A Comparison of Tower to Rooftop Monitoring and Resulting Estimated Performance

Andrew Kurtz – APRS World, LLC

Why Collect Data?

- To determine a site's wind resource
- To determine the economic feasibility of installing a wind turbine
- A Poorly Sited Turbine:
  - Results in an unhappy customer
  - Is bad business
  - Hurts the industry

APRS WORLD, LLC

Mick’s Site


1
2
3
50 feet
20 m
© 2013 Microsoft Corporation
Available Exclusively by DigitalGlobe

How was the data collected?

- Anemometers

- Data Loggers

APRS WORLD, LLC

Notes about the data

- Recorded to memory card
- 1 CSV (spreadsheet) file per day
- Tilt-up Tower – Since Nov. 2007
- Rooftop – Since Dec 2009
- Result: over 3,200 files
- More than 4.6 million rows of data…
- That’s a lot of data!

Data Processing

- Reduce the data to a common working set
  - Only days with a full day's worth of data from both data loggers
  - Detect equipment problems or other possible issues such as anemometer icing
    - Anemometer A shows 20 to 30 MPH readings throughout the day
    - Anemometer B shows 0 MPH readings all day

Working with databases

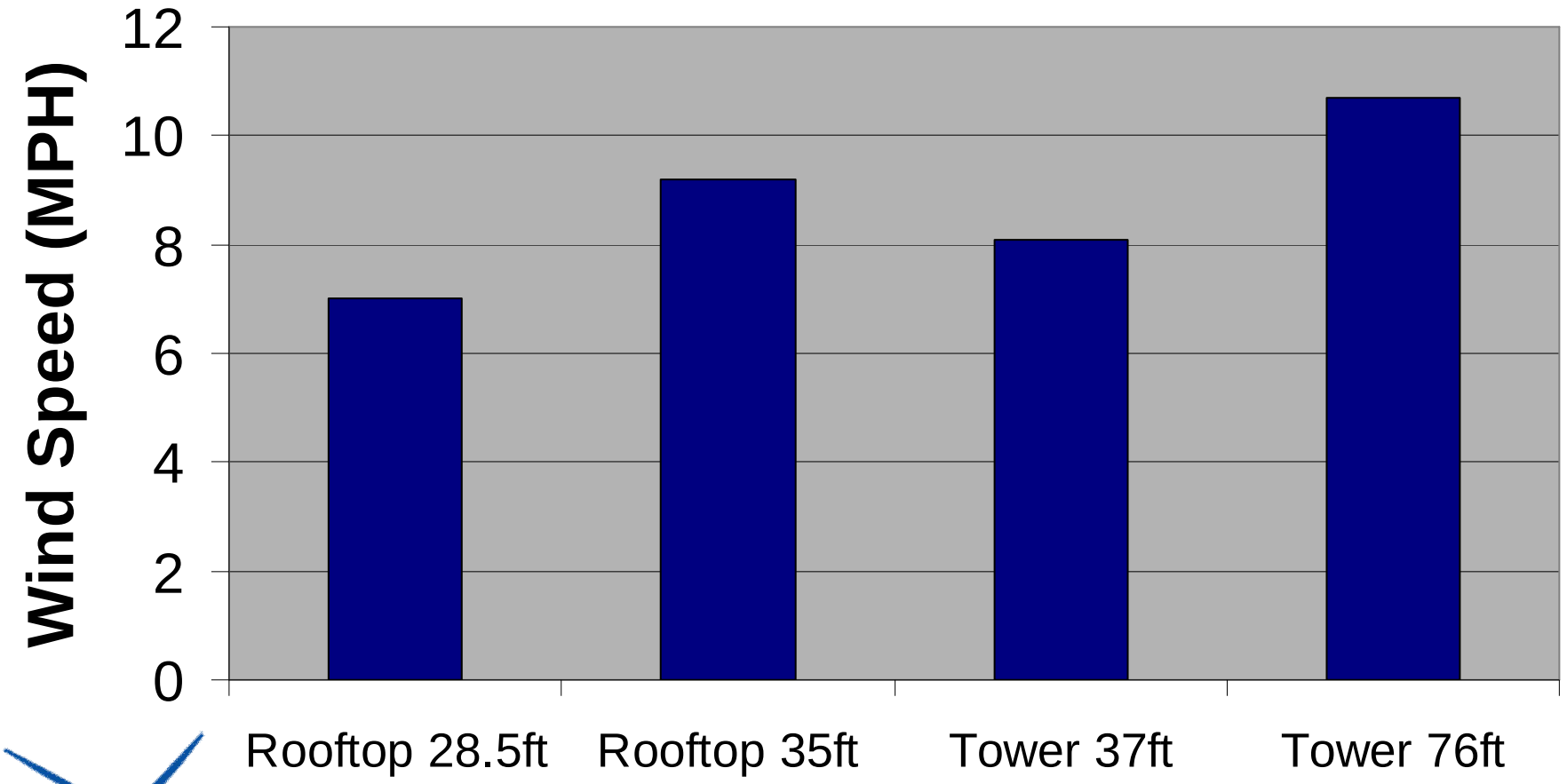
- Easier to work with large quantities of data
- Example, average wind speed:

```
mysql> SELECT ROUND(AVG(wsTower74),1)
       FROM towerData;
```

Result: 10.7 (MPH)

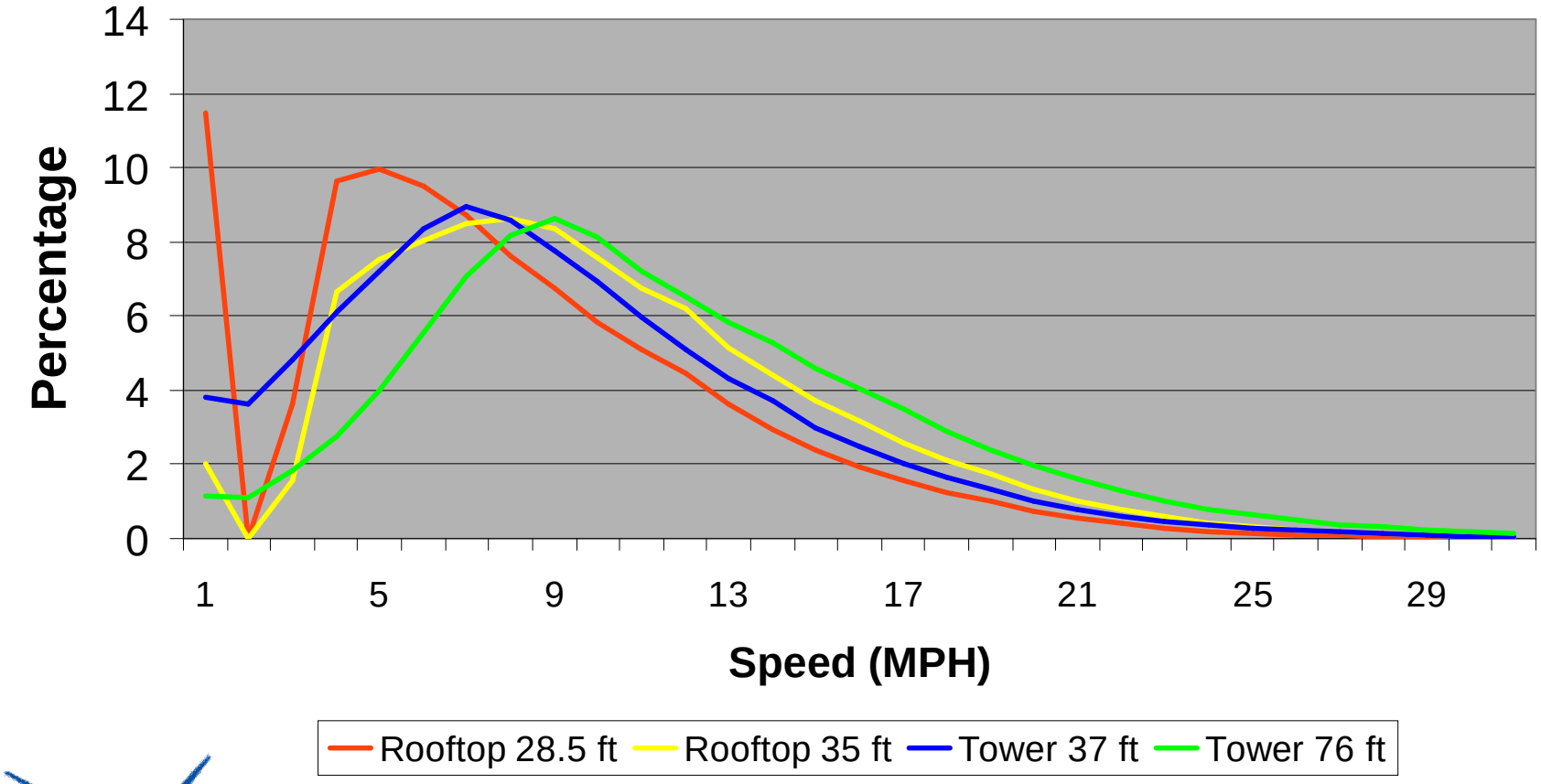
- Possible to do more complex operations such as frequency distributions

Average Wind Speeds



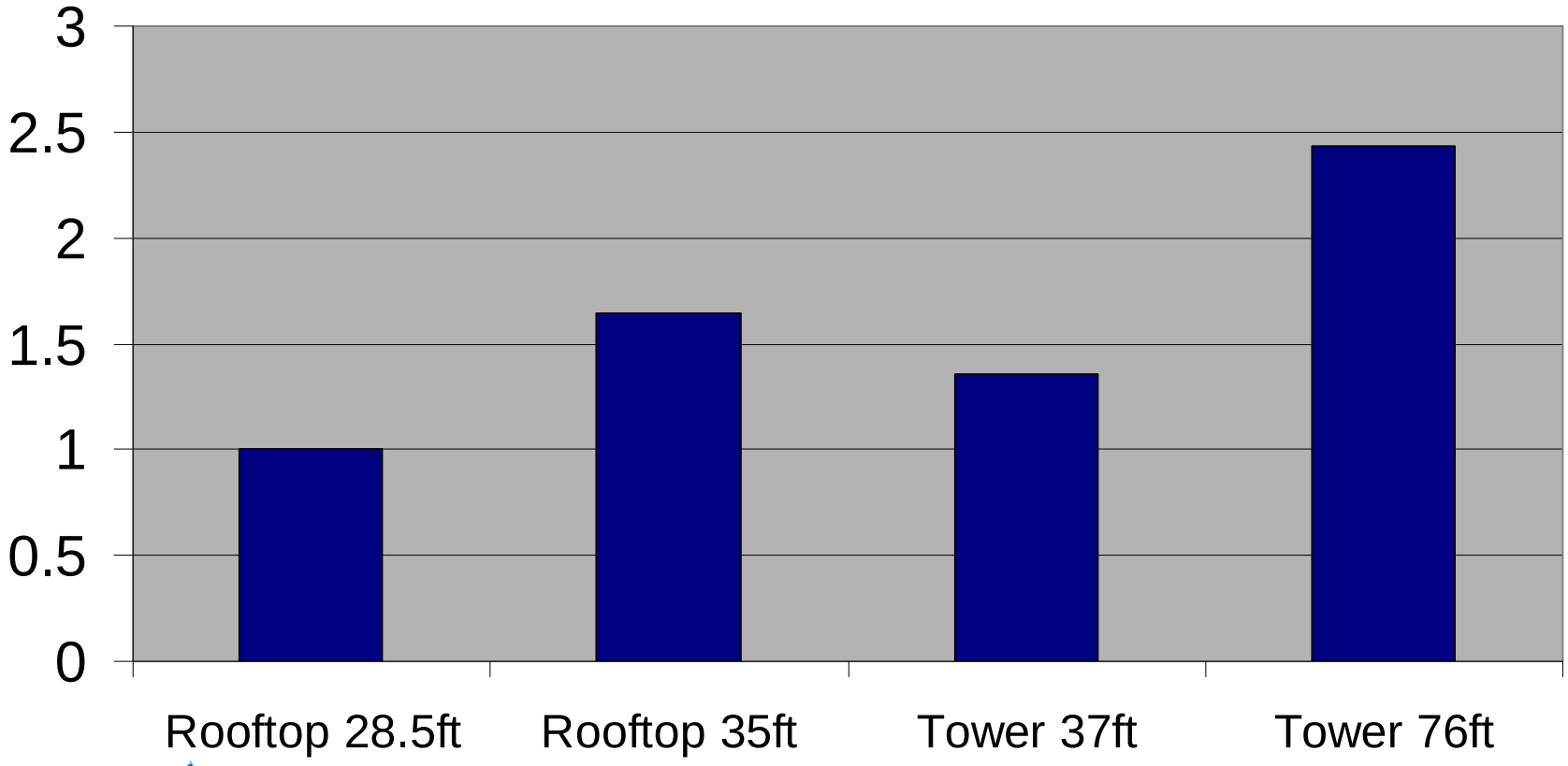
APRS WORLD, LLC

Wind Speed Frequency Distribution



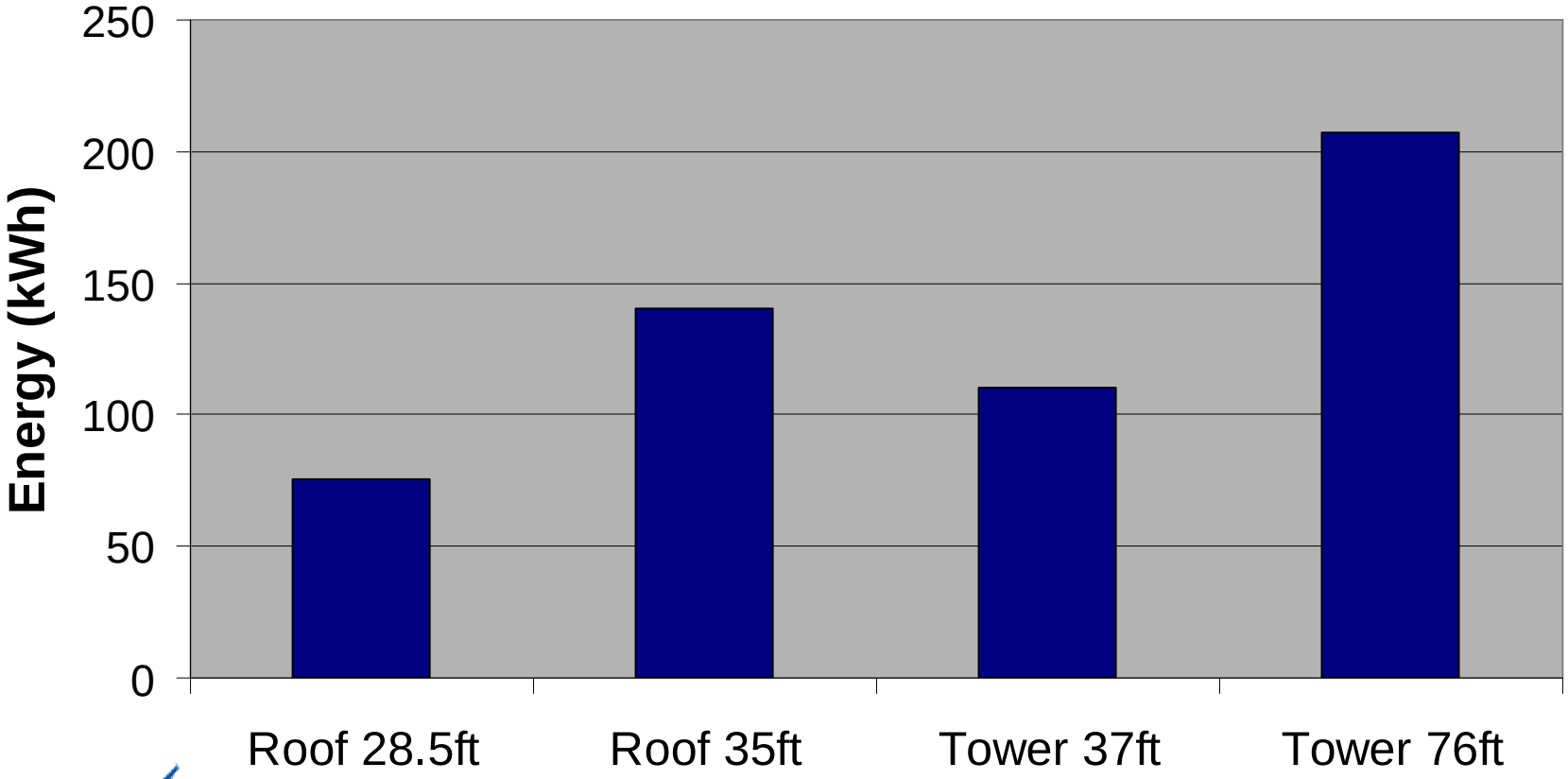
APRS WORLD, LLC

Ratio of Available Energy



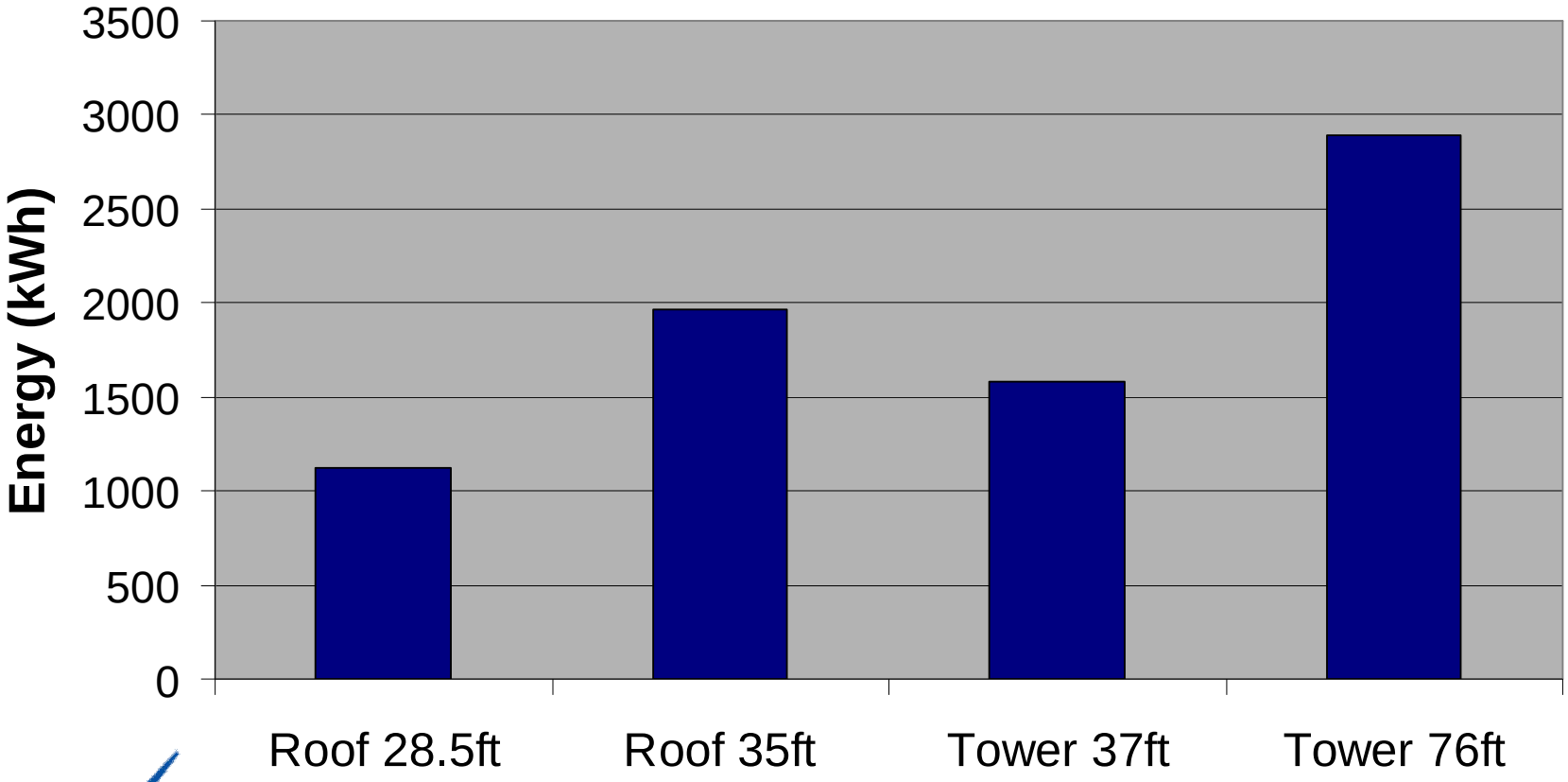
APRS WORLD, LLC

Estimated Annual Energy Production
Turbine A – 1.1m rotor diameter



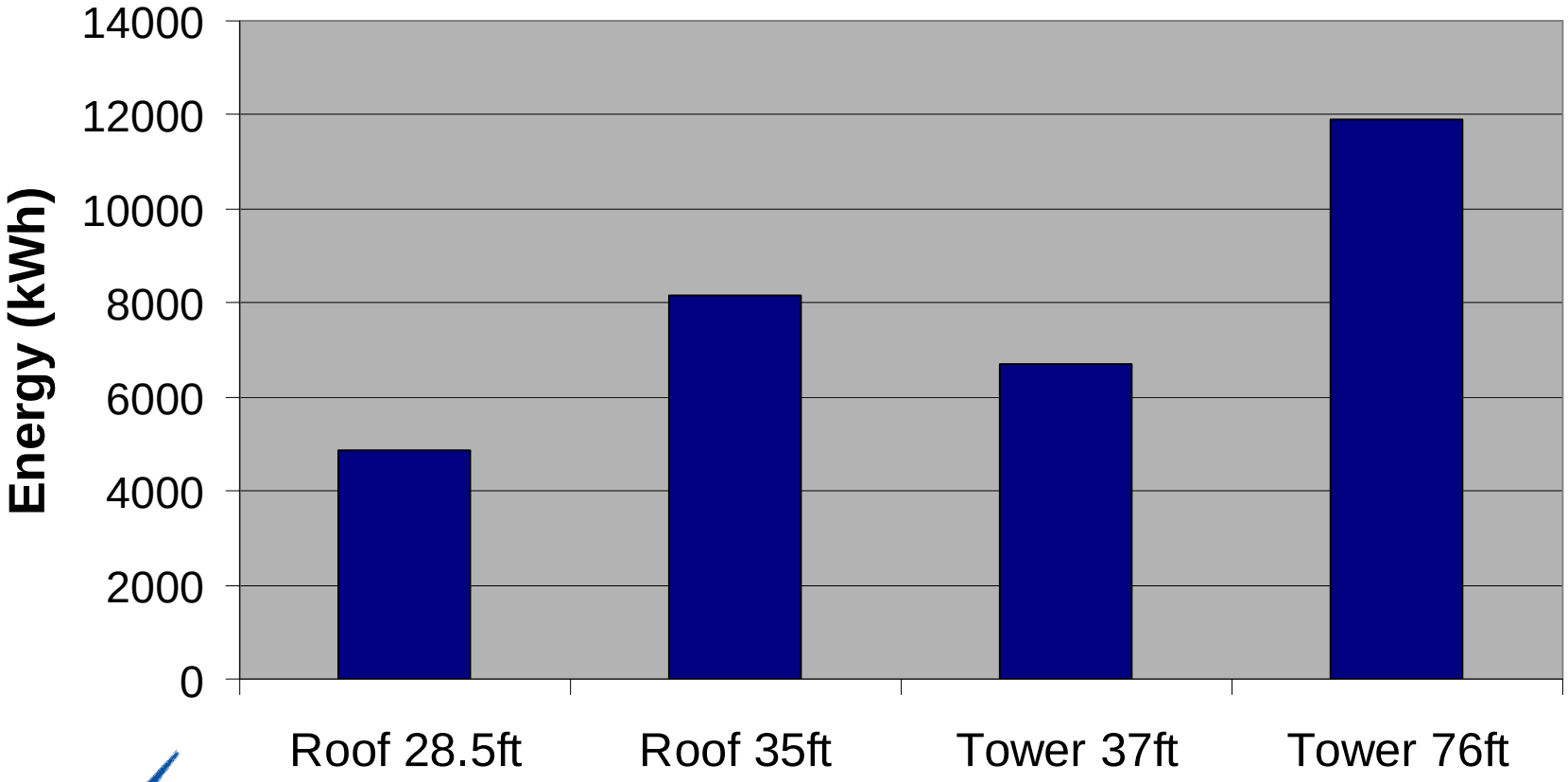
APRS WORLD, LLC

Estimated Annual Energy Production
Turbine B – 3.7m rotor diameter



APRS WORLD, LLC

Estimated Annual Energy Production
Turbine C – 7m rotor diameter



APRS WORLD, LLC

Conclusions

- Different locations on the same property show significantly different wind resource
- You don’t truly know the wind resource for a particular location without collecting data
- The results speak for themselves: Proper siting on a sufficiently tall tower is critical to wind turbine performance

e-mail: andrew@aprsworld.com
web: www.aprsworld.com