

# Small Wind Turbines

Installing small wind turbine generators (WTGs) in the urban/built environment - What not to do...

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Image courtesy of GoogleMaps

# WTG Specs

Case Study : 3228 Idaho St., Berkeley, CA, USA

## Make & Model: Aero Power Systems SL 1500 (1979)

- Designer: Mario Agnello
- Year installed: 1982
- Type: Horizontal Axis Wind Turbine [HAWT]
- Mounted on a 60' Solargy Tower Monotube
- Orientation: Upwind
- Diameter: 12 ft [3.66m]
- Rated Power [max]: 1.5 kW
- Rated wind speed: 23.9-25 mph [10.7 m/s]
- Cut-in speed: 6 -8 mph [3.6 m/s]
- Cut-out speed: 101 mph [45 m/s]

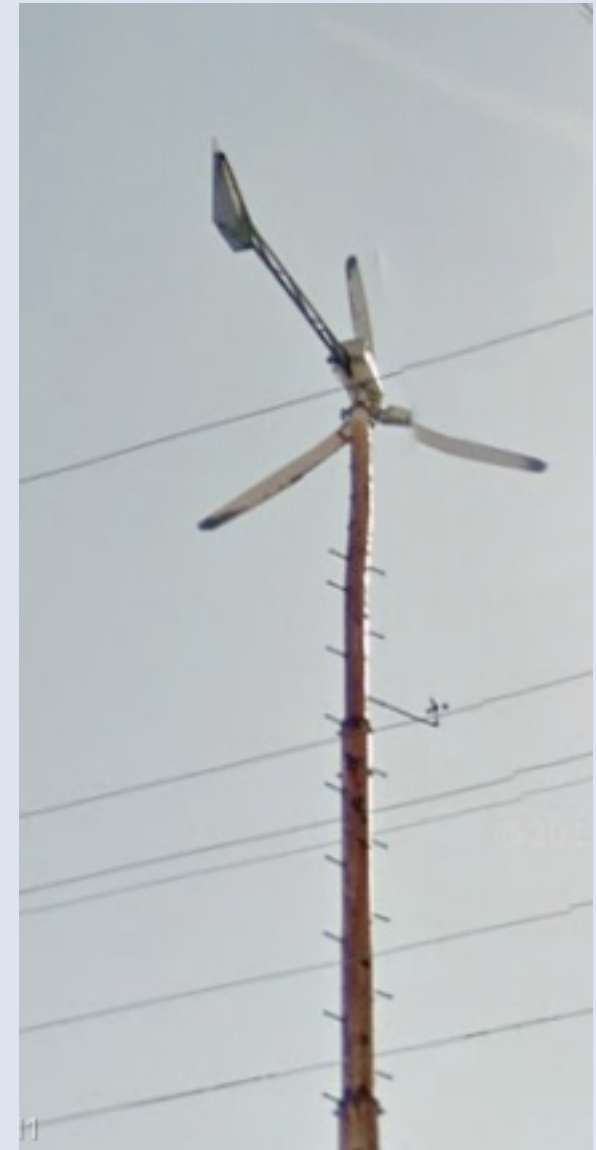


Image courtesy of GoogleMaps

# Cost & Site Info

Case Study : 3228 Idaho St., Berkeley, CA, USA

## WTG Cost

- \$3,000 [circa 1980]
- Total installation cost [City of Berkeley estimate]: \$12,000
- Total charges actually paid: \$17,000

## WTG Site Info

- Medium height & density, residential (qualitative roughness)
- Buildings of mixed height (2-4 storeys) & mature trees
- Closely spaced detached & semi-detached houses
- Five-plex housing structure

# WTG Site

Case Study : 3228 Idaho St., Berkeley, CA, USA



Image courtesy of GoogleMaps

## **“City’s first residential windmill...” \***

- Developer touted 1/3rd of Berkeley’s 40,000 homes could be serviced by wind power
- 400 kW/month
- 90% of PG&E electric bill
- State of CA 55% tax credit incentive
- PG&E to purchase excess power generated @ \$0.072/kWh (10 years)
- 125 mph cut-out speed
- Co-generated power

\* 25 March 1982 *The Berkeley Gazette*, Page 4

**Generating electricity closer to where it will be used makes sense, but...**

# The Outcome

Case Study : 3228 Idaho St., Berkeley, CA, USA

## **One needs to consider the potential outcome...**

- **Lack of performance - decision rendered to decommission after three months (PG&E bill)**
- **Customer dissatisfaction -> legal action pursued**
- **Derelict WT for ~30 years**
  - Free-wheeling for ~10 years (confirmed)
  - Brake cable accidentally (?) severed
  - Potential public safety hazard
  - Potential public & private property damage potential

# The Solution

Do the knowledge...

## **As a consumer, caveat emptor...**

- **Know your wind resource**
- **Know your local ordinances**
- **Know how to site your WTG**
  - Consider site characteristics i.e. minimal terrain roughness
  - Installation location - On or near the structure?
  - Installation location - If on a rooftop, how high above the rooftop should the hub height be to capture the accelerating wind coming over the rooftop parapet?
- **Understand the WTG specs as per your individual requirements**
  - Turbine mid-rotor height
  - Published data e.g. performance, power curves

# One Helpful Tool

A good starting point...

## UK Carbon Trust Wind Yield Estimation Tool (UK only)

### Wind yield estimator

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#### 1. Site details

**a. Location**

Region


Please enter a grid reference for more accurate results.

Postcode  OR Grid reference

[Location found - click here to check results on map](#)

**b. Character**

The tool will automatically select a canopy height based on your chosen site type. If you prefer, you can choose another site type or enter your better estimate in the canopy height box.




 **Medium height and density, industrial**  
Buildings of mixed height (two to four storeys) [...more](#)

Canopy height  m

#### 2. Turbine details

**a. Rotor height**

Enter the the mid-rotor height in metres relative to the ground or the canopy layer. Specify how you have made your measurement by selecting the appropriate image. For the best estimate, the mid-rotor height should be entered as either above or below the canopy rather than above the ground.

Ground upward  Canopy upward  Canopy downward

Mid rotor height  m

**b. Turbine specifications**

Turbine type



# References

Case Study : 3228 Idaho St., Berkeley, CA, USA

- **Vossa Wysinger Family**
- *The Berkeley Gazette*
- **City of Berkeley, CA, USA**
  - Planning & Development Office
  - Zoning Office
  - City Manager
- **UK Carbon Trust**

[http://www.carbontrust.co.uk/emerging-technologies/technology-directory/wind/\\_layouts/ctassets.aspx/windpowerestimator/WindPowerEstimator.aspx](http://www.carbontrust.co.uk/emerging-technologies/technology-directory/wind/_layouts/ctassets.aspx/windpowerestimator/WindPowerEstimator.aspx)