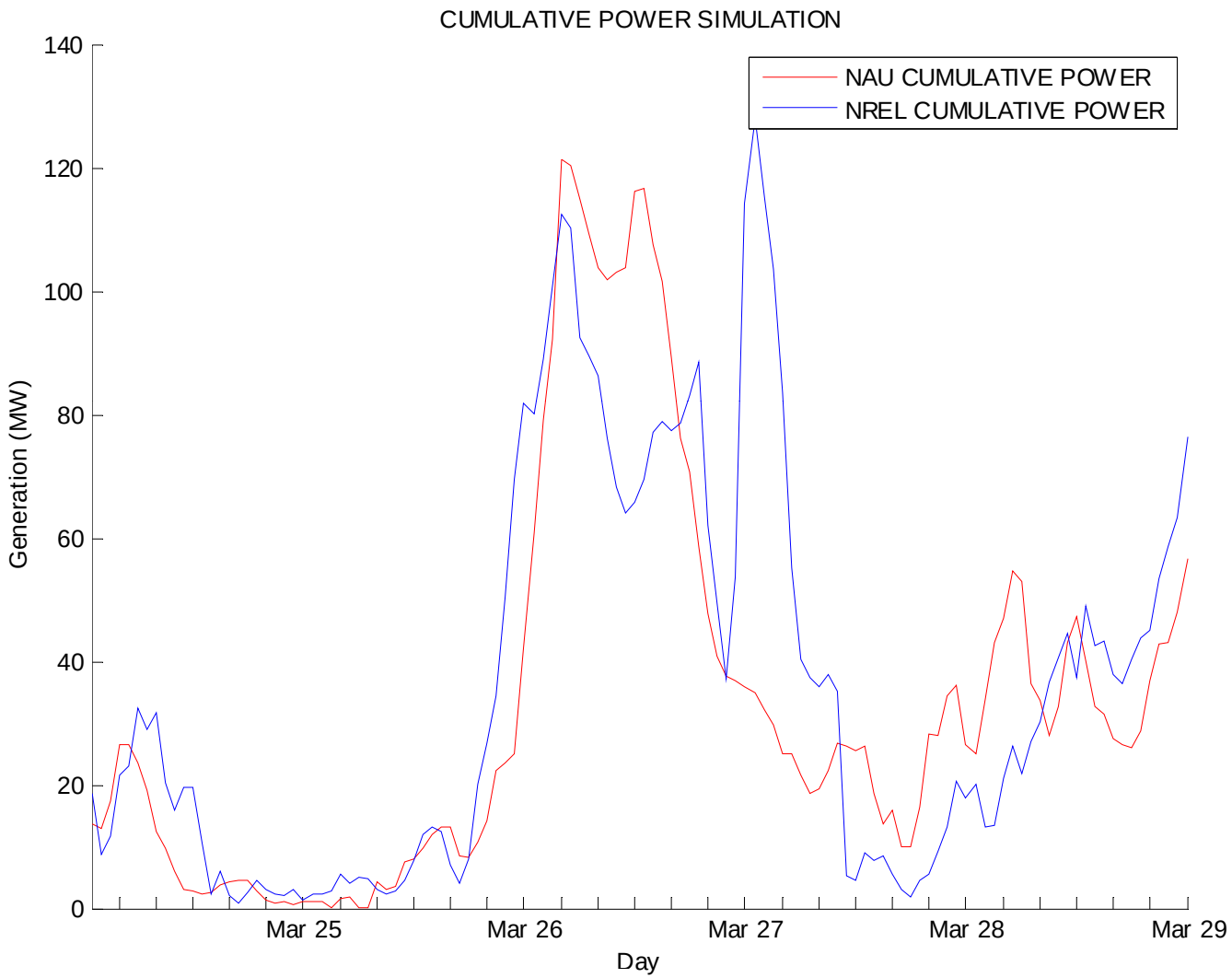


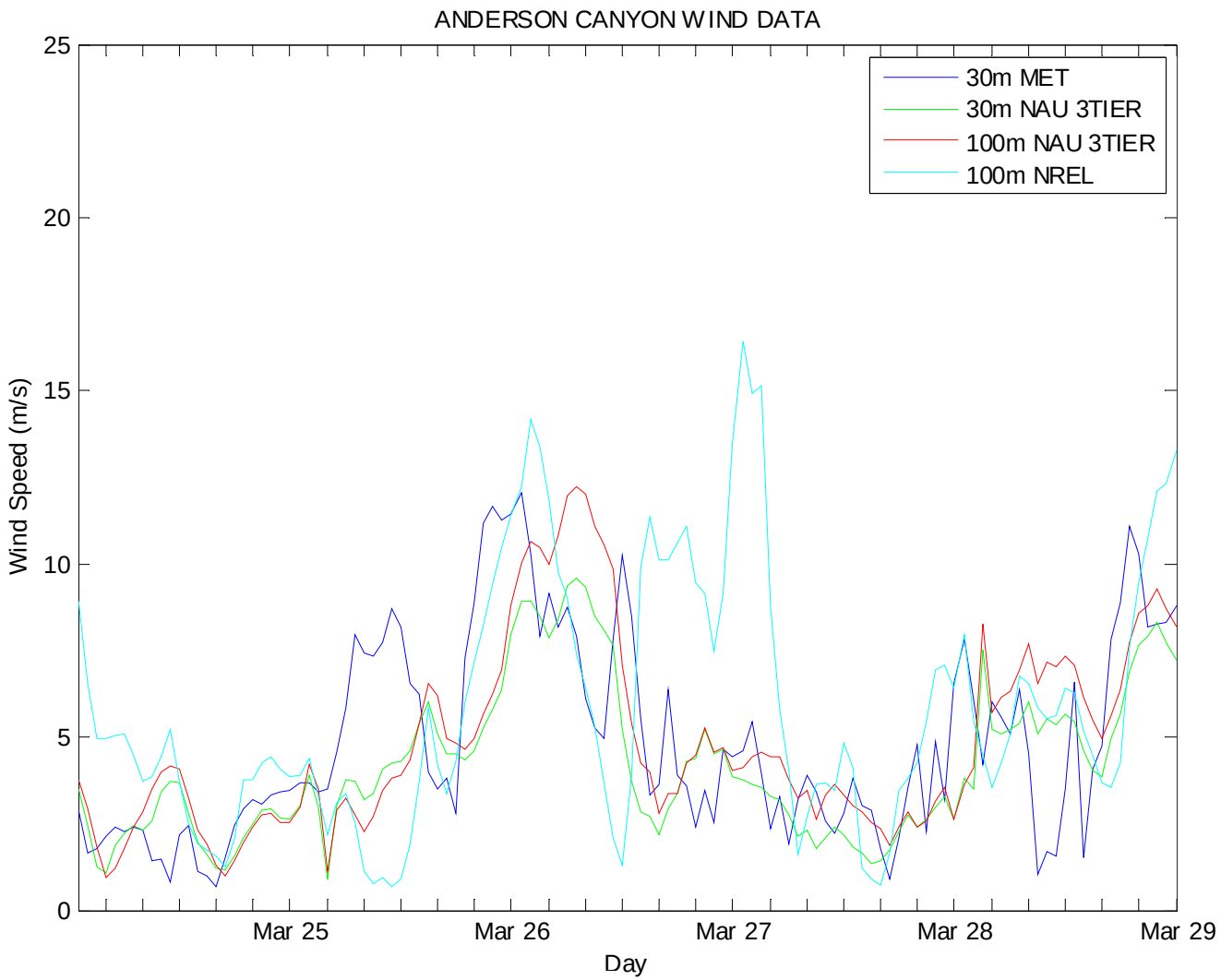
5-day Power Plot – March 2




ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
35
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day

5-day Power Plot – March 26




ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Day

Conclusions about spikes

- January 1 – Spike is an anomaly
- January 16 – Ramp is a keeper
- February 3 – Spike is a anomaly
- February 6 – Spike is an anomaly
- March 2 – Spike is a keeper
- March 26 – Spike is an anomaly

Data Sources

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Wind Speed Data Sources

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- Data was used from three sources:
  - **30m met tower data**. 30-m wind speed data from met towers that NAU owns. For more info or data, see http://wind.nau.edu/anemometer/index_ddmenu.shtml
  - **30m and 100m 3TIER NAU simulated wind speed data**. For the wind integration study that NAU conducted for Arizona Public Service in 2007, 3TIER performed a meso-scale simulation for two large regions of Arizona. The simulation was nominally for a 5-km grid, 10-minute resolution, 1996 through 2006 (though Aubrey Cliffs and Gray Mountain were at 1-km resolution). Study report: http://wind.nau.edu/APSWindIntegrationsStudy.shtml
  - **100m 3TEIR NREL simulated wind speed data (WWSIS)**.

Wind Power Data Sources

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- Data was used from two sources:
  - **<u>3TIER NAU simulated wind power data</u>**.
    - 80-m hub height
    - GE 1.5sl turbines, 77-m rotor
    - 10 power plants simulated across AZ
    - Each power plant typically composed of Nine, 36-MW strings of wind turbines (24 1.5-MW turbines per string)
    - Power simulation conducted using 3TIER's SCORE method.
  - **<u>100m 3TEIR NREL simulated wind speed data (WWSIS)</u>**.
    - 100-m hub height
    - Vestas V-90 3-MW turbines
    - 30,000 30-MW strings of turbines (10 3-MW turbines per string) modeled across the western US
    - Power simulation via 3TIER's SCORE-Lite method.

Comparison Locations

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- Locations in Arizona (see following map):
  - Bullhead City, Aubrey Cliffs, Gray Mountain, Anderson Canyon, and Springerville
  - The sites for the met tower and simulation data are "co-located" within a couple miles.
- Data compared:
  - Wind Speed: NAU Met Tower and wind speed data from the NAU 3TIER and NREL 3TIER simulations
  - Wind Power: Compared the two 3TIER simulations

    (note, there are no wind power plants in Arizona, therefore actual power data cannot be compared)

3Tier NAU Modeling Zones
(Met tower/comparison locations in red)

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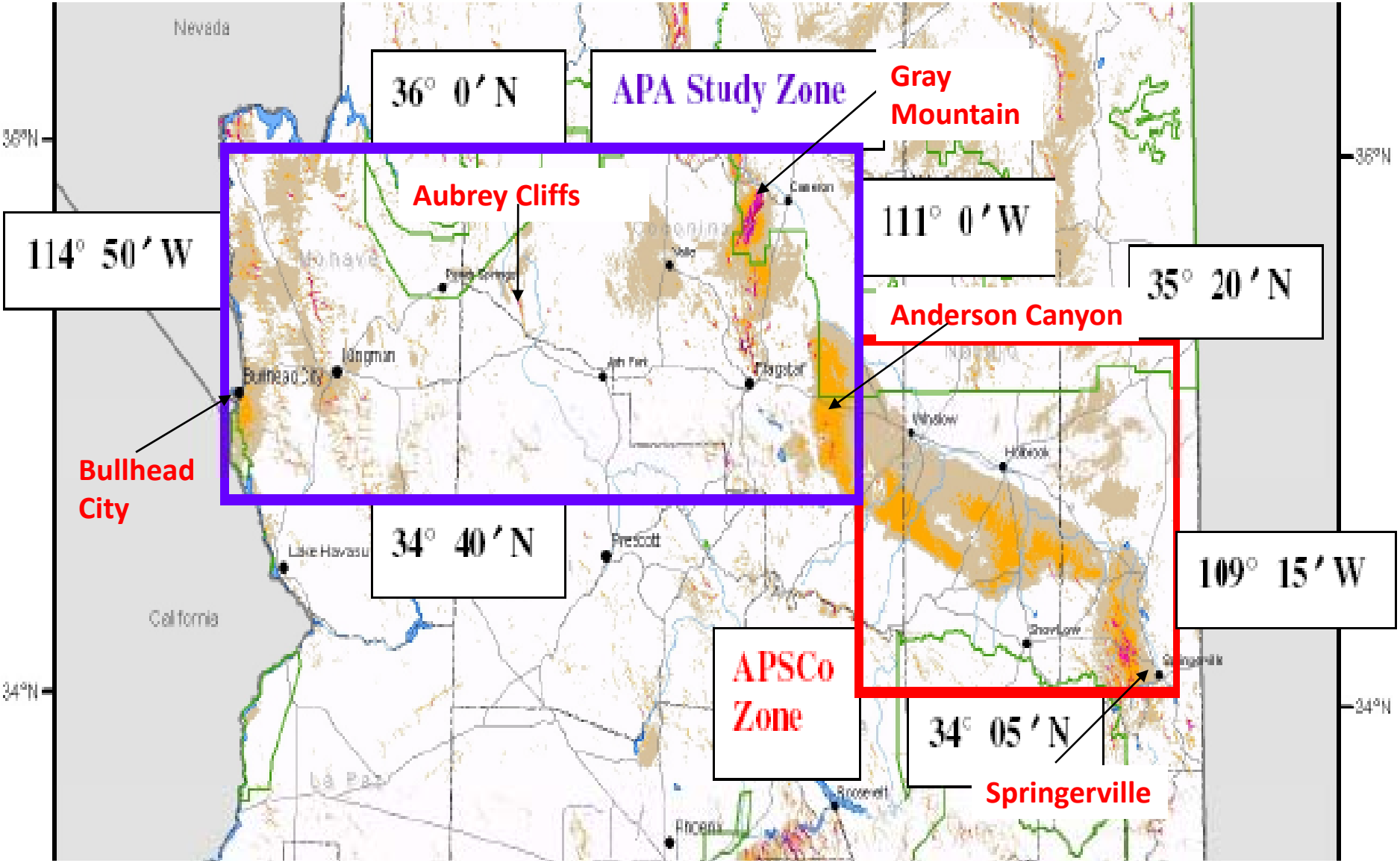
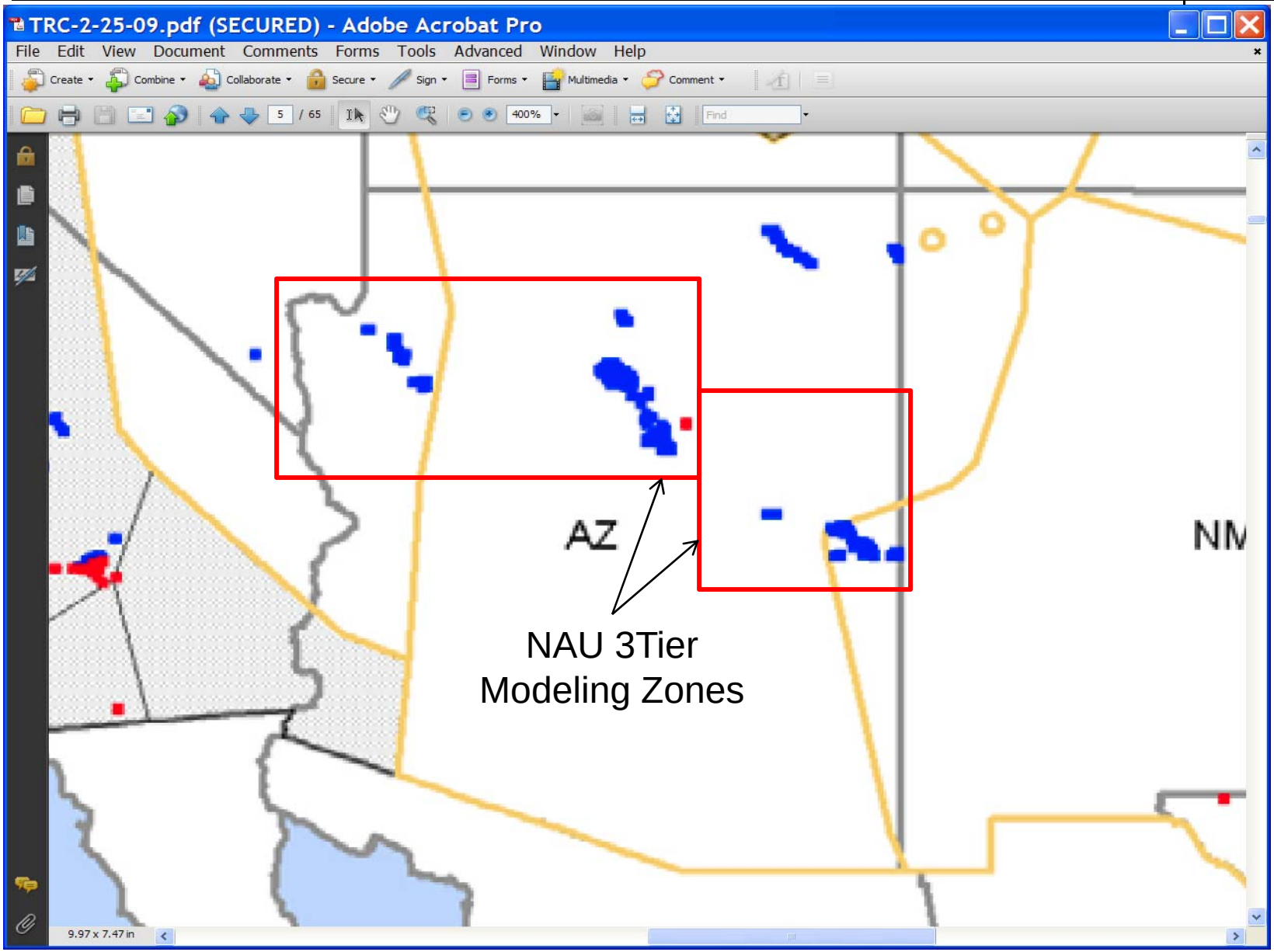


NREL 3TIER Power Plants



NAU 3TIER Wind Power Plant Locations

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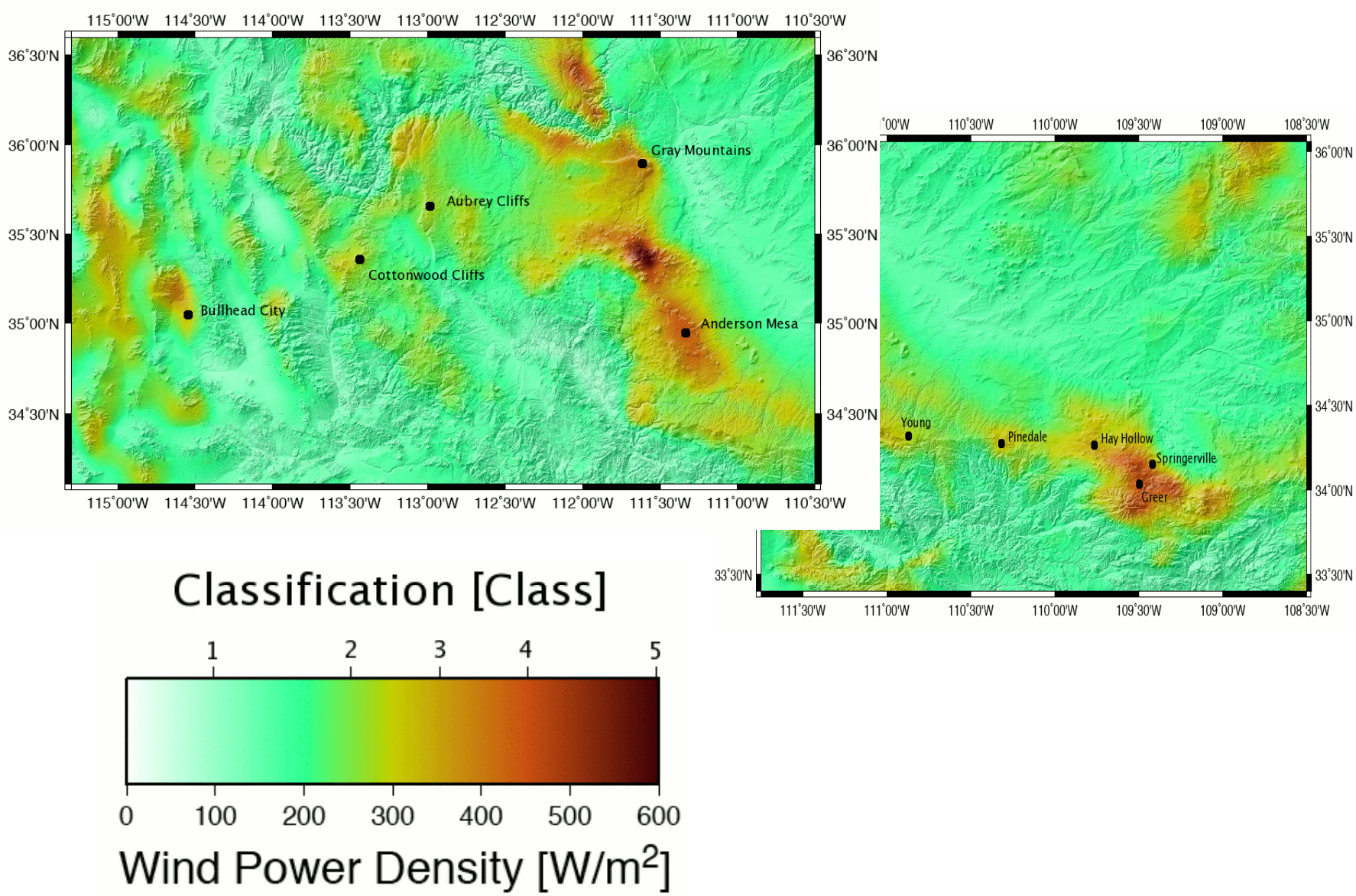

Power Simulation Plots for Set A, 2006

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- Power data in Greenwich Mean Time (GMT) for both simulations (time is synchronized between the two simulations)
- 10-minute data was averaged every hour
- Plots for each date:
  - NAU 3TIER power: MW vs. time, over 2 day time span
  - NREL 3TIER power: MW vs. time, over 2 day time span
  - Both NAU and NREL simulations: MW vs. time, (total power only… output of all sites combined) over 2 day time span
  - NAU 3TIER power: MW vs. time, over 5 day time span
  - NREL 3TIER power: MW vs. time, over 5 day time span
  - Both NAU and NREL simulations: MW vs. time, (total power only… output of all sites combined) over 5 day time span

Notes on Power Comparisons

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- The power output for one string of turbines from each simulation at each of the five sites were compared.
- The power output of one string of turbines was 30 MW for the NREL WWSIS simulation.
- The power output of one string of turbines at each site from the NAU power simulation was normalized to 30 MW, so that the plots will be directly comparable:
  - At Anderson Canyon, Aubrey Cliffs, Gray Mountain, and Springerville, one string of turbines output a max of 36 MW, therefore to match the NREL power simulation the power data was multiplied by a constant of 30/36=5/6.
  - At Bullhead City, one string of turbines output a max of 39 MW, so the NAU power data was multiplied by 30/39=10/13.
- NAU Power simulation data was shifted (+14) hours to GMT time.

Detailed Wind Power and Wind Speed Plots

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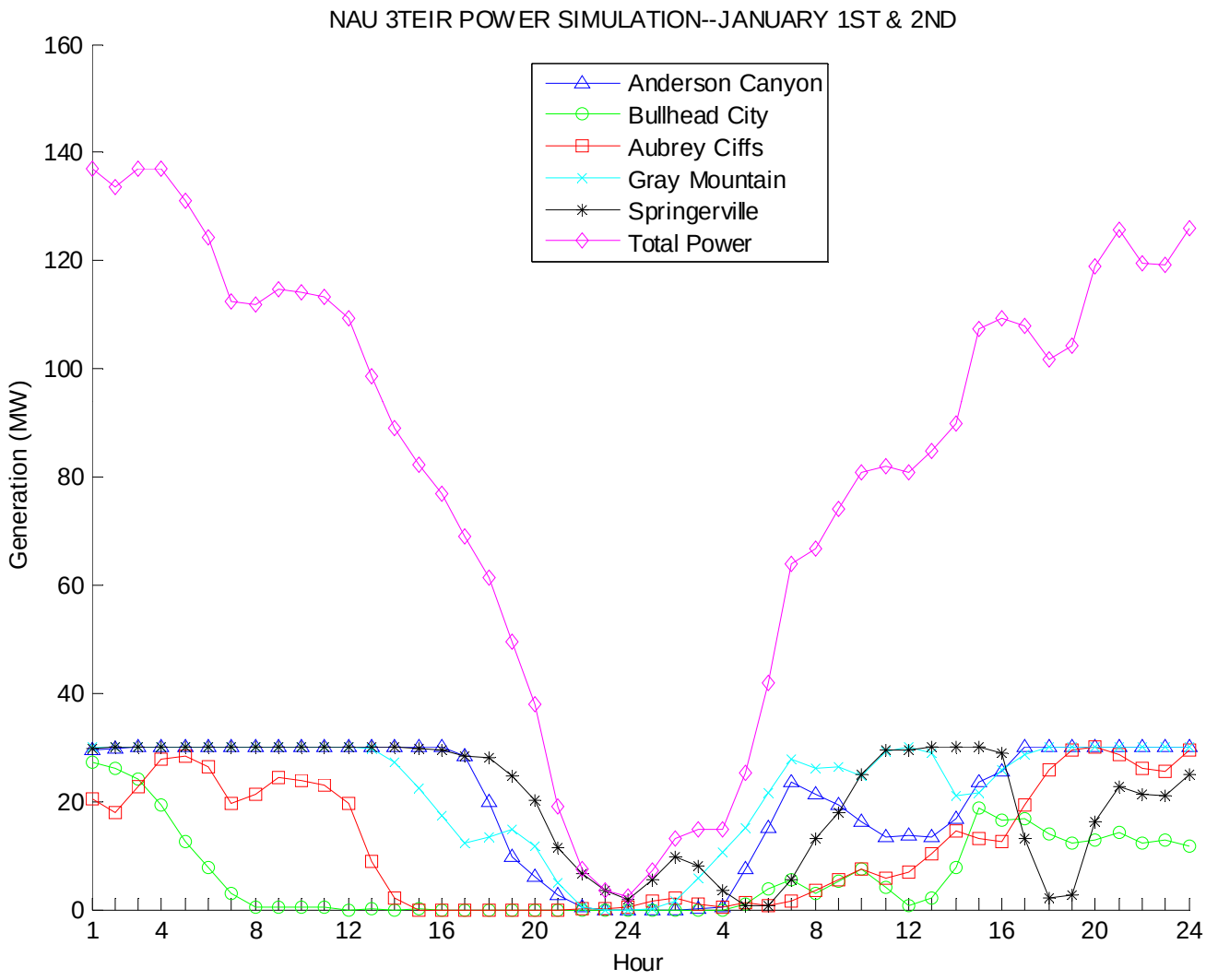
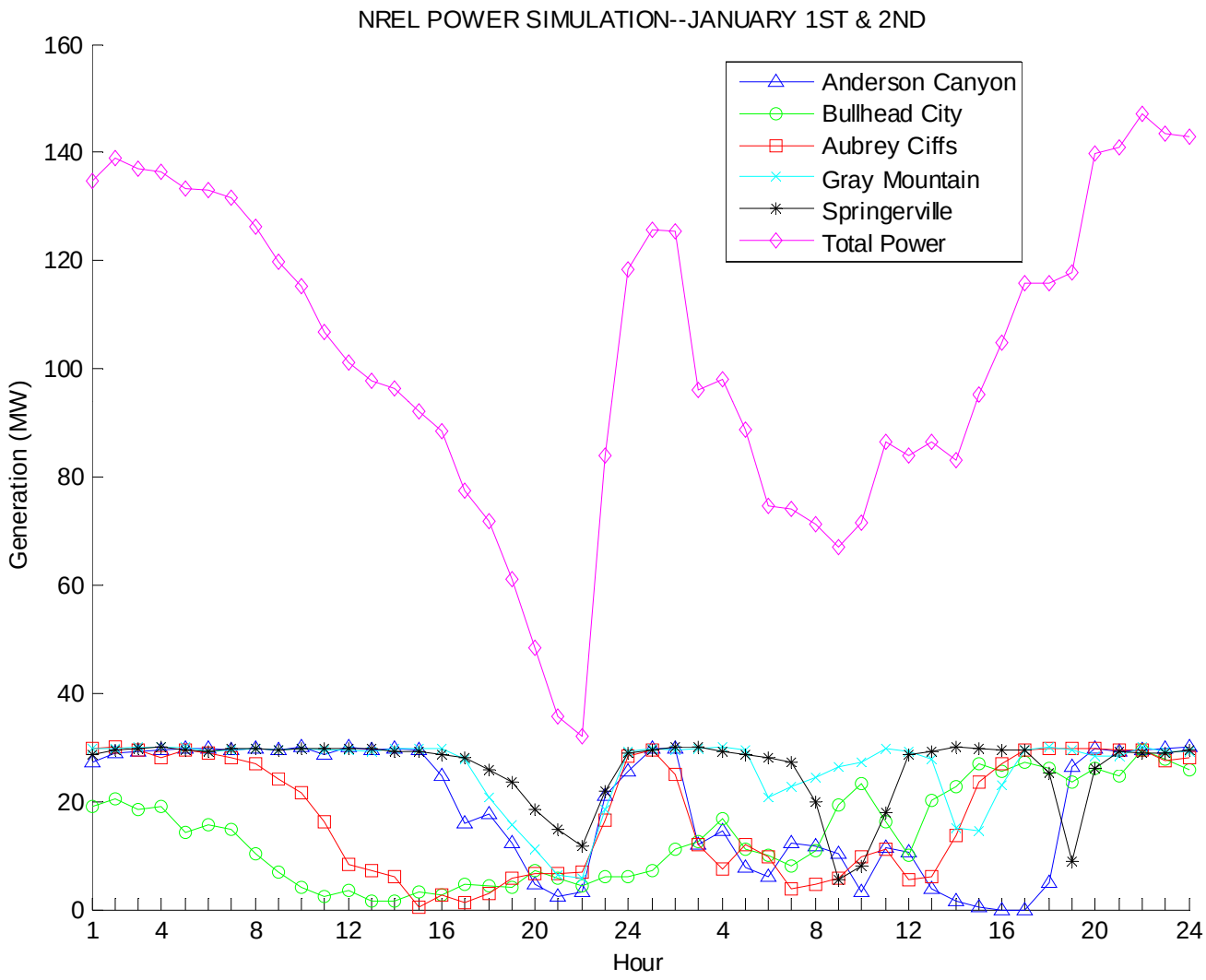
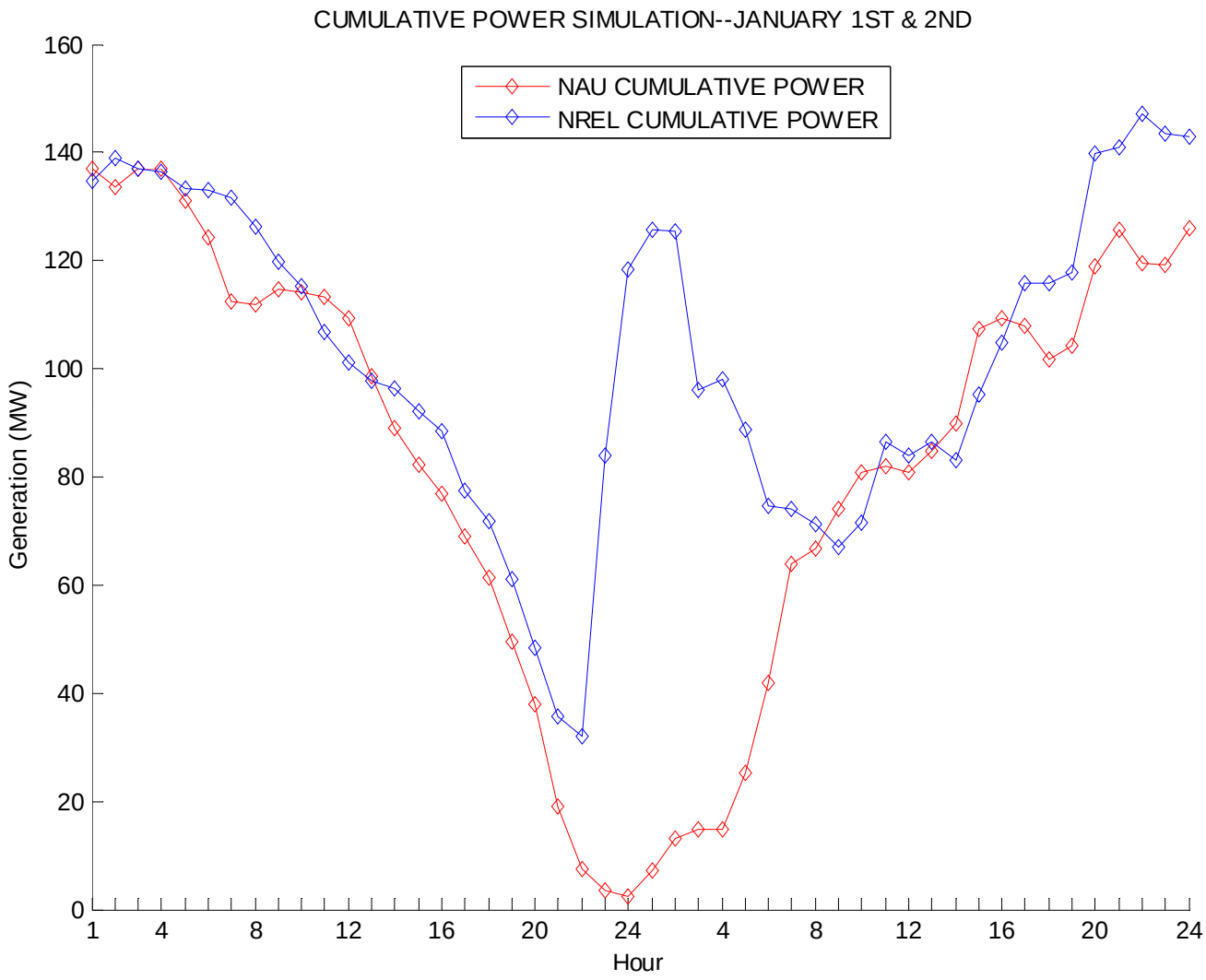
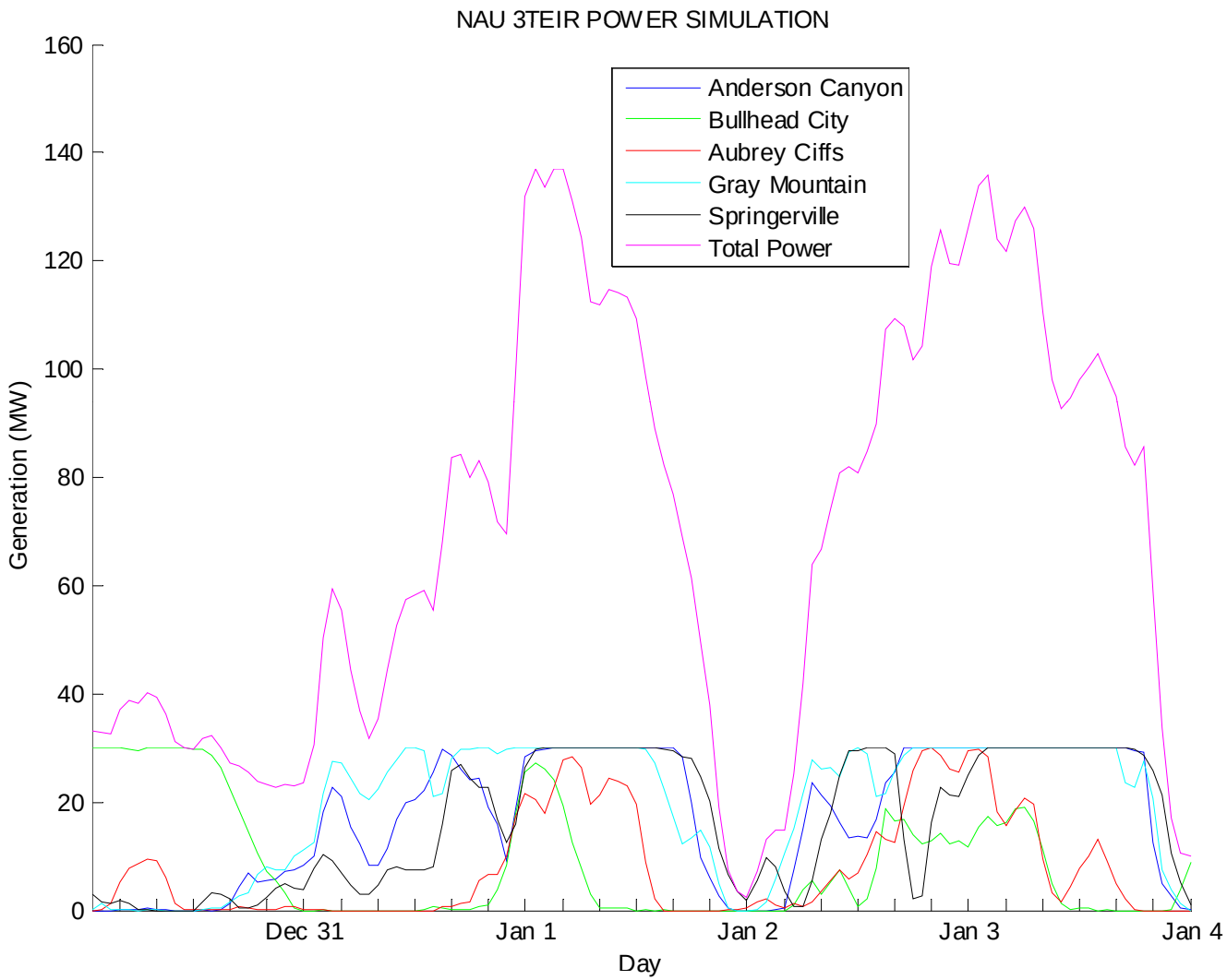
2-day Power Plots – January 1

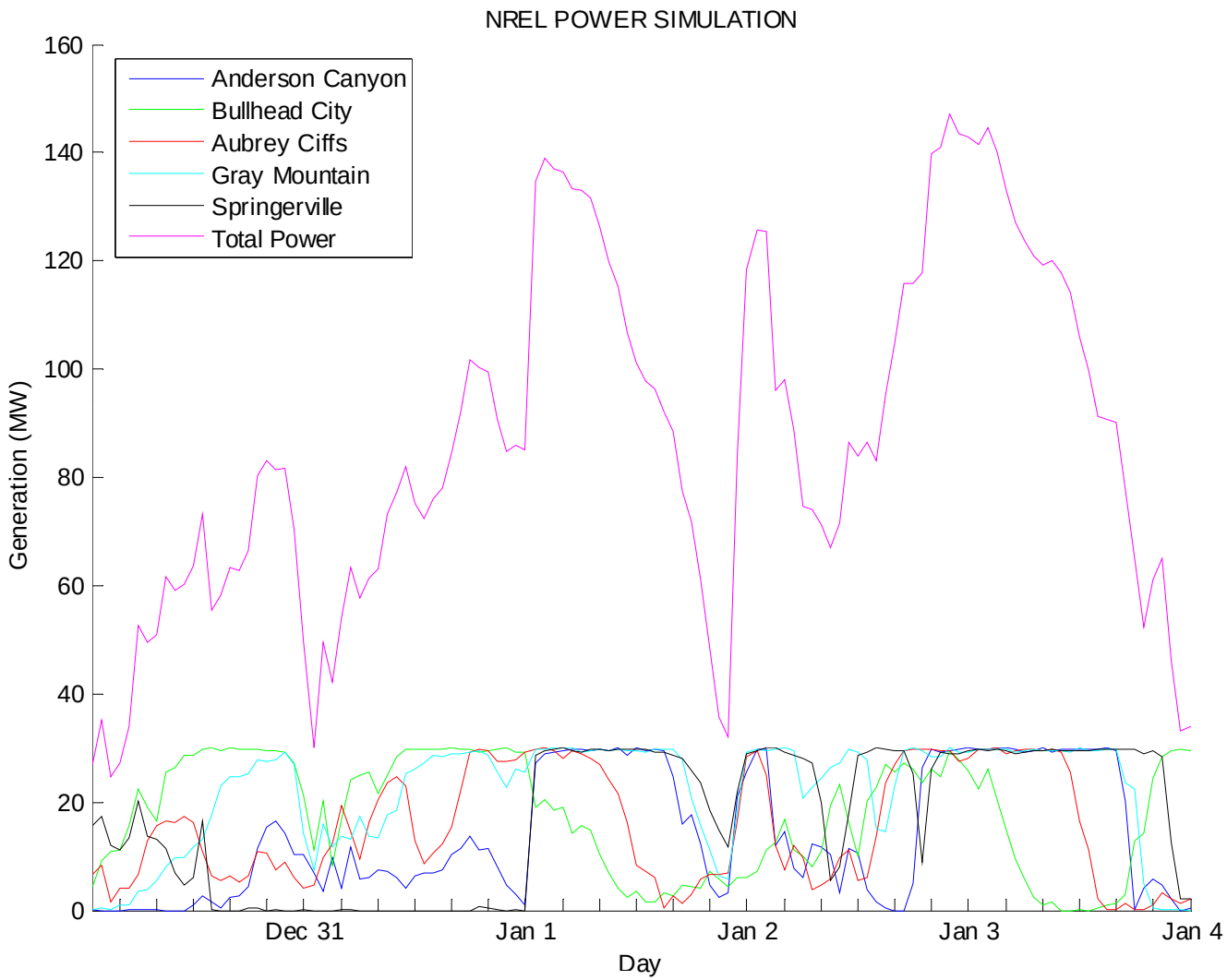


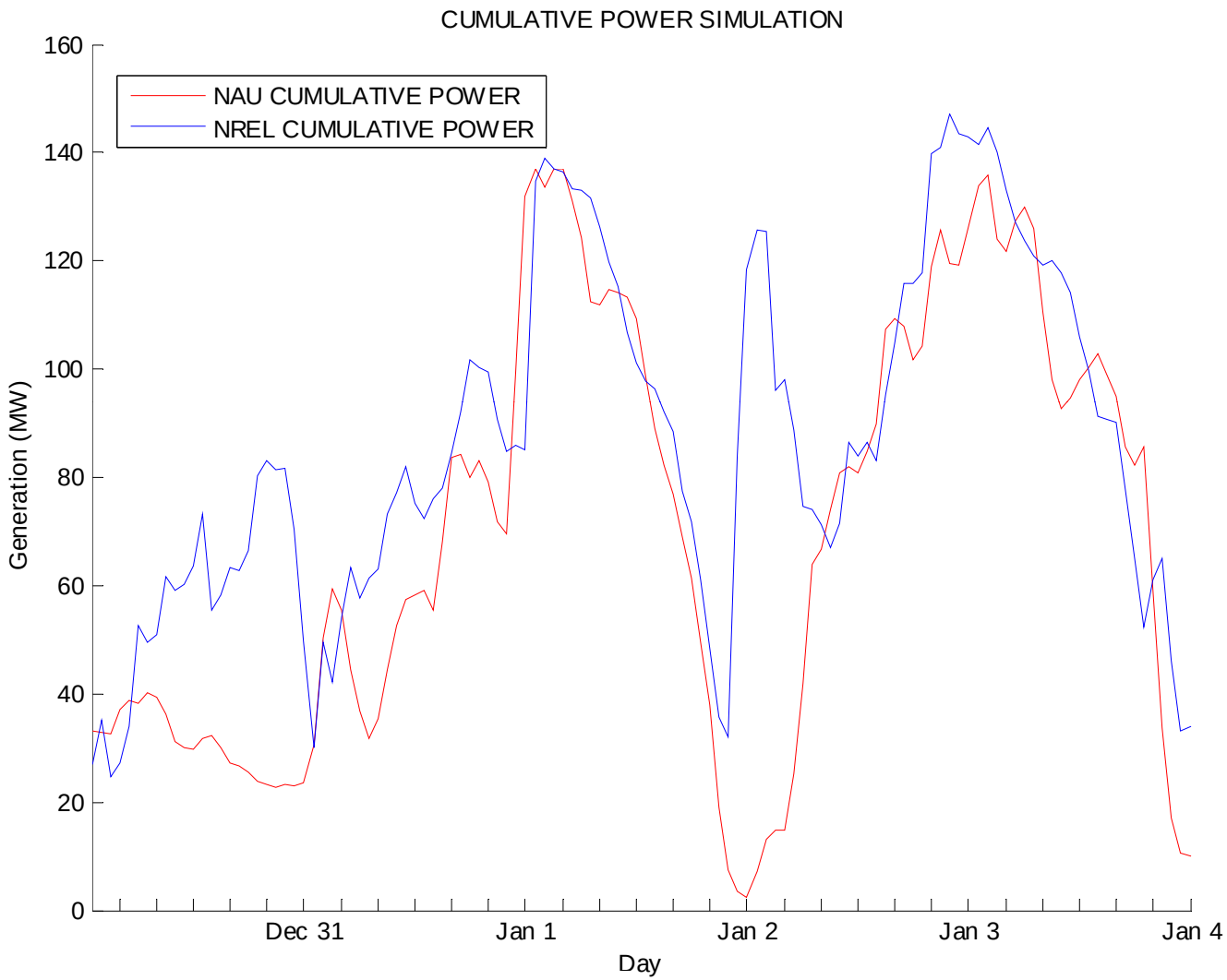

NREL POWER SIMULATION--JANUARY 1ST & 2ND
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
Generation (MW)
Hour
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--JANUARY 1ST & 2ND
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24

5-day Power Plots – January 1




NREL POWER SIMULATION
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
Generation (MW)
0
20
40
60
80
100
120
140
160
Dec 31
Jan 1
Jan 2
Jan 3
Jan 4
Day


CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
0
20
40
60
80
100
120
140
160
Dec 31
Jan 1
Jan 2
Jan 3
Jan 4
Day

Wind Speed Plots

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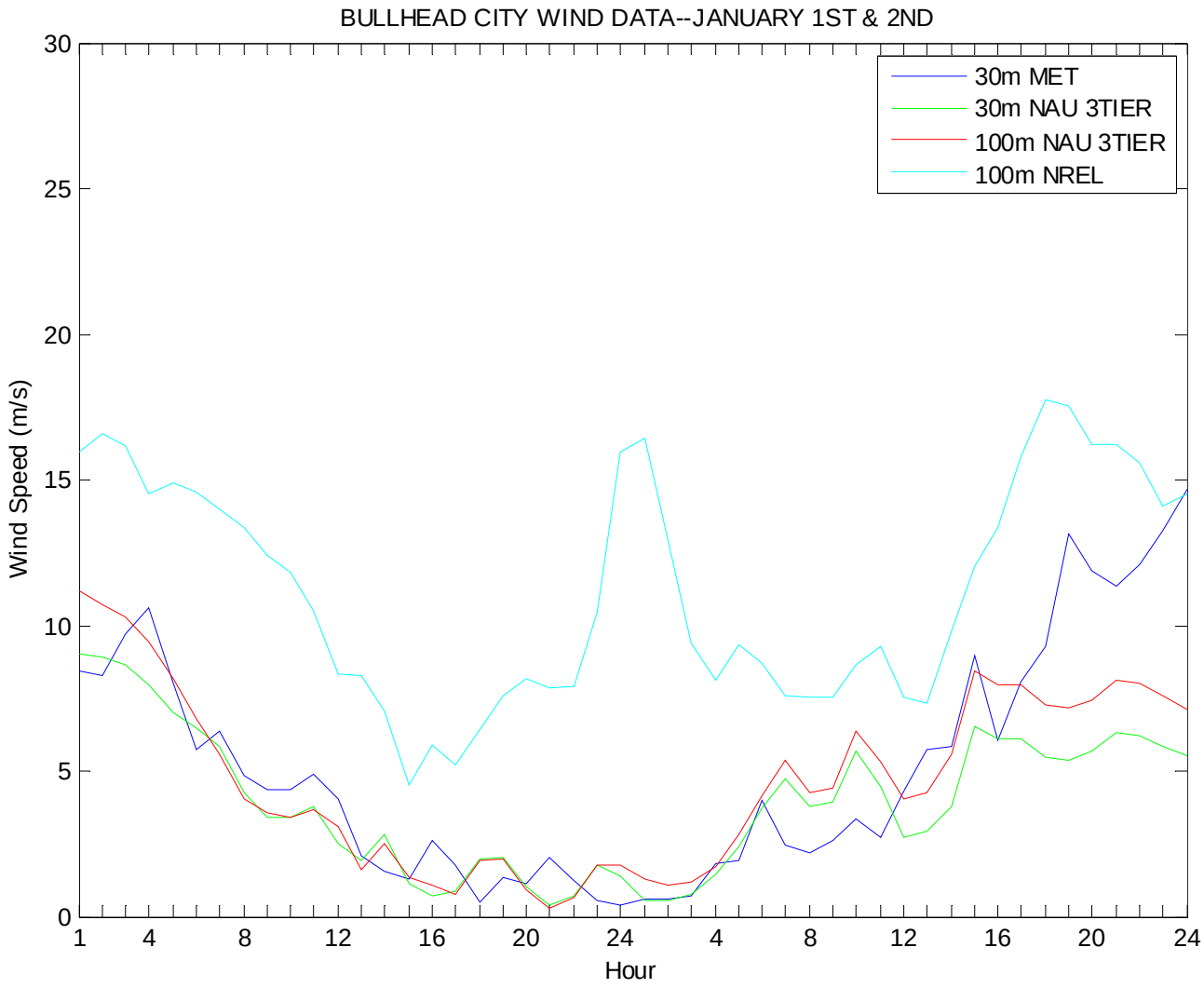
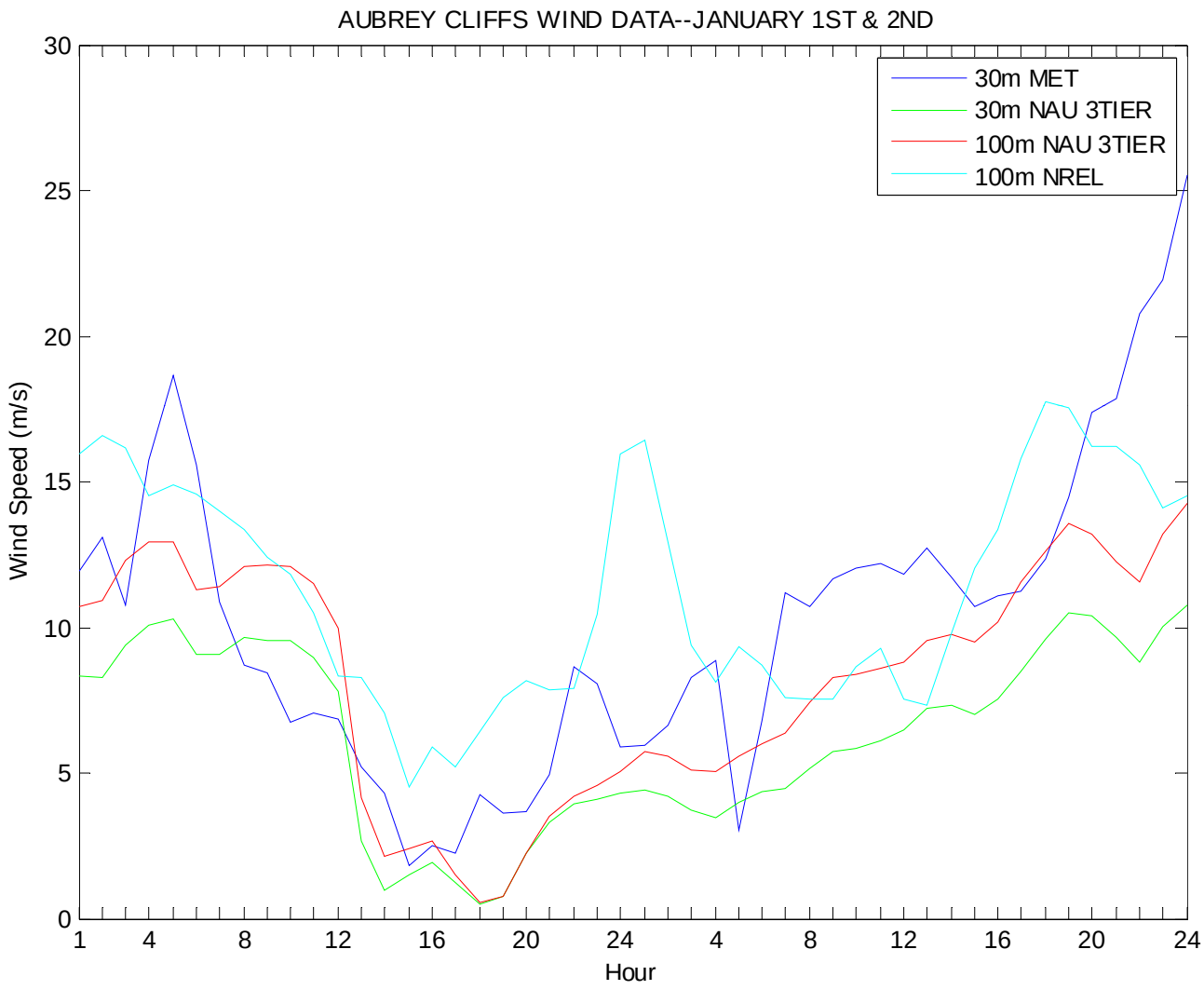
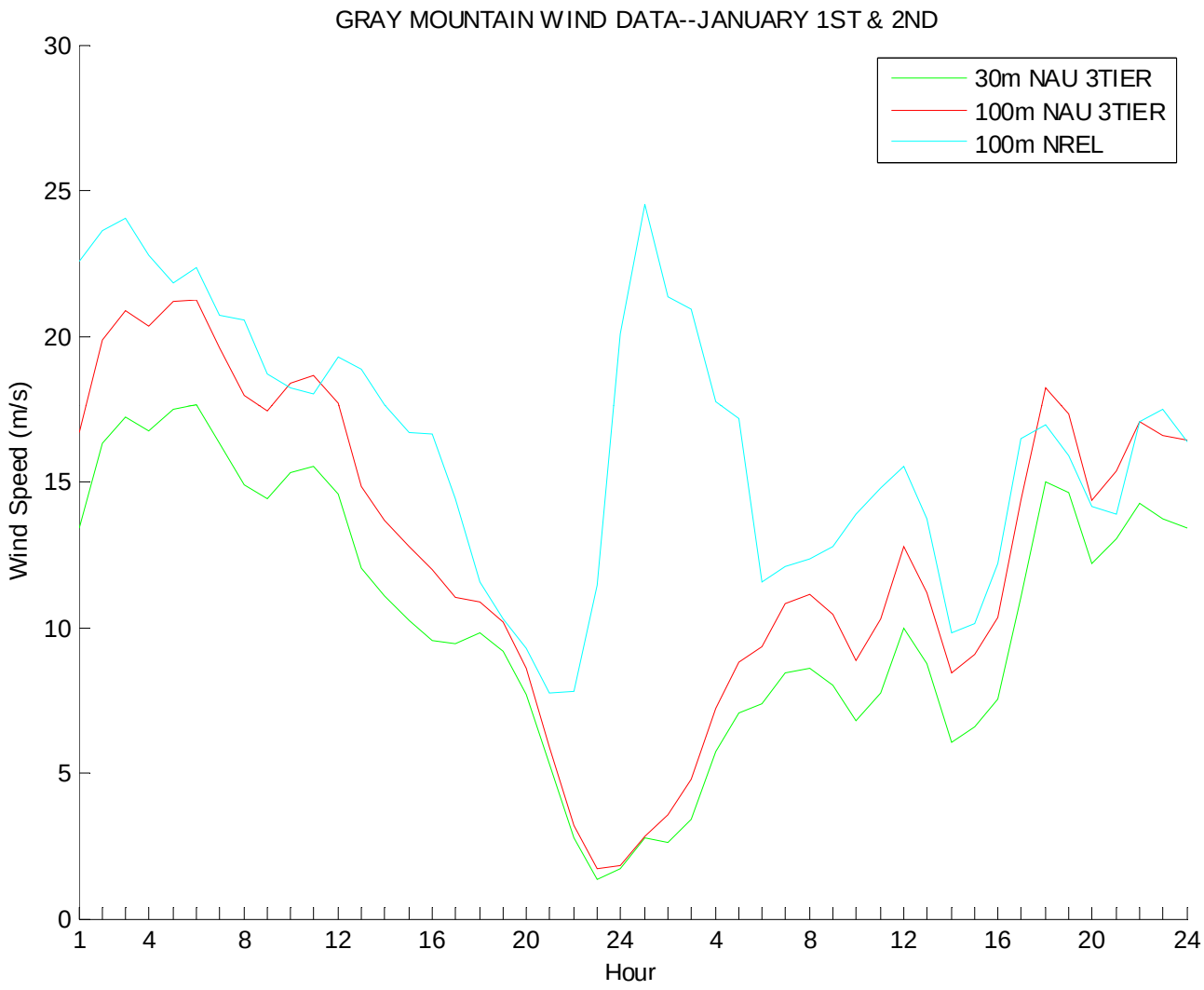
- Wind Data in Greenwich Mean Time (GMT) for 3TIER simulations.
- AZ Met tower data shifted to GMT.
- 10-minute wind speed data was averaged hourly.
- Comparing wind speed at each site from each source for 2 and 5 day time span.
  - Bullhead City
  - Aubrey Cliffs
  - Gray Mountain
  - Anderson Canyon
  - Springerville

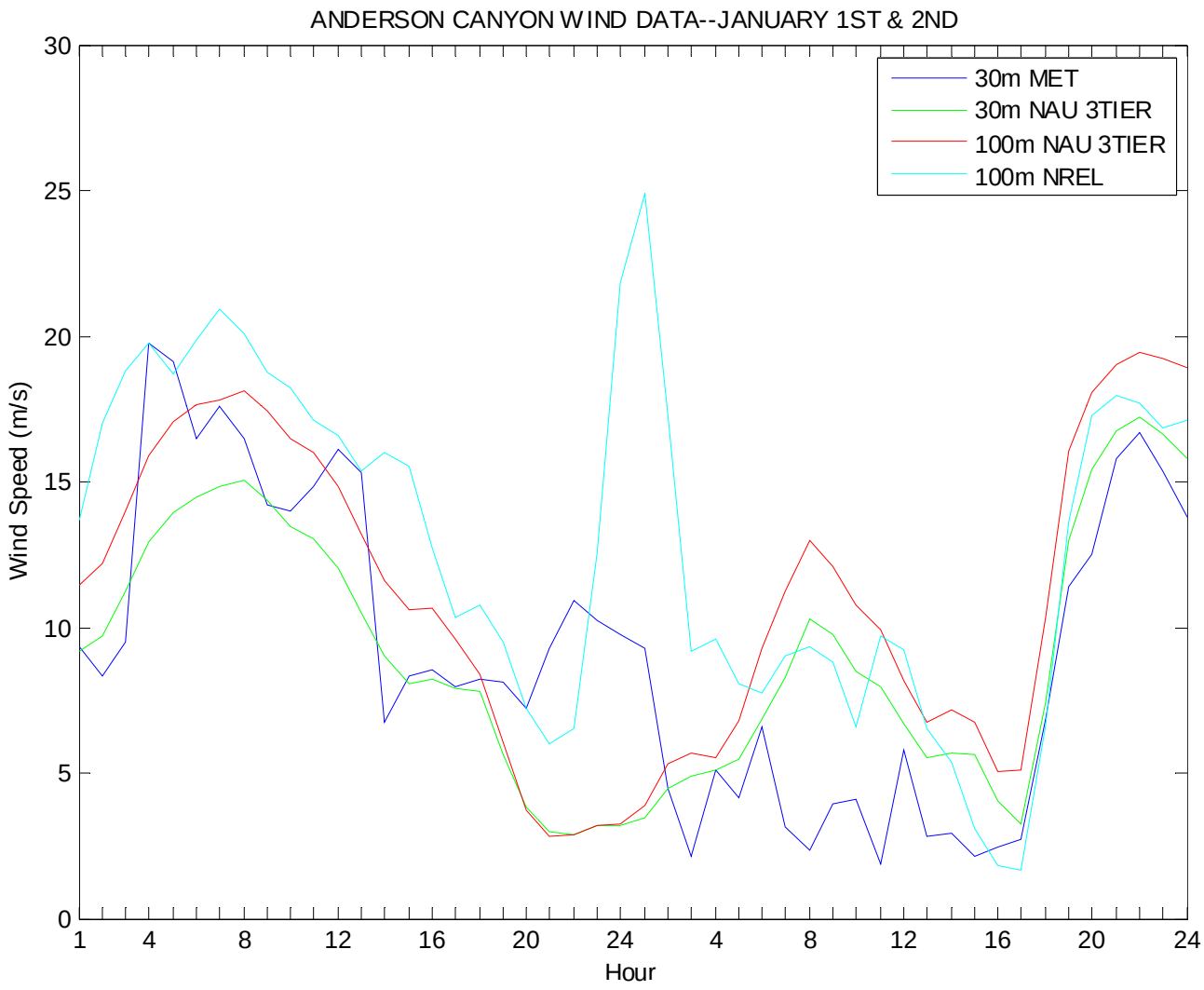
2-day Wind Plots – January 1

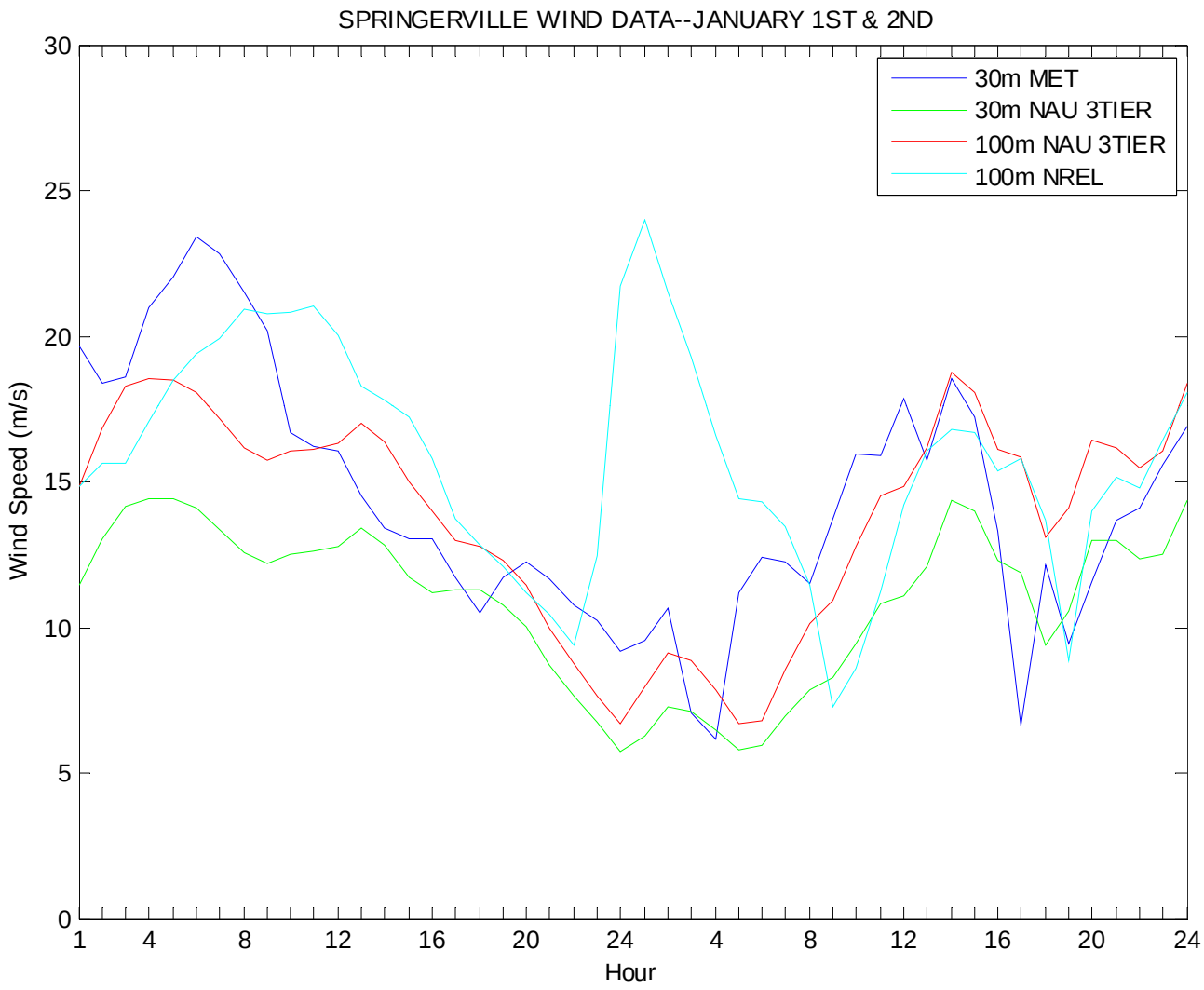



AUBREY CLIFFS WIND DATA--JANUARY 1ST & 2ND
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

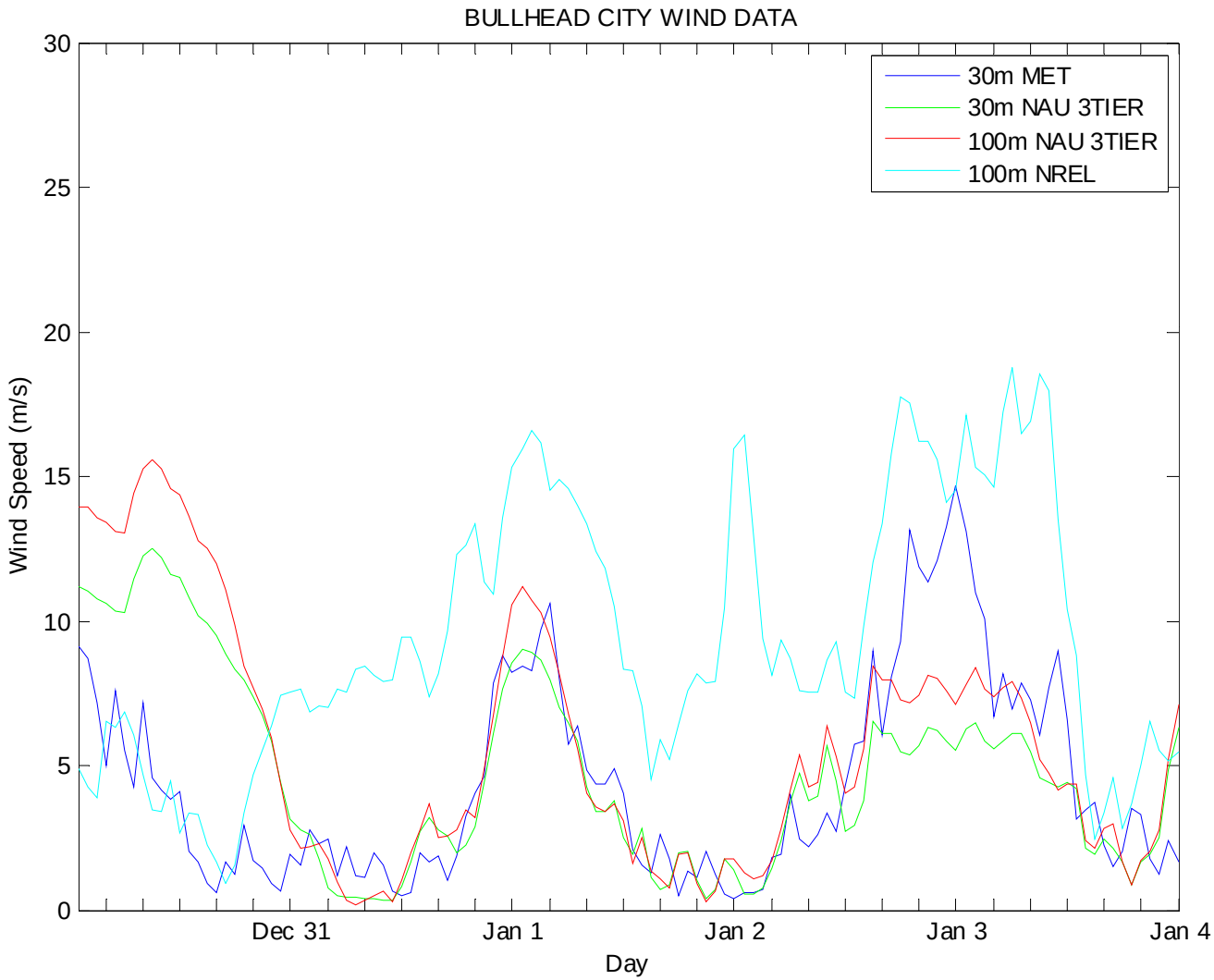


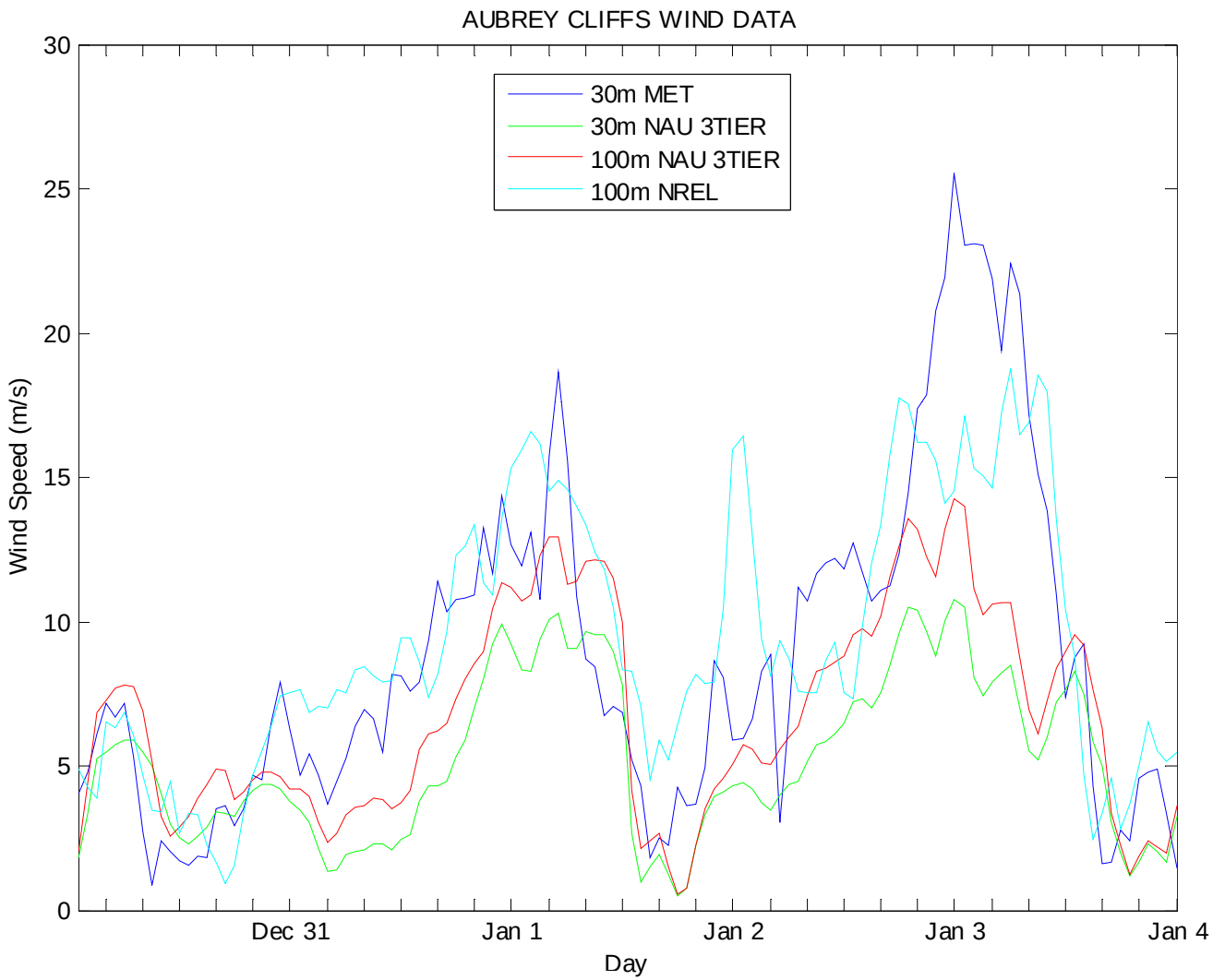
Note, no met tower data was available at Gray Mountain for these dates.

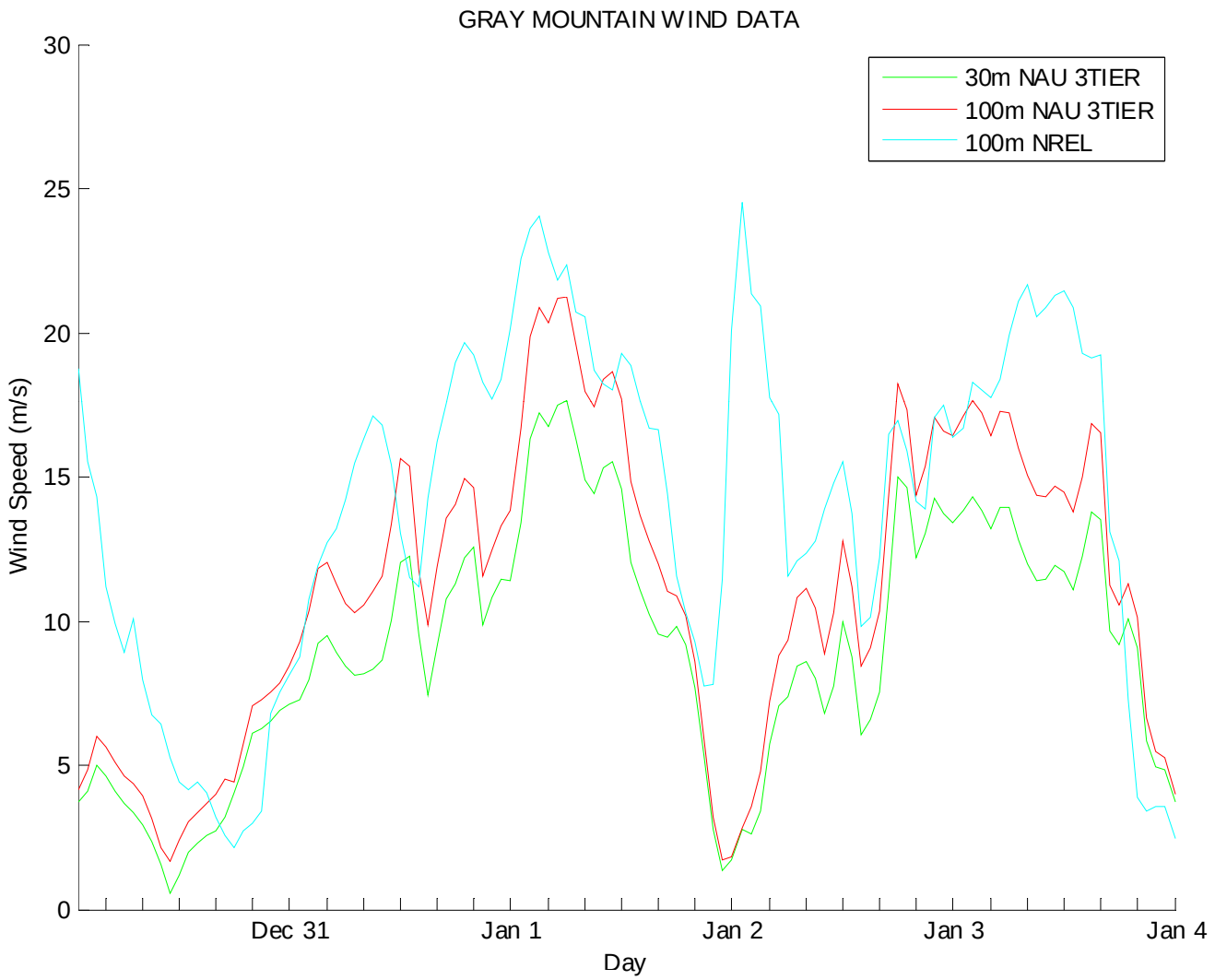

ANDERSON CANYON WIND DATA--JANUARY 1ST & 2ND
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24


SPRINGERVILLE WIND DATA--JANUARY 1ST & 2ND
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

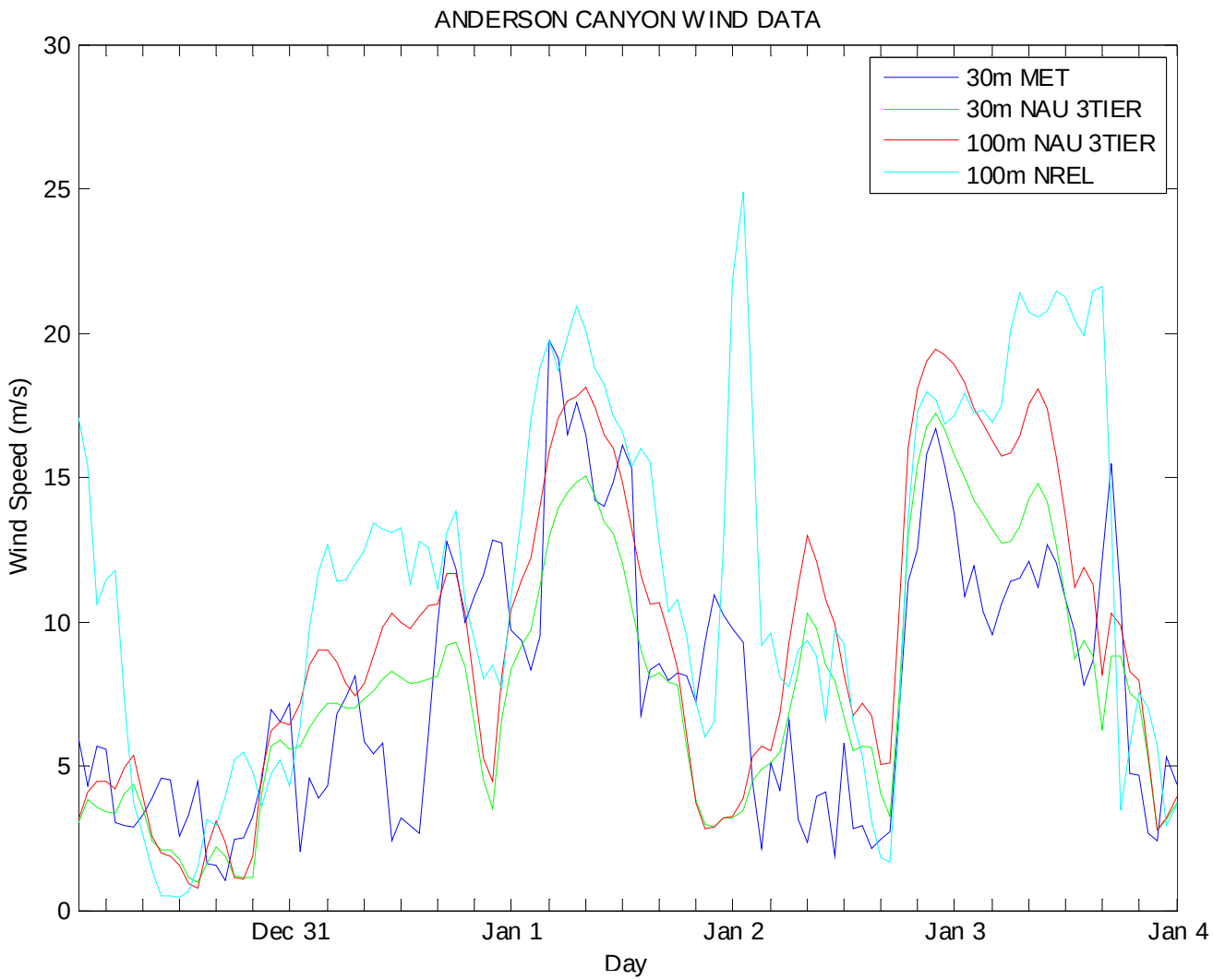
5-day Wind Plots – January 1

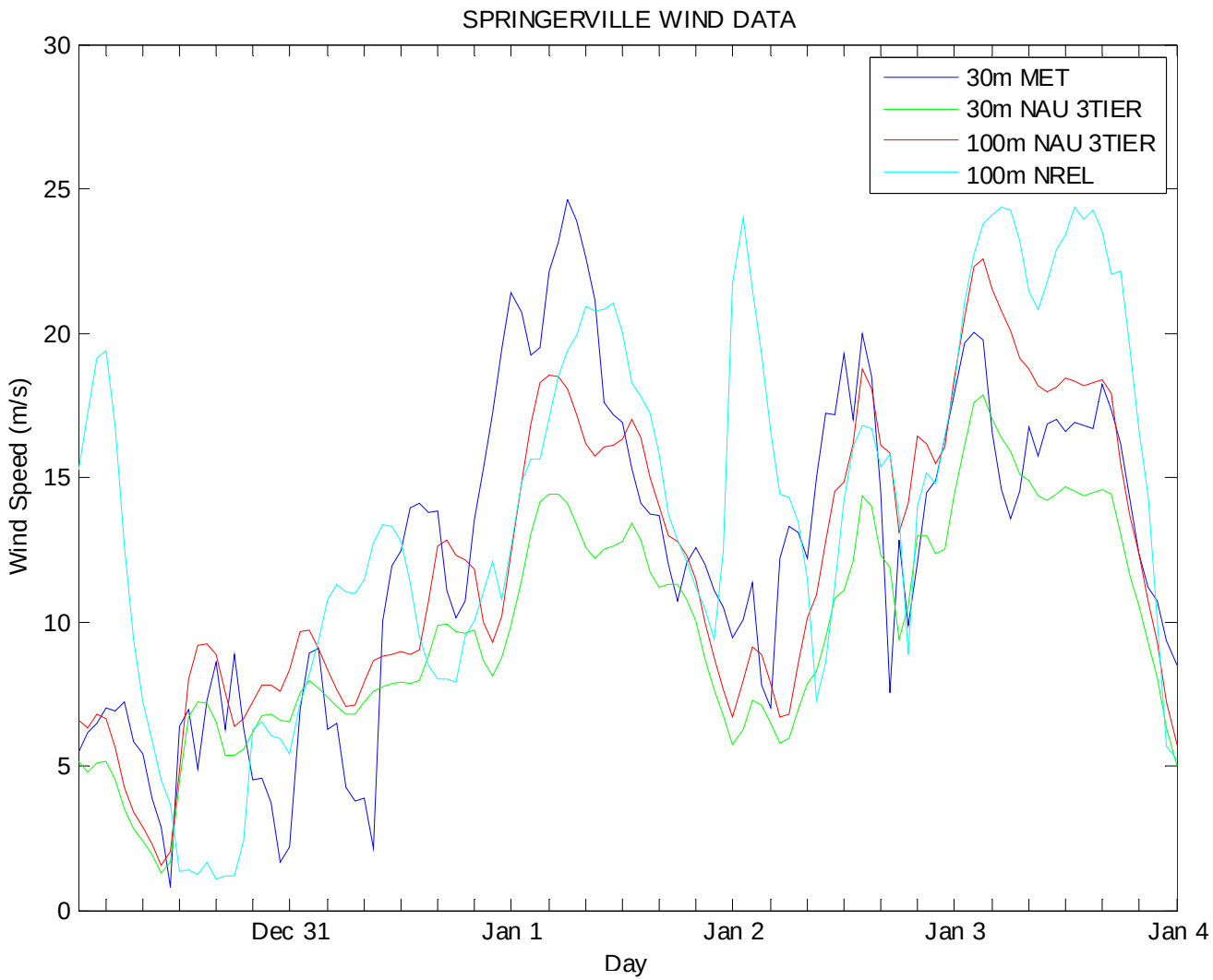



AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Dec 31
Jan 1
Jan 2
Jan 3
Jan 4
Day

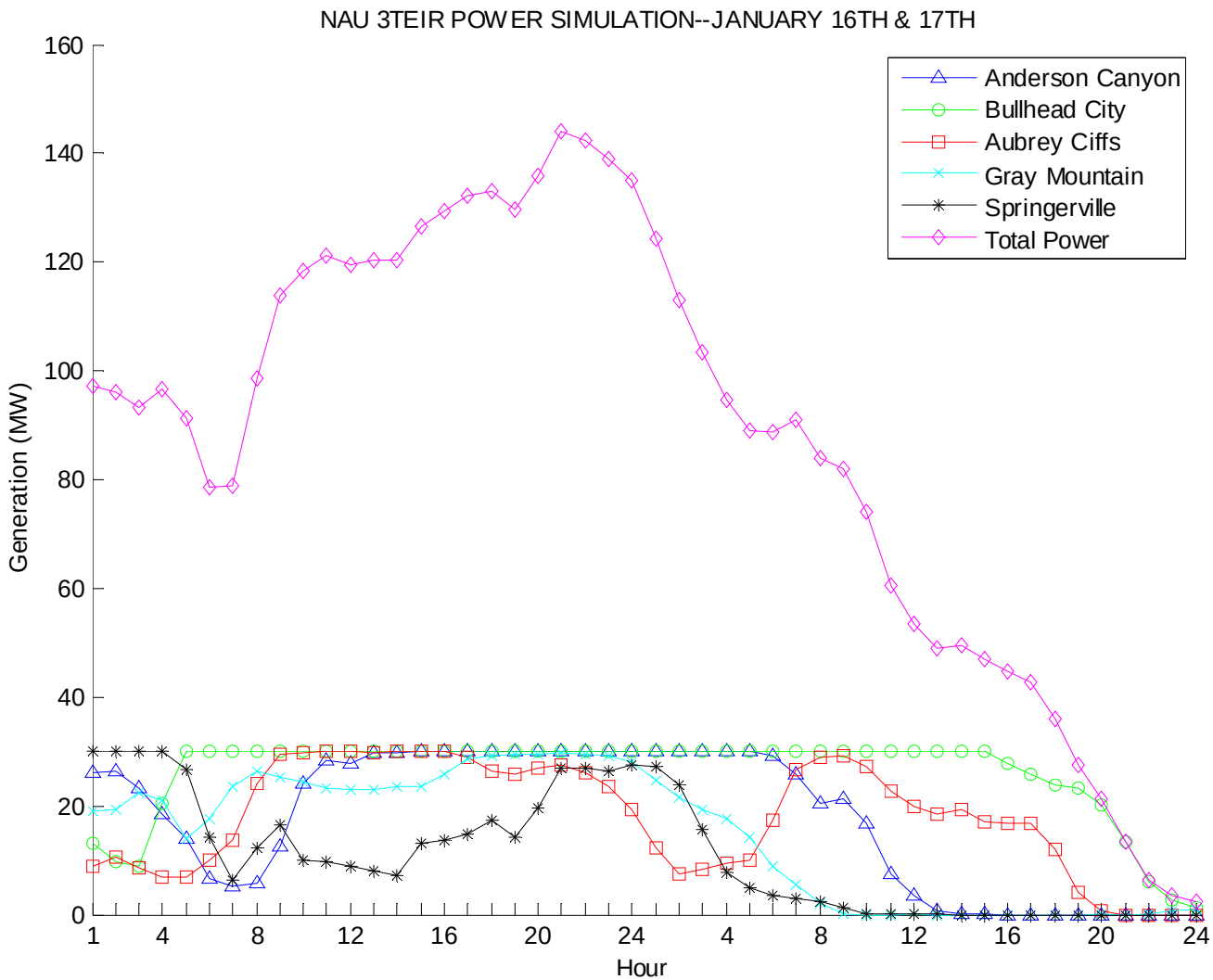


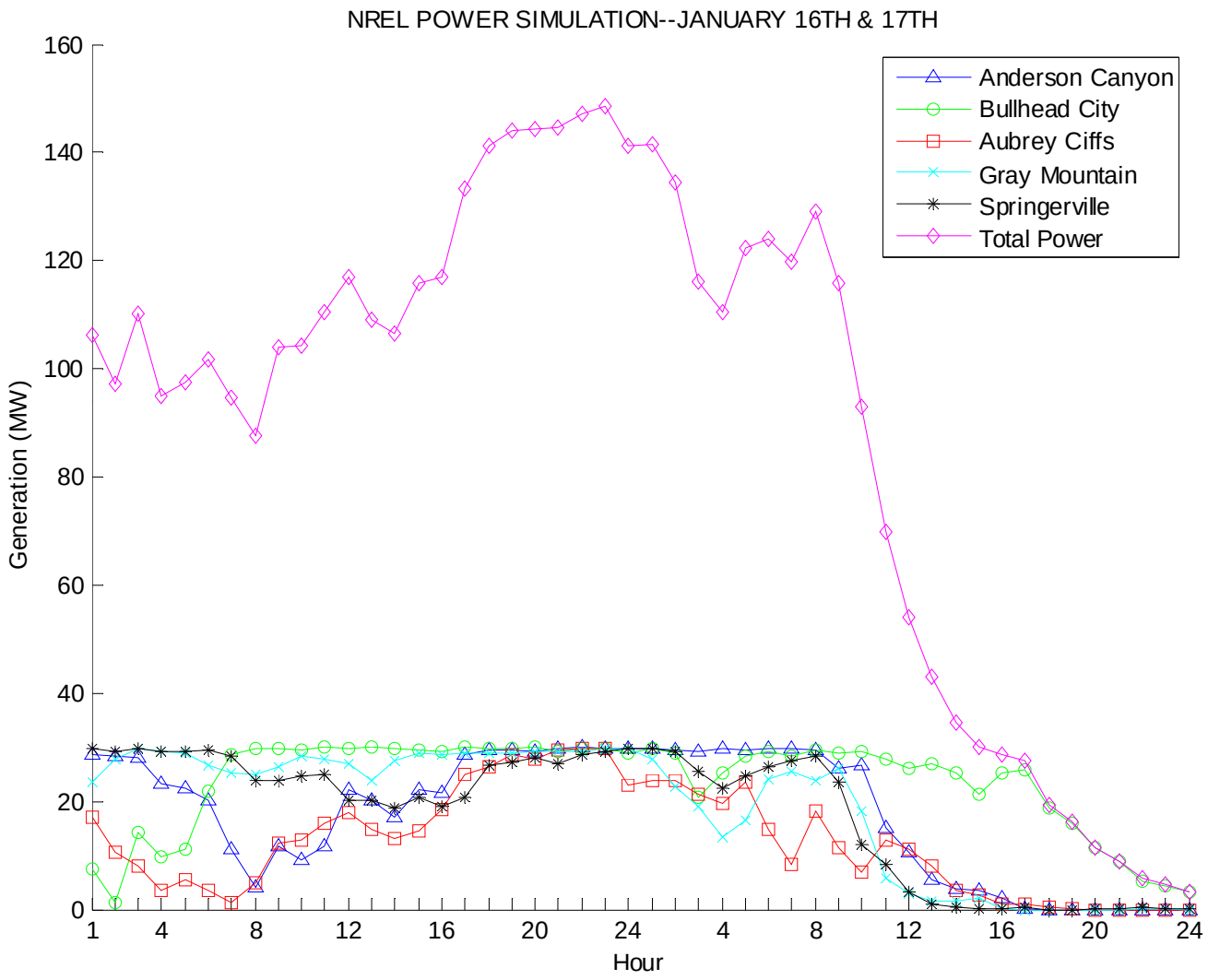
Note, no met tower data was available at Gray Mountain for these dates.

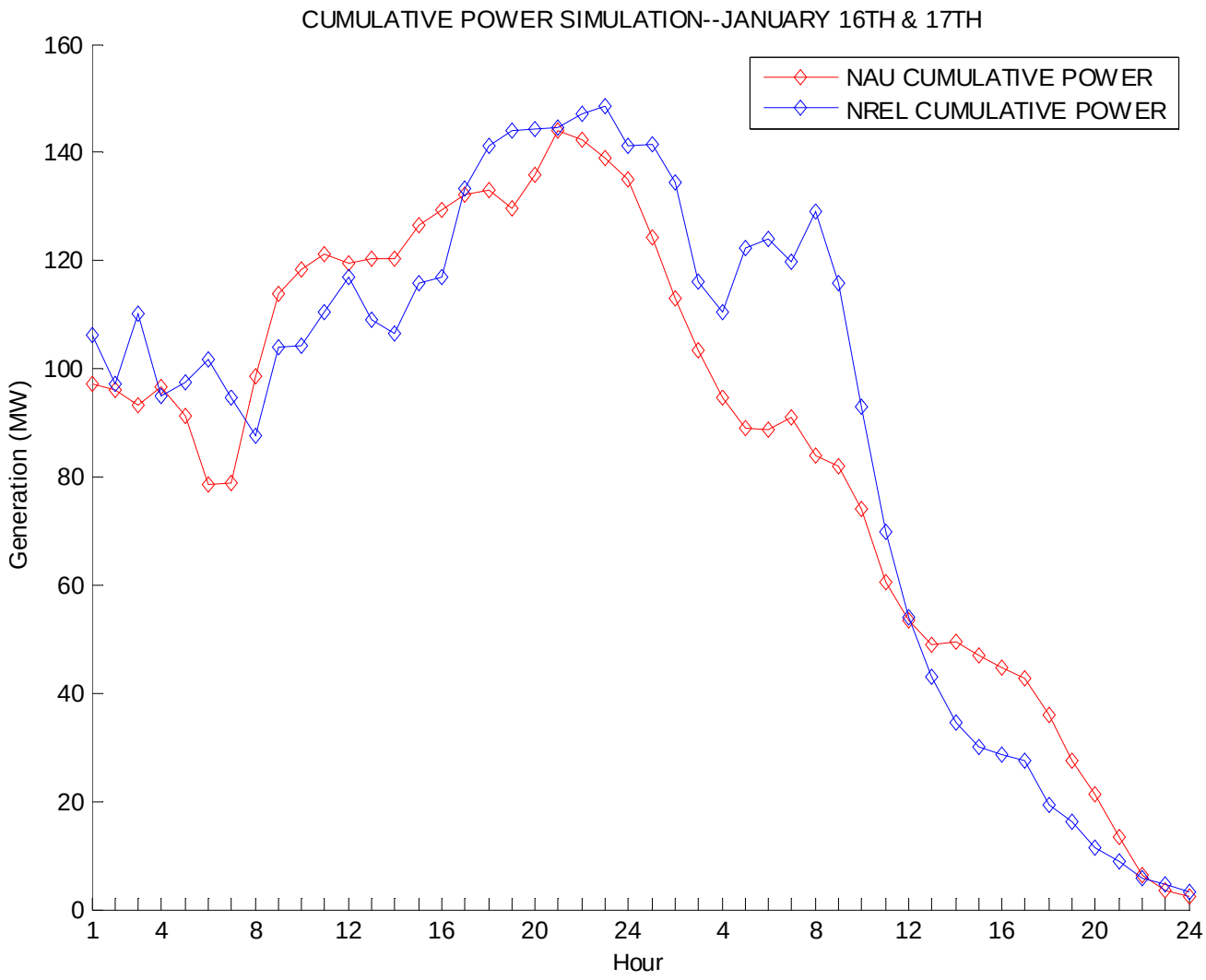

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Dec 31
Jan 1
Jan 2
Jan 3
Jan 4
Day


SPRINGERVILLE WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Dec 31
Jan 1
Jan 2
Jan 3
Jan 4
Day

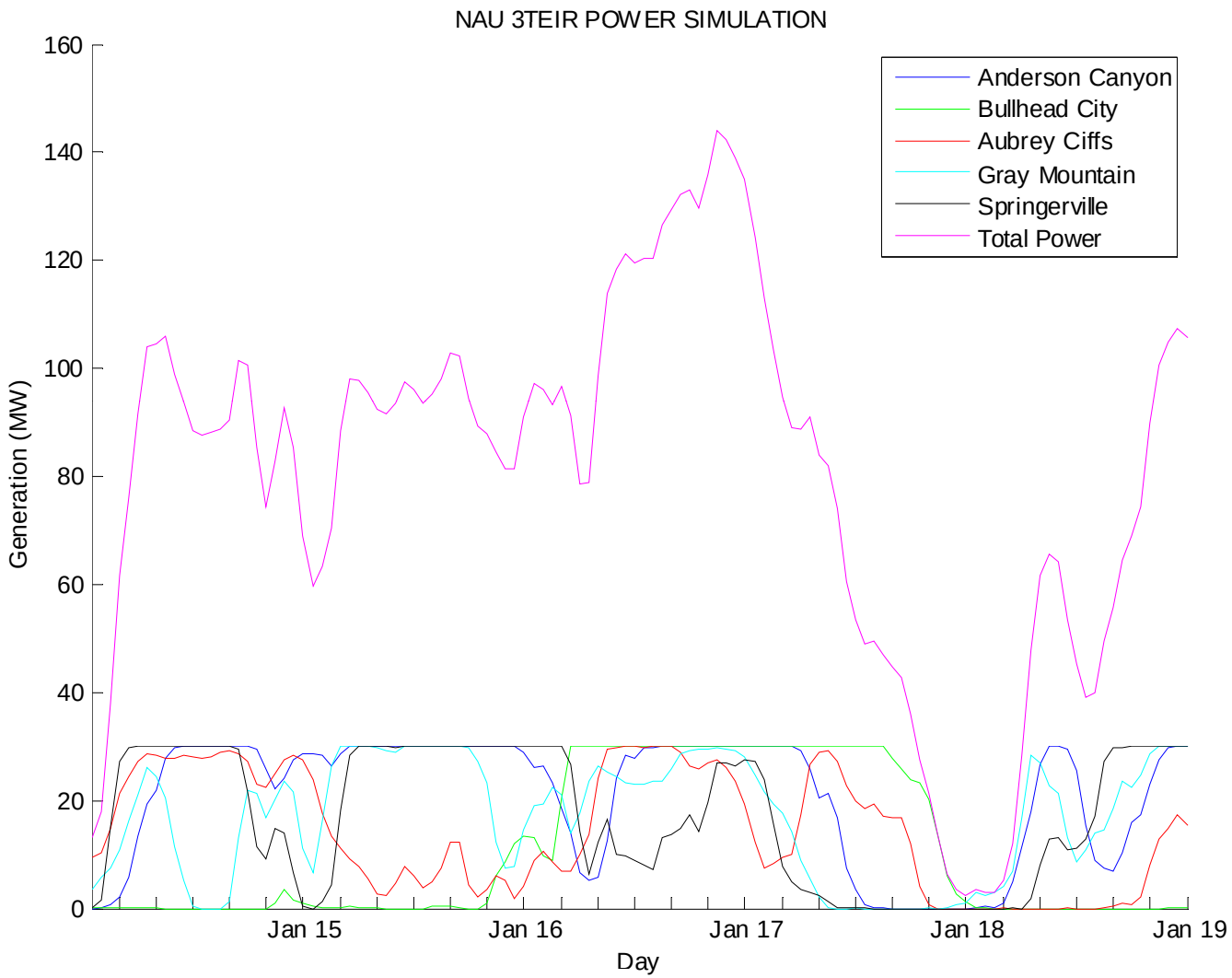
2-day Power Plots – January 16

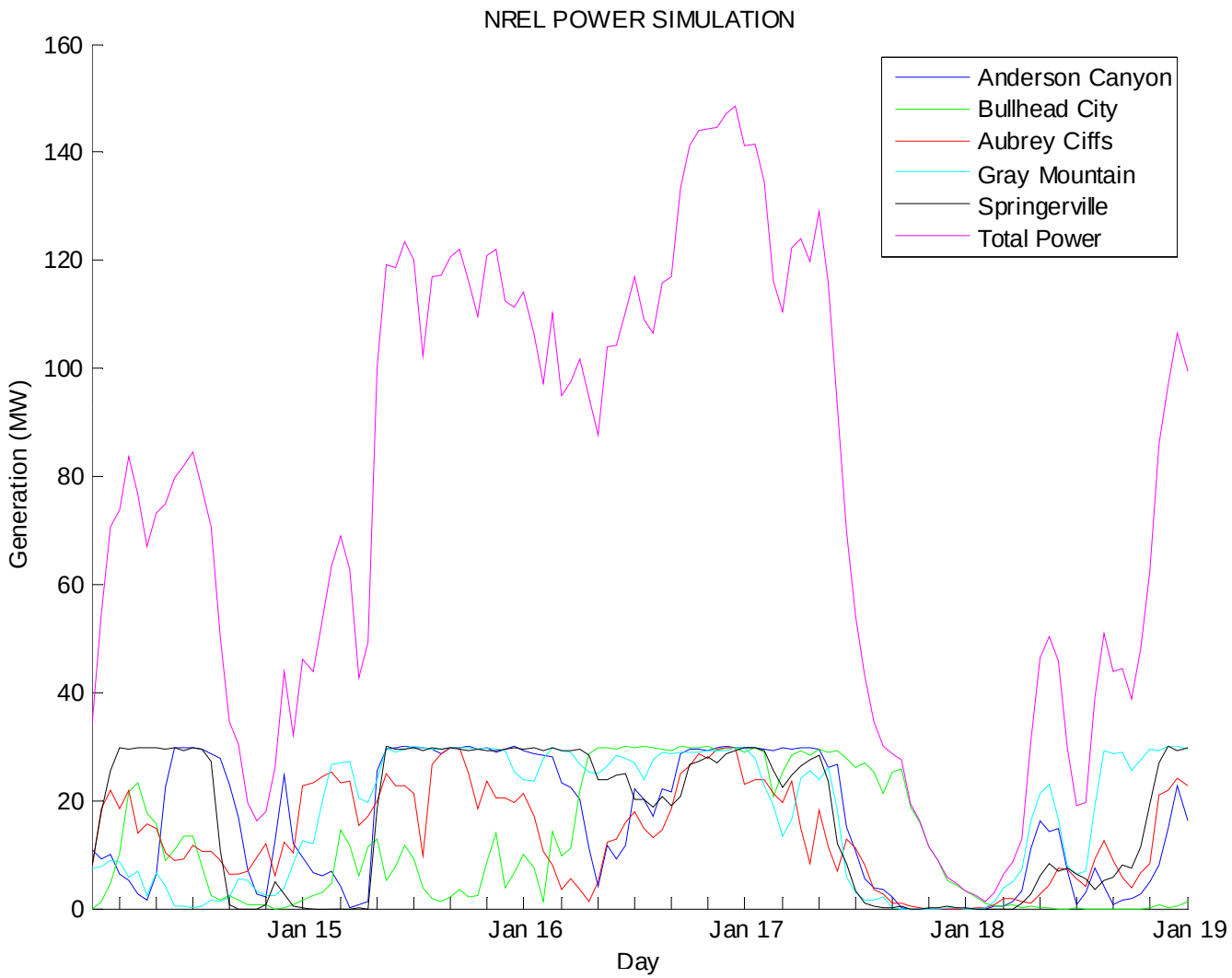


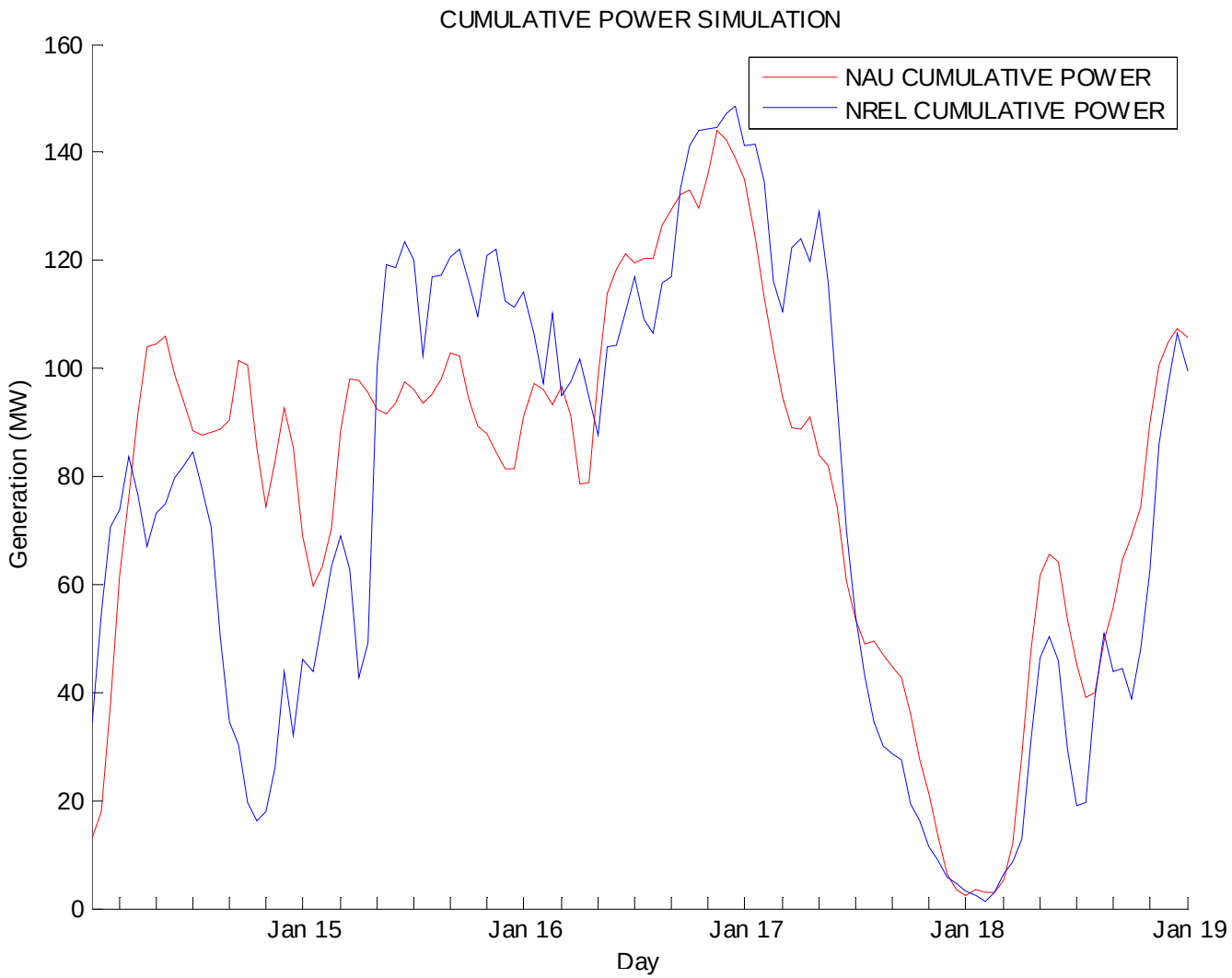

NREL POWER SIMULATION--JANUARY 16TH & 17TH
Generation (MW)
Hour
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--JANUARY 16TH & 17TH
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24

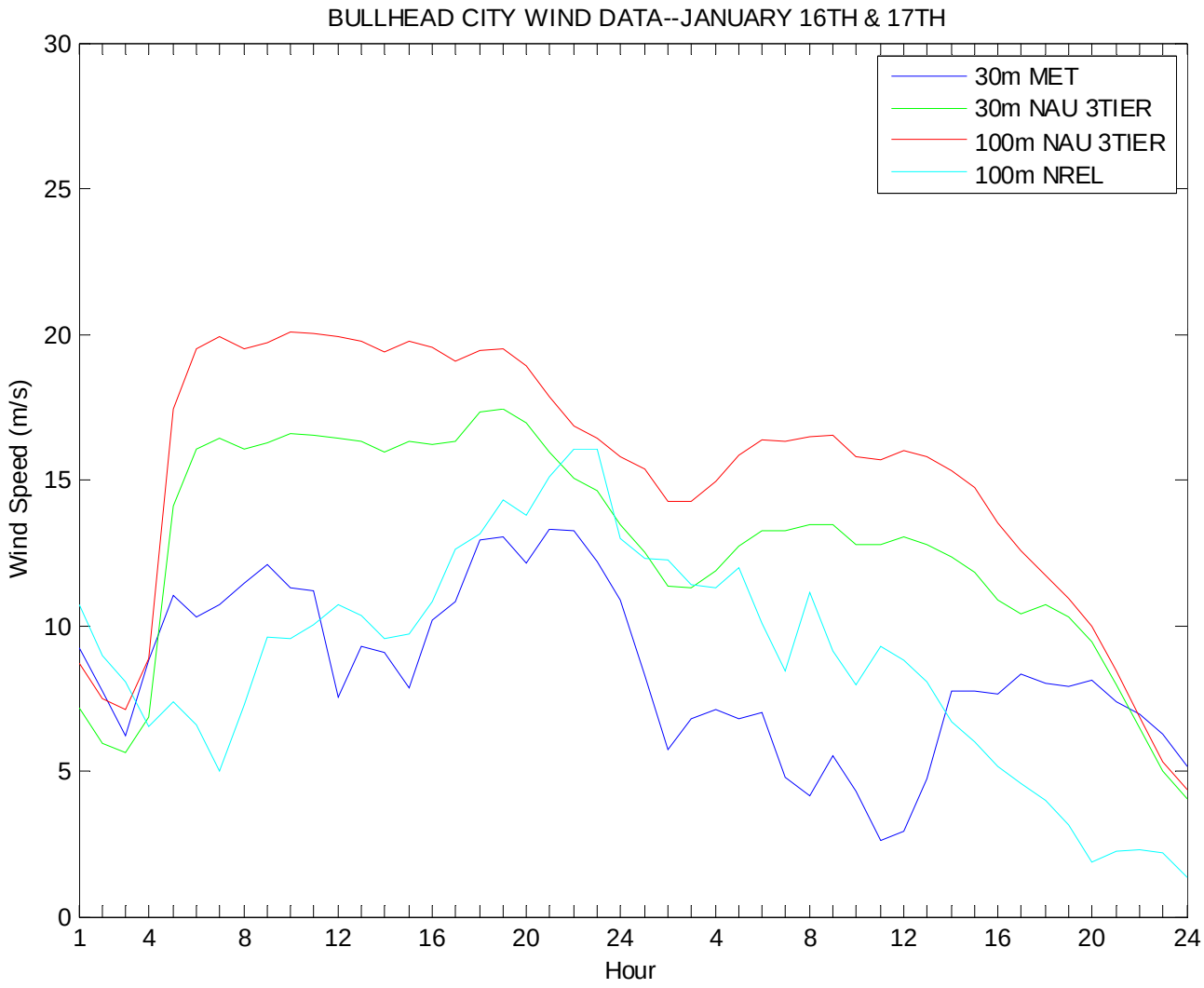
5-day Power Plots – January 16

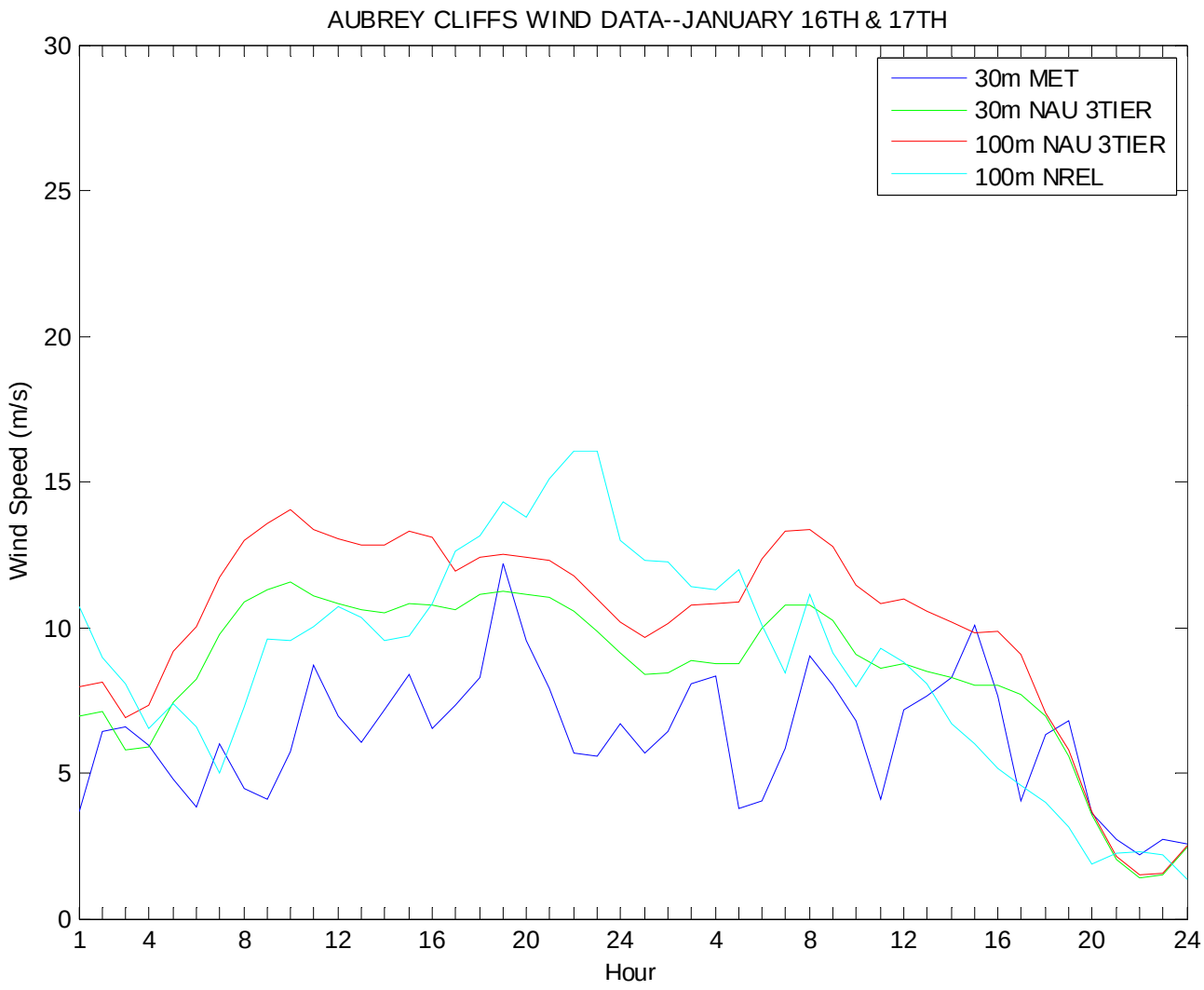


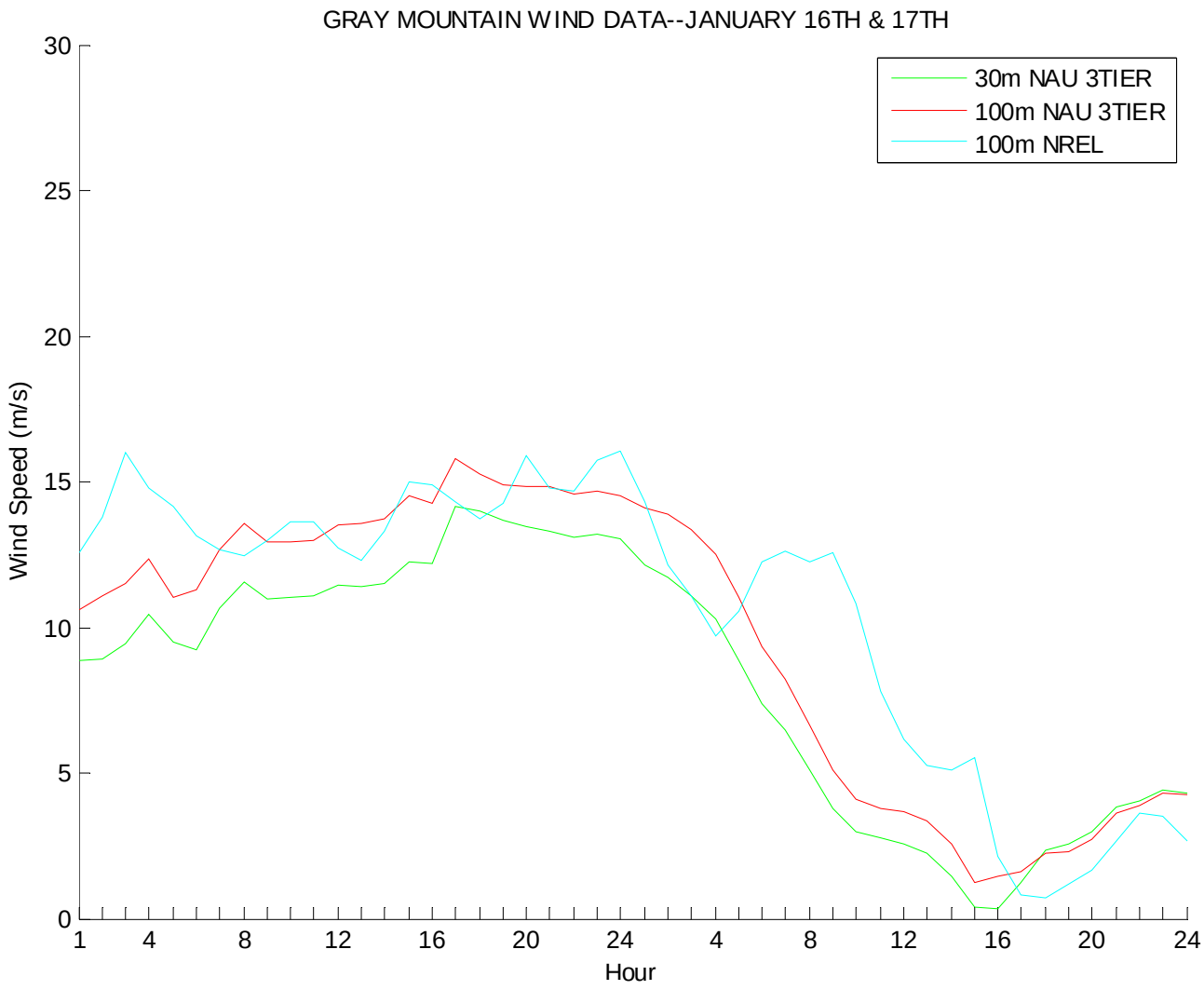

NREL POWER SIMULATION
Generation (MW)
160
140
120
100
80
60
40
20
0
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power


CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
0
20
40
60
80
100
120
140
160
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day

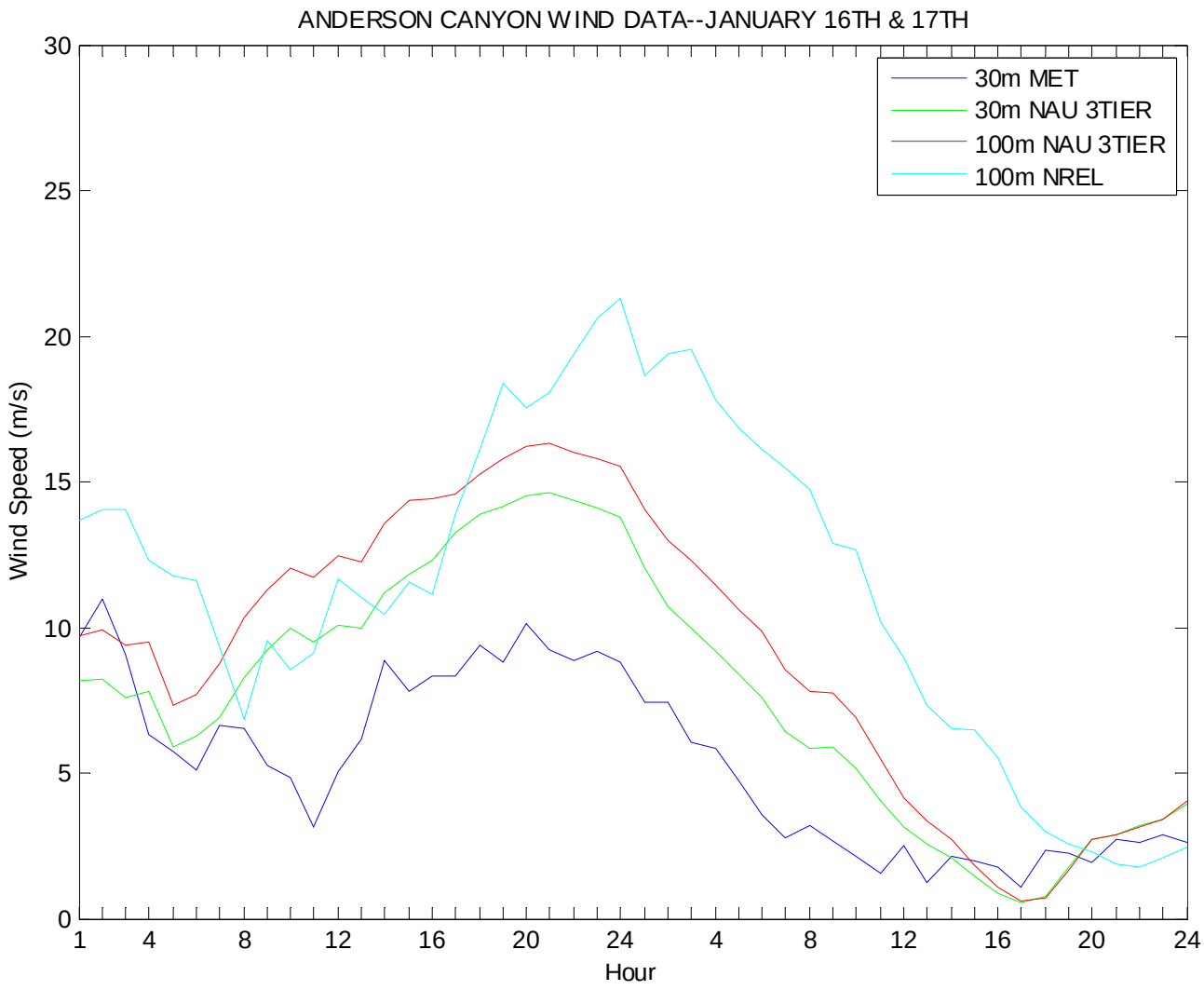
2-day Wind Plots – January 16

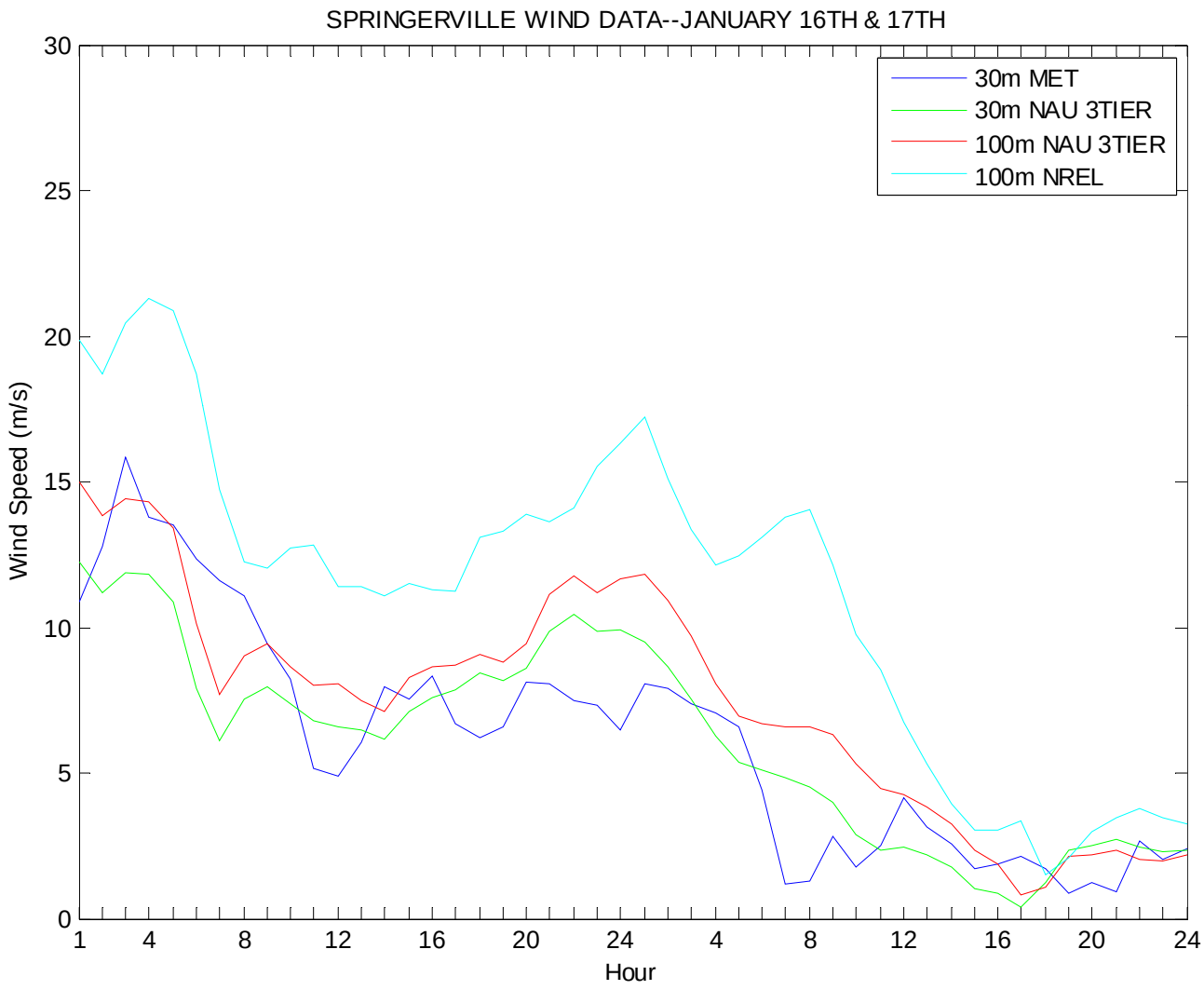



AUBREY CLIFFS WIND DATA--JANUARY 16TH & 17TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

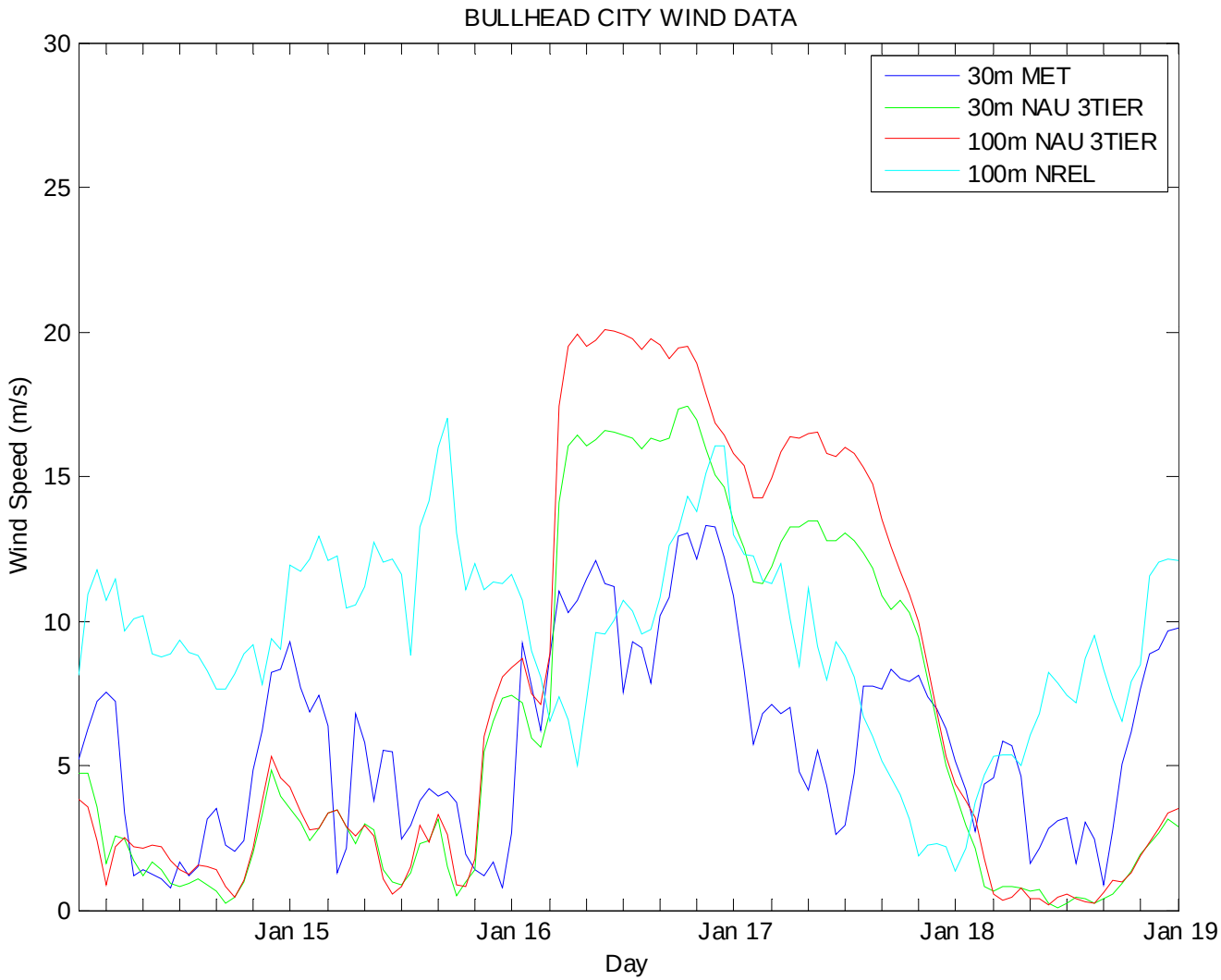


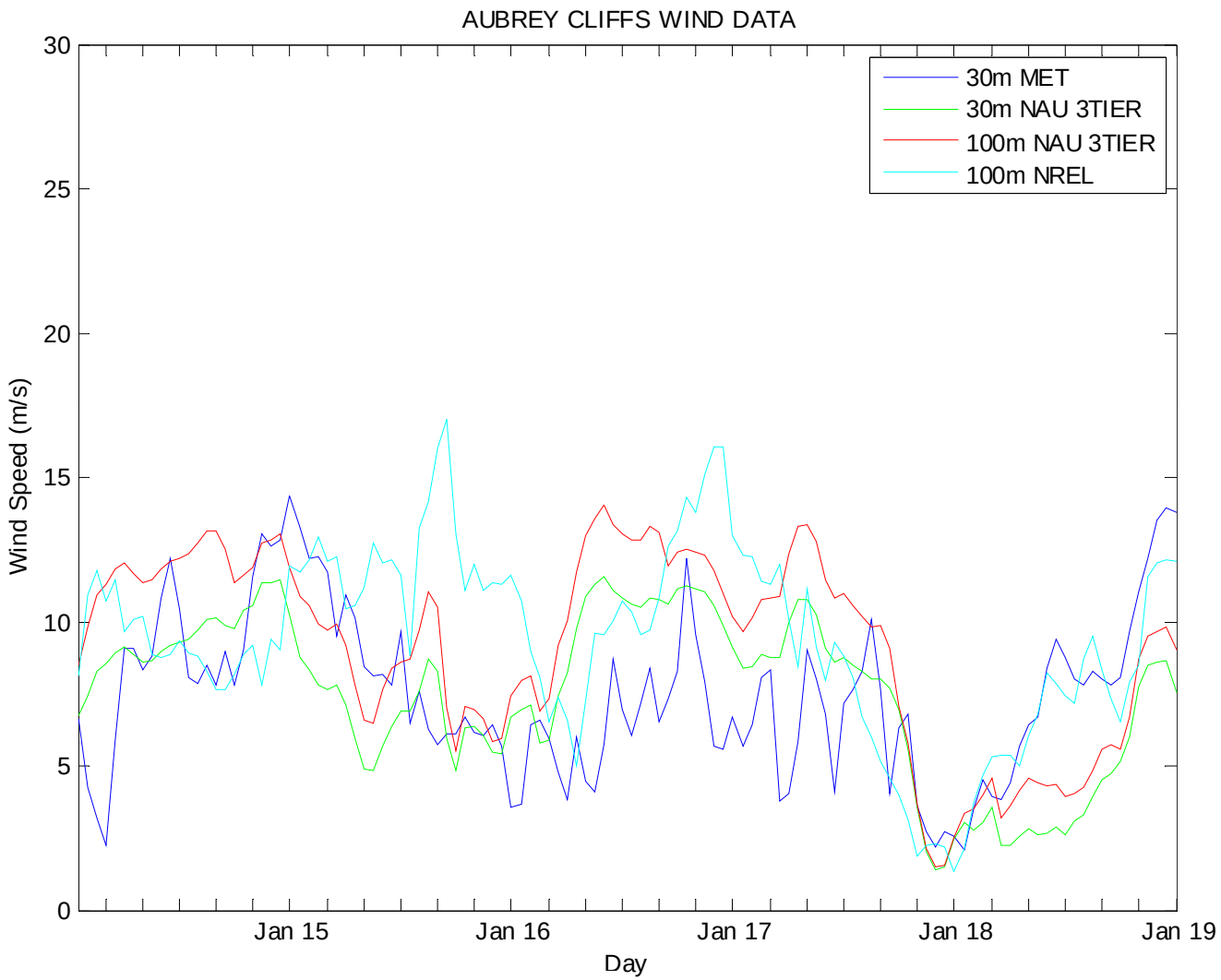
Note, no met tower data was available at Gray Mountain for these dates.

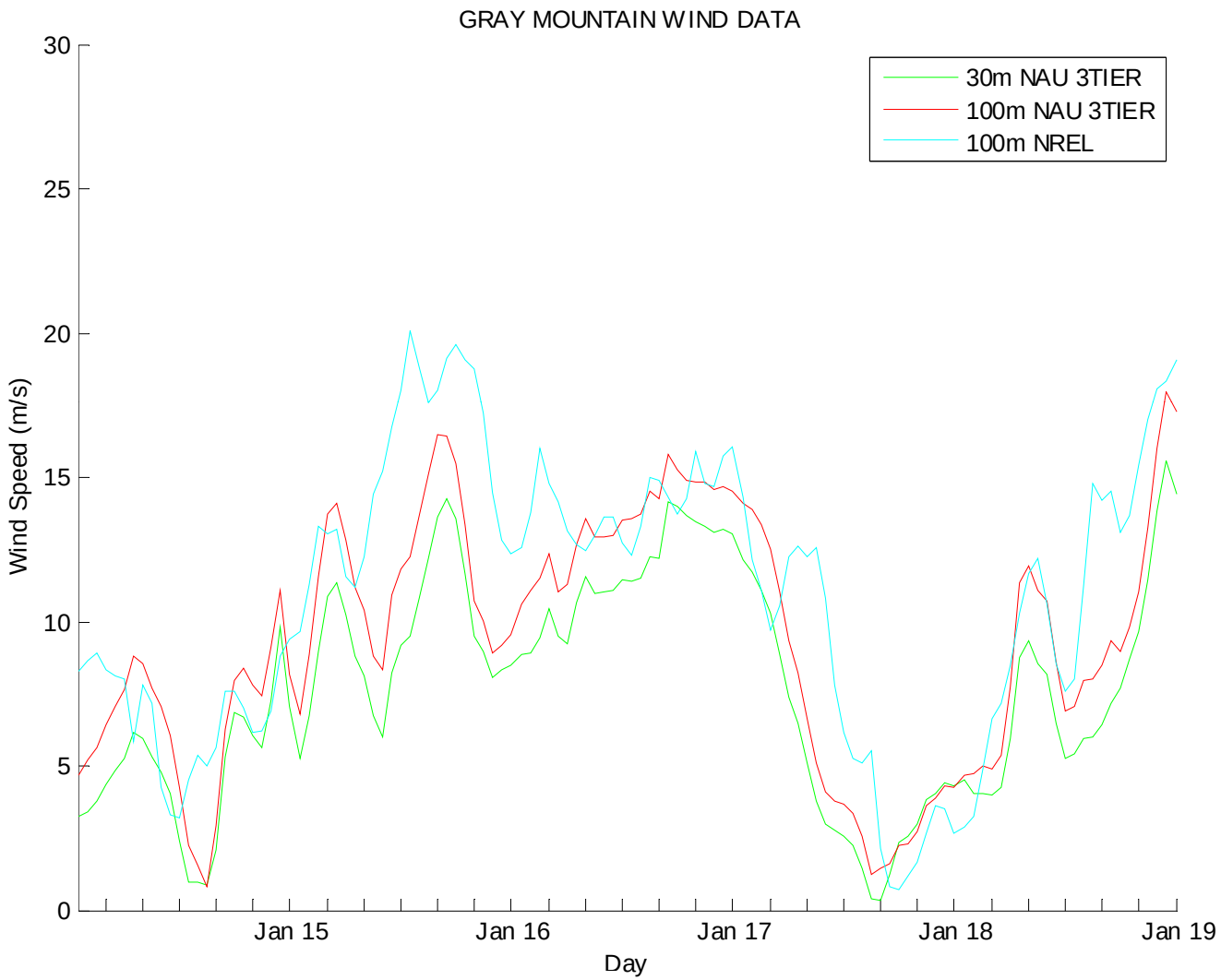

ANDERSON CANYON WIND DATA--JANUARY 16TH & 17TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24


SPRINGERVILLE WIND DATA--JANUARY 16TH & 17TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

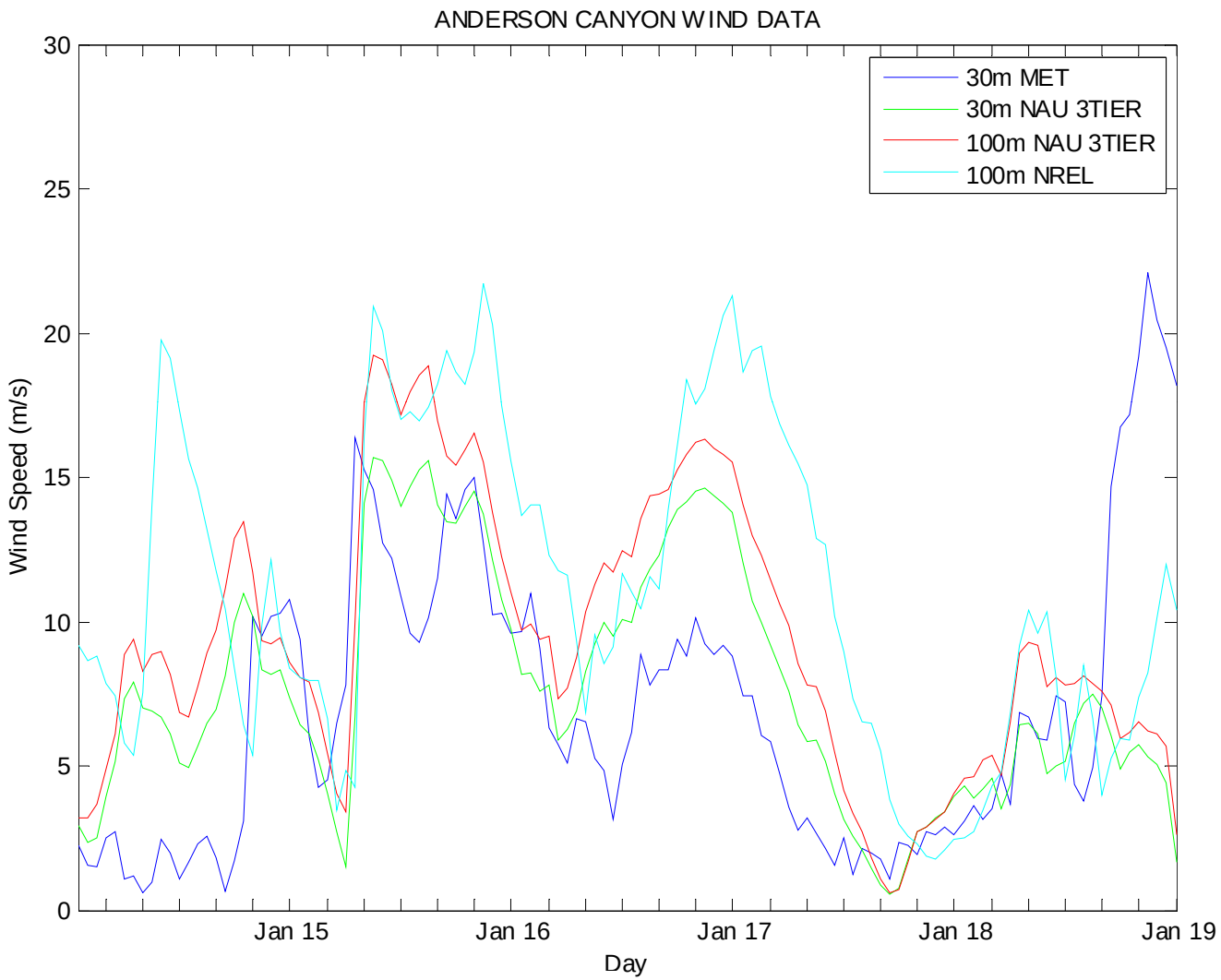
5-day Wind Plots – January 16

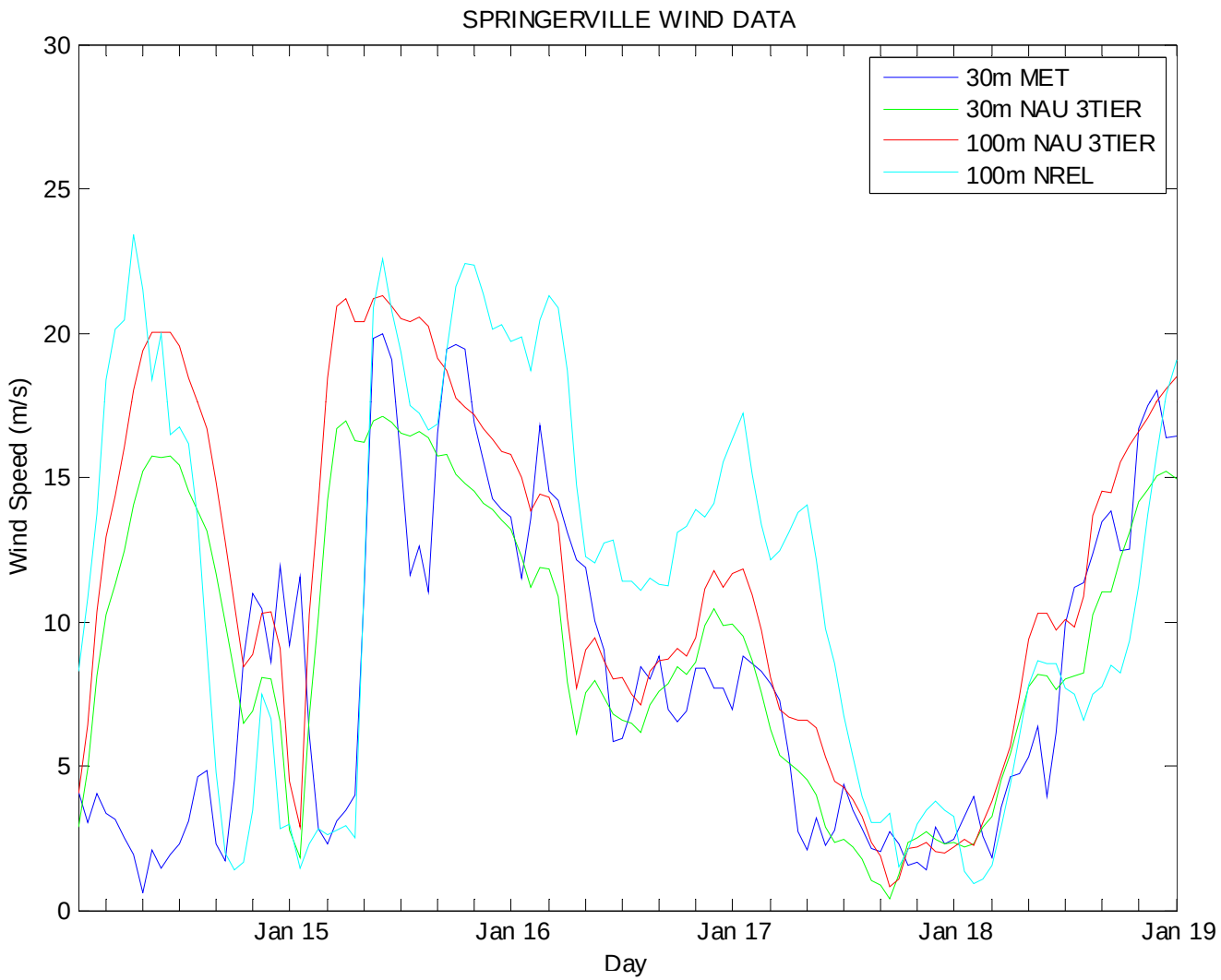



AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day

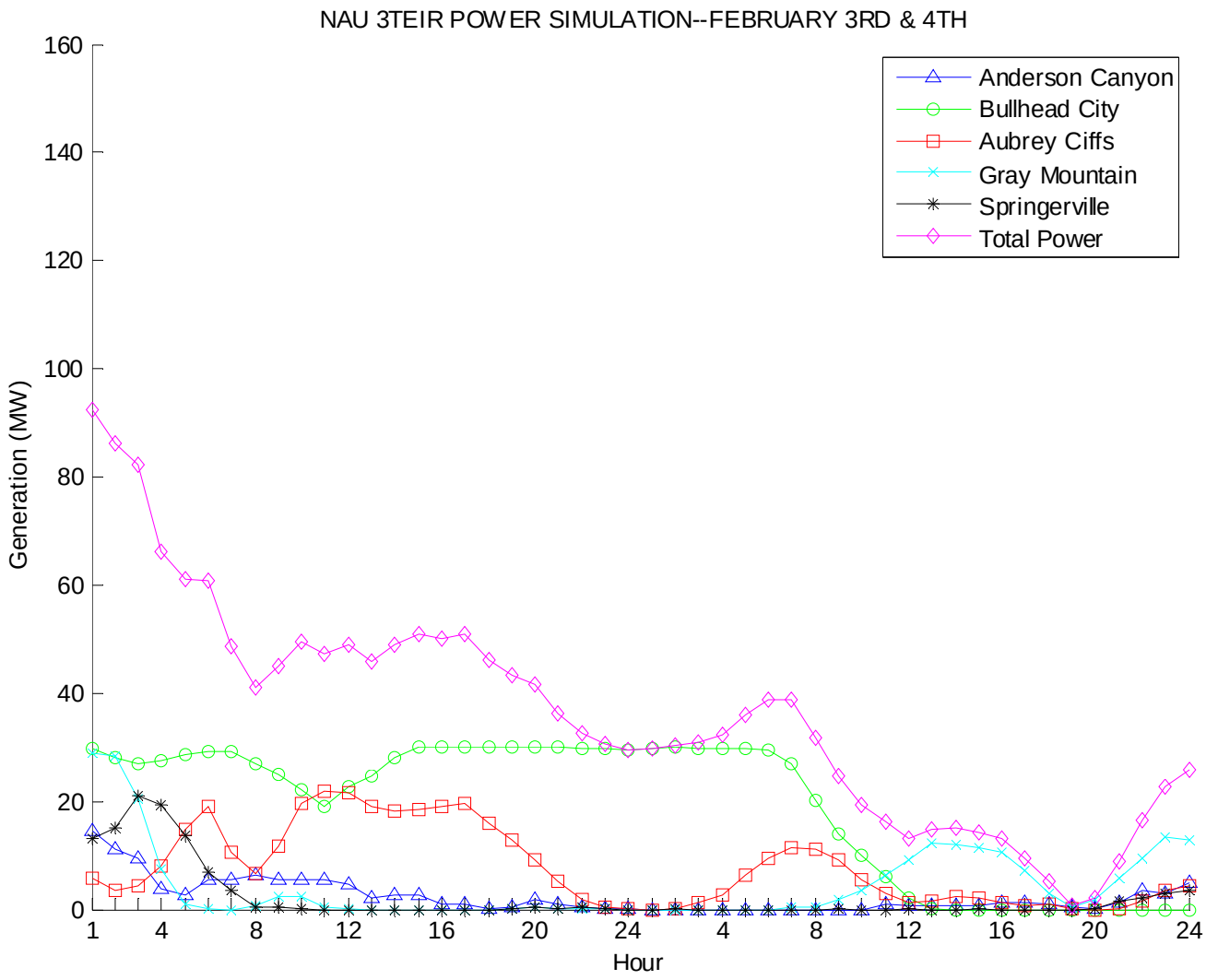


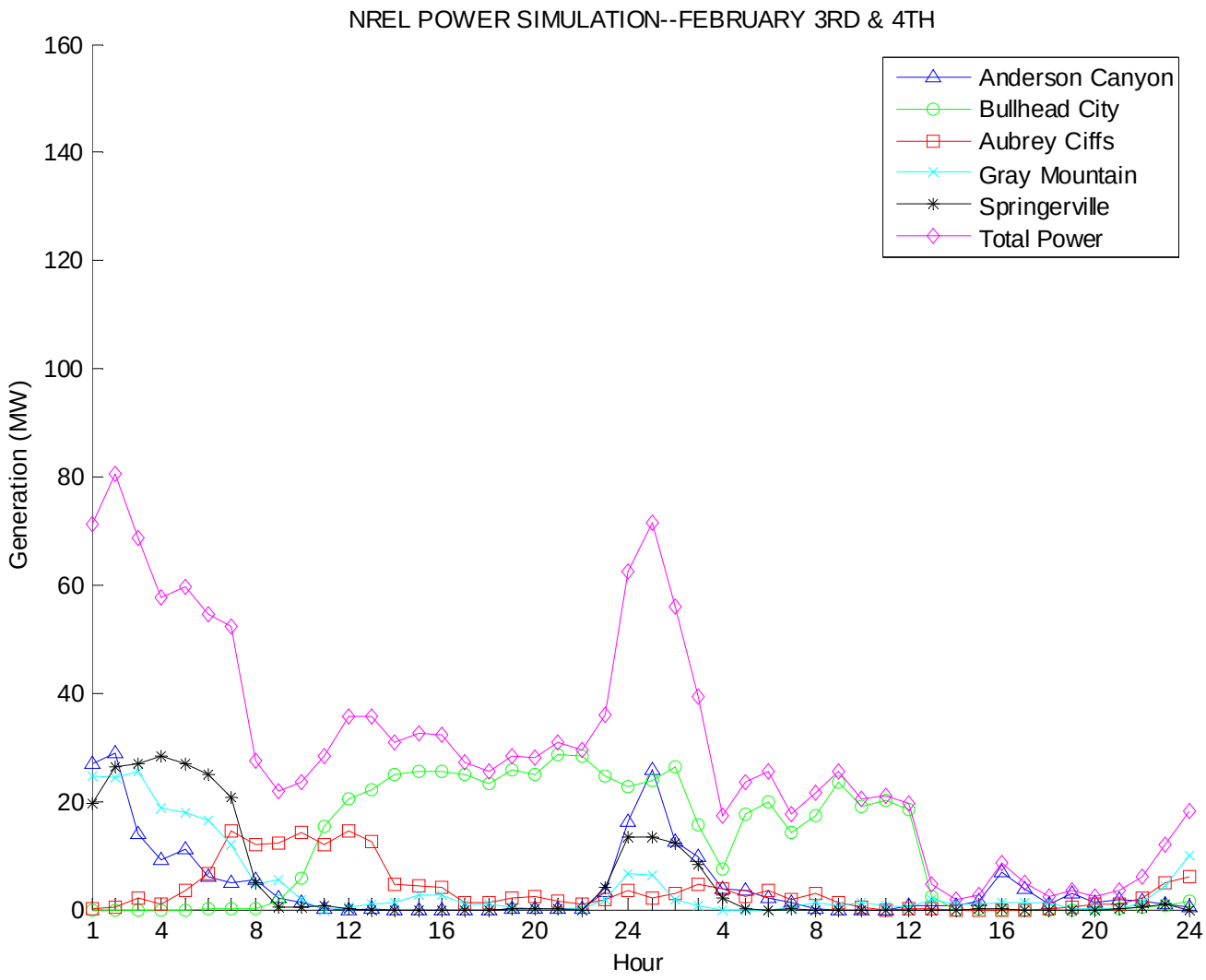
Note, no met tower data was available at Gray Mountain for these dates.

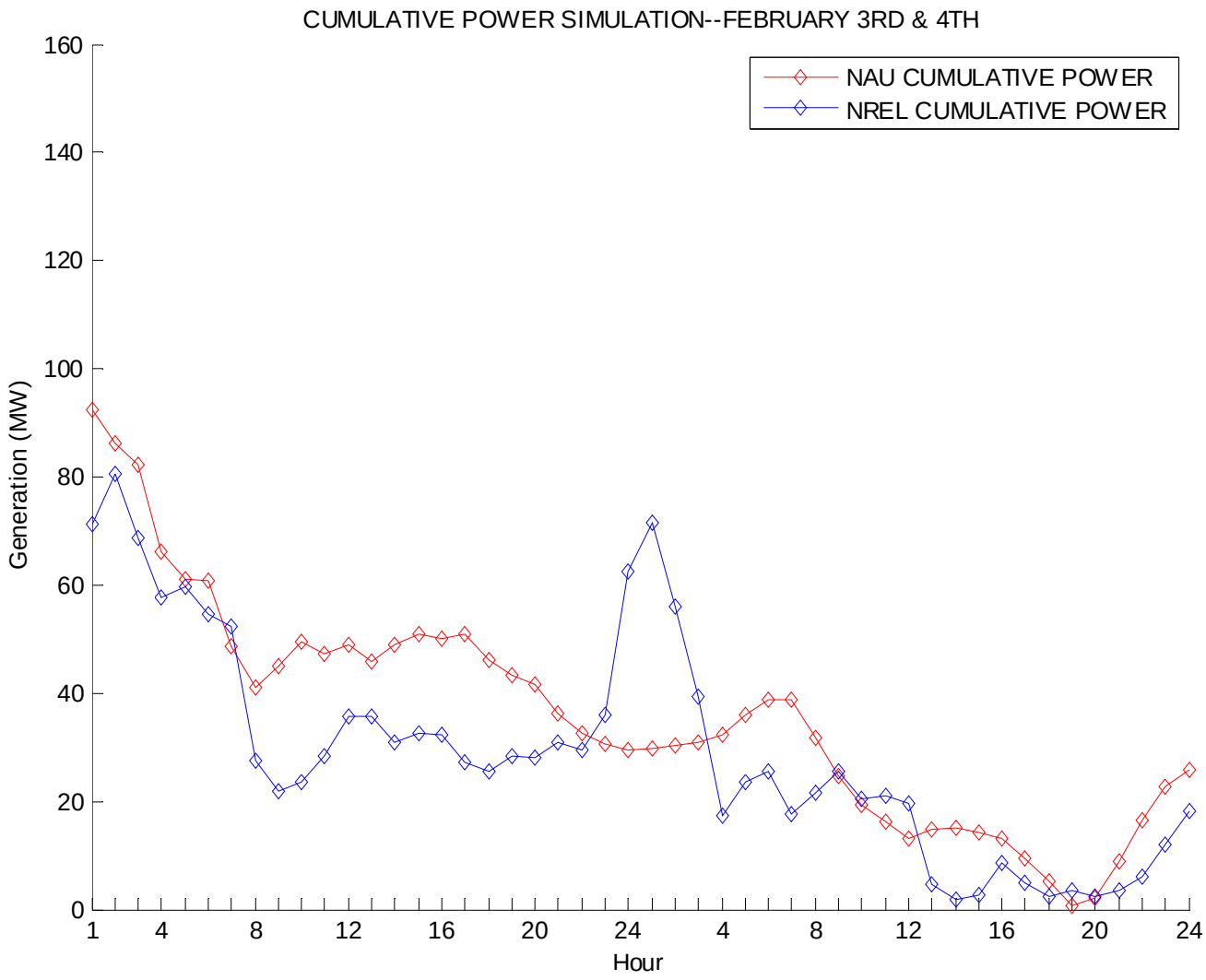

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day


SPRINGERVILLE WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Day

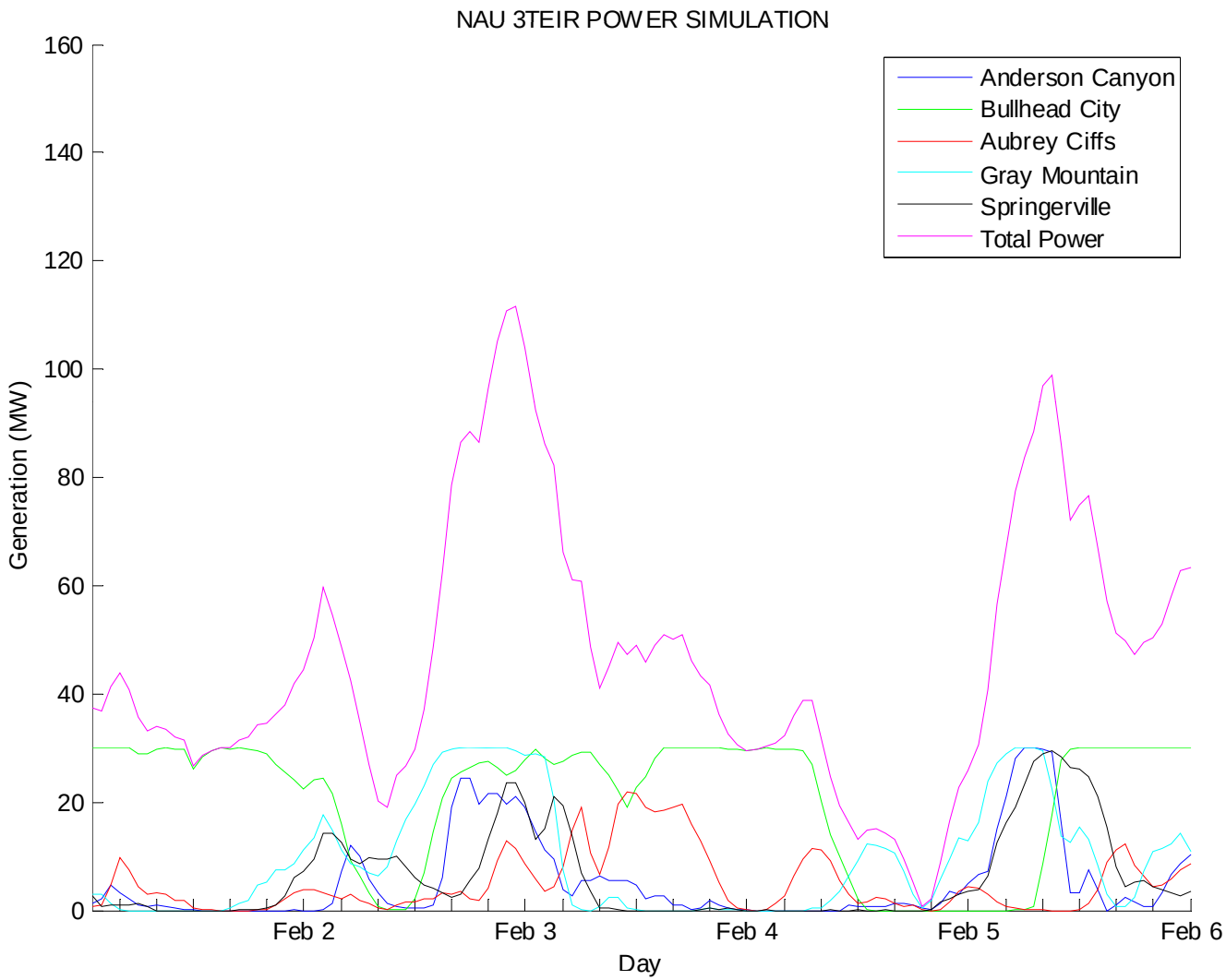
2-day Power Plots – February 3

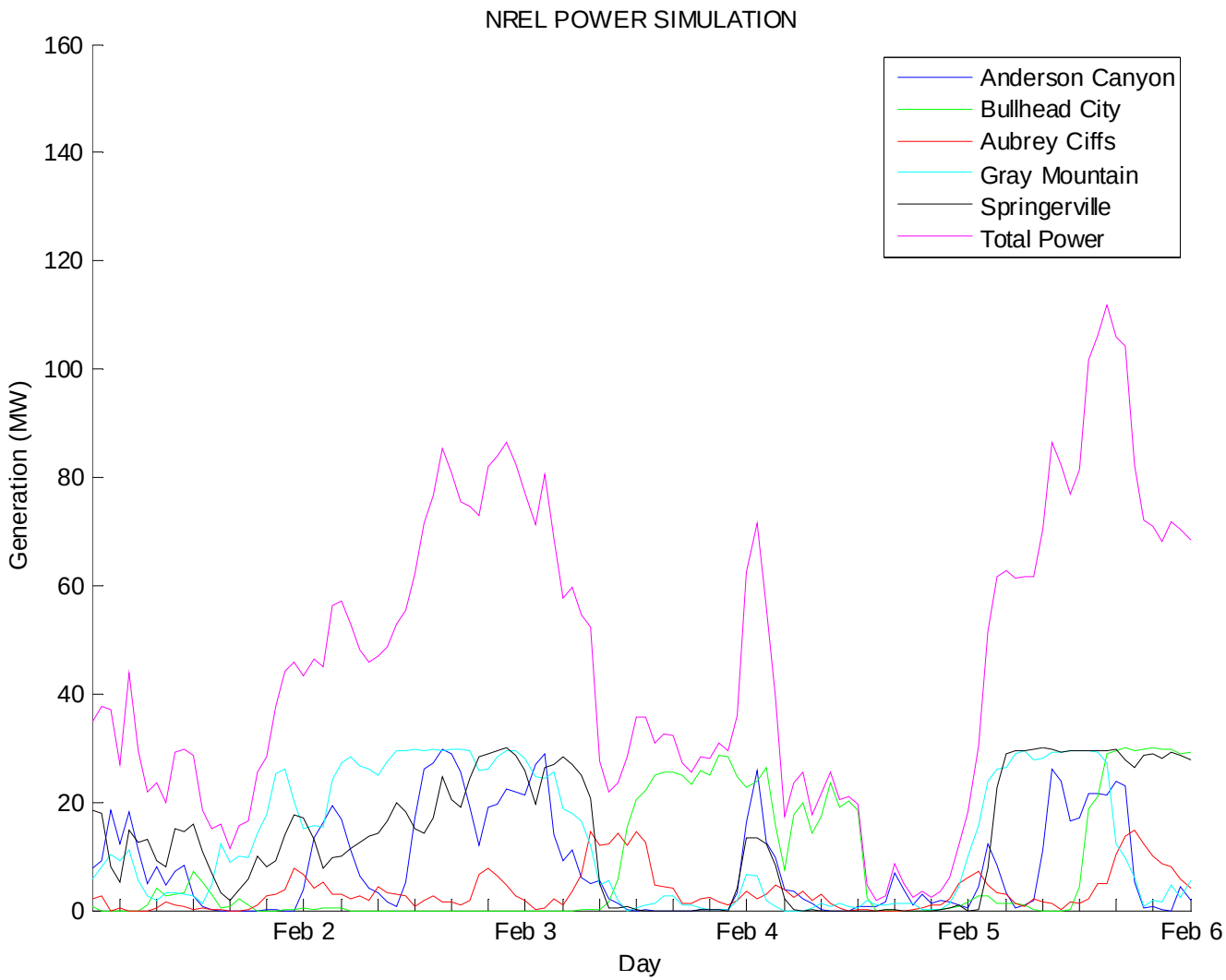


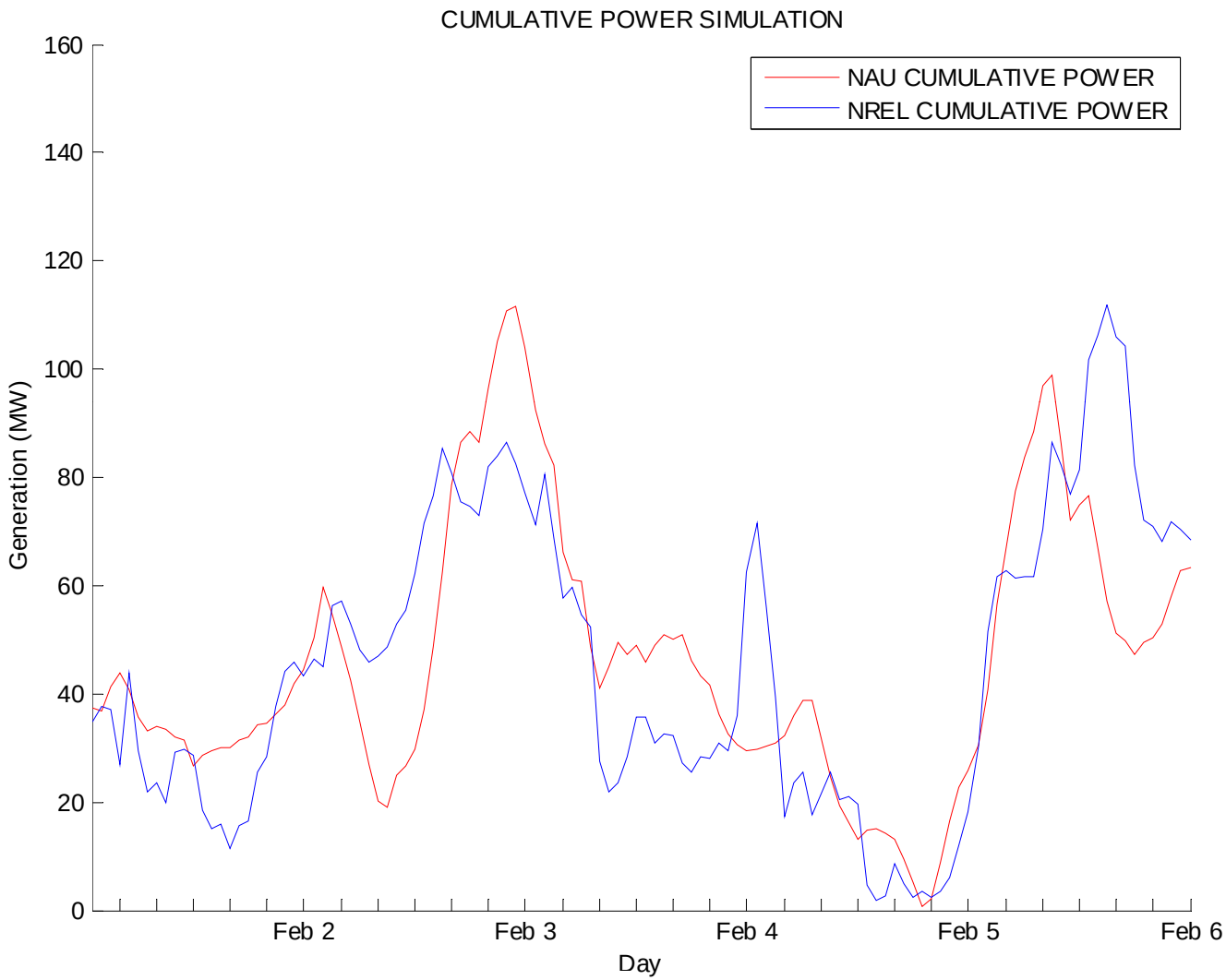

NREL POWER SIMULATION--FEBRUARY 3RD & 4TH
Generation (MW)
Hour
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--FEBRUARY 3RD & 4TH
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24

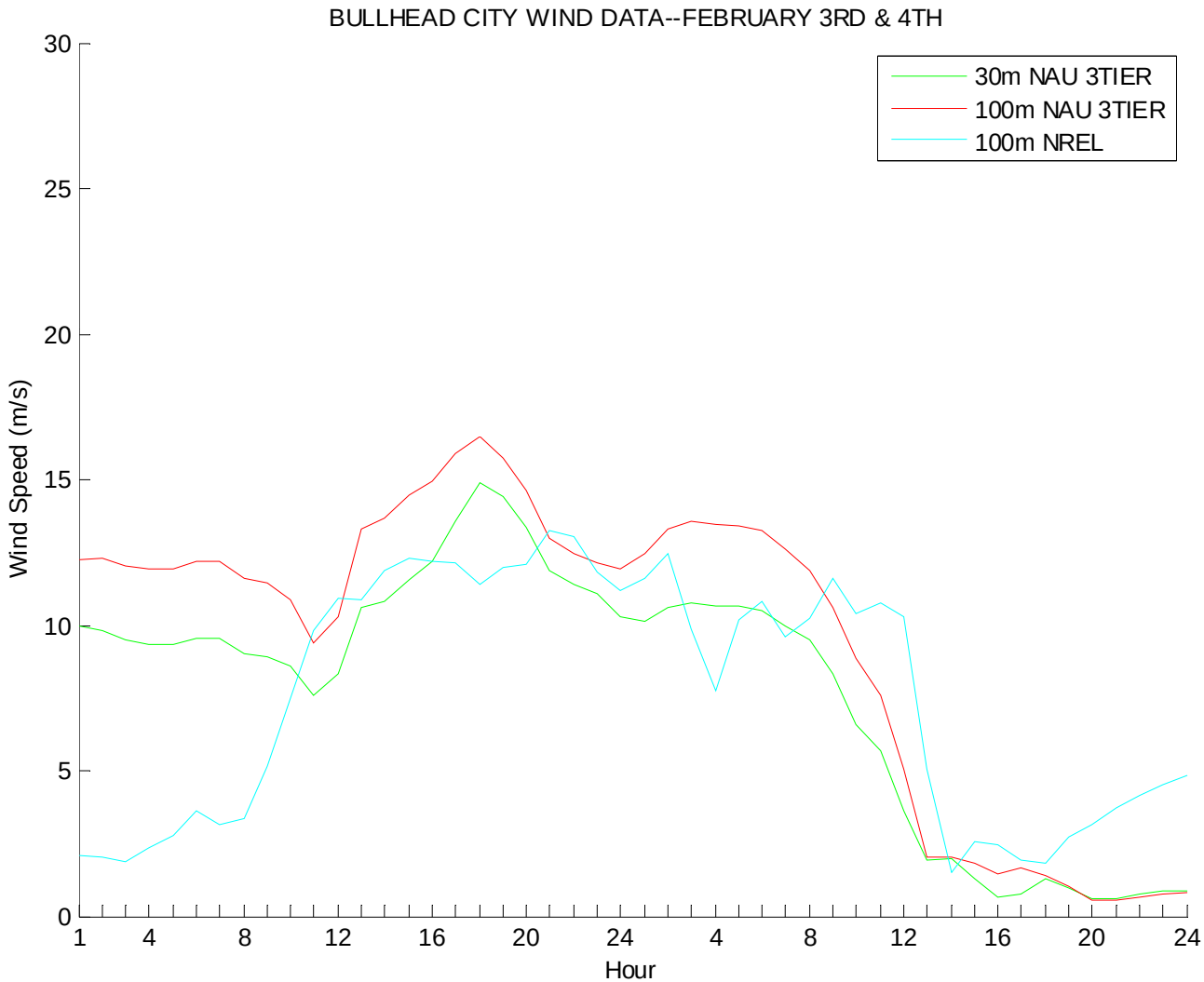
5-day Power Plots – February 3



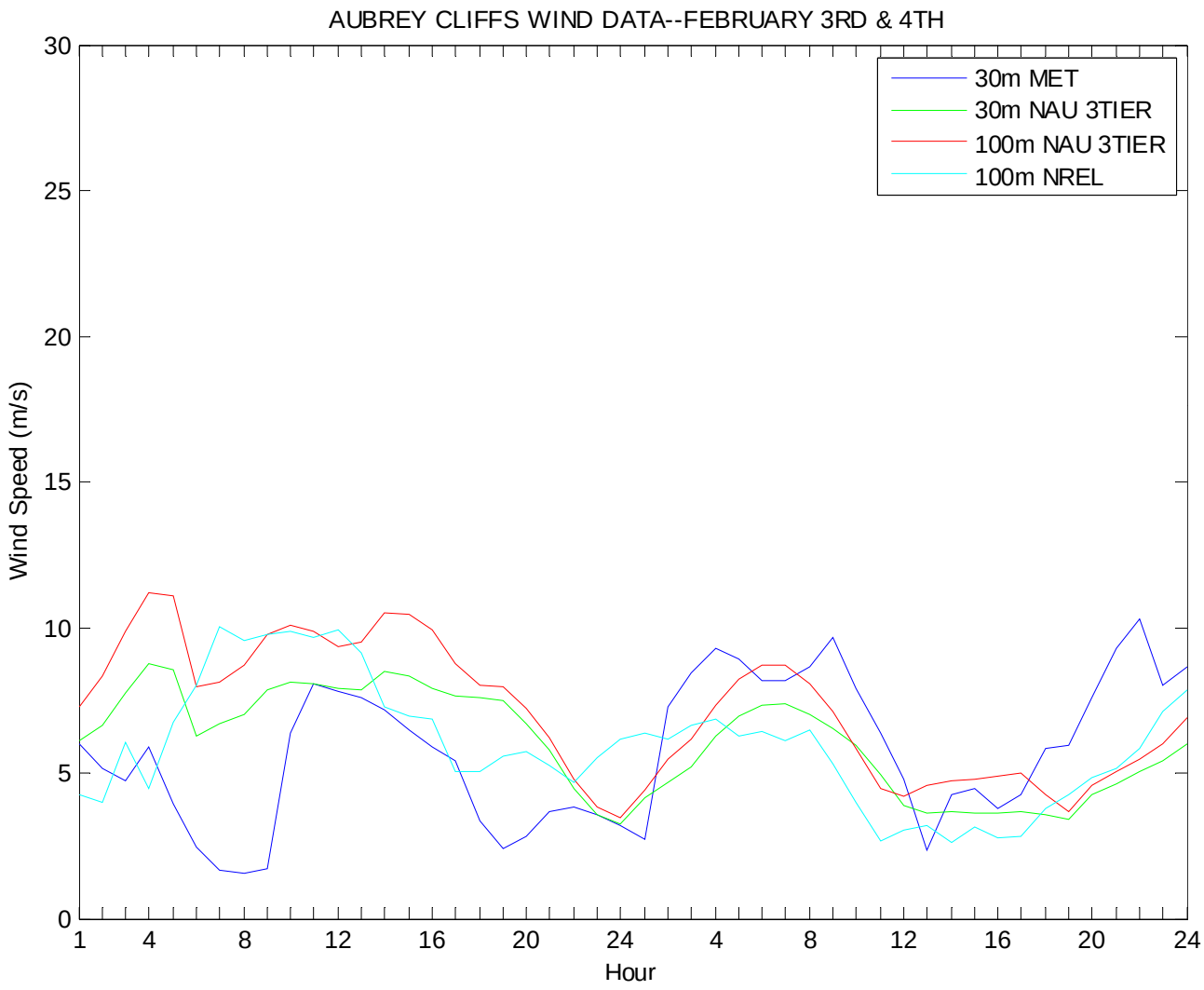

NREL POWER SIMULATION
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
Generation (MW)
0
20
40
60
80
100
120
140
160
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day

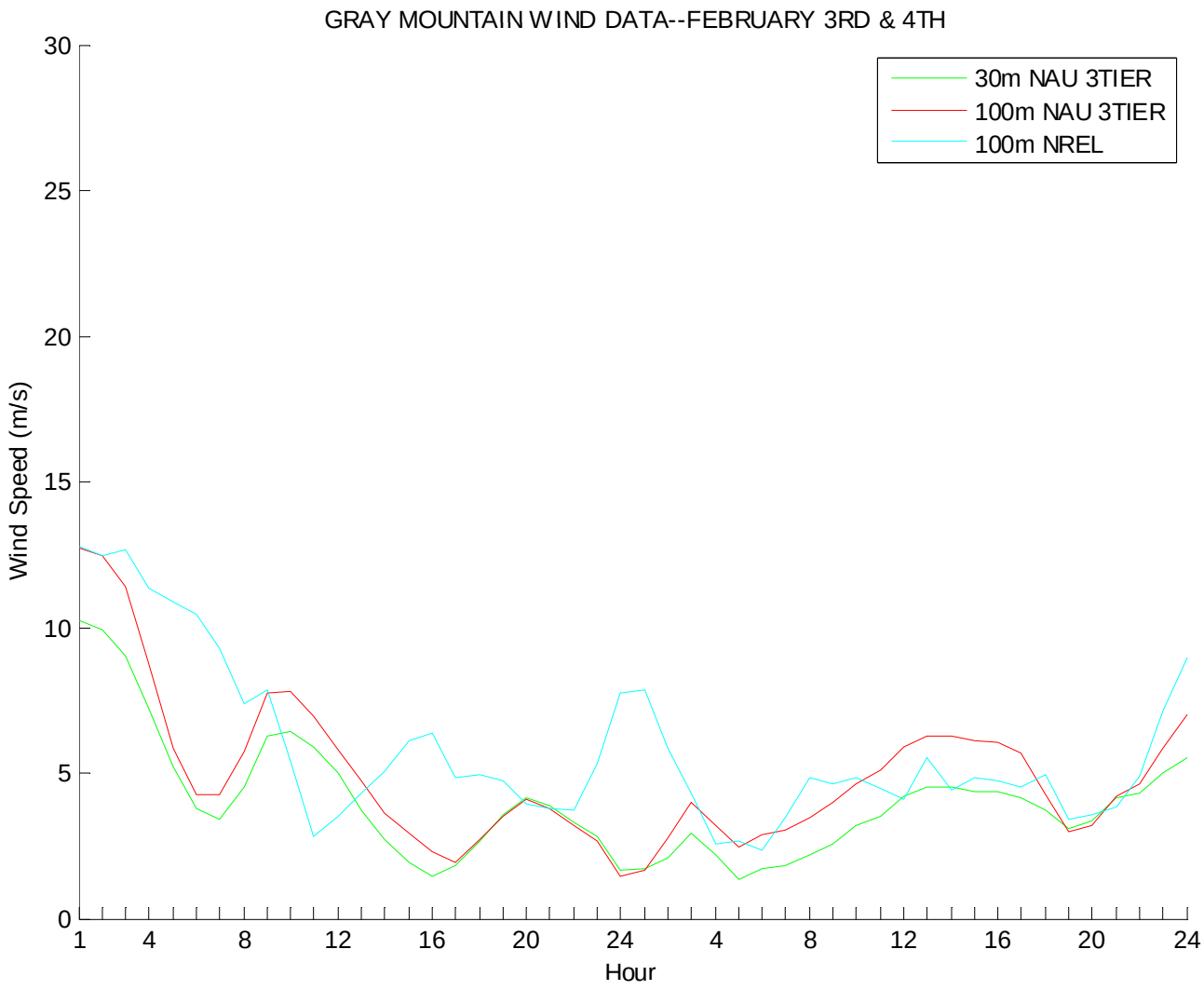

CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
0
20
40
60
80
100
120
140
160
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day

2-day Wind Plots – February 3

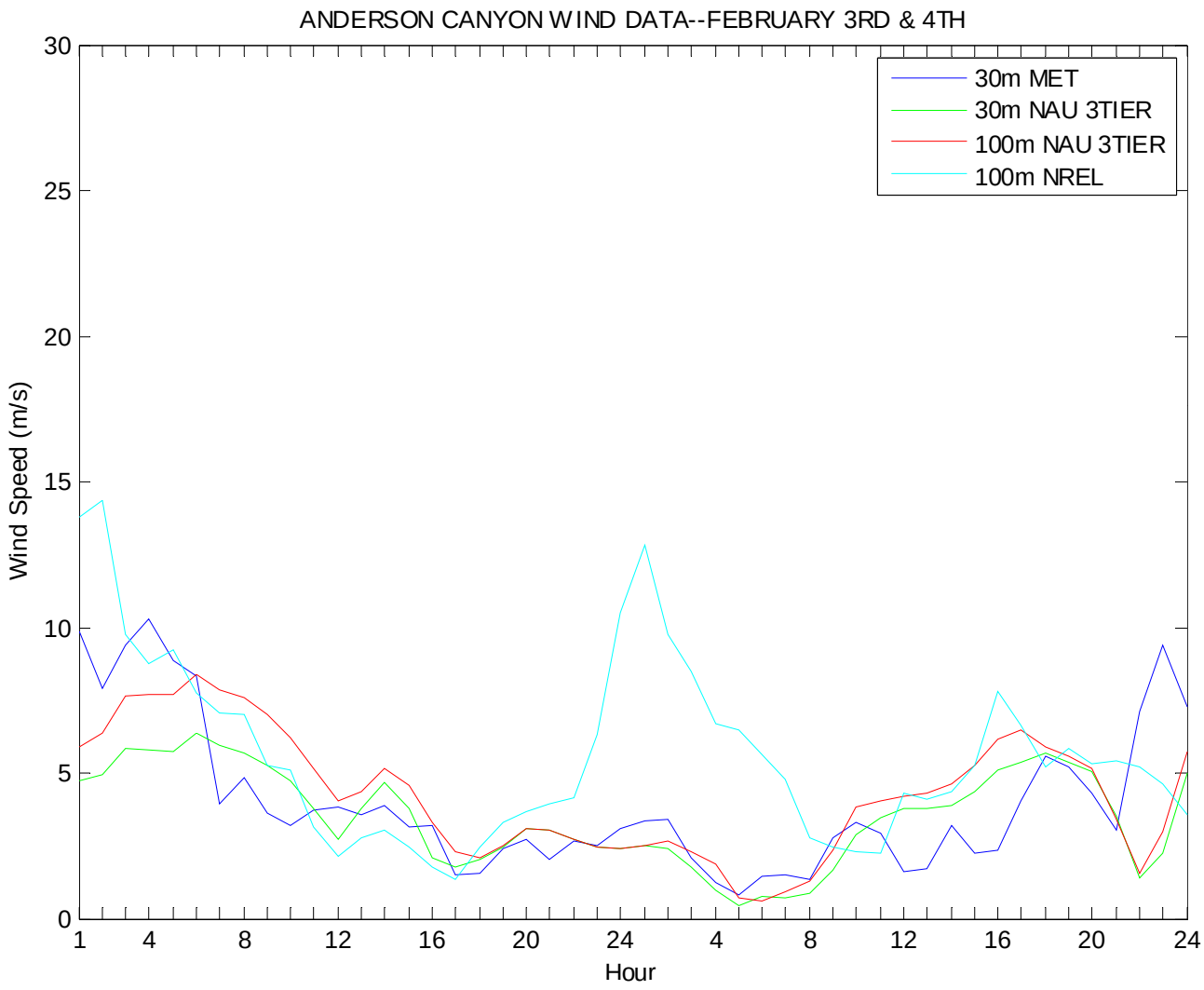


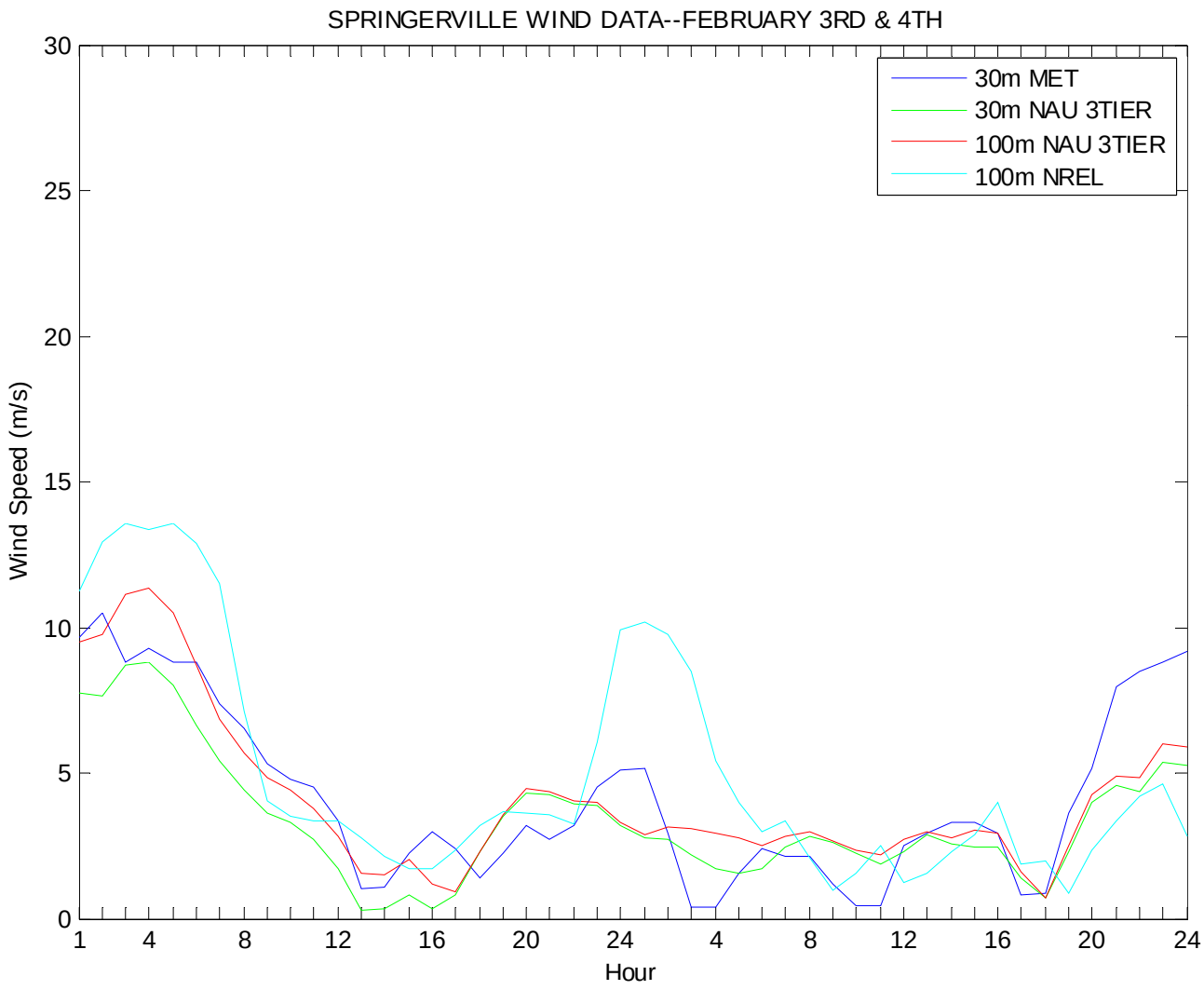
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA--FEBRUARY 3RD & 4TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

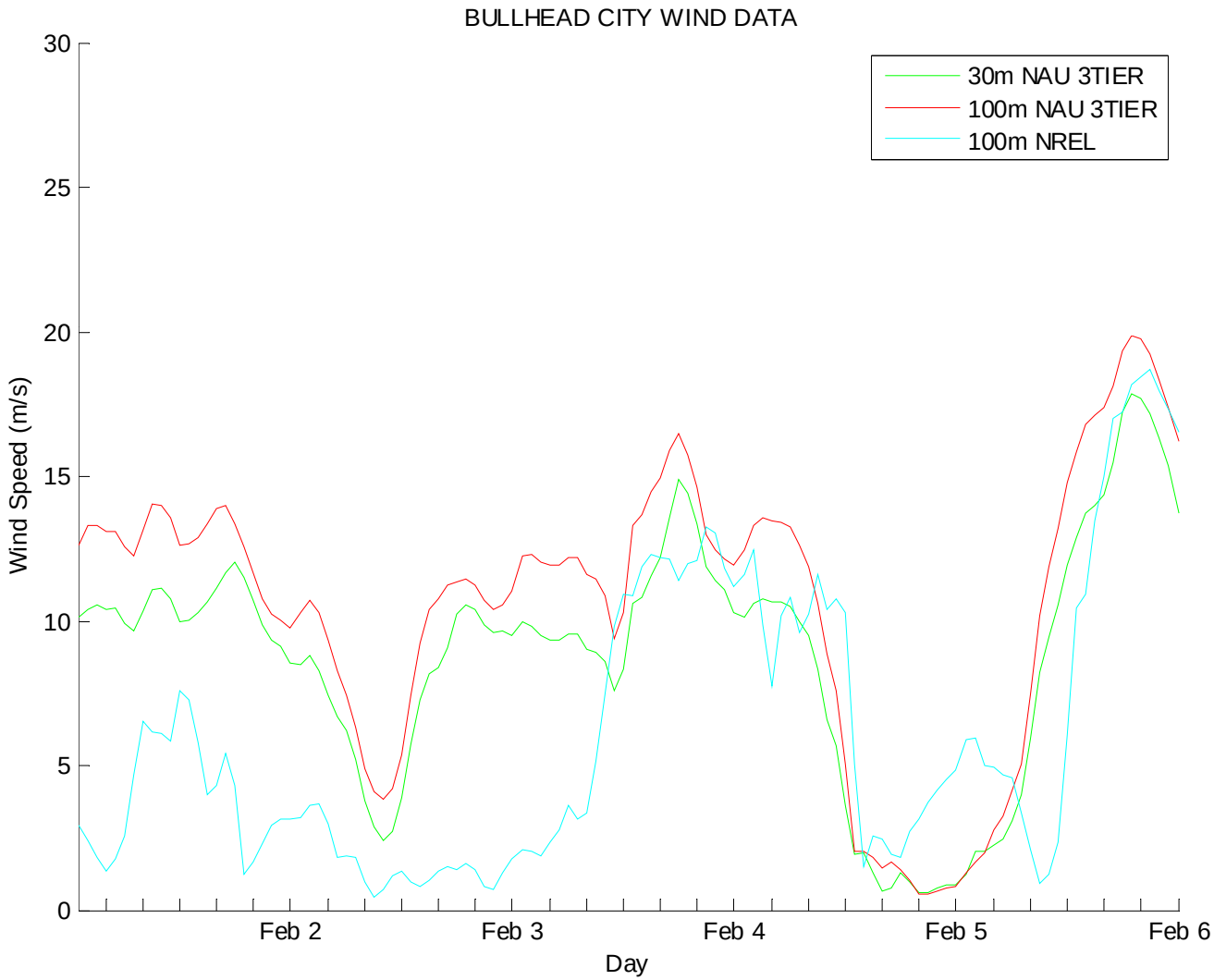


Note, no met tower data was available at Gray Mountain for these dates.

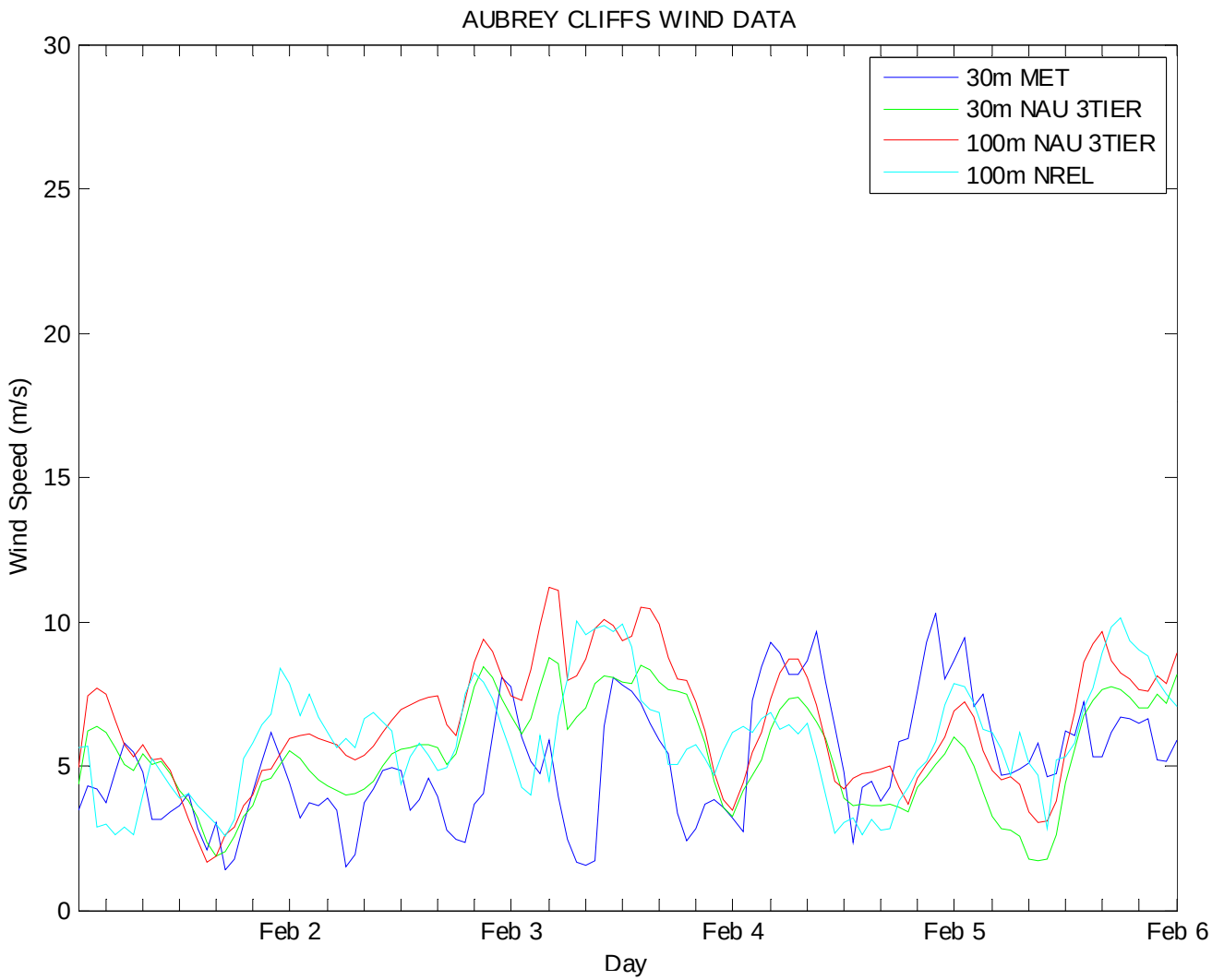

ANDERSON CANYON WIND DATA--FEBRUARY 3RD & 4TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

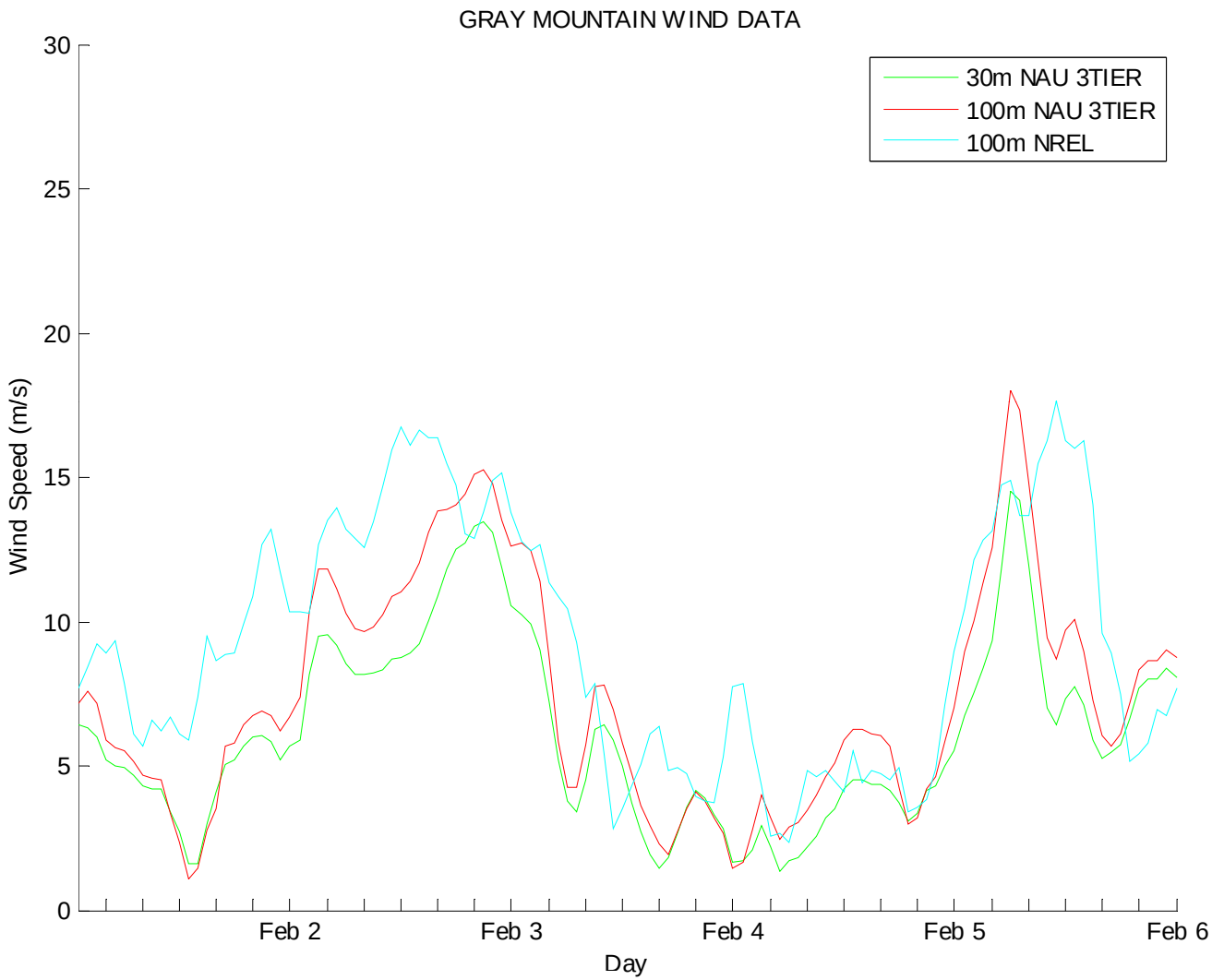

SPRINGERVILLE WIND DATA--FEBRUARY 3RD & 4TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
1
4
8
12
16
20
24
4
8
12
16
20
24

5-day Wind Plots – February 3

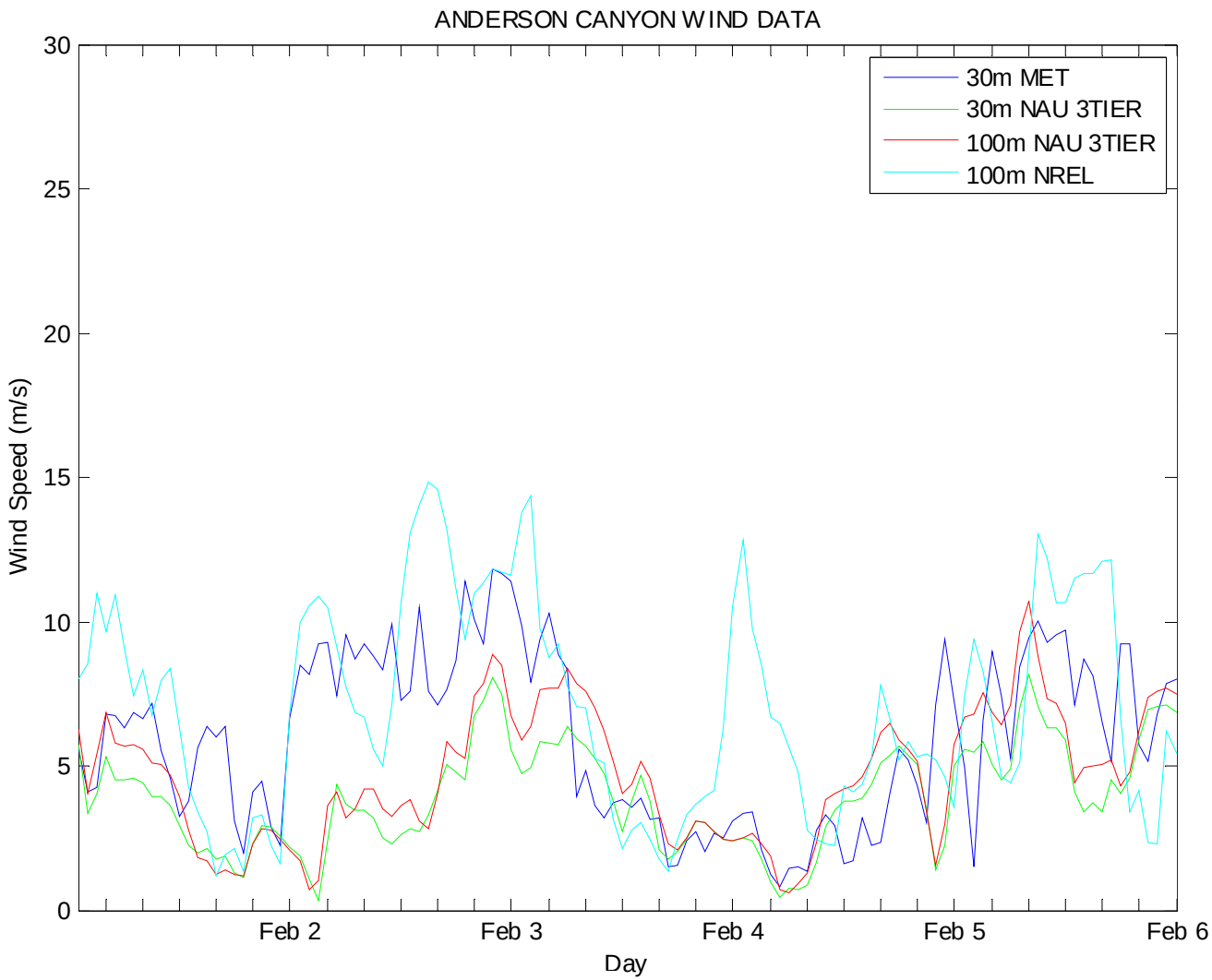


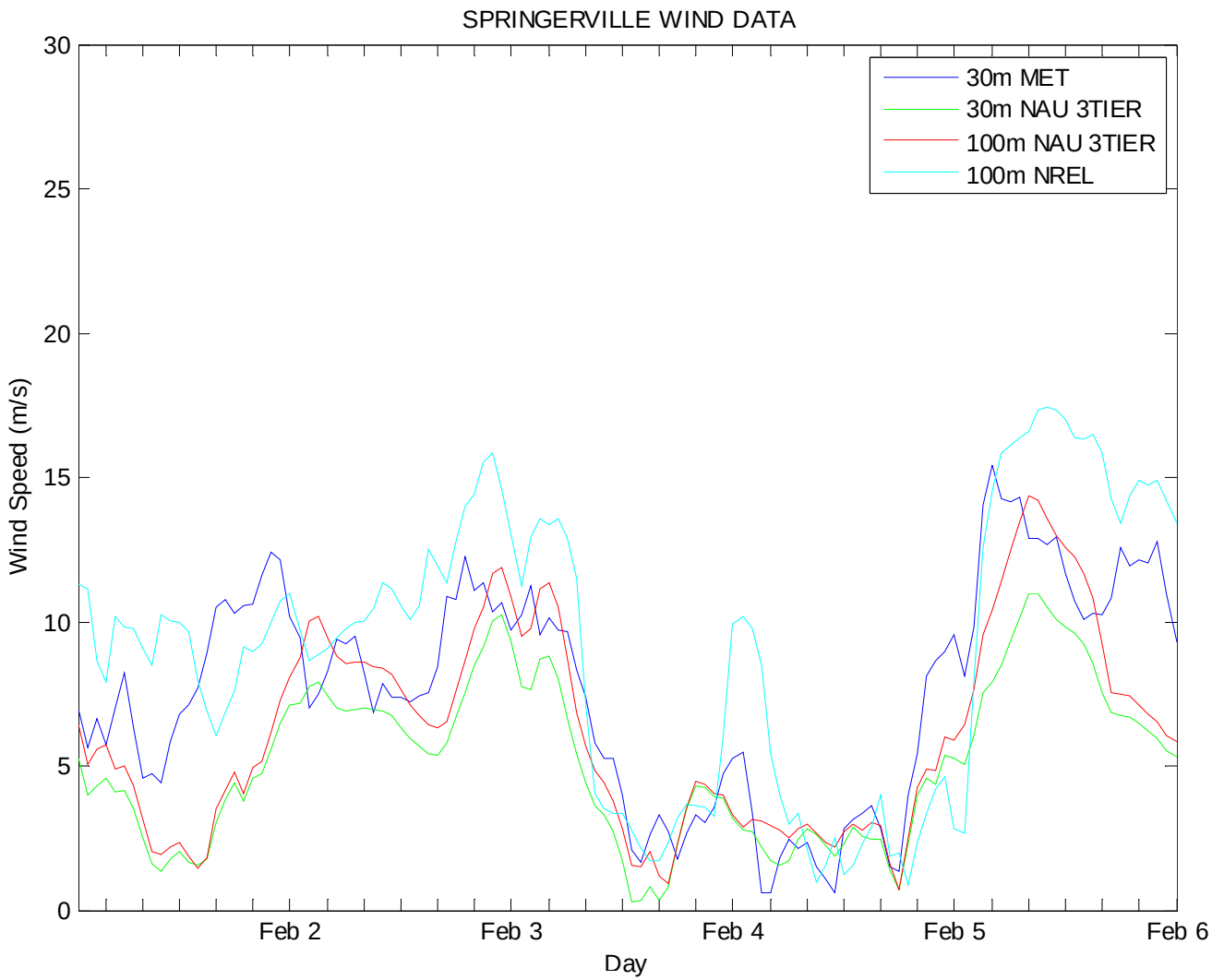
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day

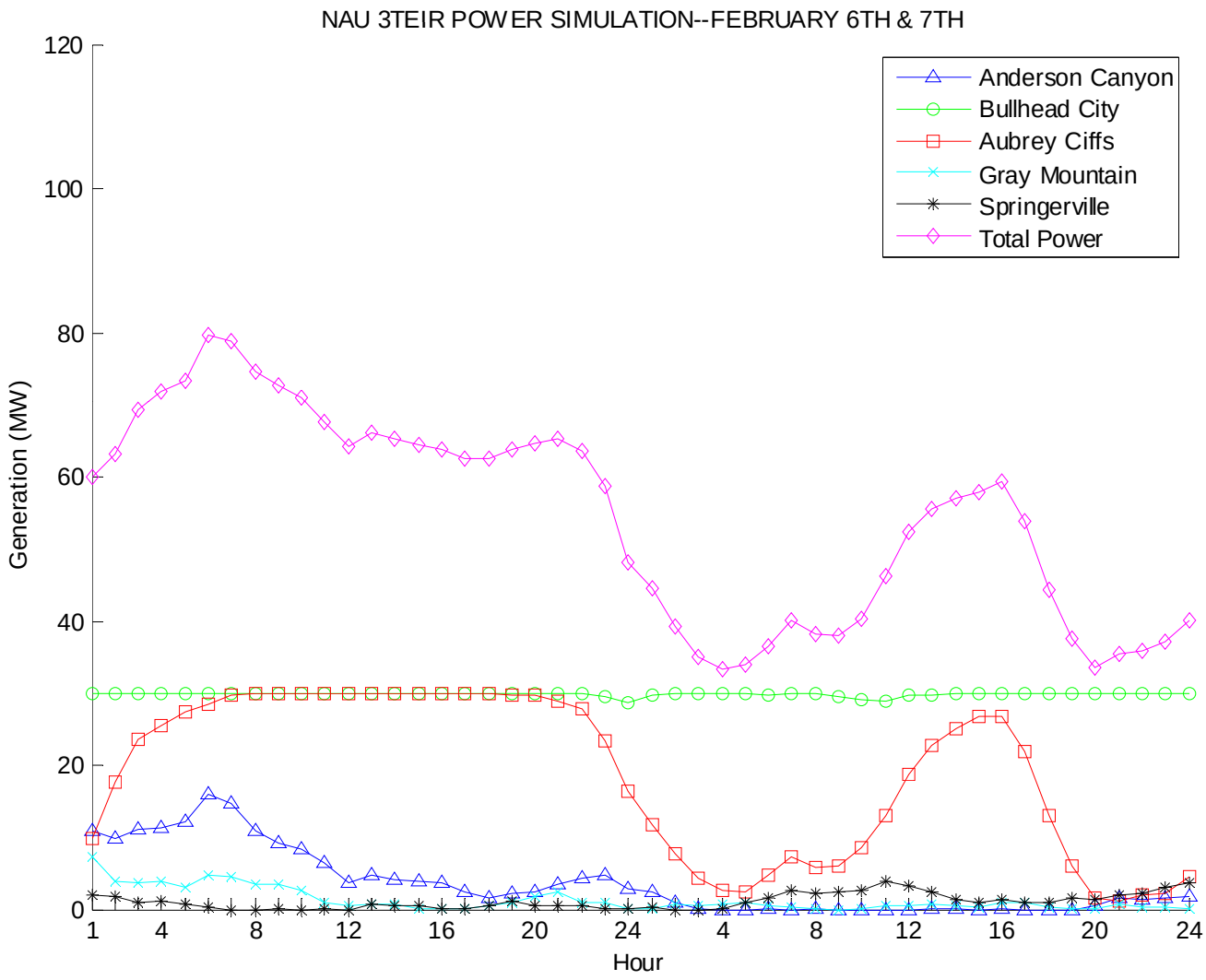


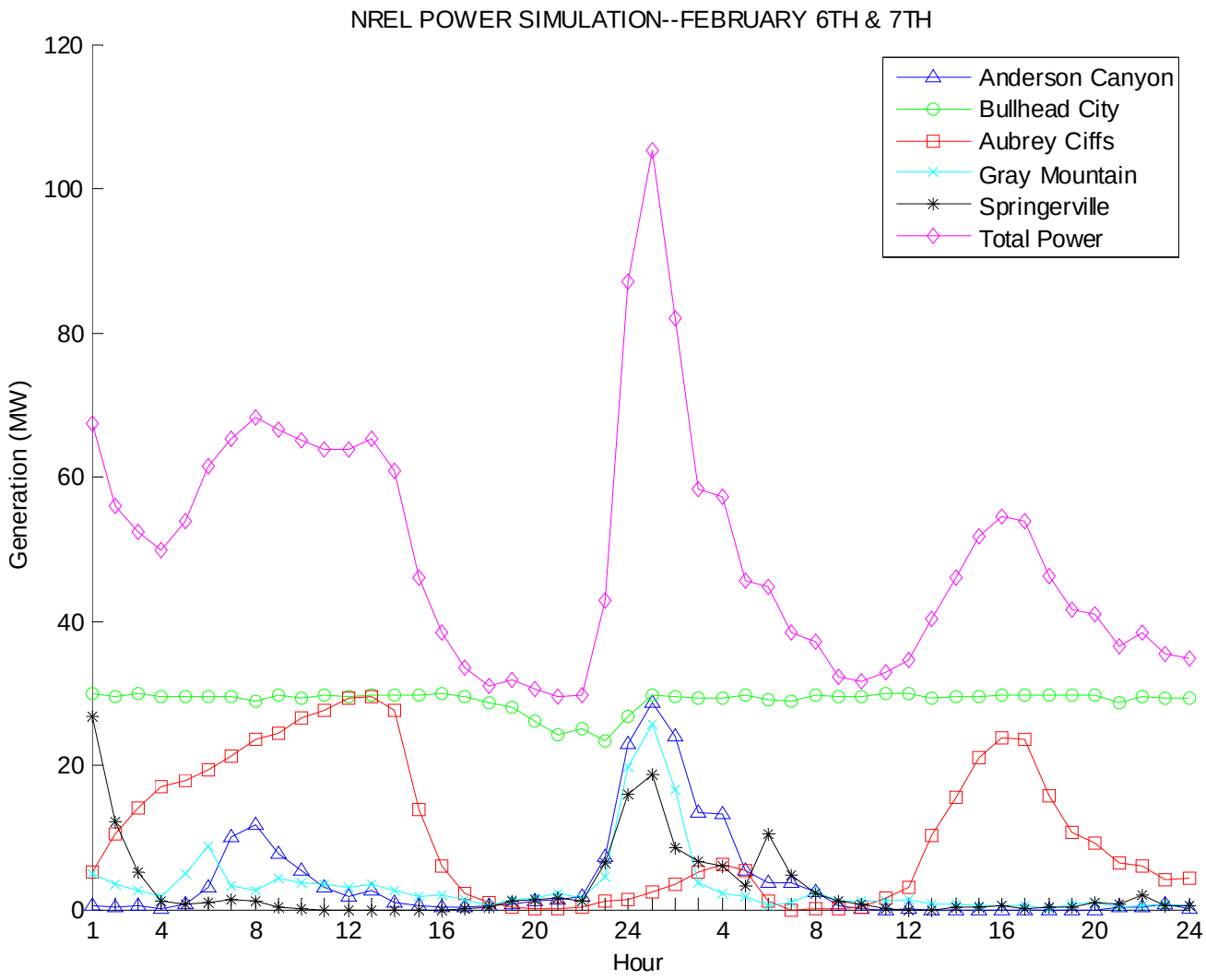
Note, no met tower data was available at Bullhead City for these dates.

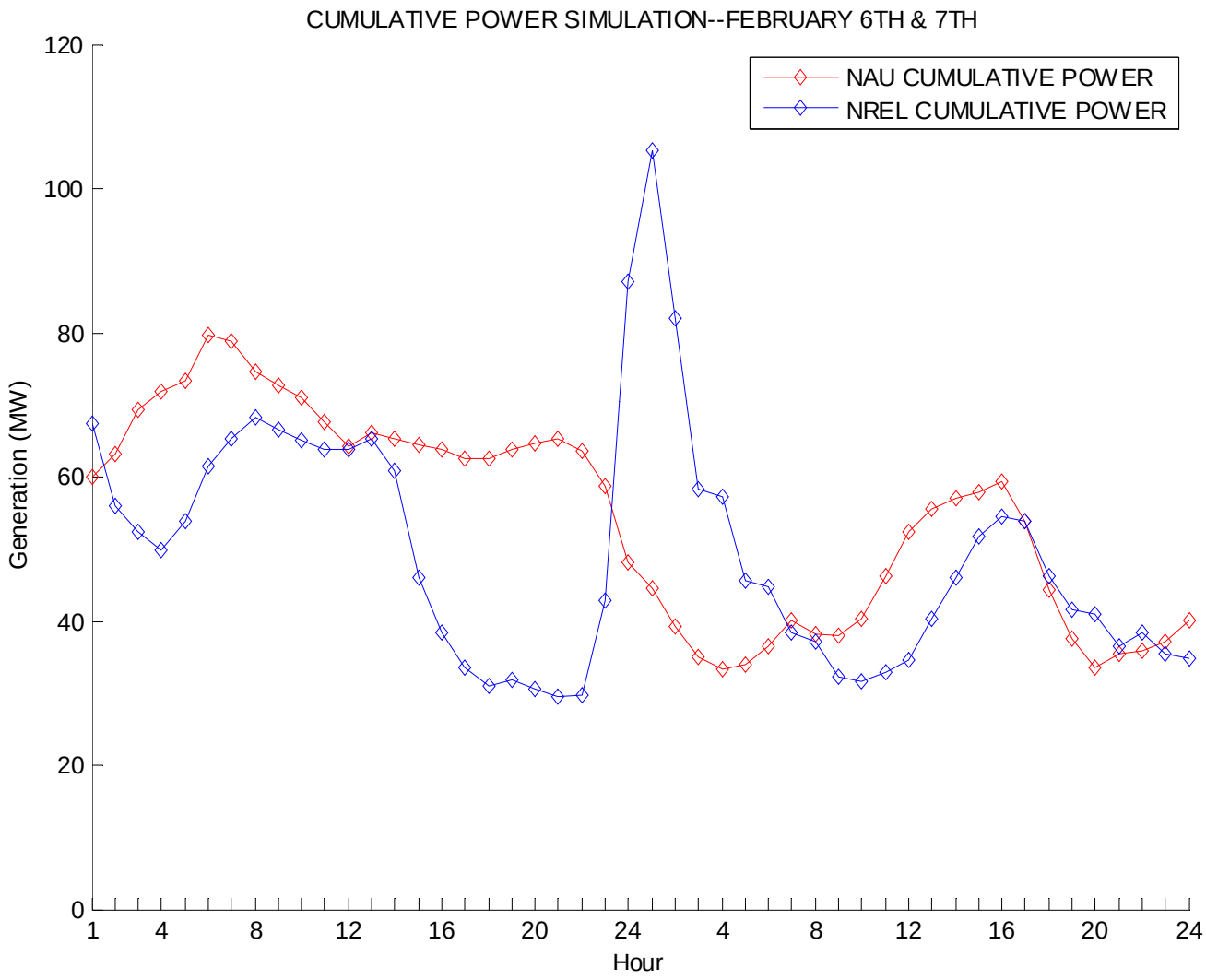

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day


SPRINGERVILLE WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
Feb 2
Feb 3
Feb 4
Feb 5
Feb 6
Day

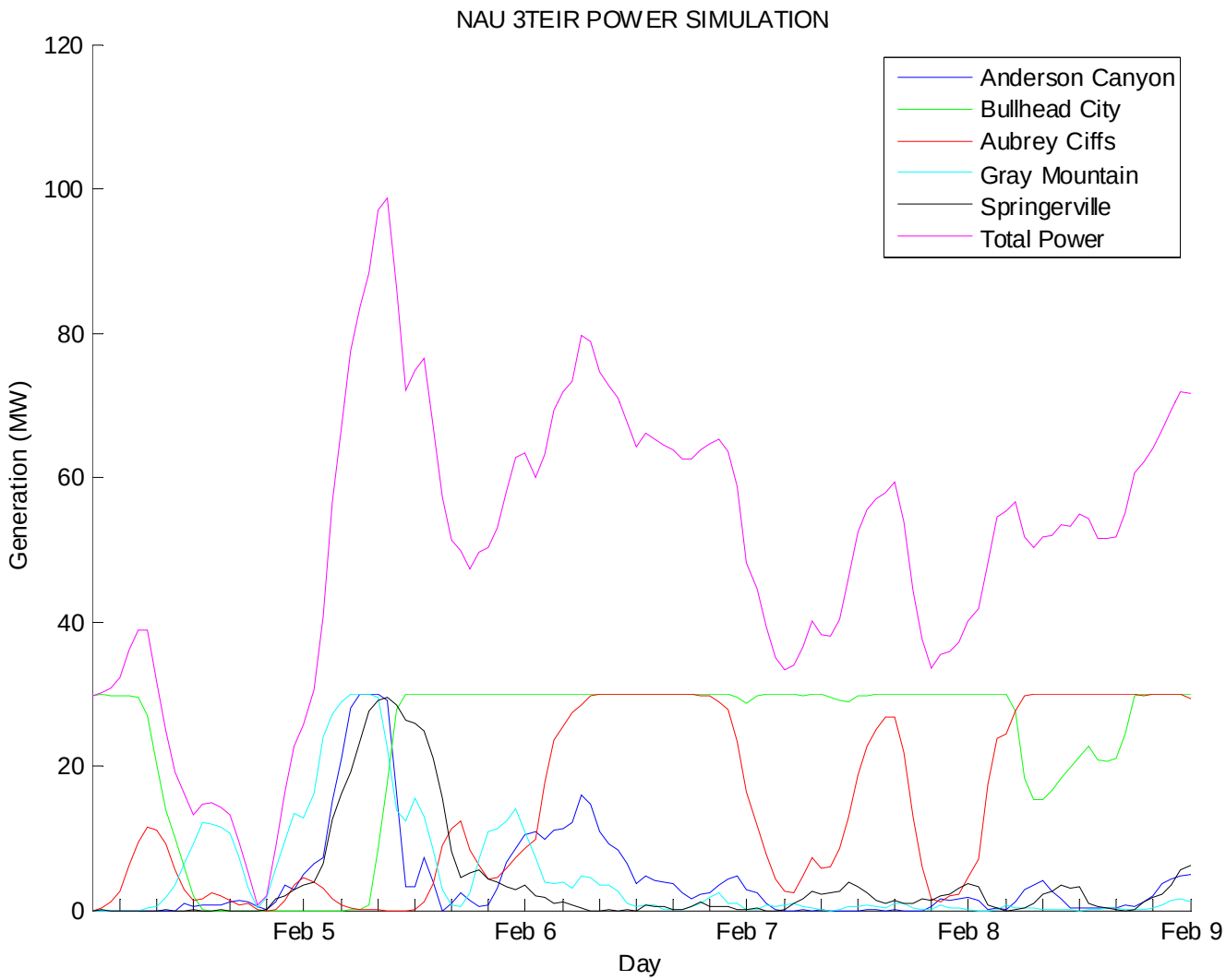
2-day Power Plots – February 6

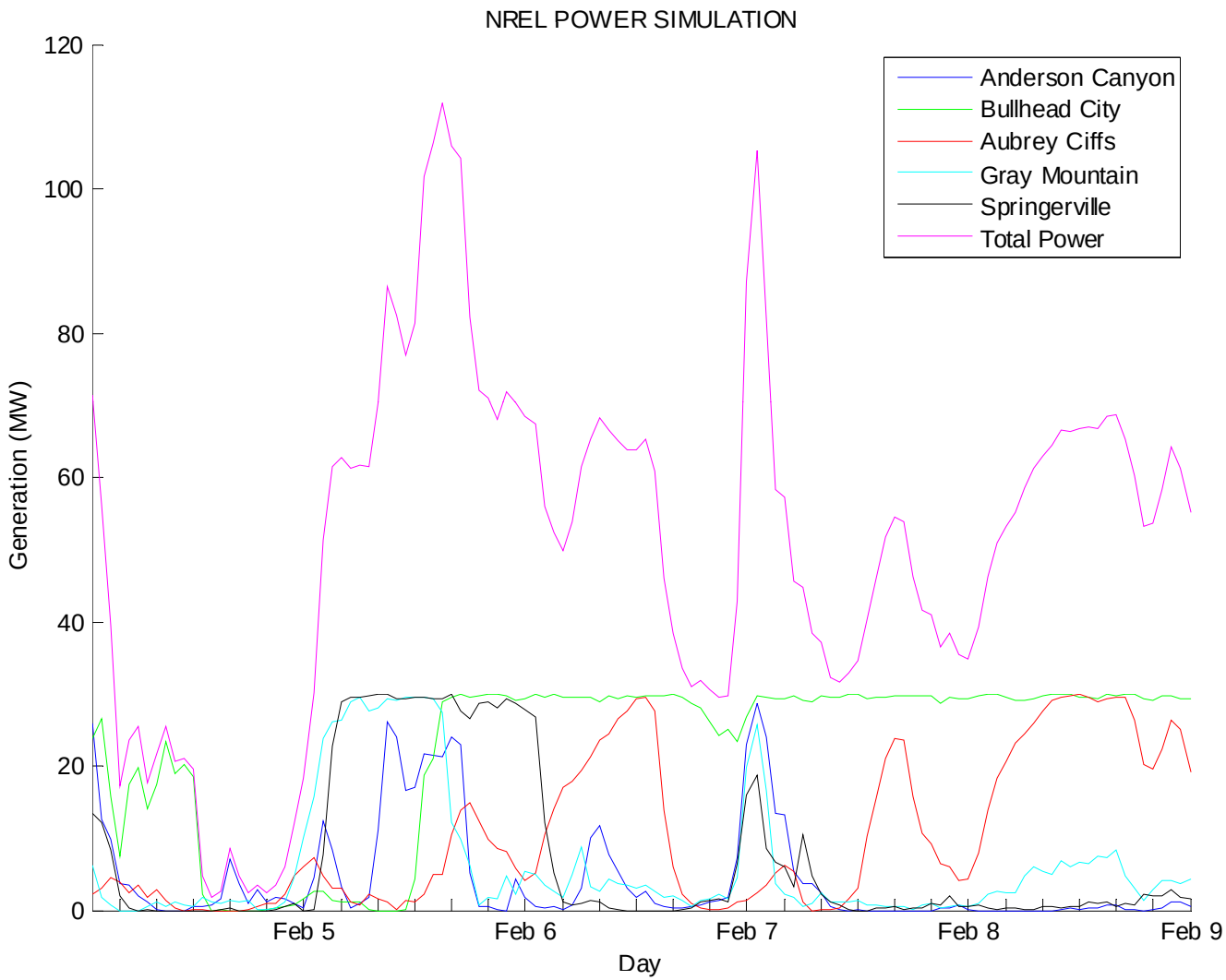


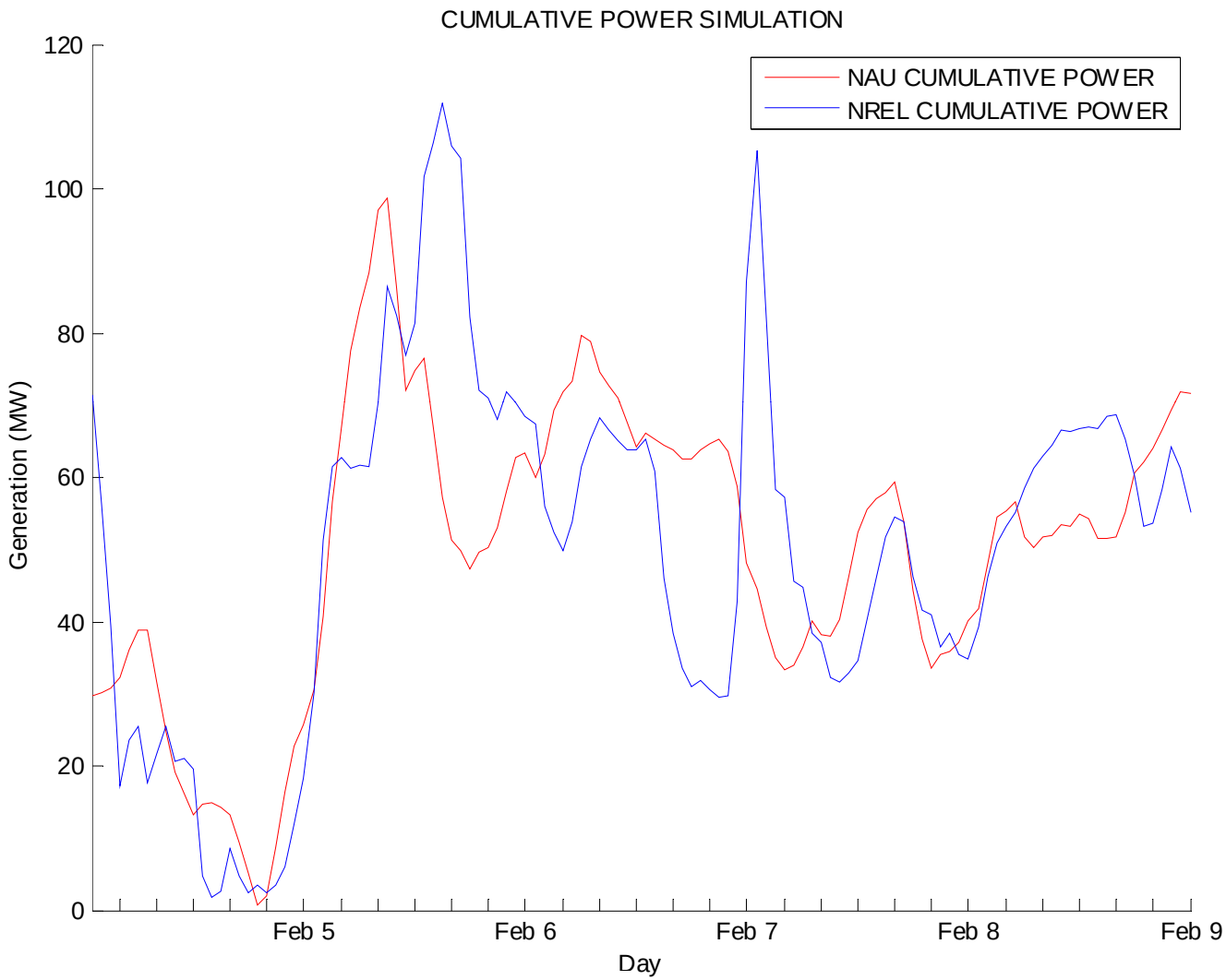

NREL POWER SIMULATION--FEBRUARY 6TH & 7TH
Generation (MW)
Hour
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
0
20
40
60
80
100
120
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--FEBRUARY 6TH & 7TH
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
1
4
8
12
16
20
24
4
8
12
16
20
24

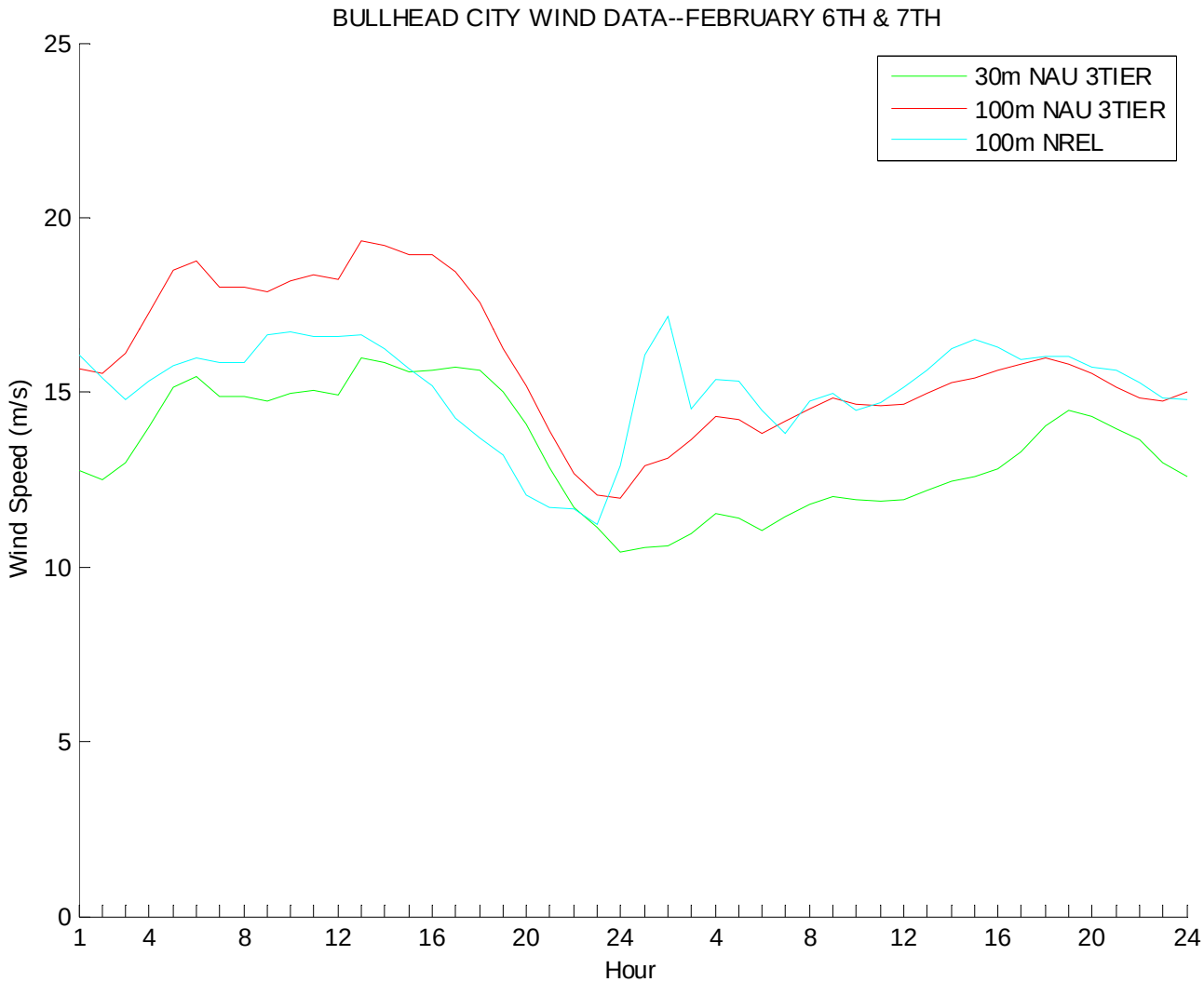
5-day Power Plots – February 6



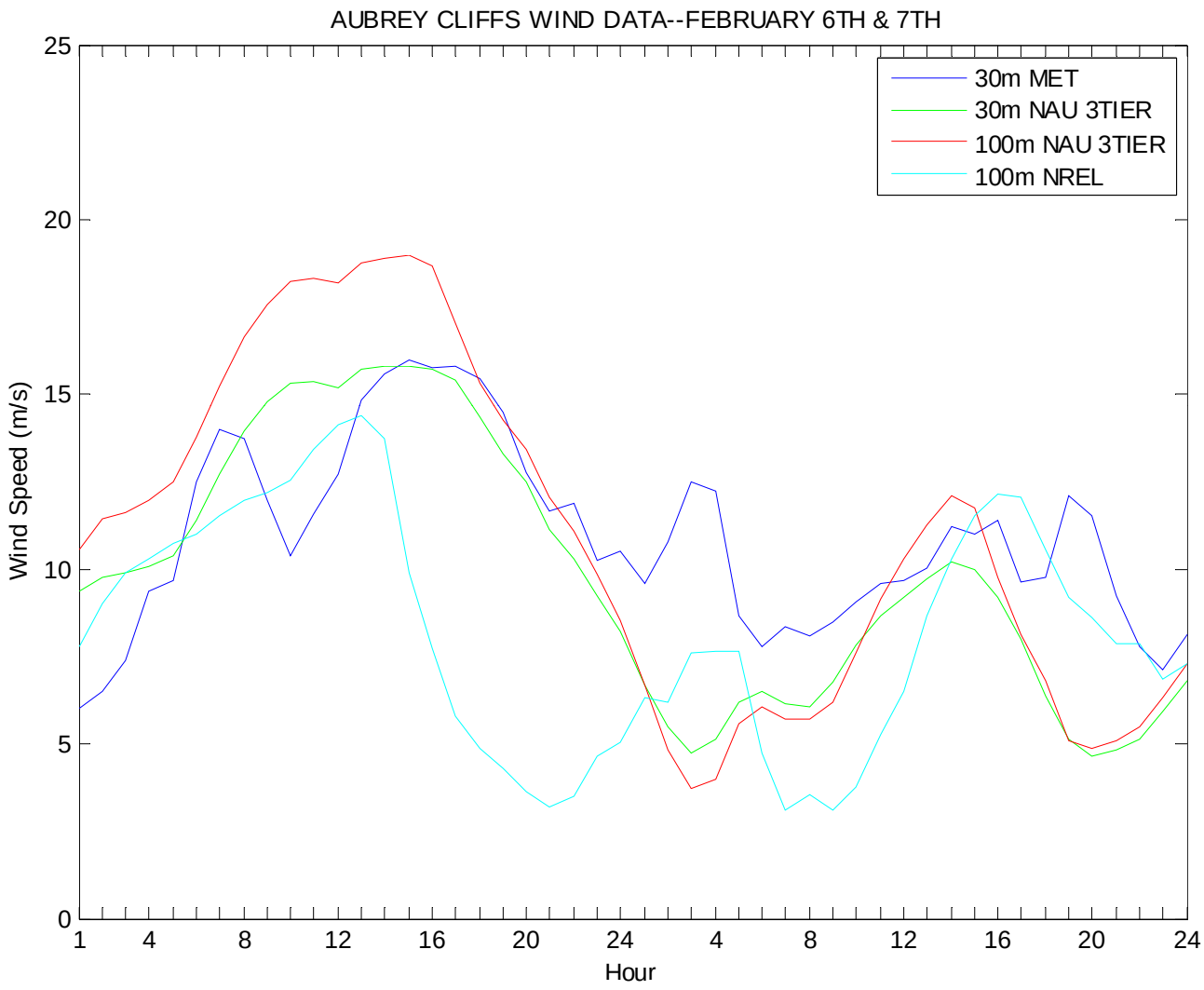

NREL POWER SIMULATION
Generation (MW)
120
100
80
60
40
20
0
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power

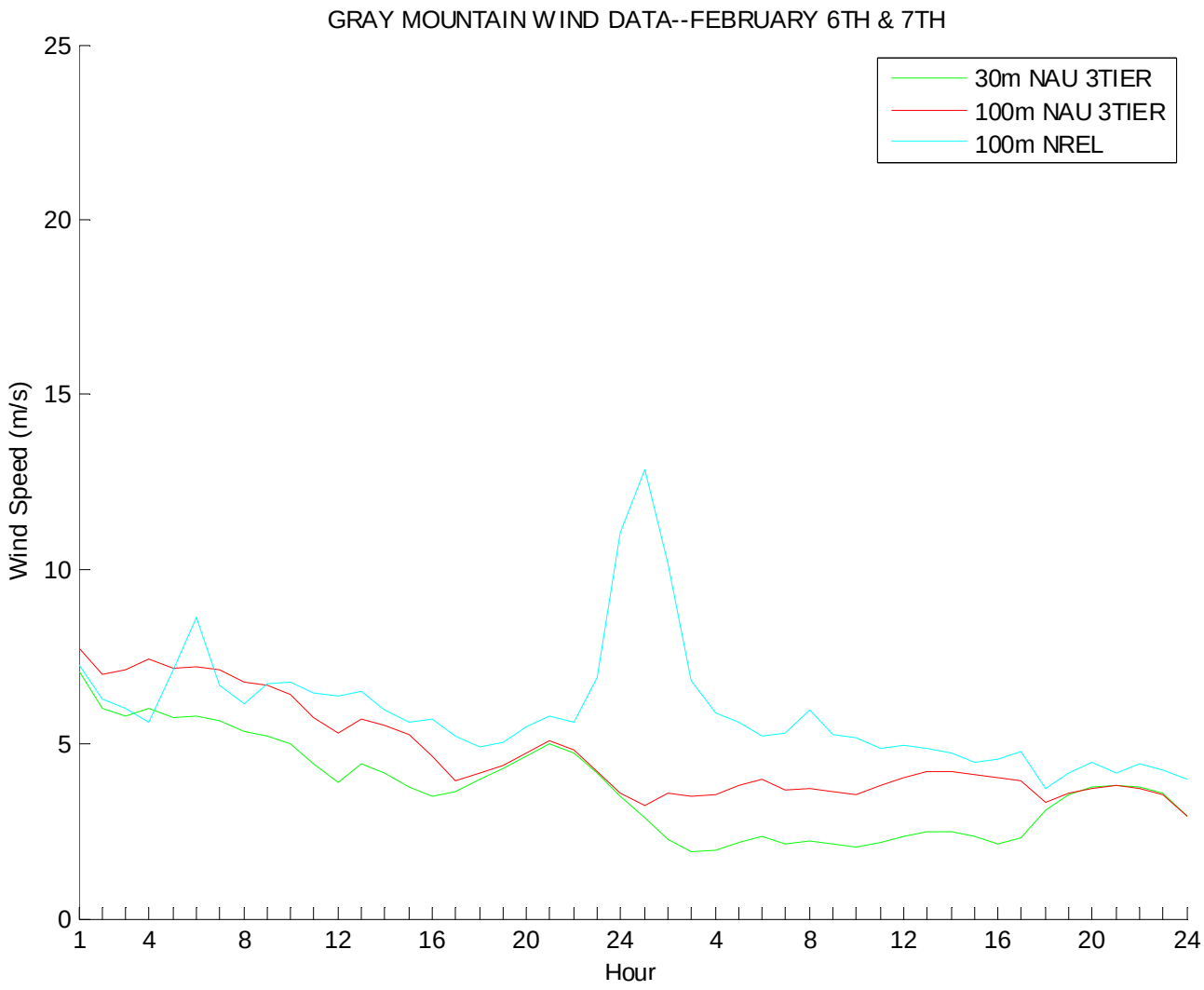

CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
120
100
80
60
40
20
0
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day

2-day Wind Plots – February 6

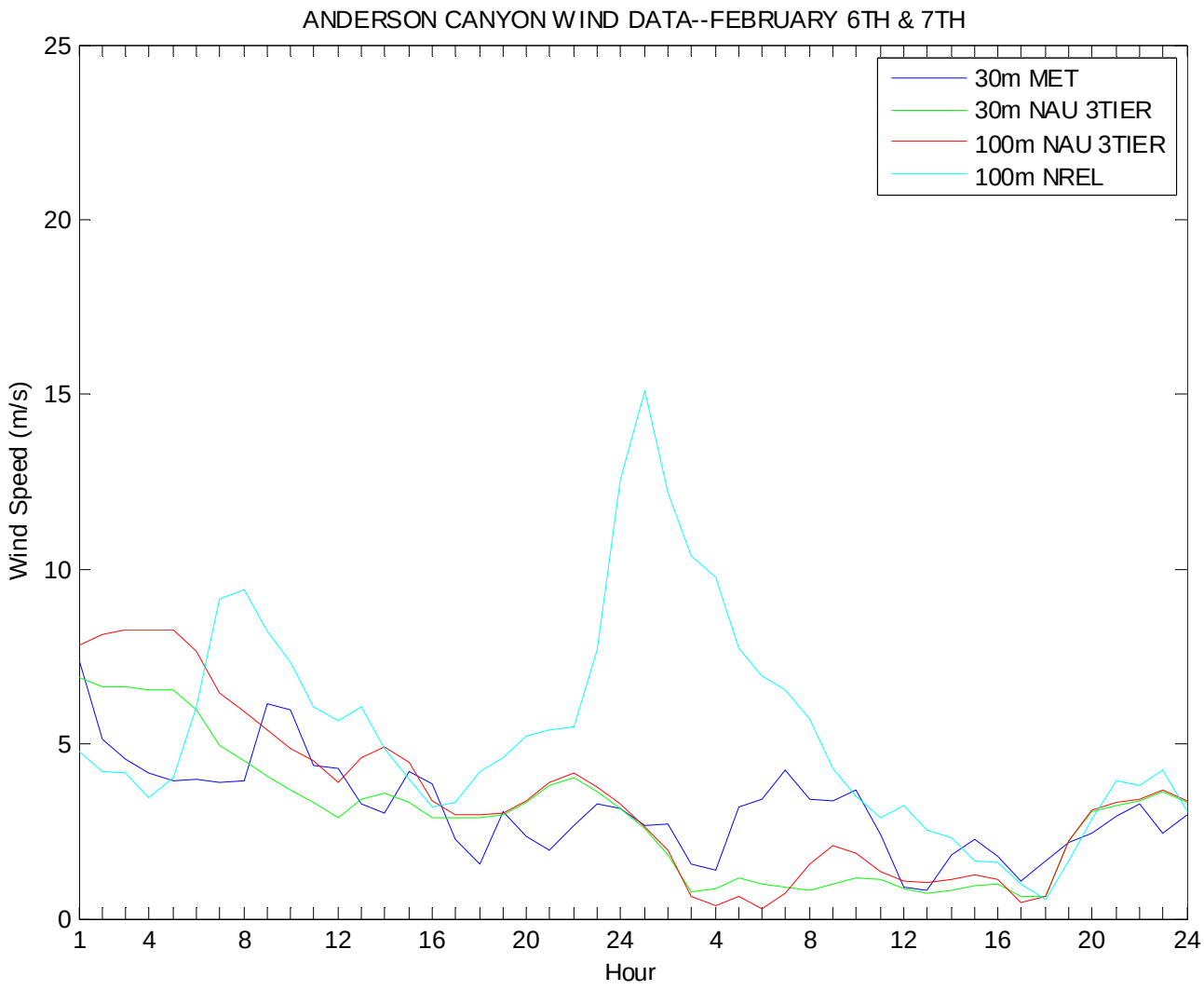


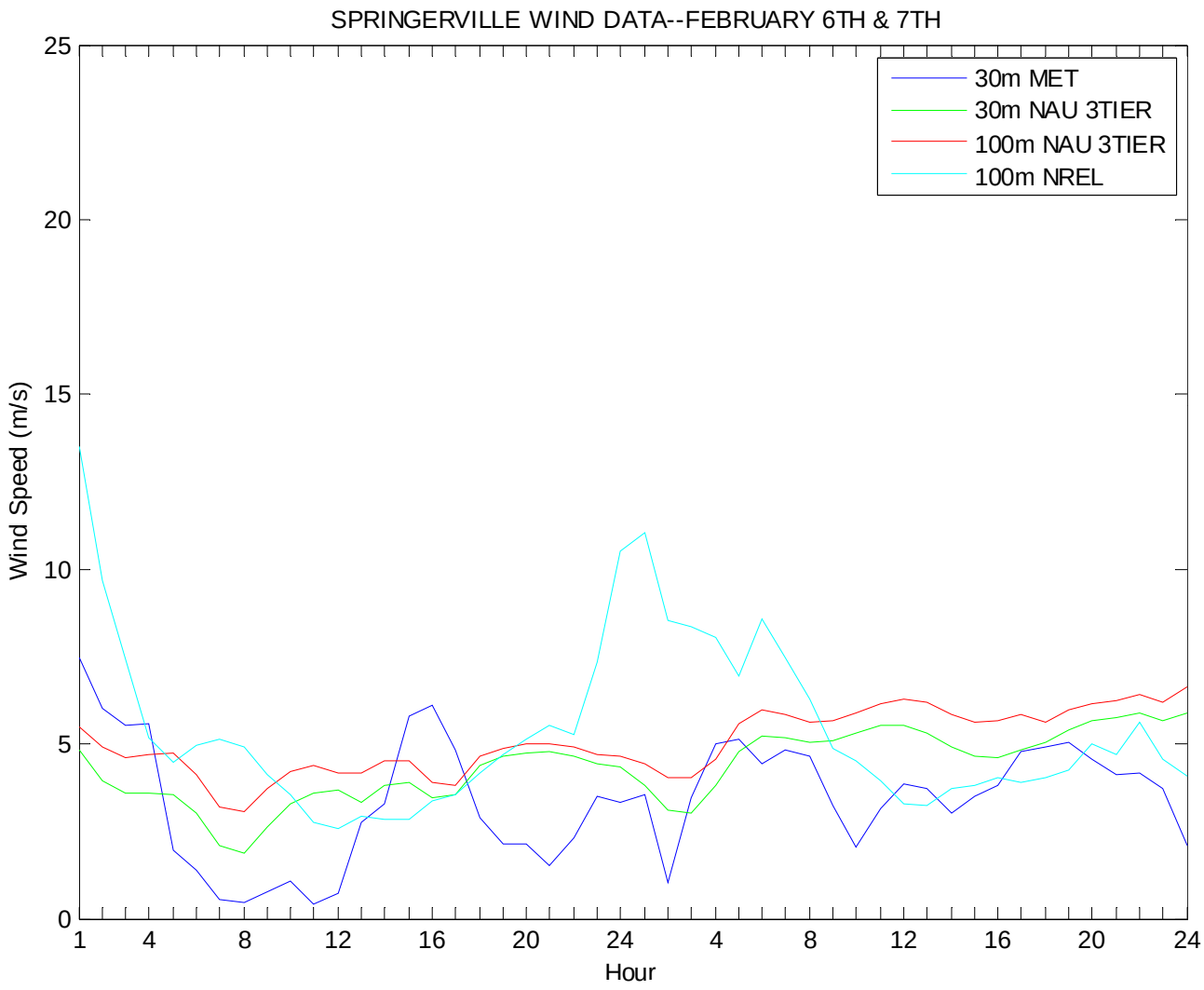
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA--FEBRUARY 6TH & 7TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
1
4
8
12
16
20
24
4
8
12
16
20
24

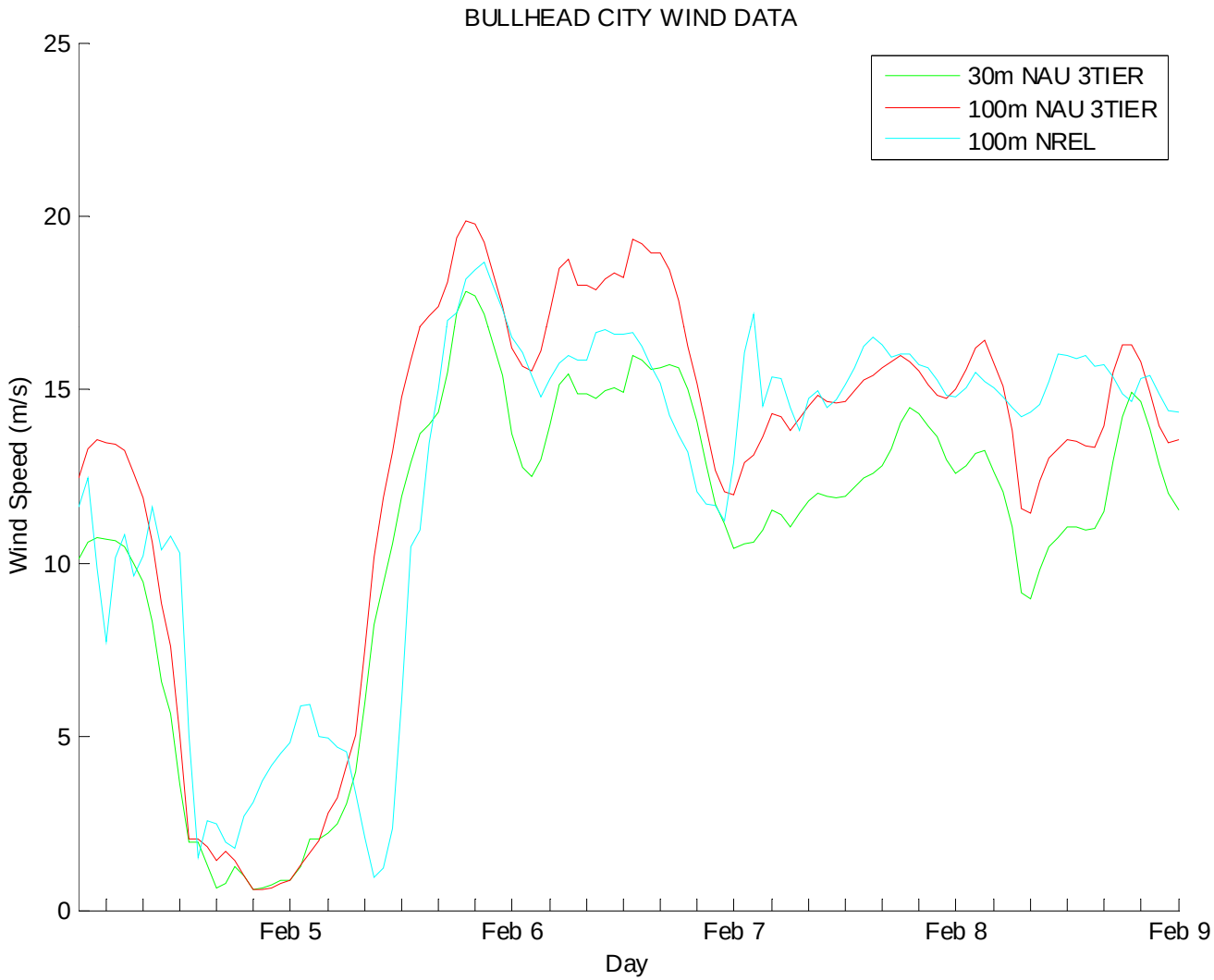


Note, no met tower data was available at Gray Mountain for these dates.

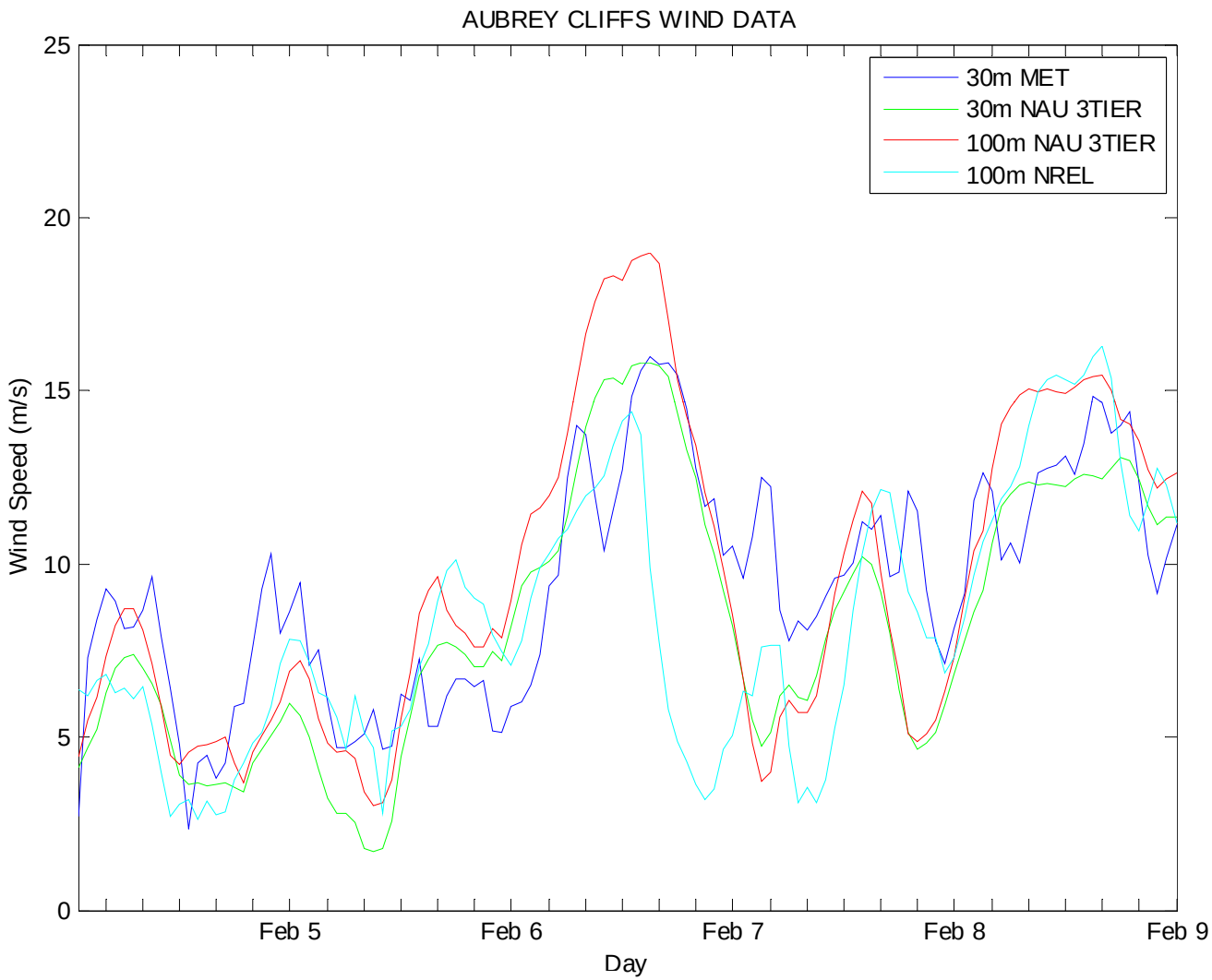

ANDERSON CANYON WIND DATA--FEBRUARY 6TH & 7TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
1
4
8
12
16
20
24
4
8
12
16
20
24

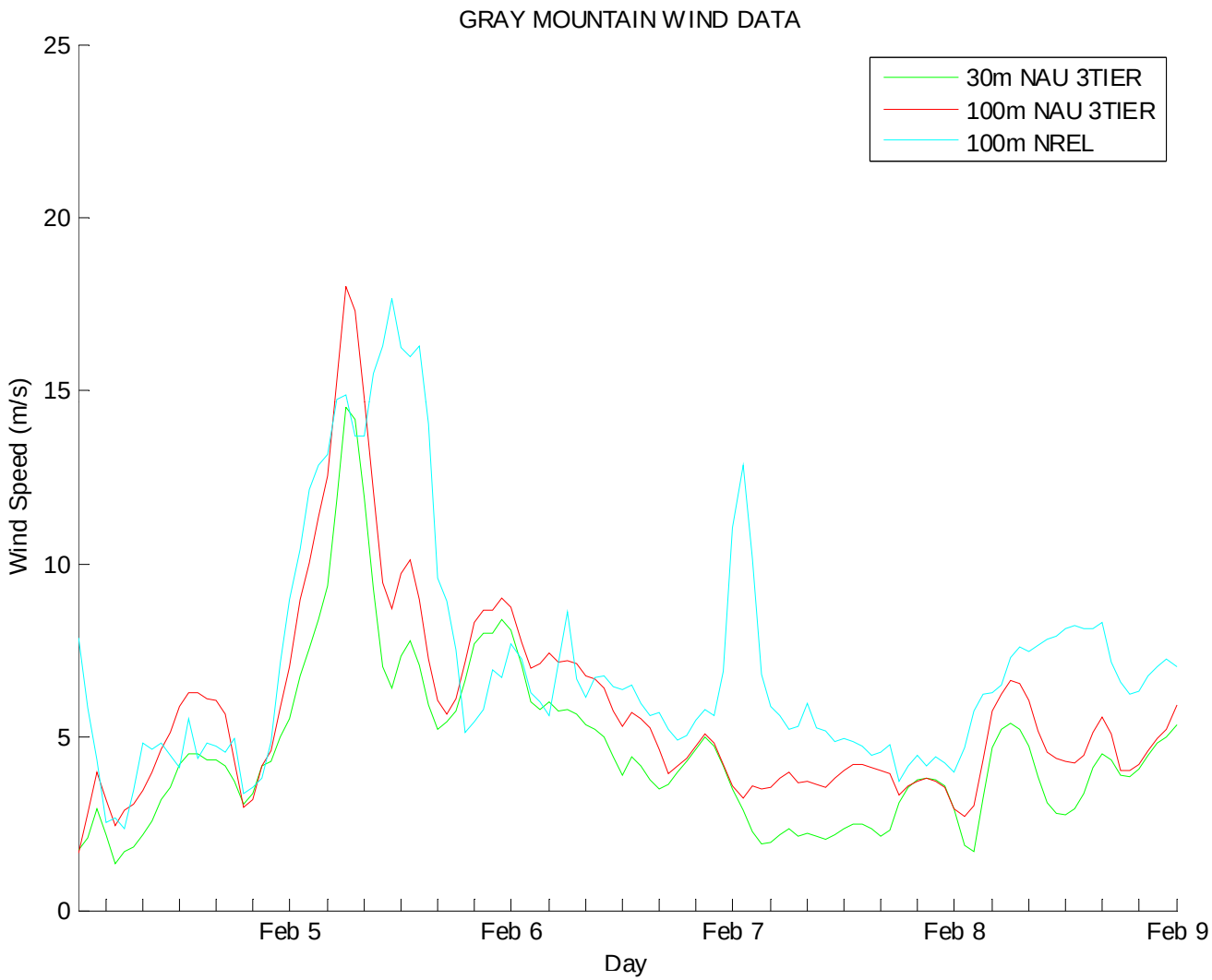

SPRINGERVILLE WIND DATA--FEBRUARY 6TH & 7TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
1
4
8
12
16
20
24
4
8
12
16
20
24

5-day Wind Plots – February 6

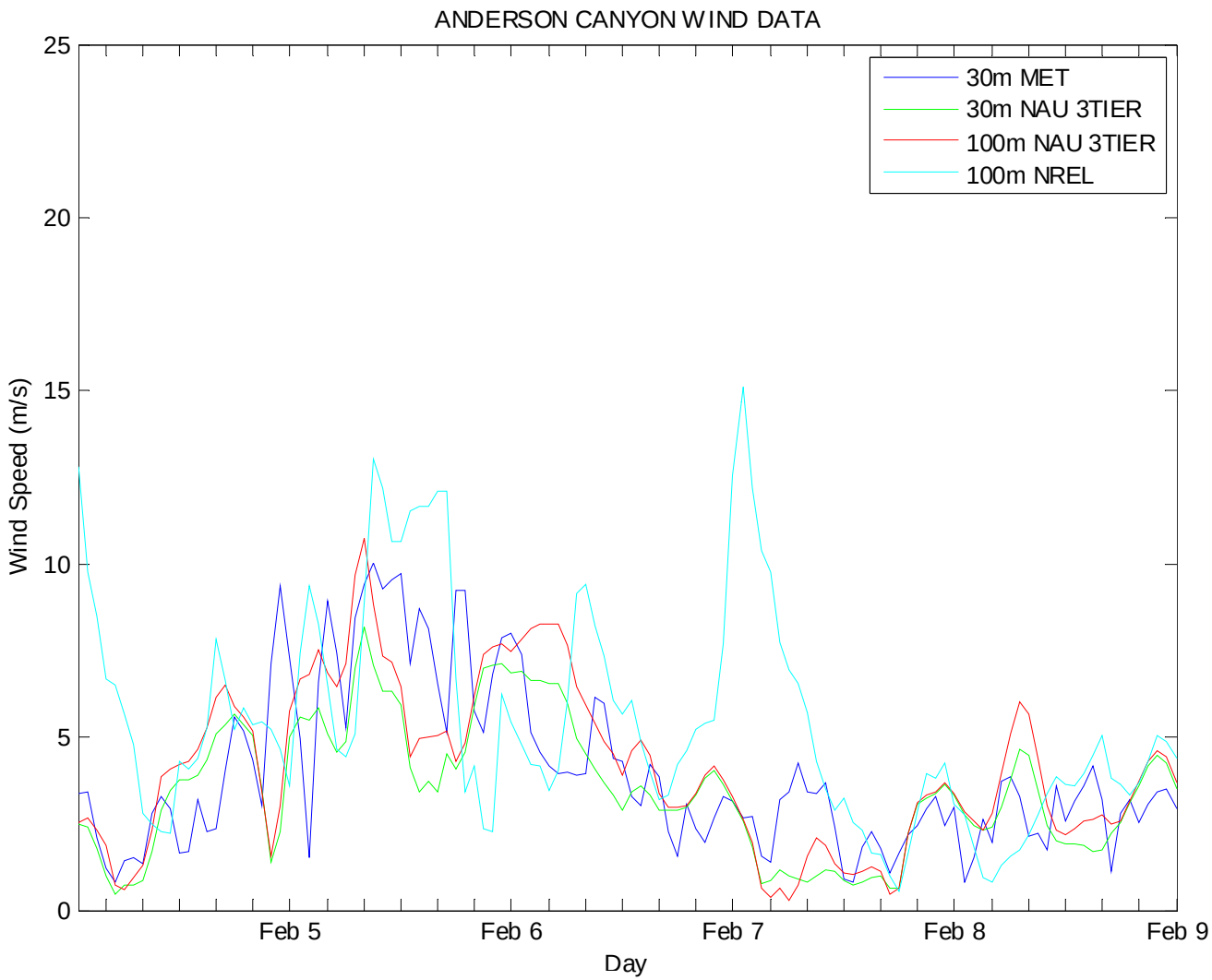


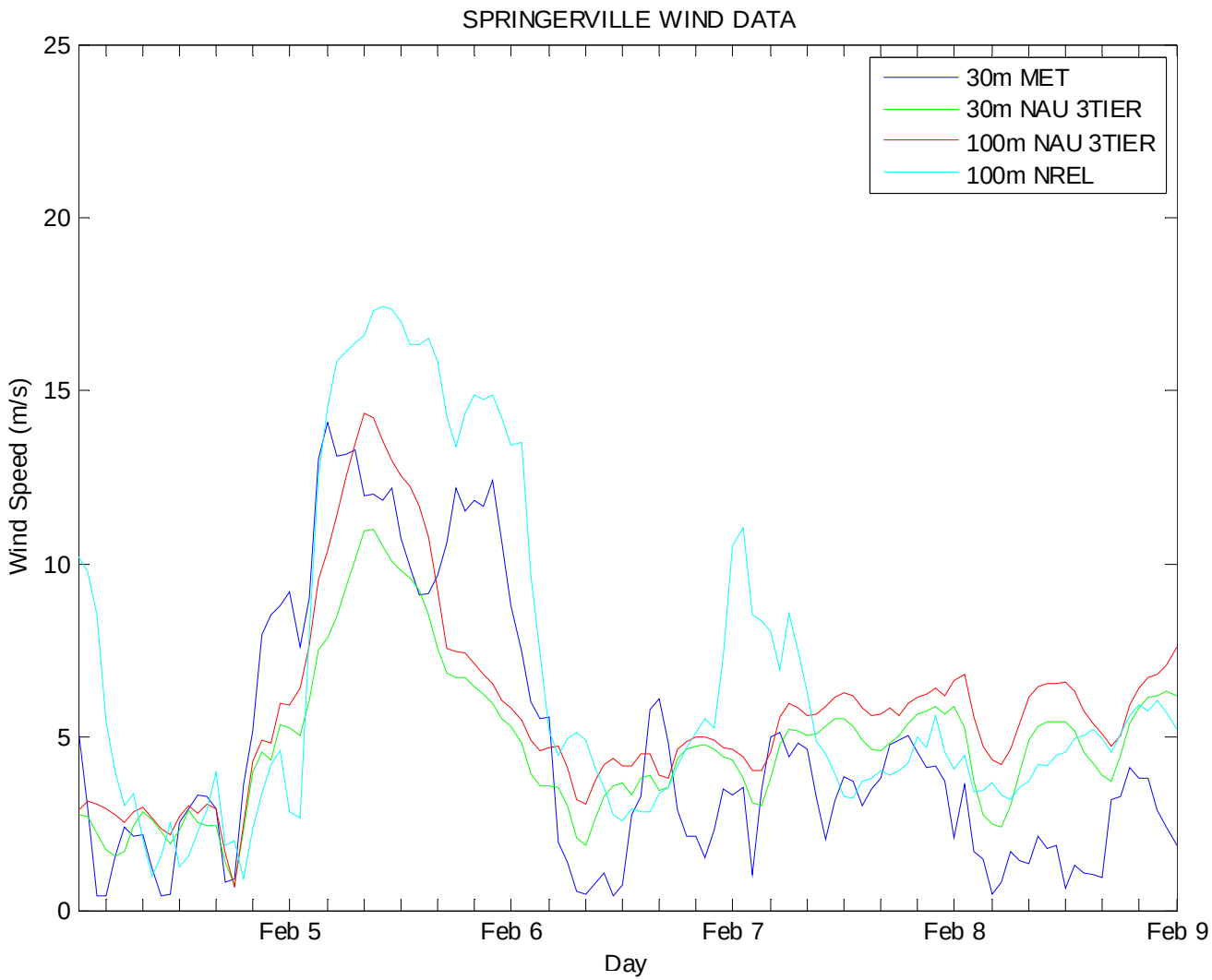
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day

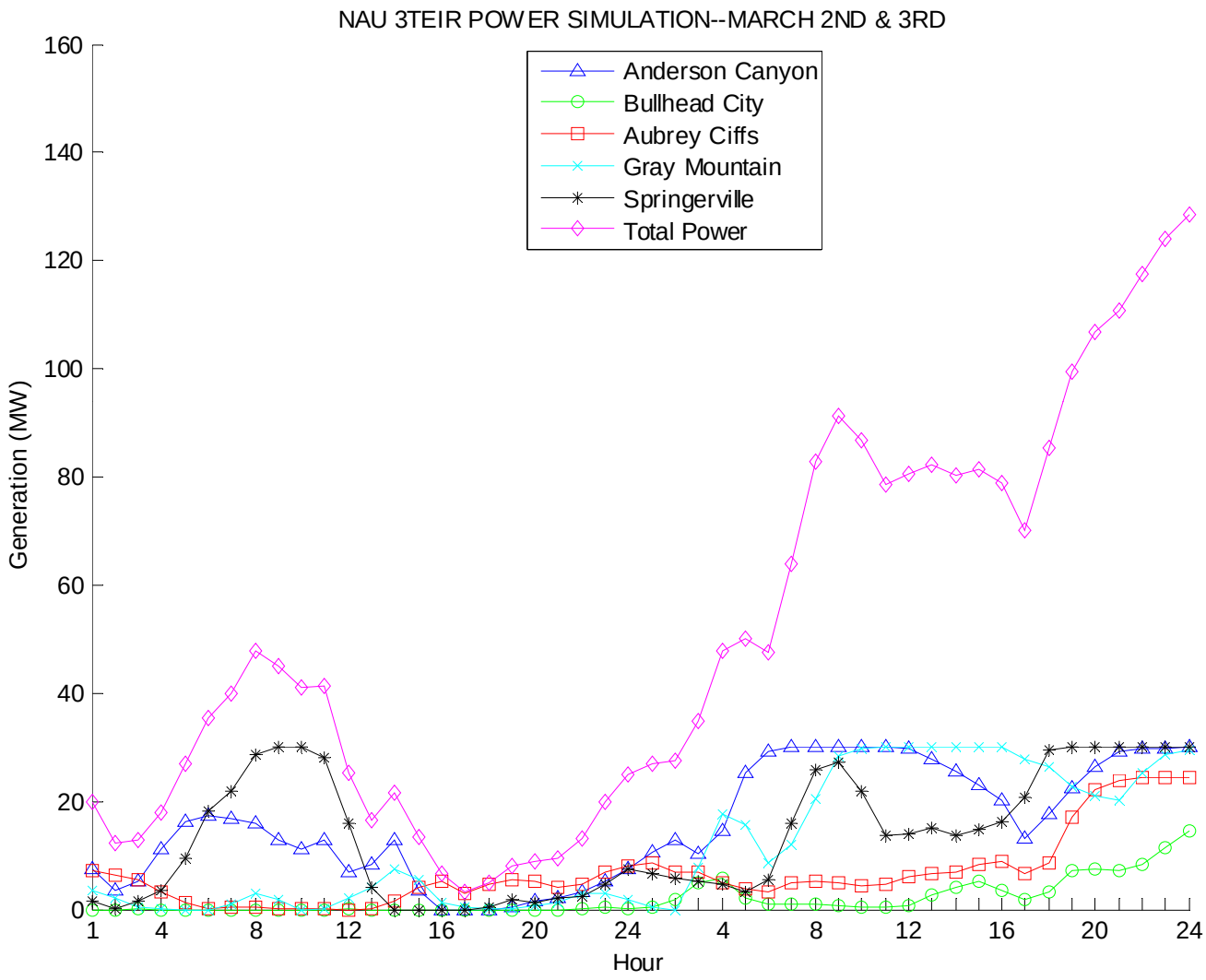


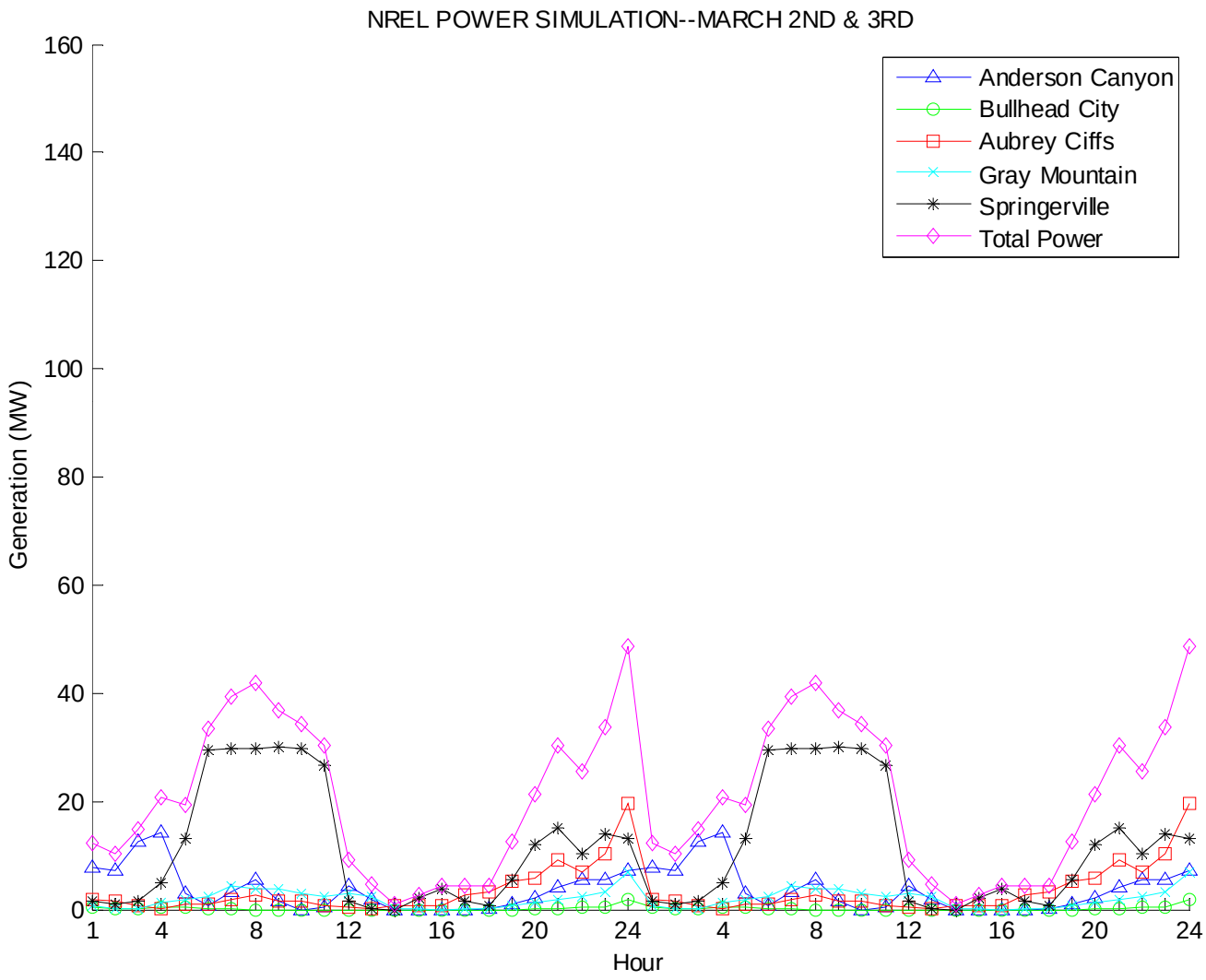
Note, no met tower data was available at Gray Mountain for these dates.

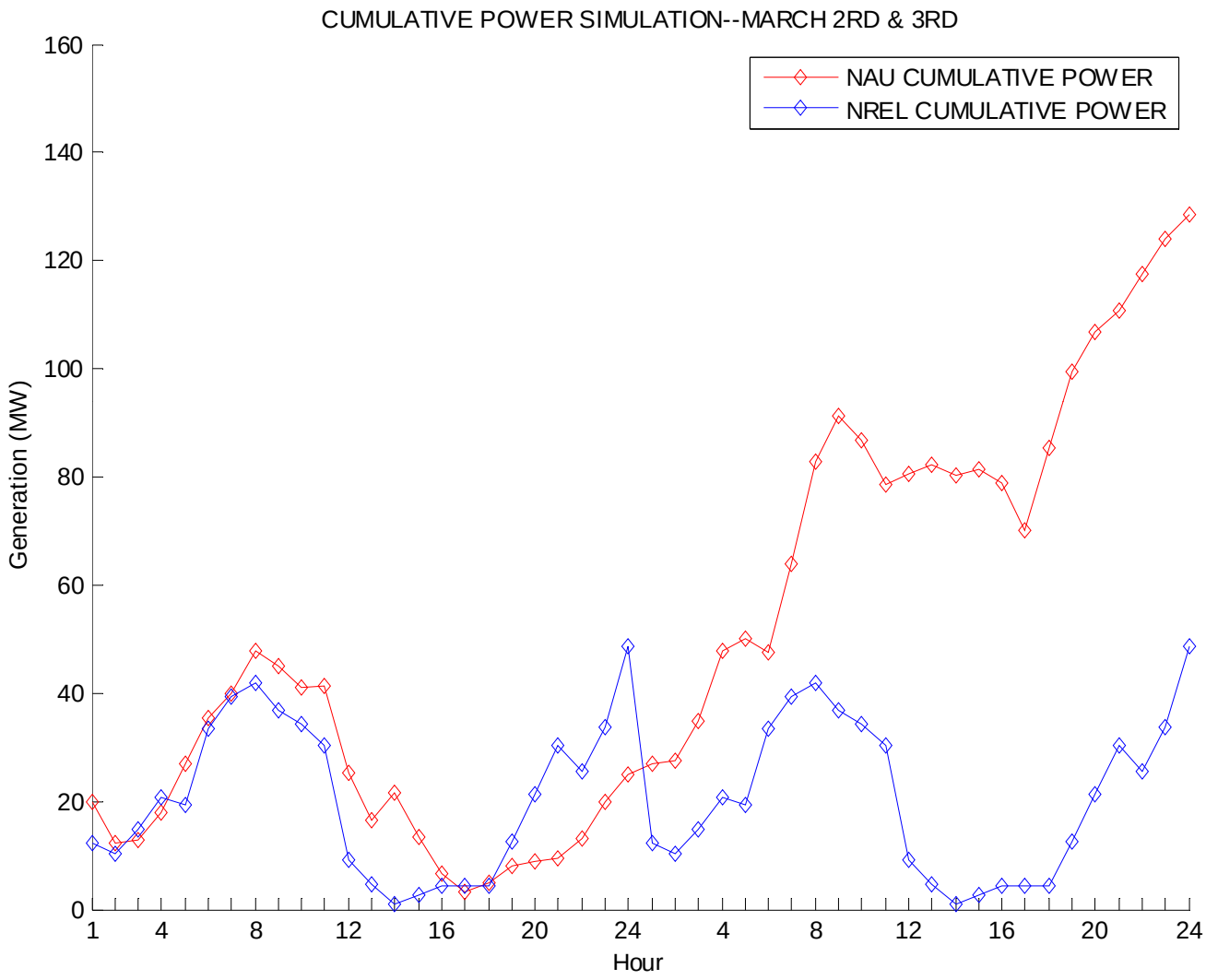

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day


SPRINGERVILLE WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Feb 5
Feb 6
Feb 7
Feb 8
Feb 9
Day

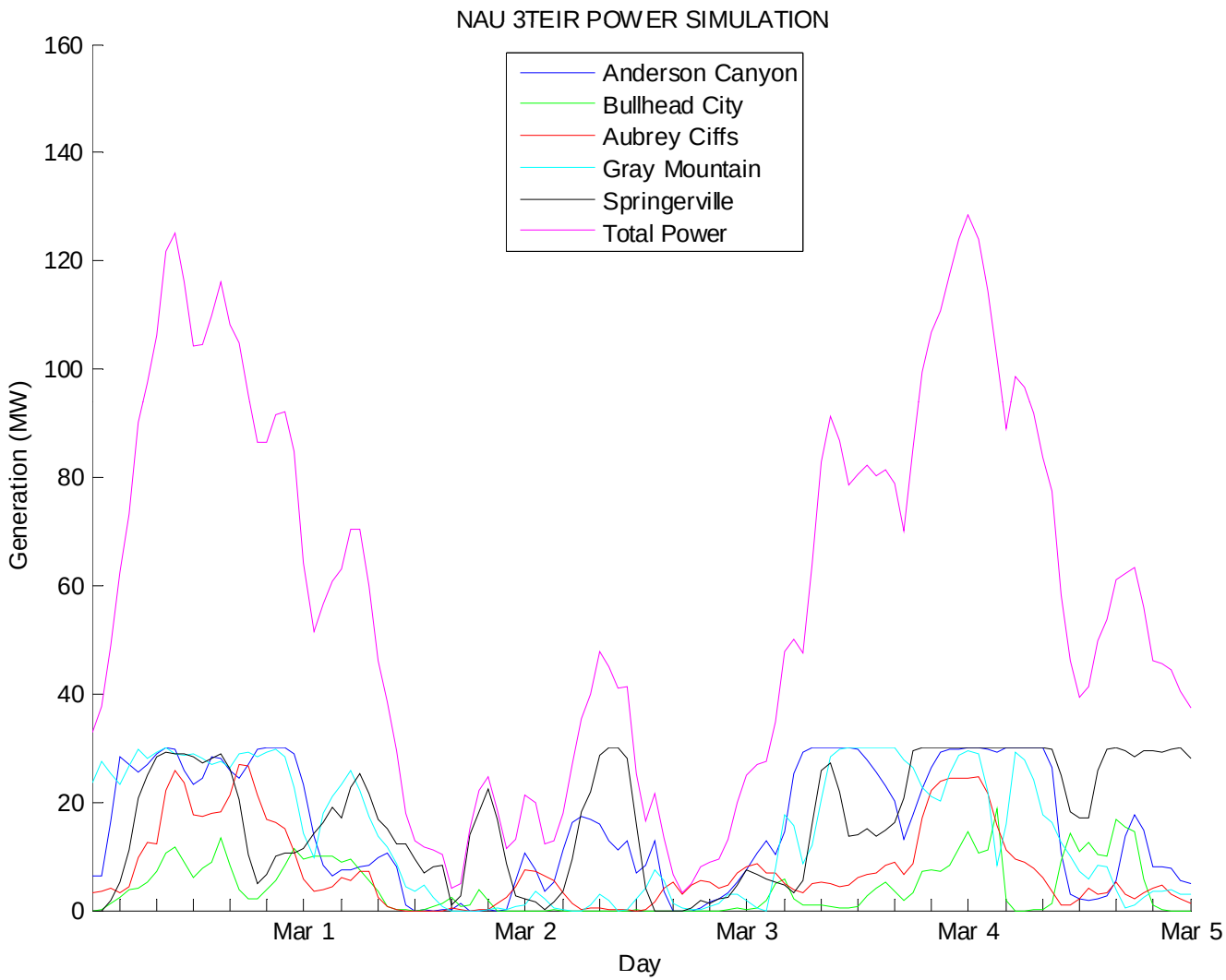
2-day Power Plots – March 2

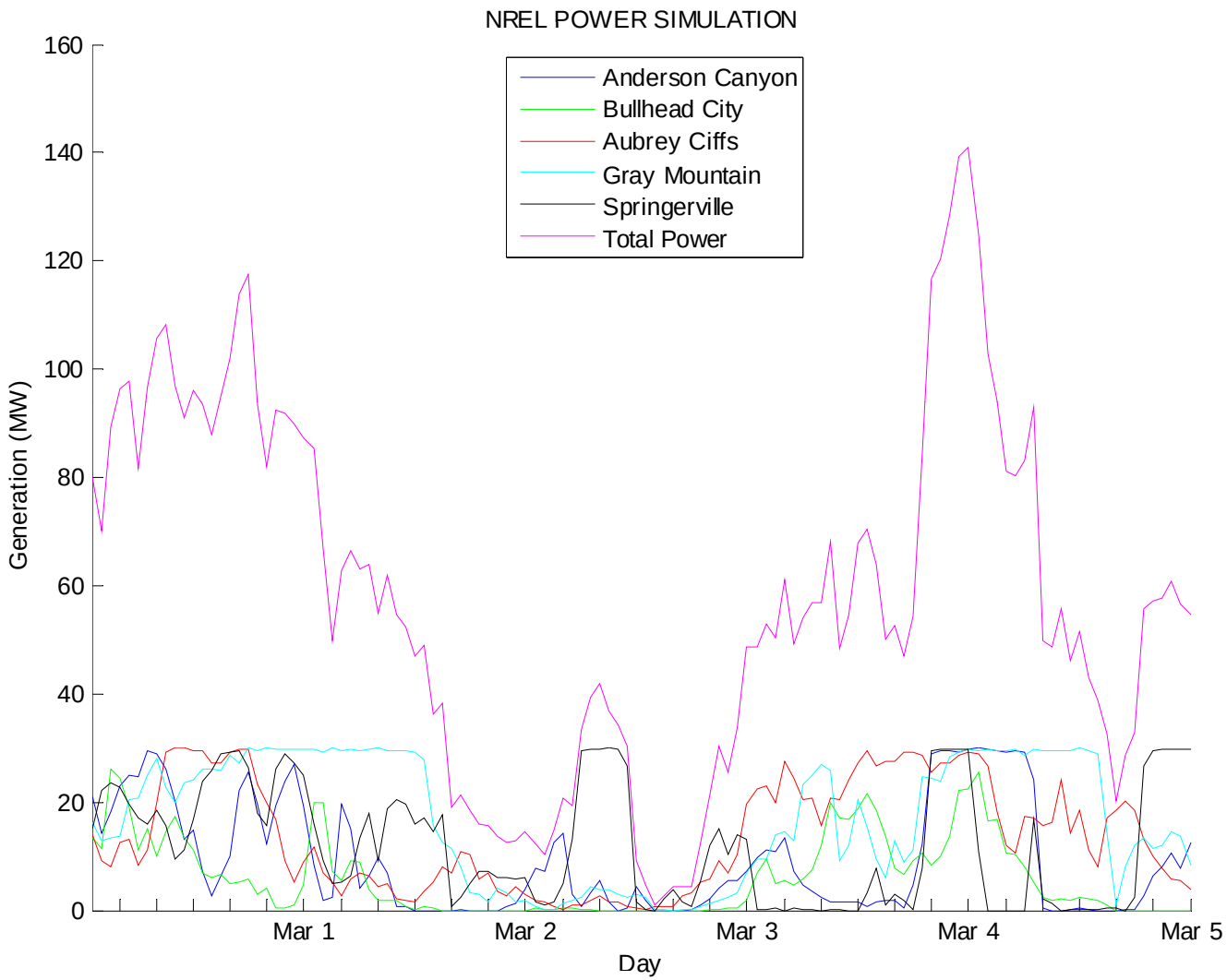


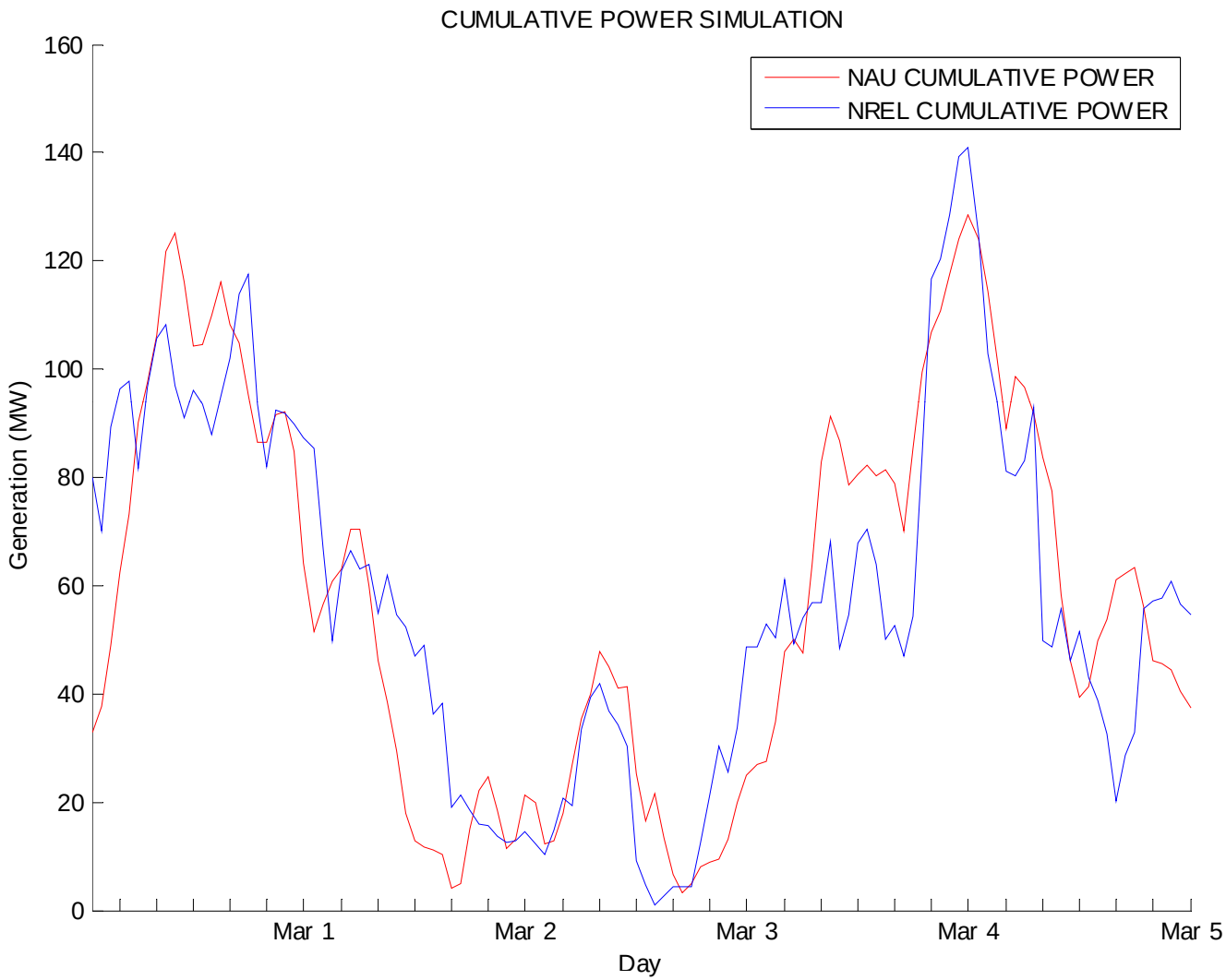

NREL POWER SIMULATION--MARCH 2ND & 3RD
Generation (MW)
Hour
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--MARCH 2RD & 3RD
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
140
160
1
4
8
12
16
20
24
4
8
12
16
20
24

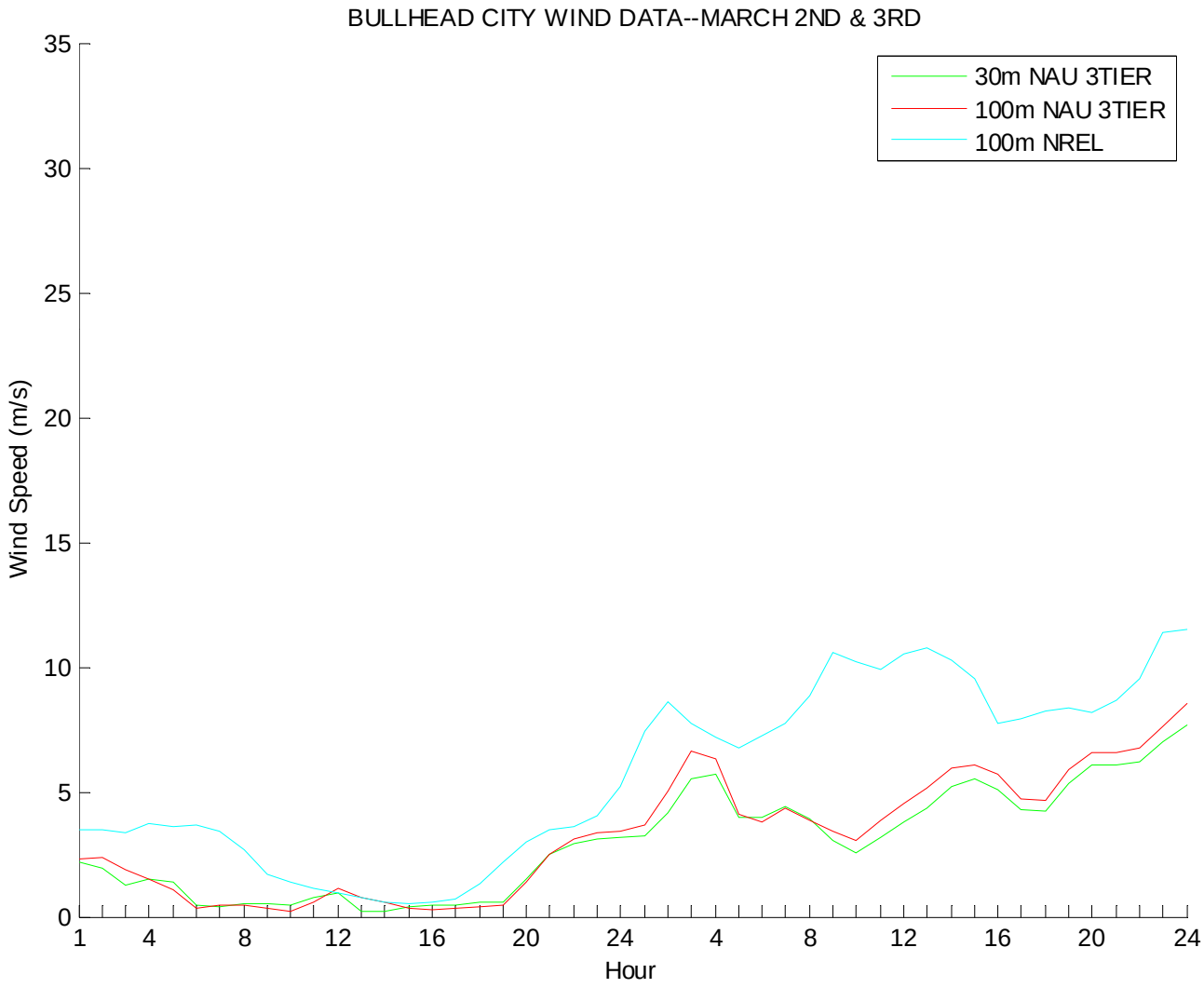
5-day Power Plots – March 2



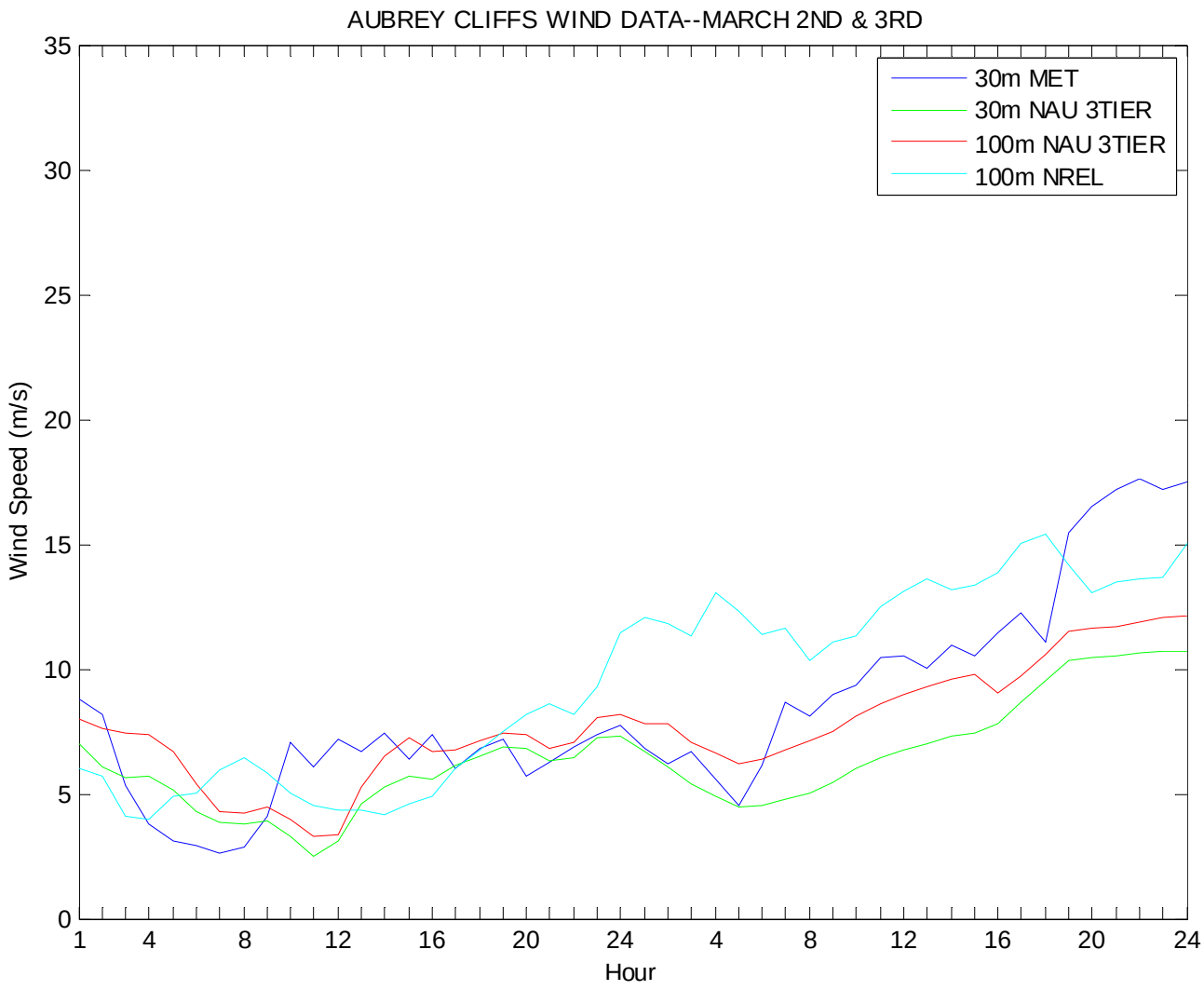

NREL POWER SIMULATION
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
Generation (MW)
0
20
40
60
80
100
120
140
160
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day

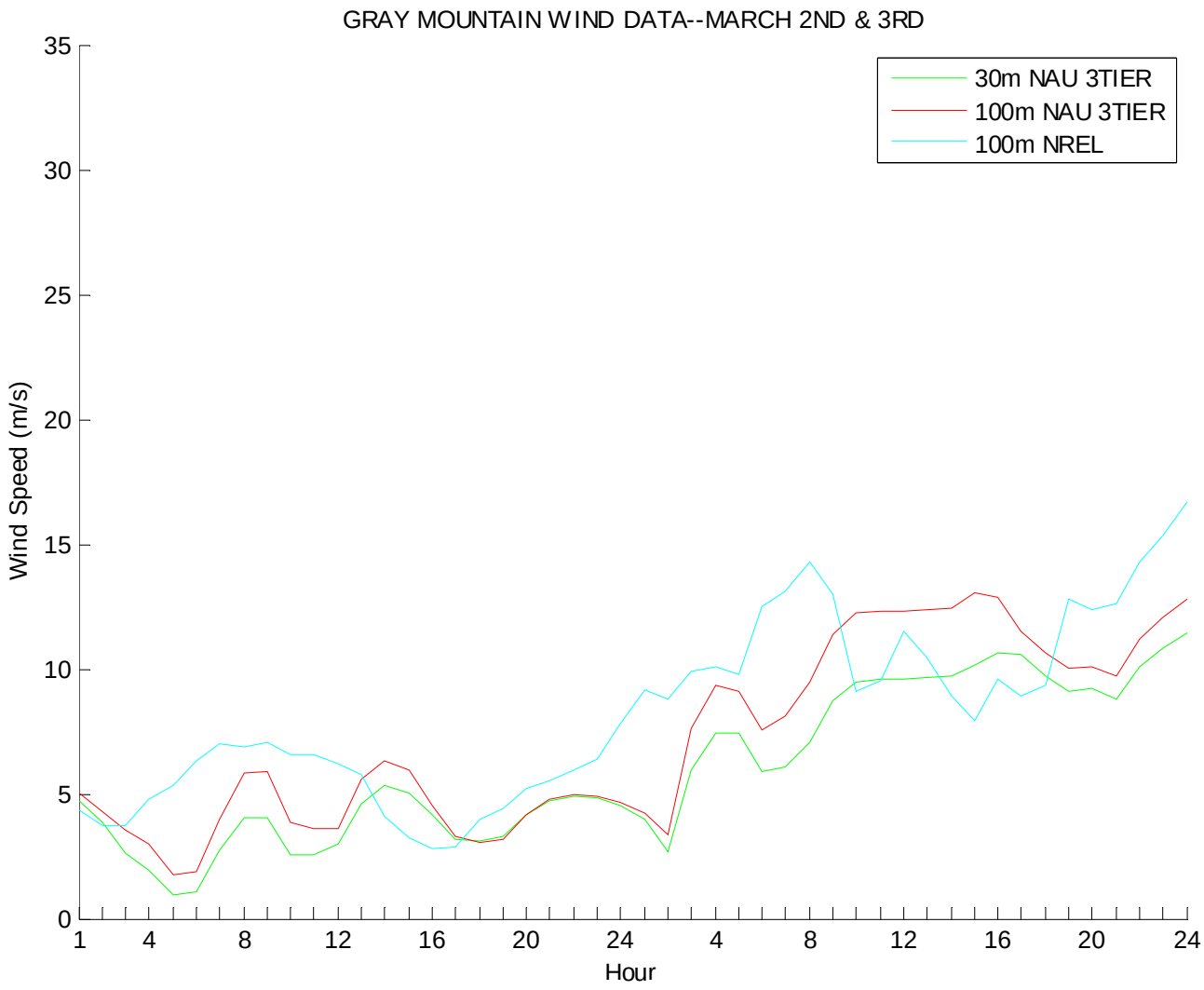

CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
0
20
40
60
80
100
120
140
160
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day

2-day Wind Plots – March 2

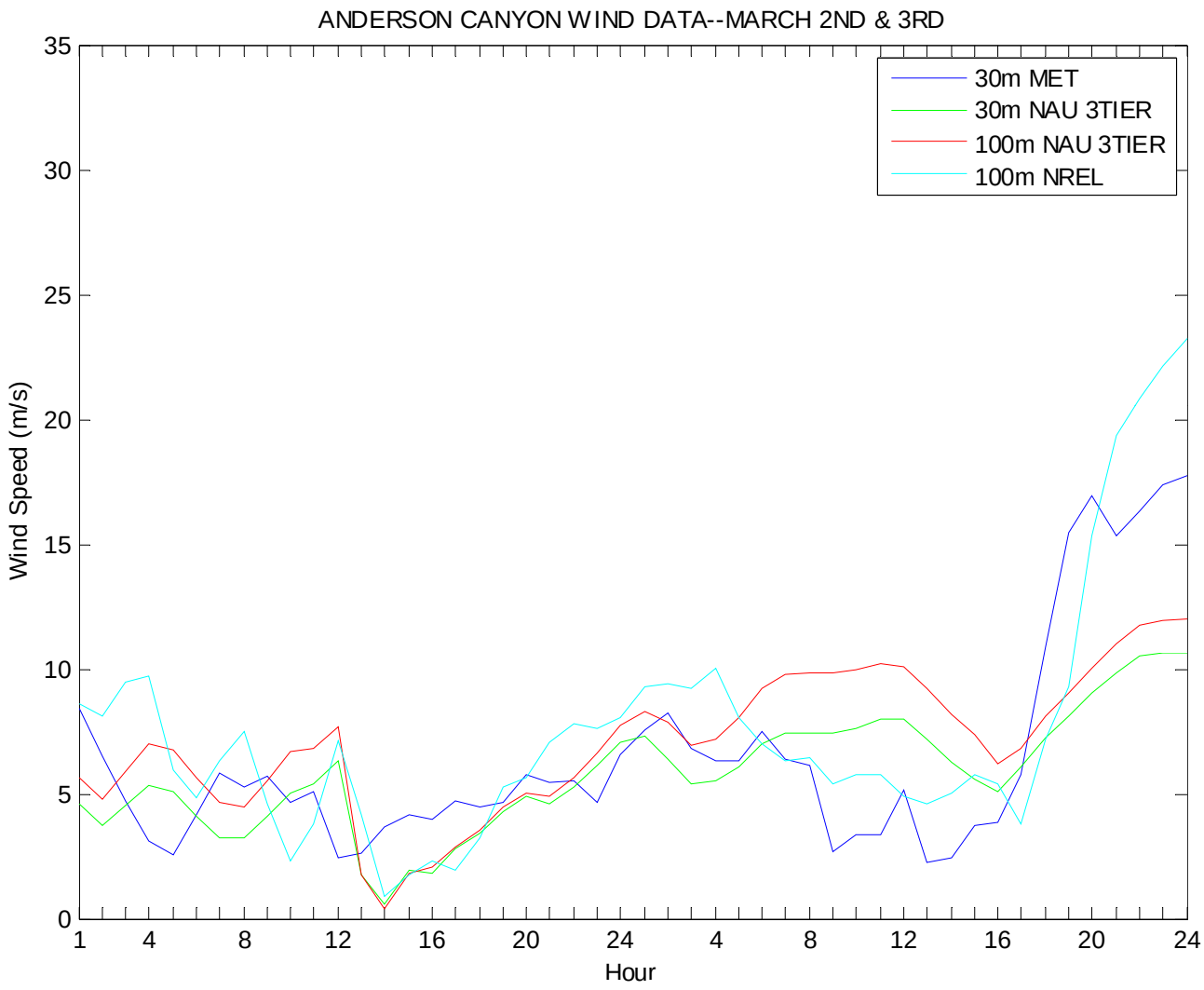


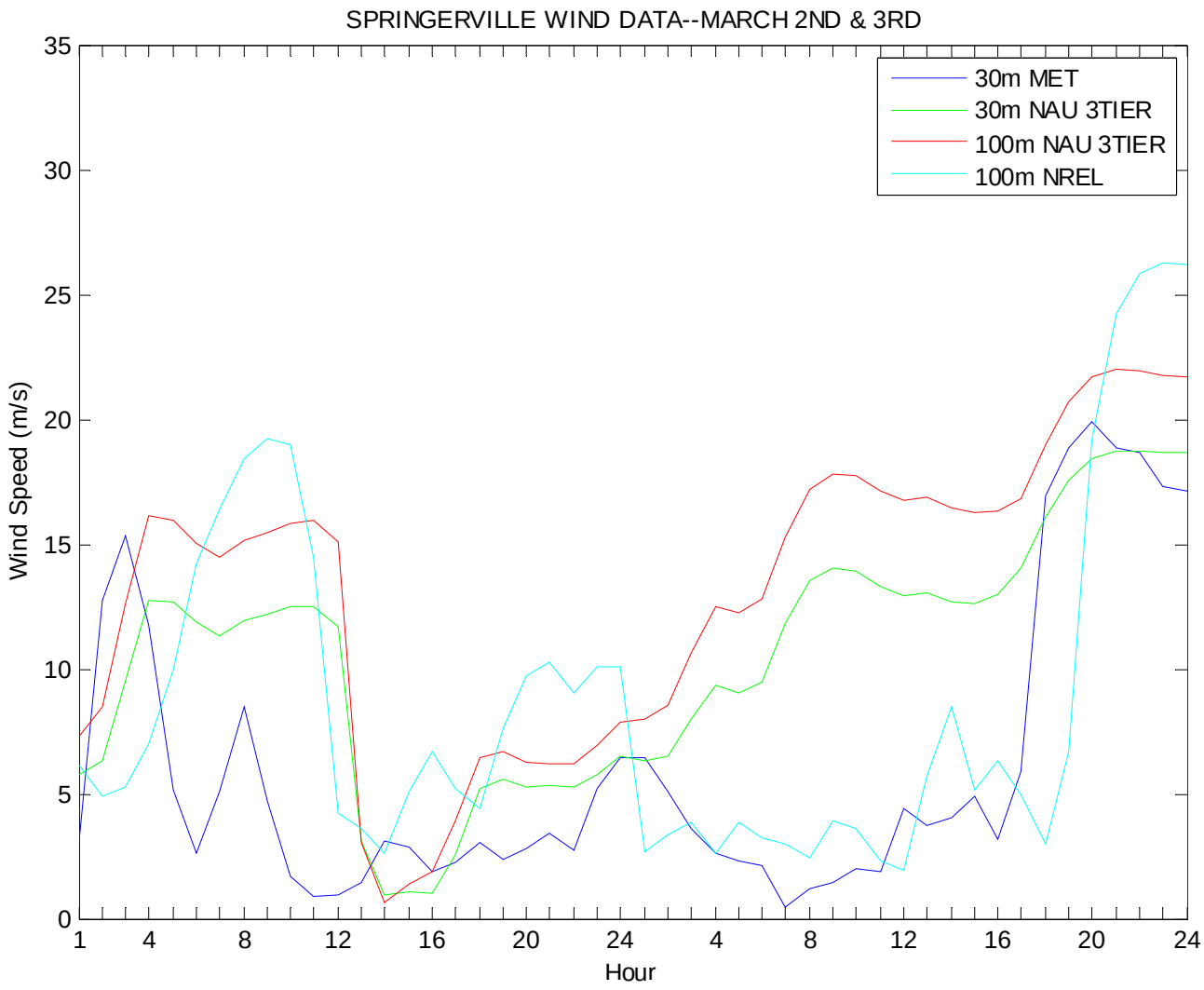
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA--MARCH 2ND & 3RD
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
35
1
4
8
12
16
20
24
4
8
12
16
20
24

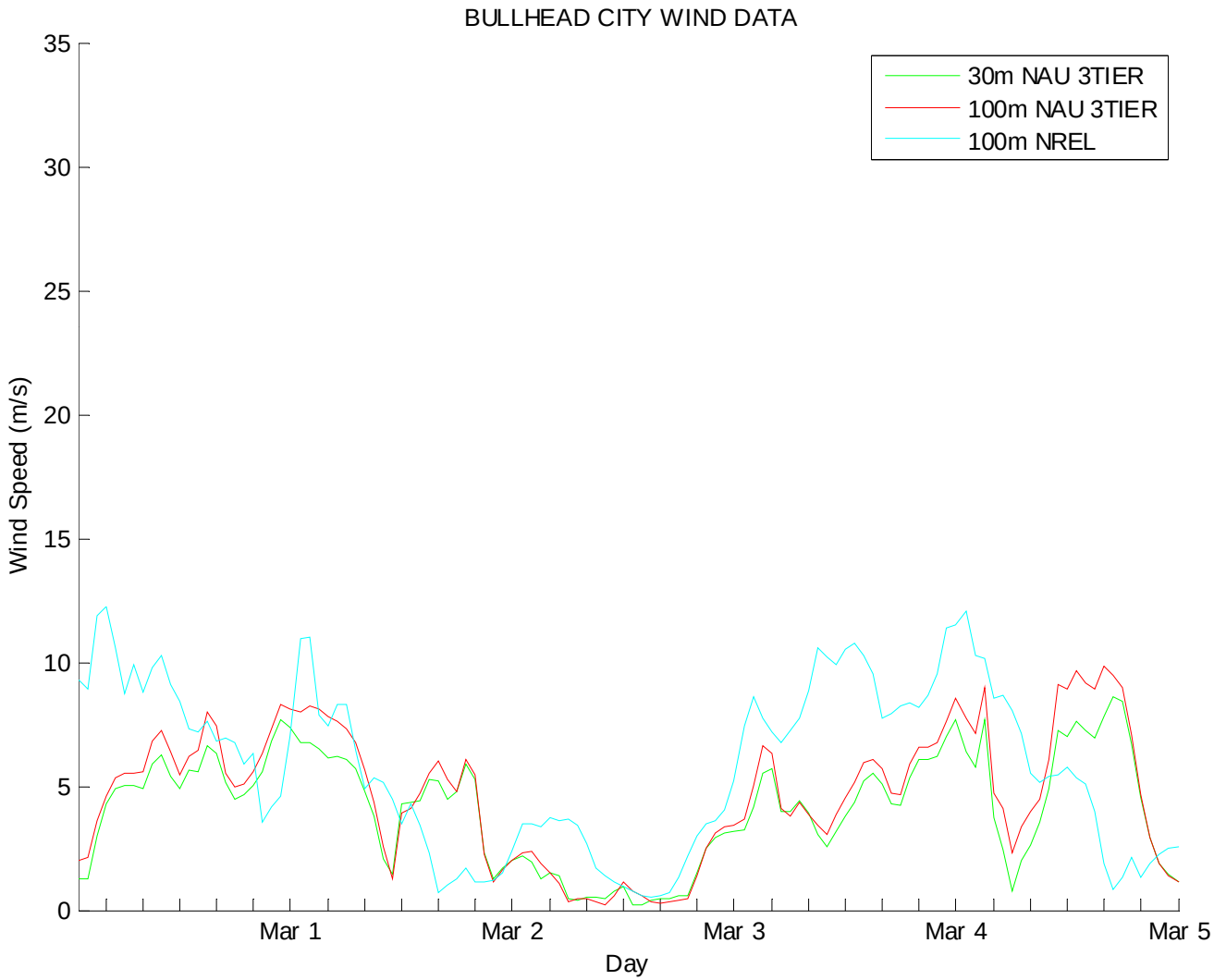


Note, no met tower data was available at Gray Mountain for these dates.

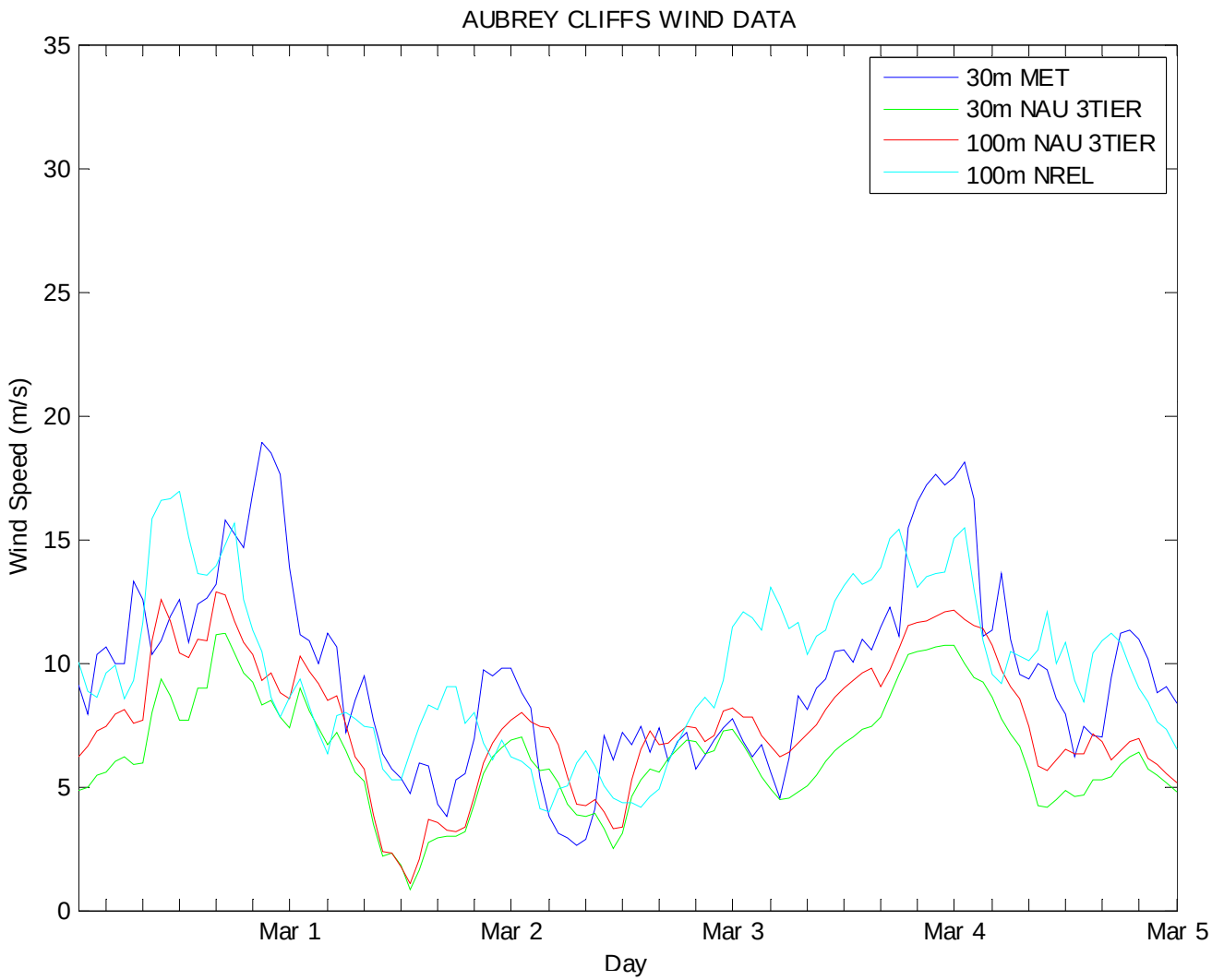

ANDERSON CANYON WIND DATA--MARCH 2ND & 3RD
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
35
1
4
8
12
16
20
24
4
8
12
16
20
24

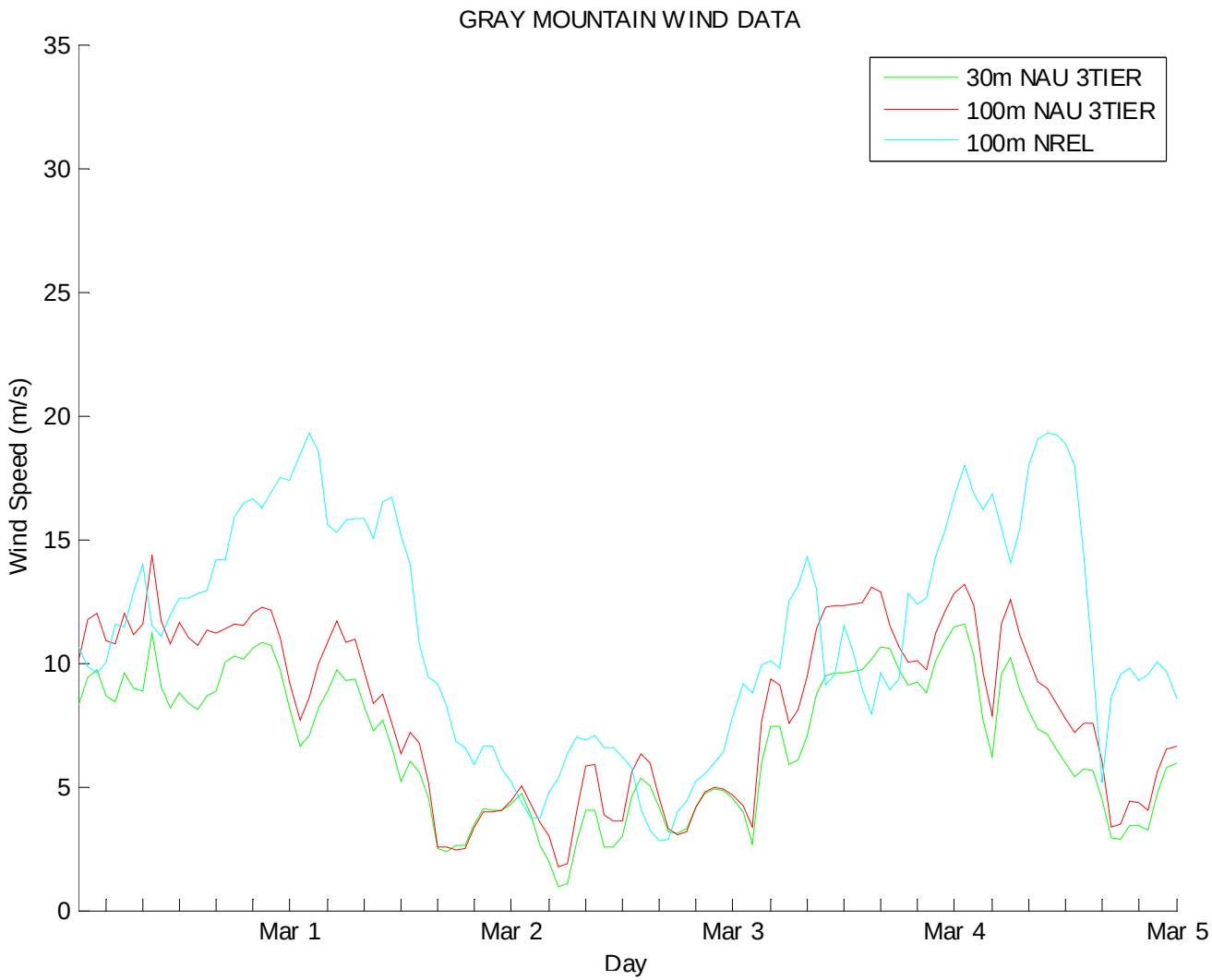

SPRINGERVILLE WIND DATA--MARCH 2ND & 3RD
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
30
35
1
4
8
12
16
20
24
4
8
12
16
20
24

5-day Wind Plots – March 2

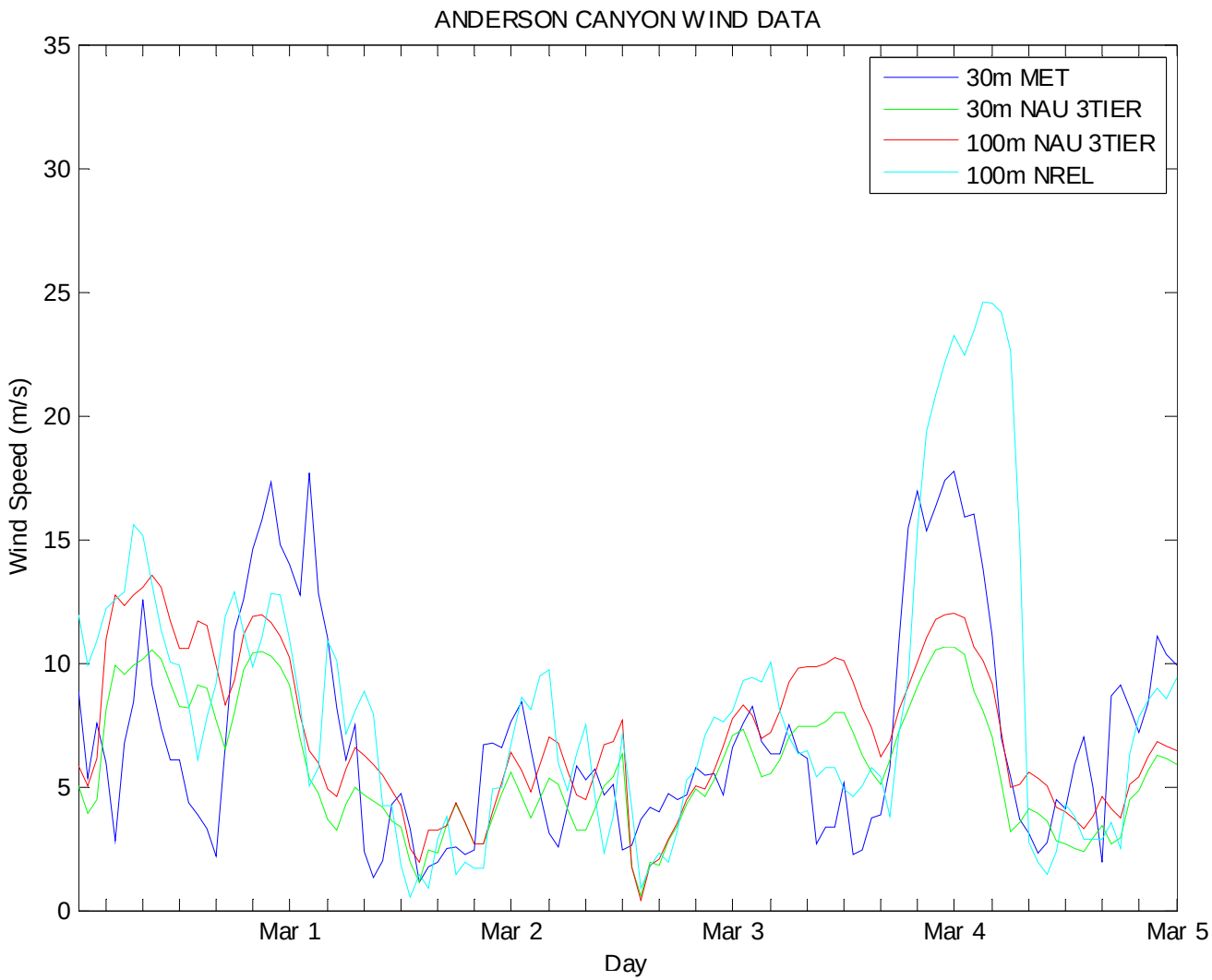


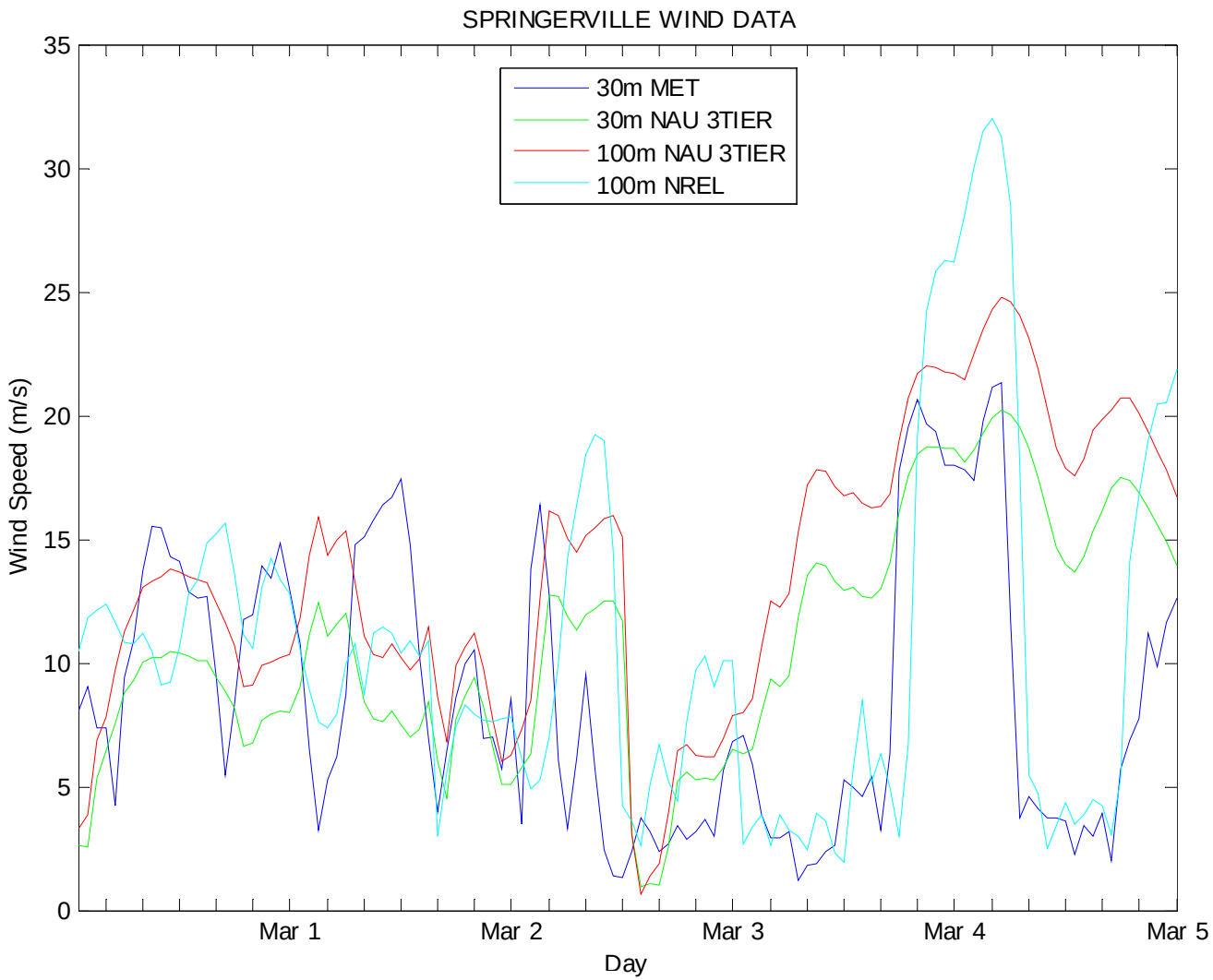
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
35
30
25
20
15
10
5
0
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day

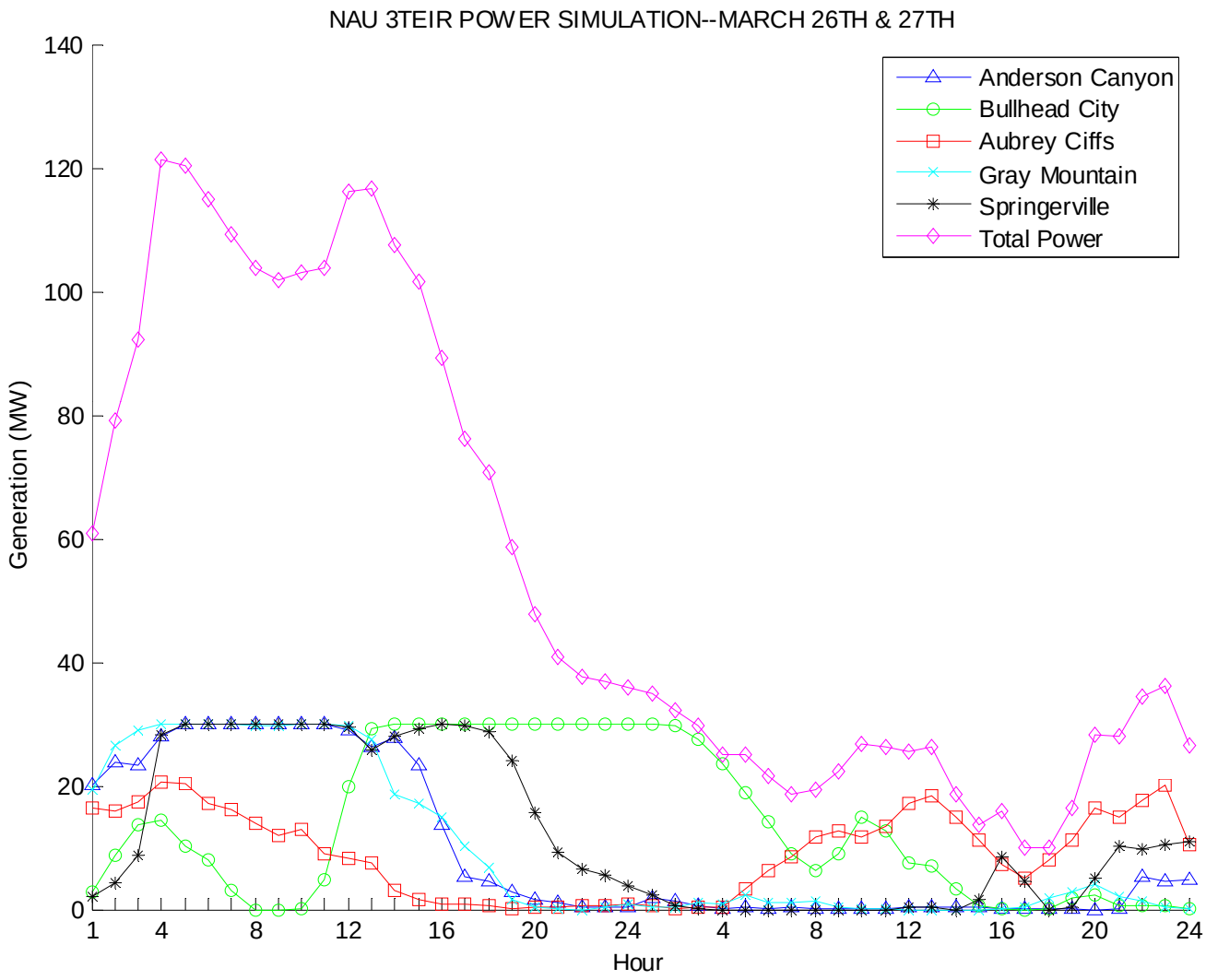


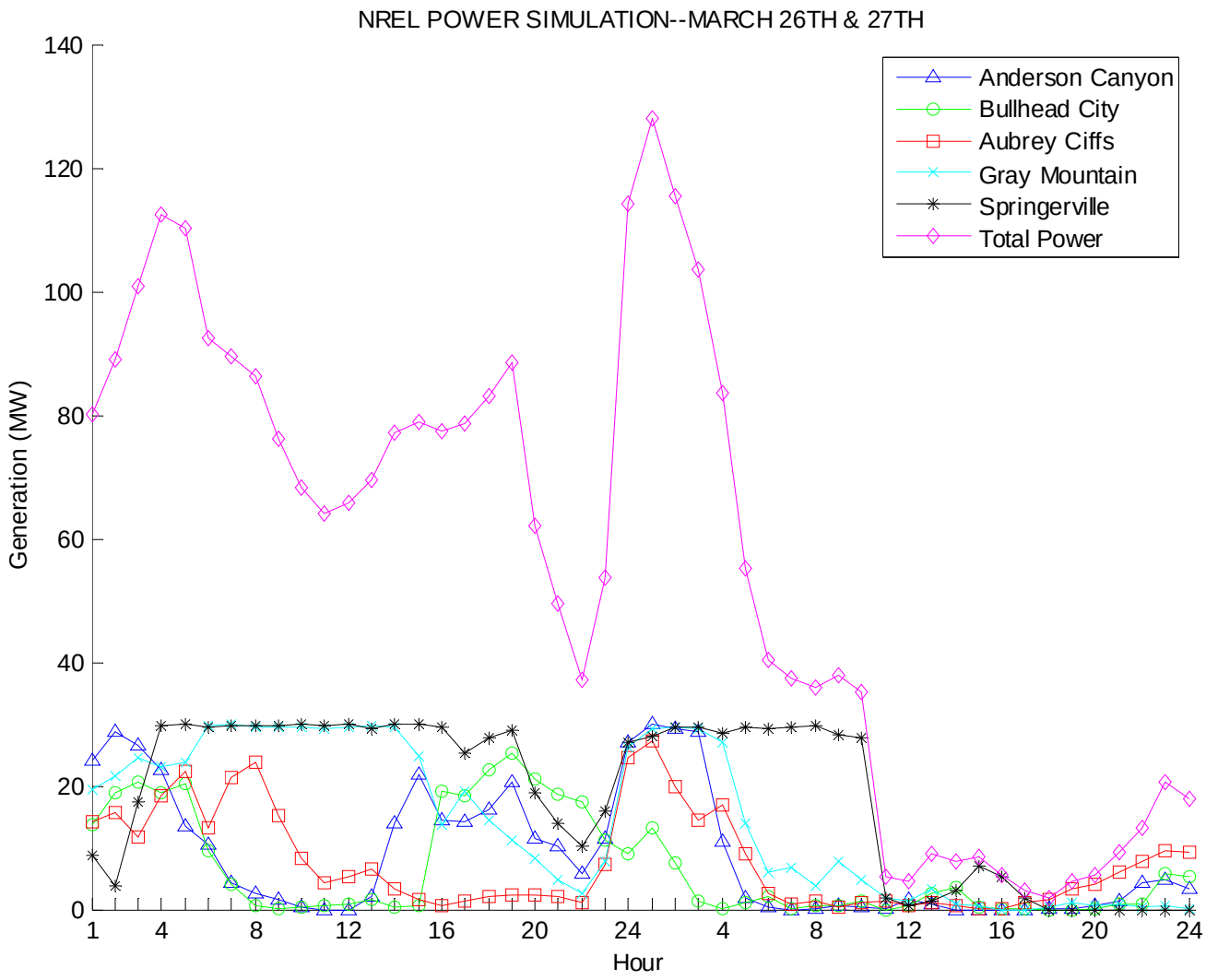
Note, no met tower data was available at Gray Mountain for these dates.

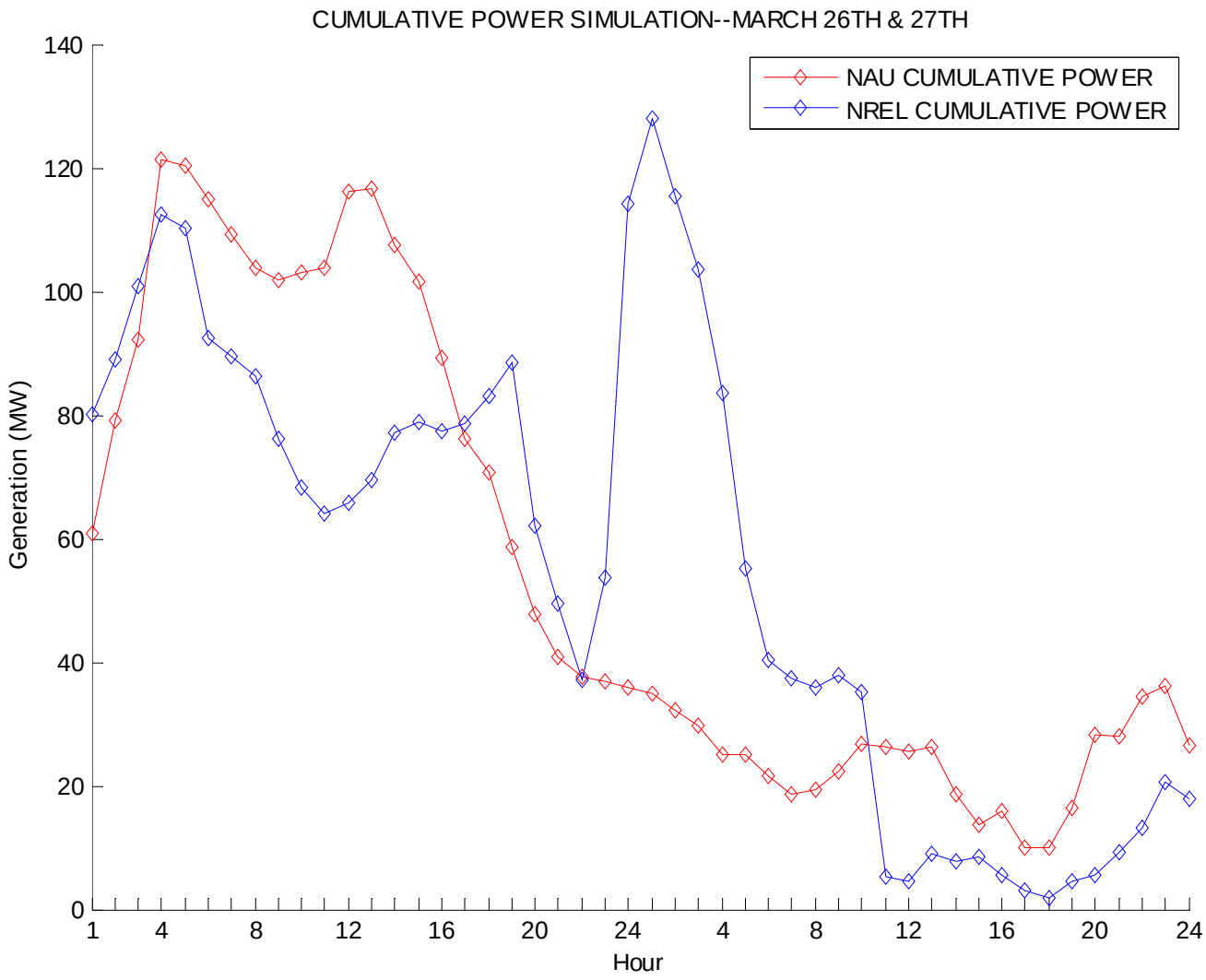

ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
35
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day


SPRINGERVILLE WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
30
35
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Day

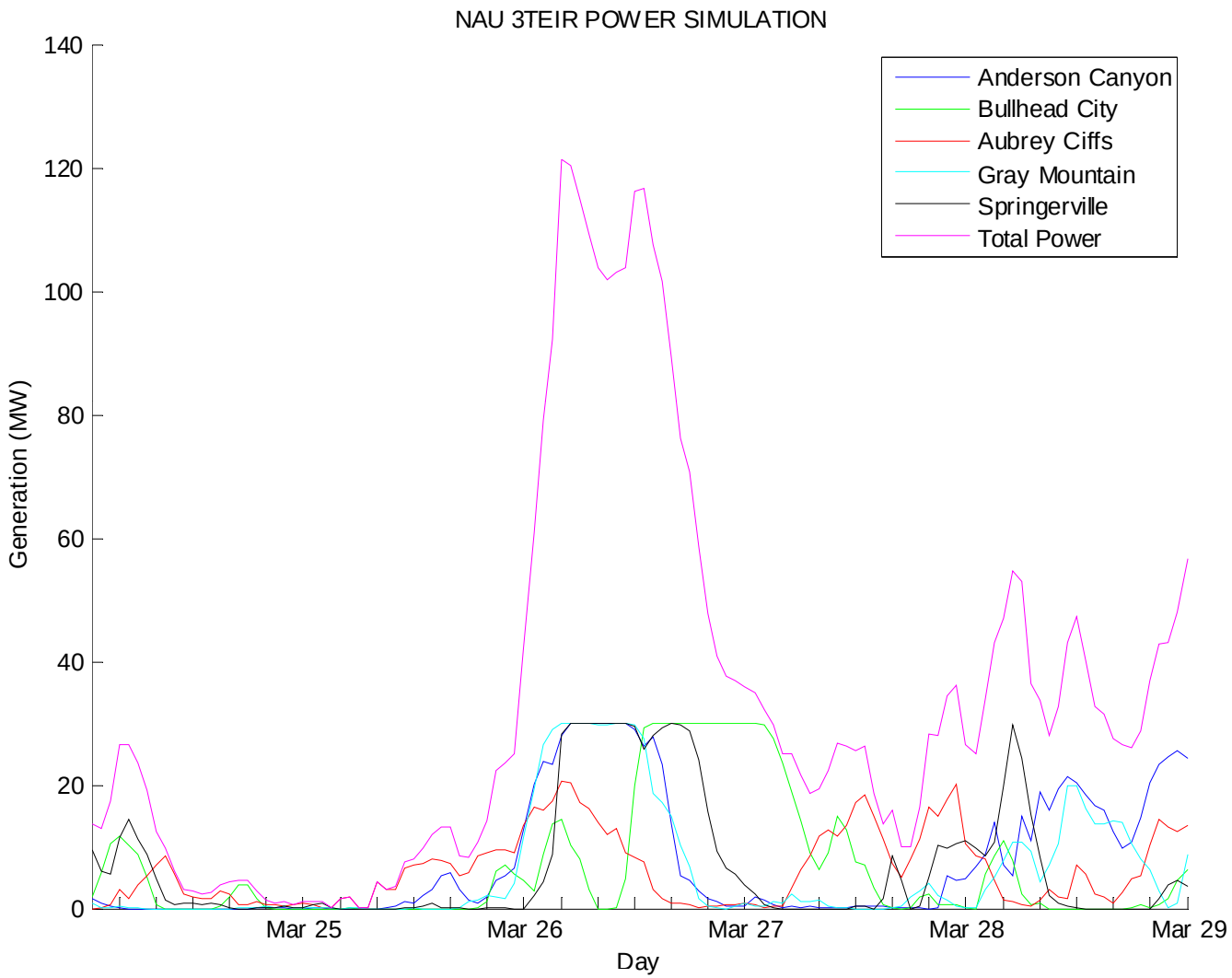
2-day Power Plots – March 26

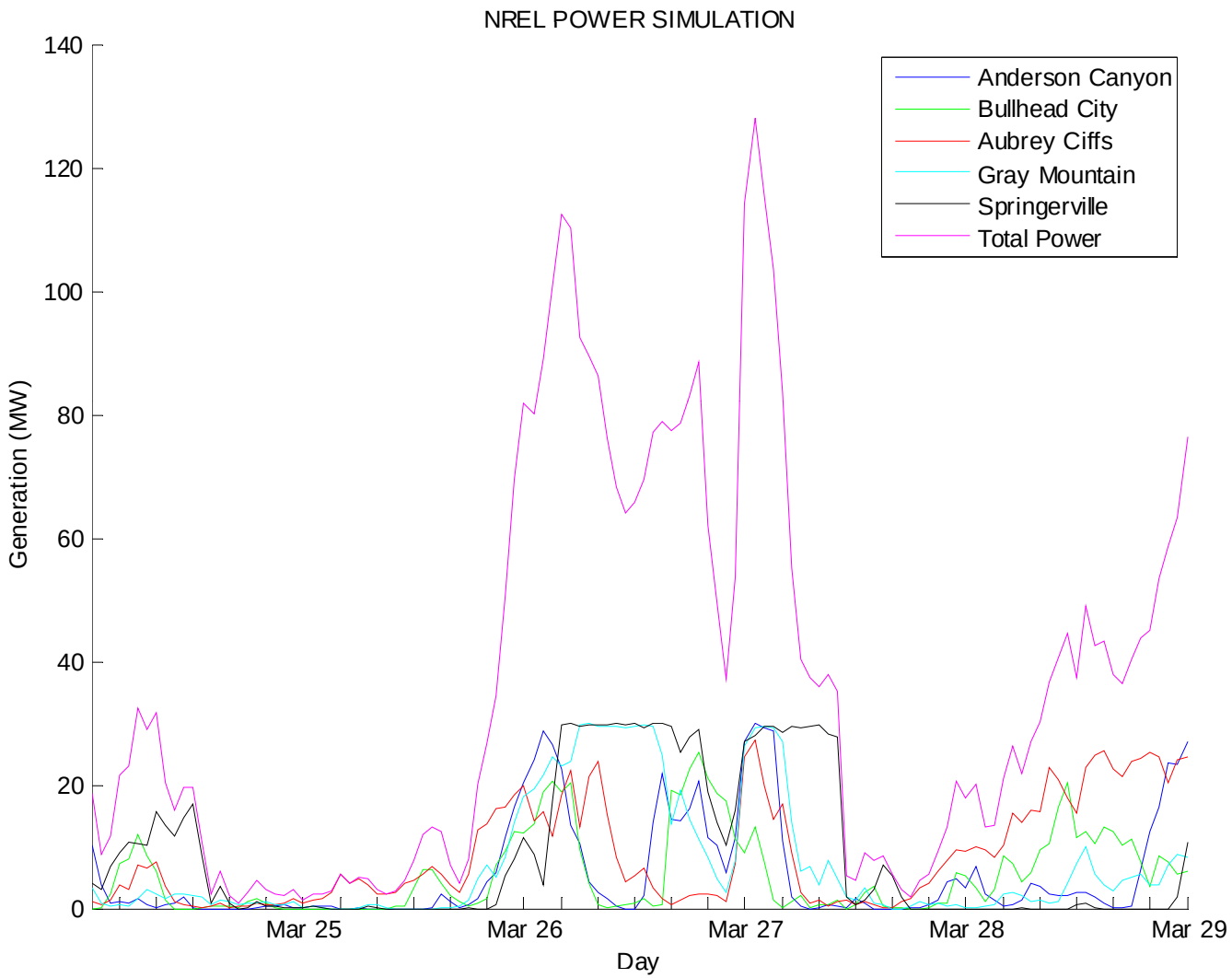


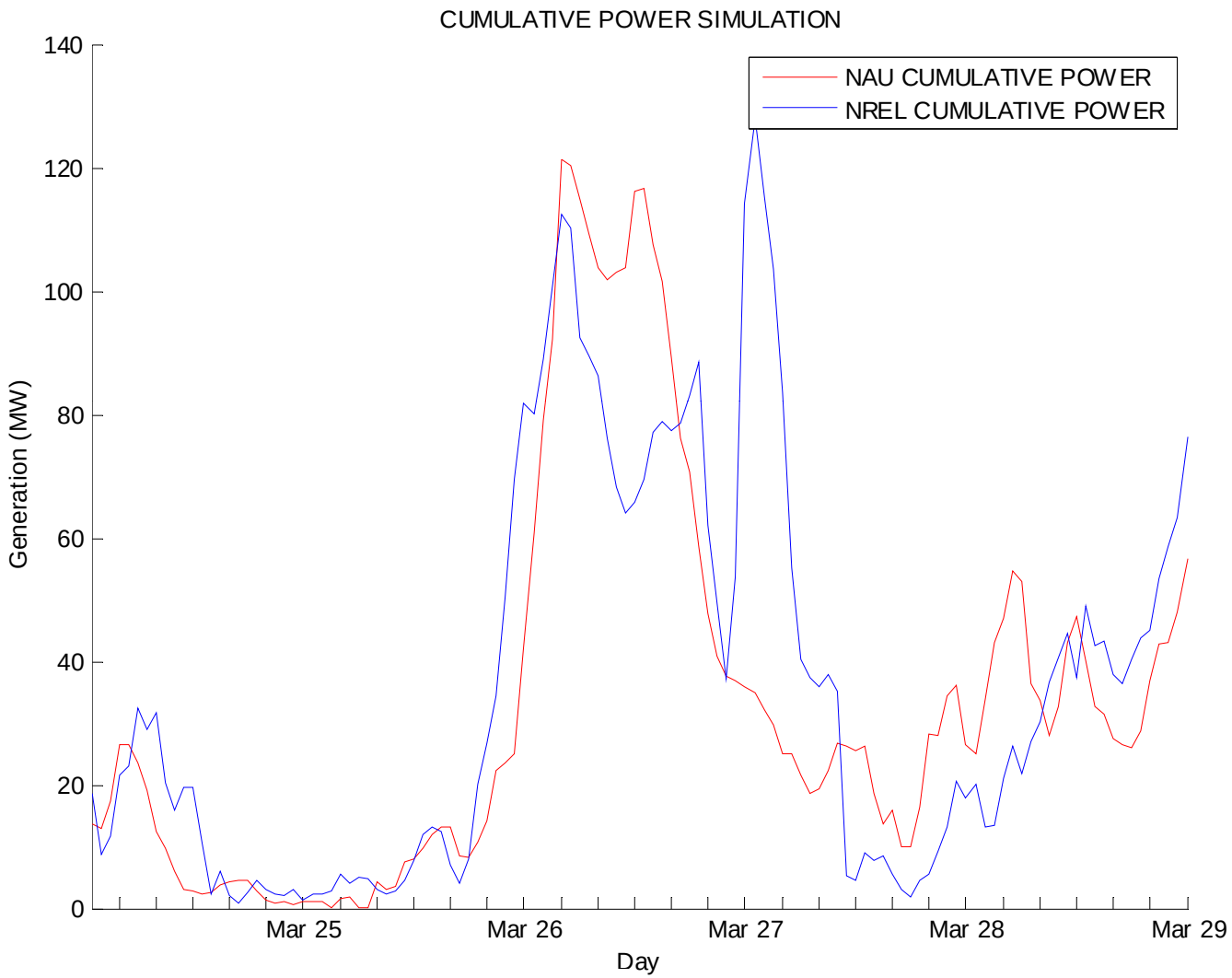

NREL POWER SIMULATION--MARCH 26TH & 27TH
Generation (MW)
Hour
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
0
20
40
60
80
100
120
140
1
4
8
12
16
20
24
4
8
12
16
20
24


CUMULATIVE POWER SIMULATION--MARCH 26TH & 27TH
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
Hour
0
20
40
60
80
100
120
140
1
4
8
12
16
20
24
4
8
12
16
20
24

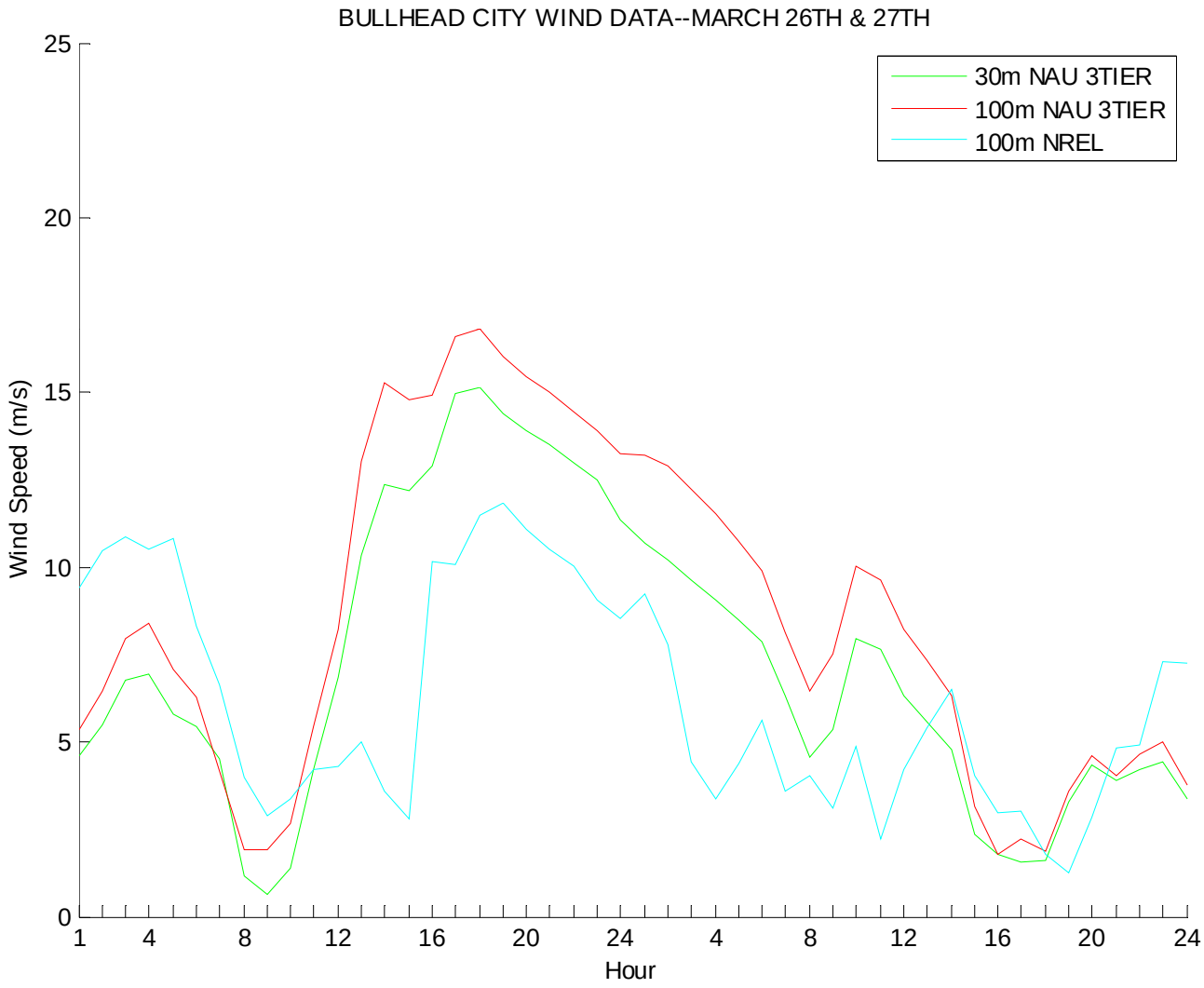
5-day Power Plots – March 26



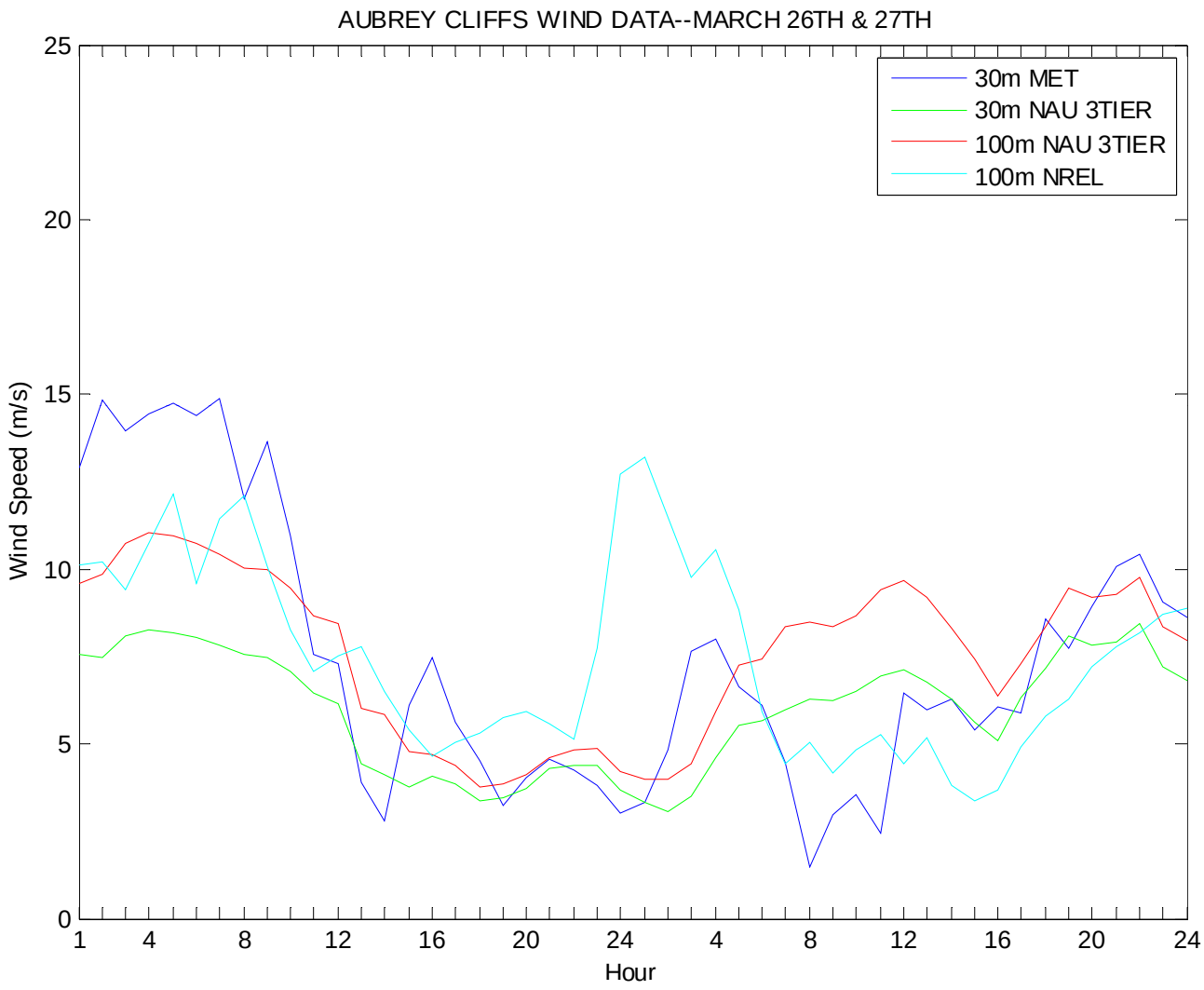

NREL POWER SIMULATION
Anderson Canyon
Bullhead City
Aubrey Ciffs
Gray Mountain
Springerville
Total Power
Generation (MW)
0
20
40
60
80
100
120
140
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Day

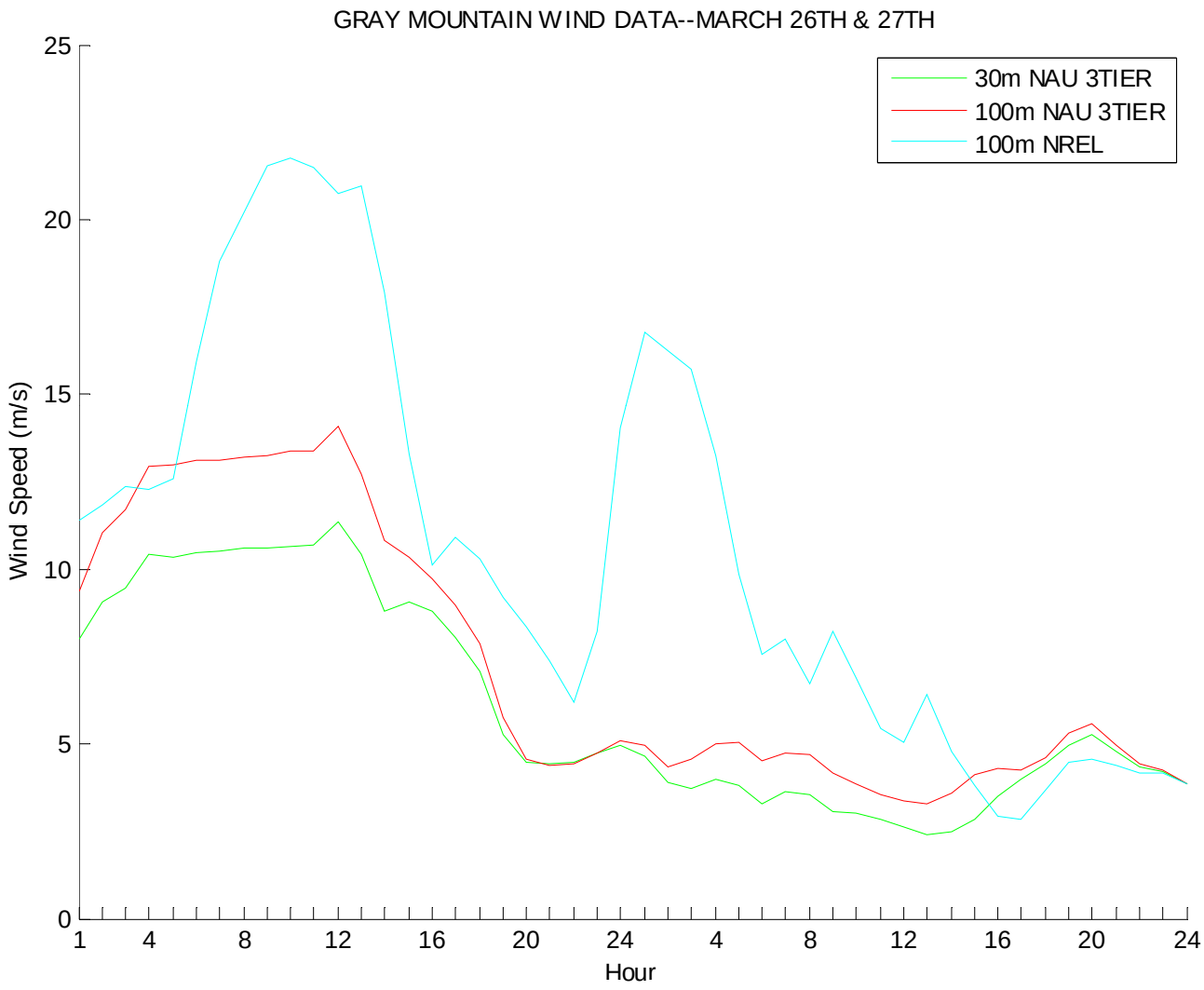

CUMULATIVE POWER SIMULATION
NAU CUMULATIVE POWER
NREL CUMULATIVE POWER
Generation (MW)
0
20
40
60
80
100
120
140
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Day

2-day Wind Plots – March 26

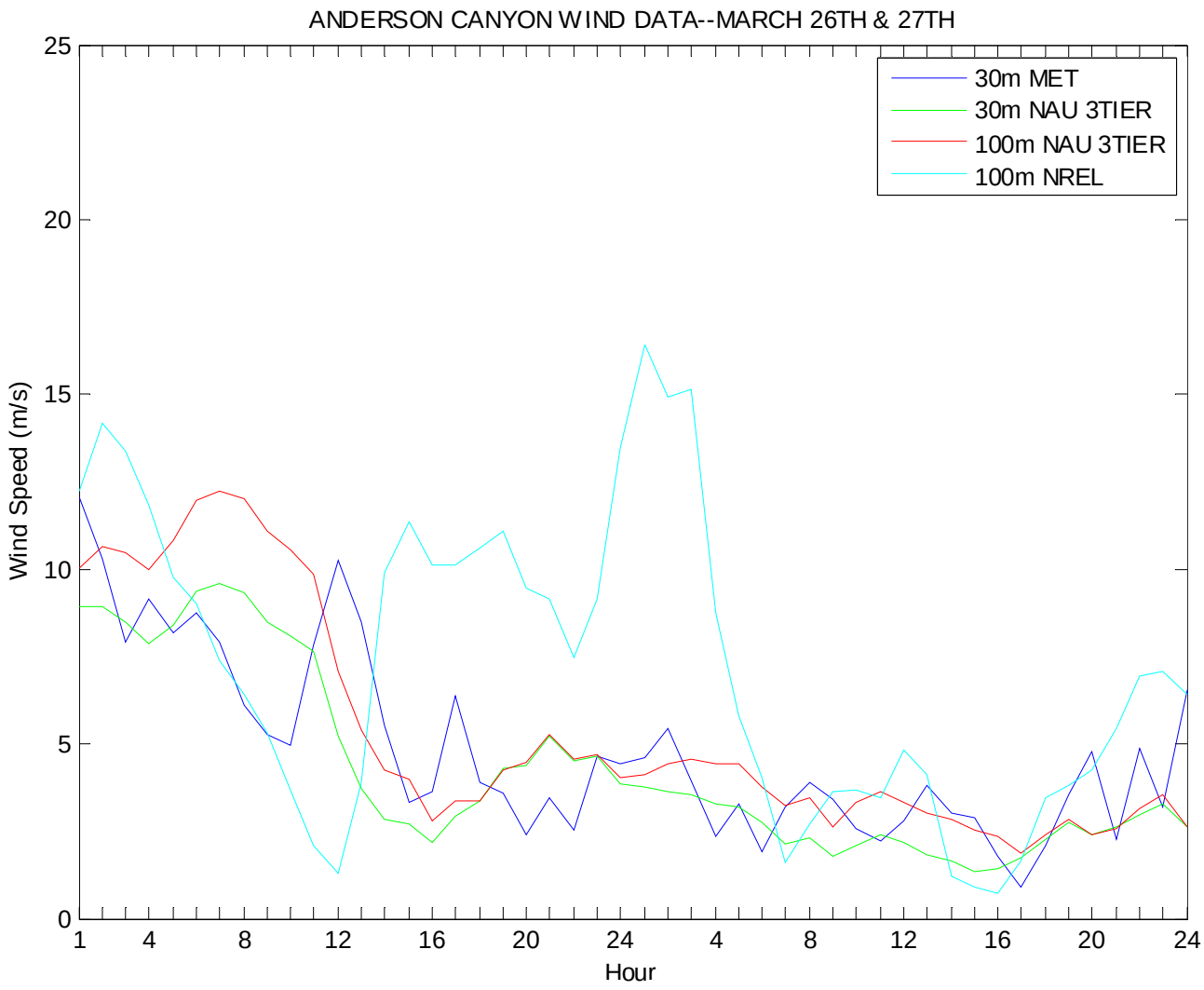


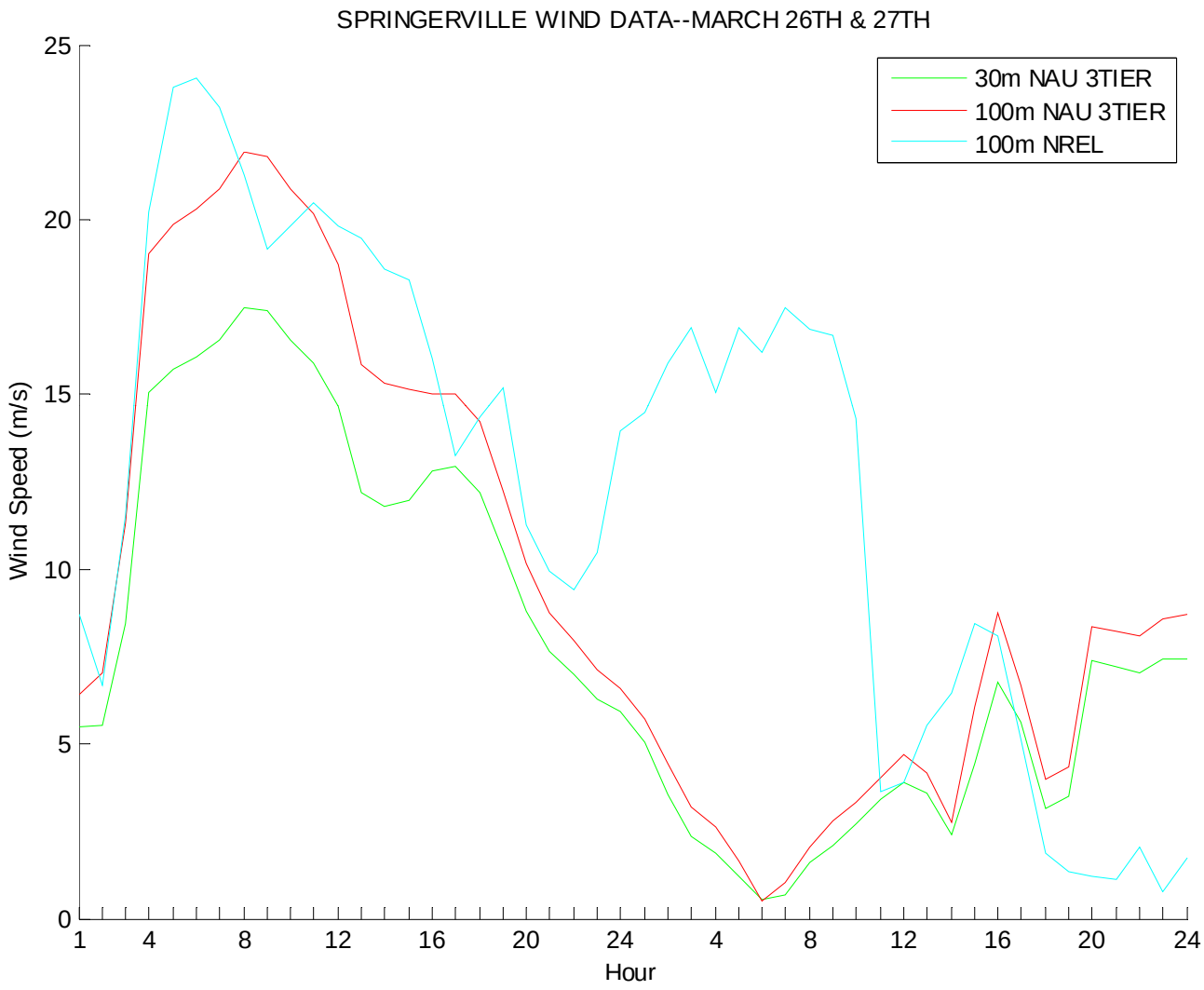
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA--MARCH 26TH & 27TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
1
4
8
12
16
20
24
4
8
12
16
20
24



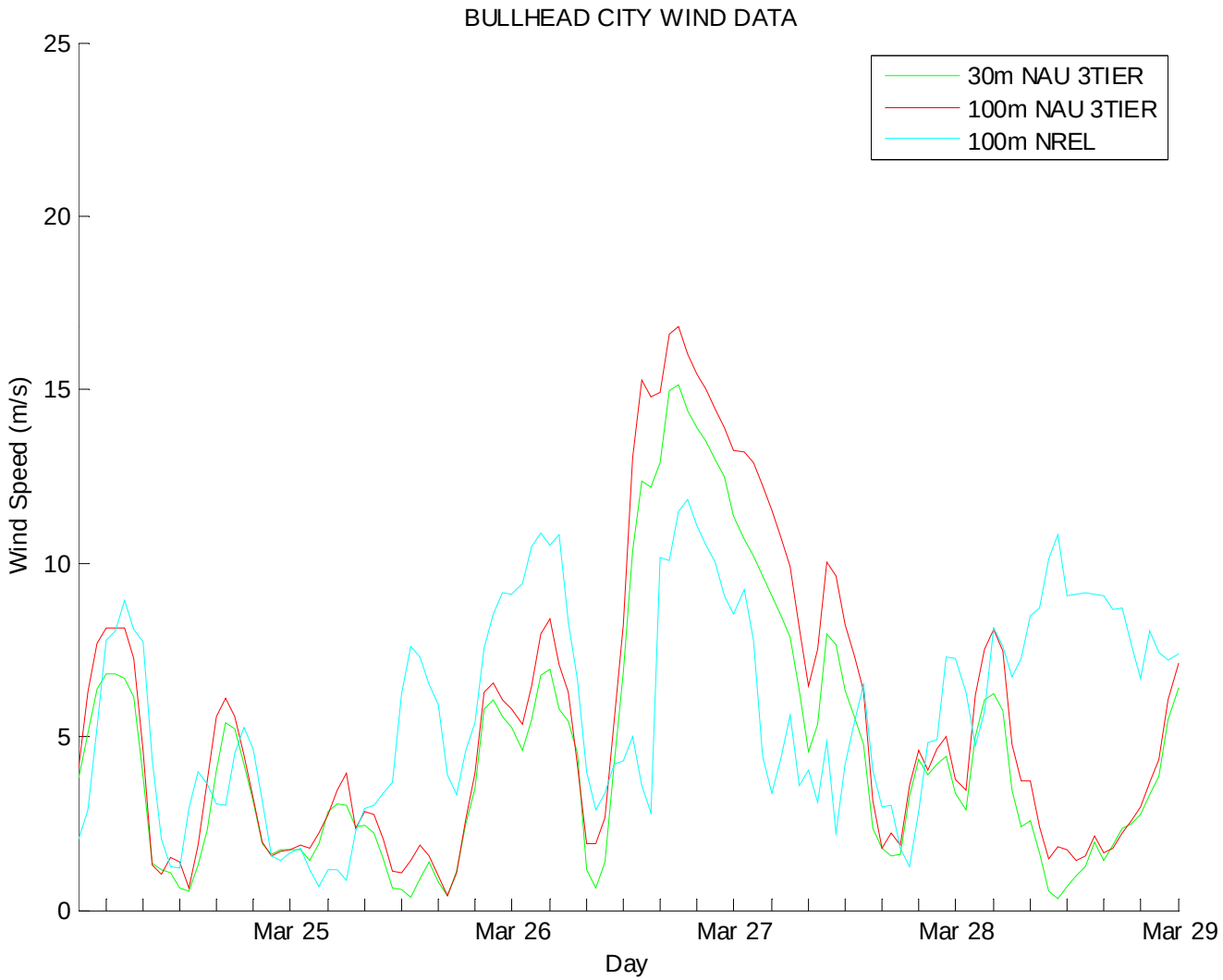
Note, no met tower data was available at Gray Mountain for these dates.


ANDERSON CANYON WIND DATA--MARCH 26TH & 27TH
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
Hour
0
5
10
15
20
25
1
4
8
12
16
20
24
4
8
12
16
20
24

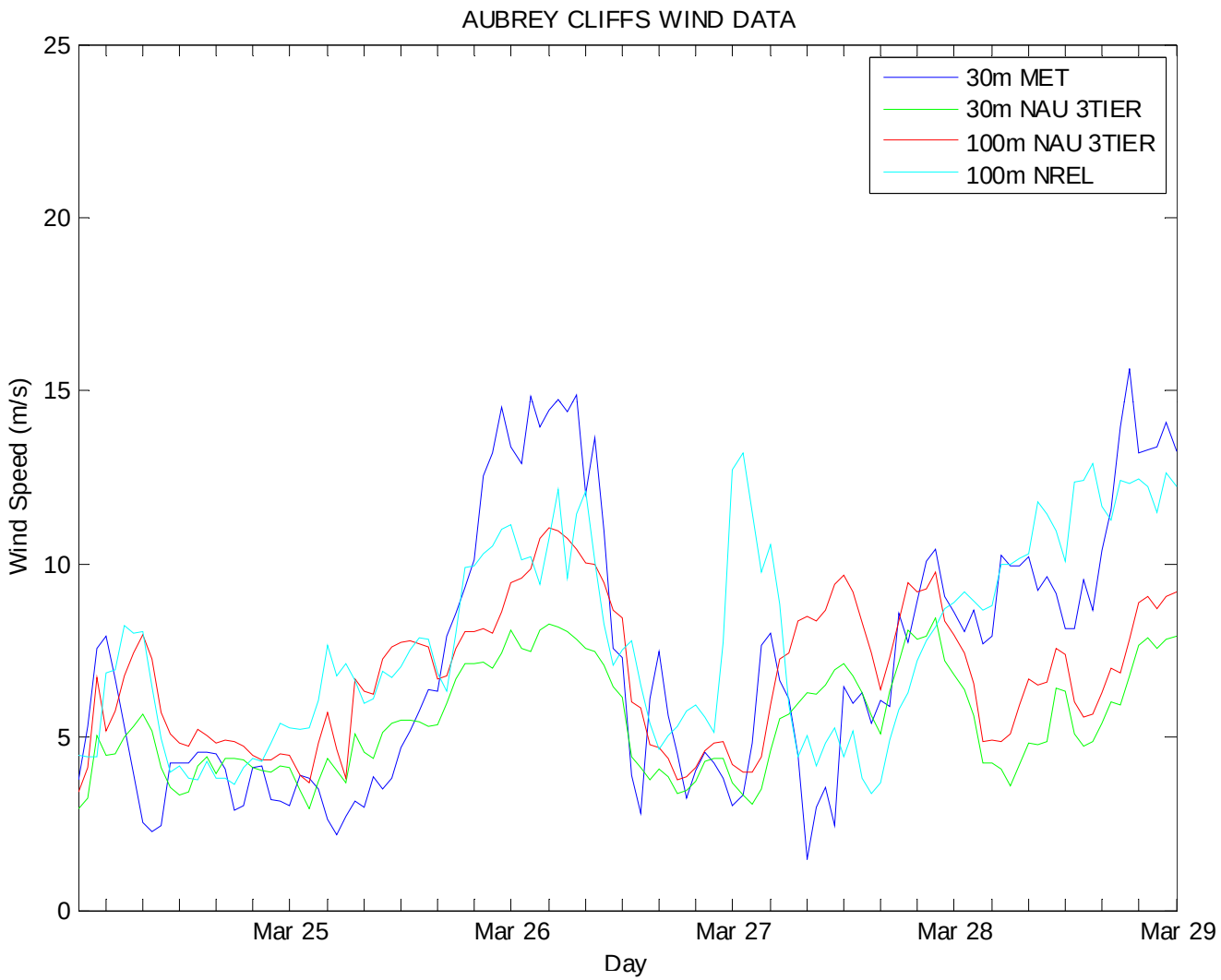


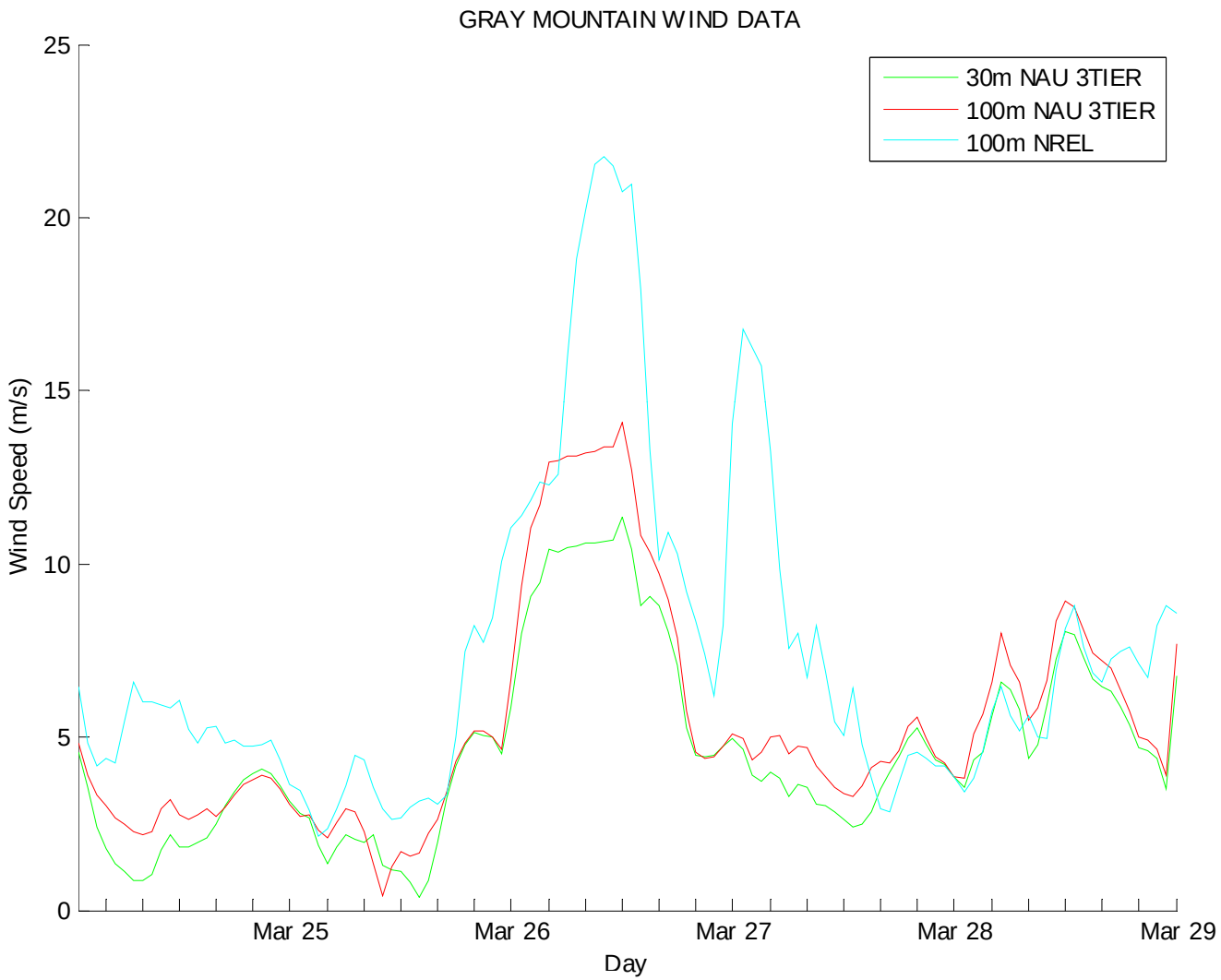
Note, no met tower data was available at Springerville for these dates.

5-day Wind Plots – March 26

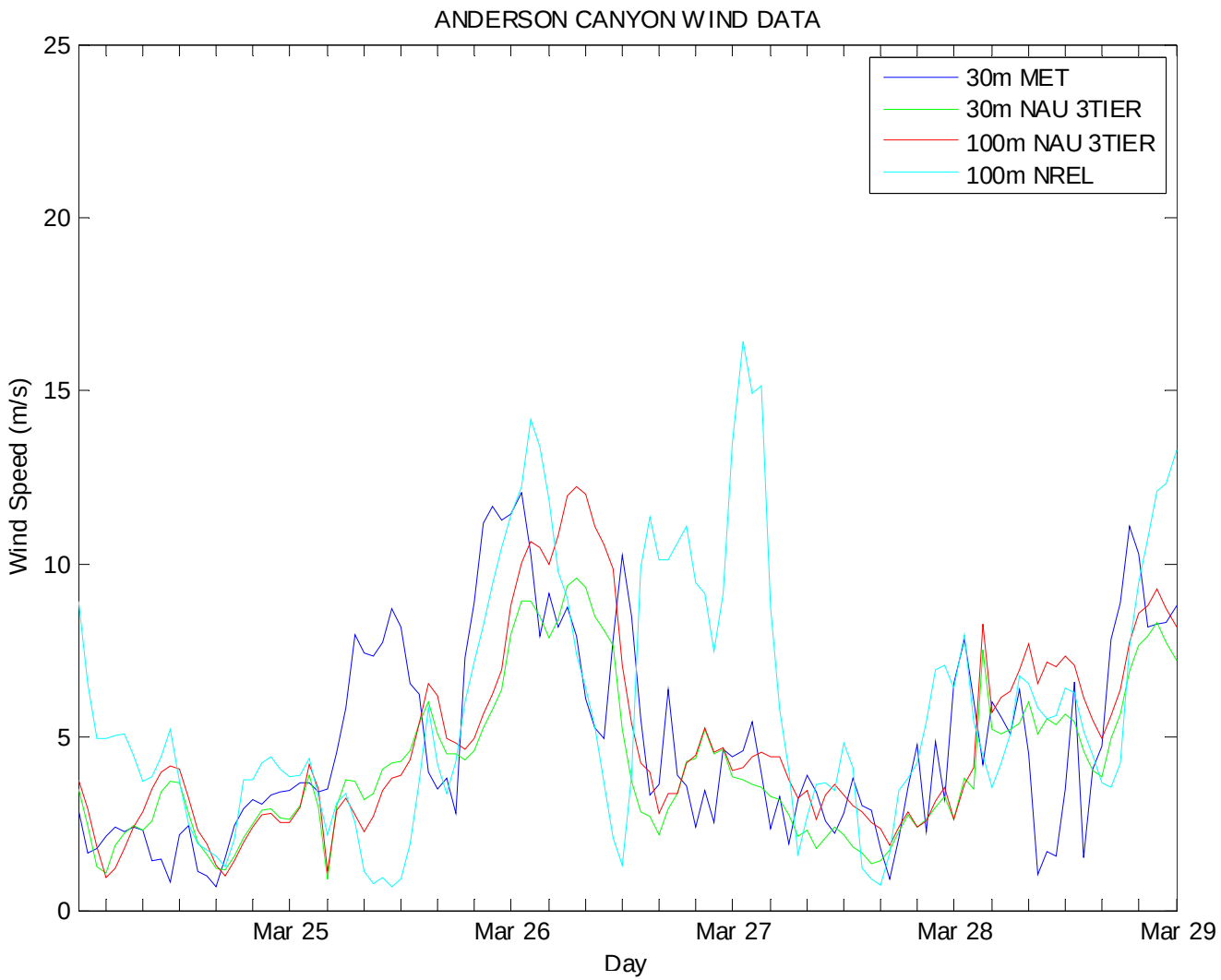


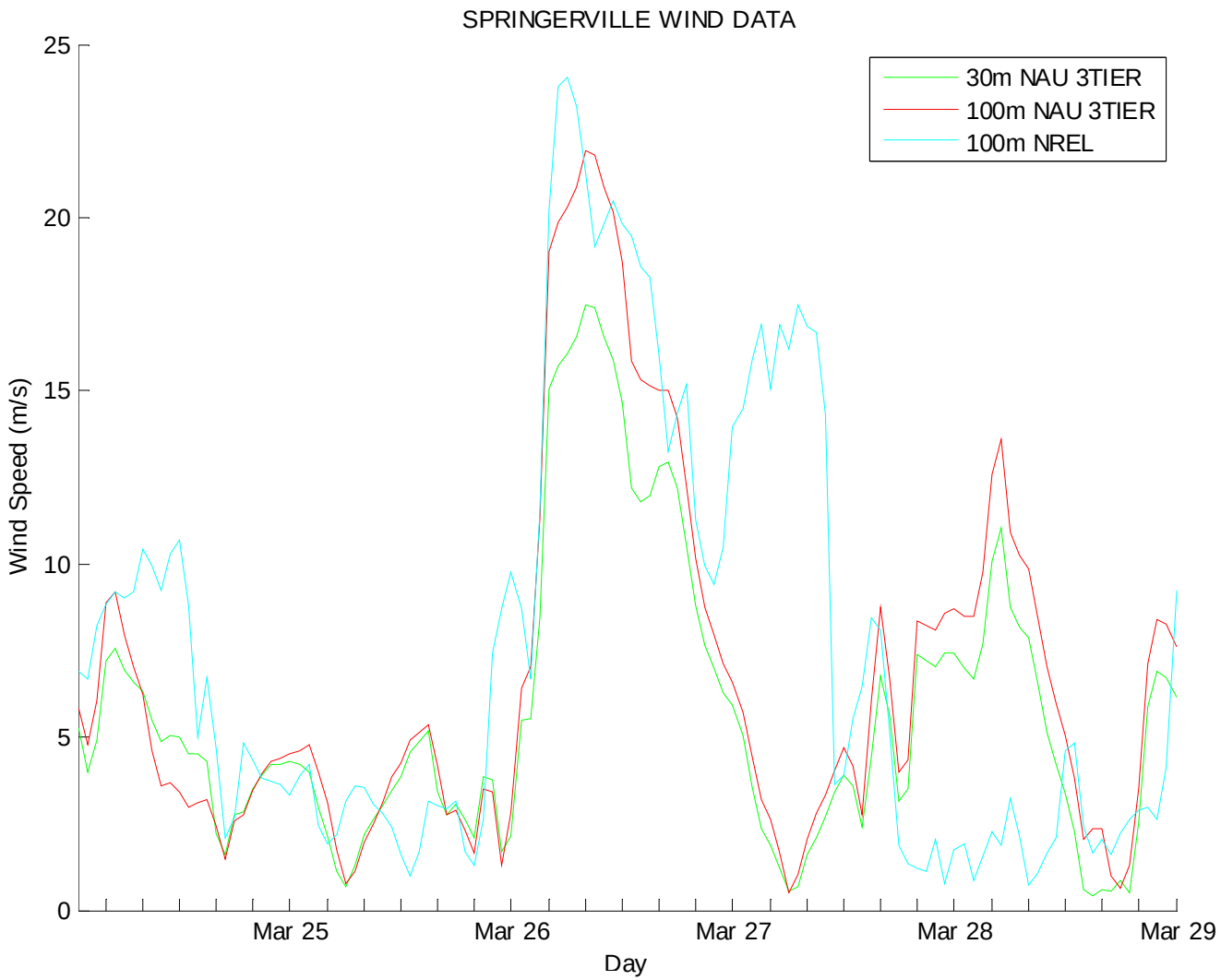
Note, no met tower data was available at Bullhead City for these dates.


AUBREY CLIFFS WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Day



Note, no met tower data was available at Gray Mountain for these dates.


ANDERSON CANYON WIND DATA
30m MET
30m NAU 3TIER
100m NAU 3TIER
100m NREL
Wind Speed (m/s)
0
5
10
15
20
25
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Day



Note, no met tower data was available at Springerville for these dates.