

Hourly wind energy in Syracuse, NY

Purpose

We want to see how the time of day correlates to the energy content of wind.

Data

We took data from KSYR, a National Weather Service surface observation station at Hancock International Airport in Syracuse, NY. The data is a list of hourly wind speed averages from 2008. We used all the data that was available, which was 8393 hours out of the 8784 possible hours. We assume that many of the unavailable hours were times of extreme weather, when a wind turbine might not be producing energy.

Latitude: 43.1092, longitude: -76.1033, elevation: 10m above ground.

Method

We sent the following request to our database ("winddata"), in which the "regionid" of KSYR is "28" and the speed is stored in dm/s.:

```
SELECT HOUR(date_time) as hourofday, ROUND(SUM(POWER(0.1*(speeddm/s),3)))
as speedcubed
```

```
FROM winddata
```

```
WHERE regionid=28 AND speeddm/s IS NOT NULL and
```

```
YEAR(date_time)=2008
```

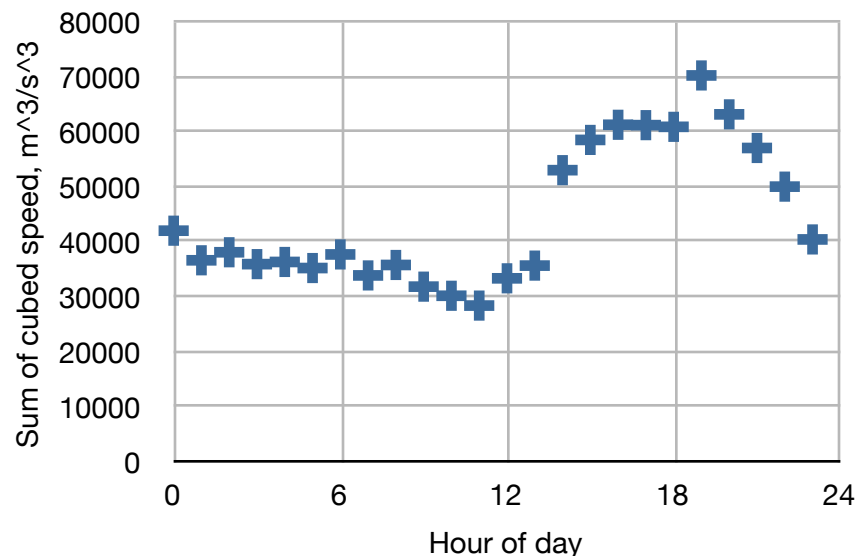
```
GROUP BY hourofday
```

The resulting data is shown at right, and in the chart below.

Result

The sum of the cubes of the speeds of the wind should be proportional to the power in the wind. Therefore, this graph is useful in estimating at what times of day, on average, wind output will be highest/lowest.

Syracuse energy by hour of day, 2008



Hour	Energy, sum speed cubed
0	42177
1	36795
2	38255
3	36098
4	36491
5	35387
6	37859
7	34044
8	35944
9	32003
10	30346
11	28561
12	33517
13	35829
14	53182
15	58681
16	61435
17	61366
18	61061
19	70403
20	63329
21	57213
22	50187
23	40587

Analysis

The graph shows the windiest hours are in the late afternoon and early evening, where cumulative energy production is likely to be double what it is in the late morning, when it is calmest.

Inferences

Hourly prices for electricity, along with demand, rise in the afternoon. A wind turbine in this location would be well-suited to match that demand, and generate electricity when it is most needed and sells for the highest prices.

A wind turbine would sit on a tower higher than 10m, where the wind may be somewhat different, likely stronger and more steady. Also, a wind turbine would probably not be sited right at the location of this weather station, since it is adjacent to airport runways. But this area of Syracuse is topographically simple, so winds nearby are likely to be very similar.

Further studies

Charts should be made for each month, seeing whether the inferences hold true for seasonal changes in the hourly demand patterns. The same type of analysis should be made for month-of-year energy instead of hour-of-day, to see also if seasonal needs are well met.

Are winds at the weather station at Cicero-North Syracuse High School similar?