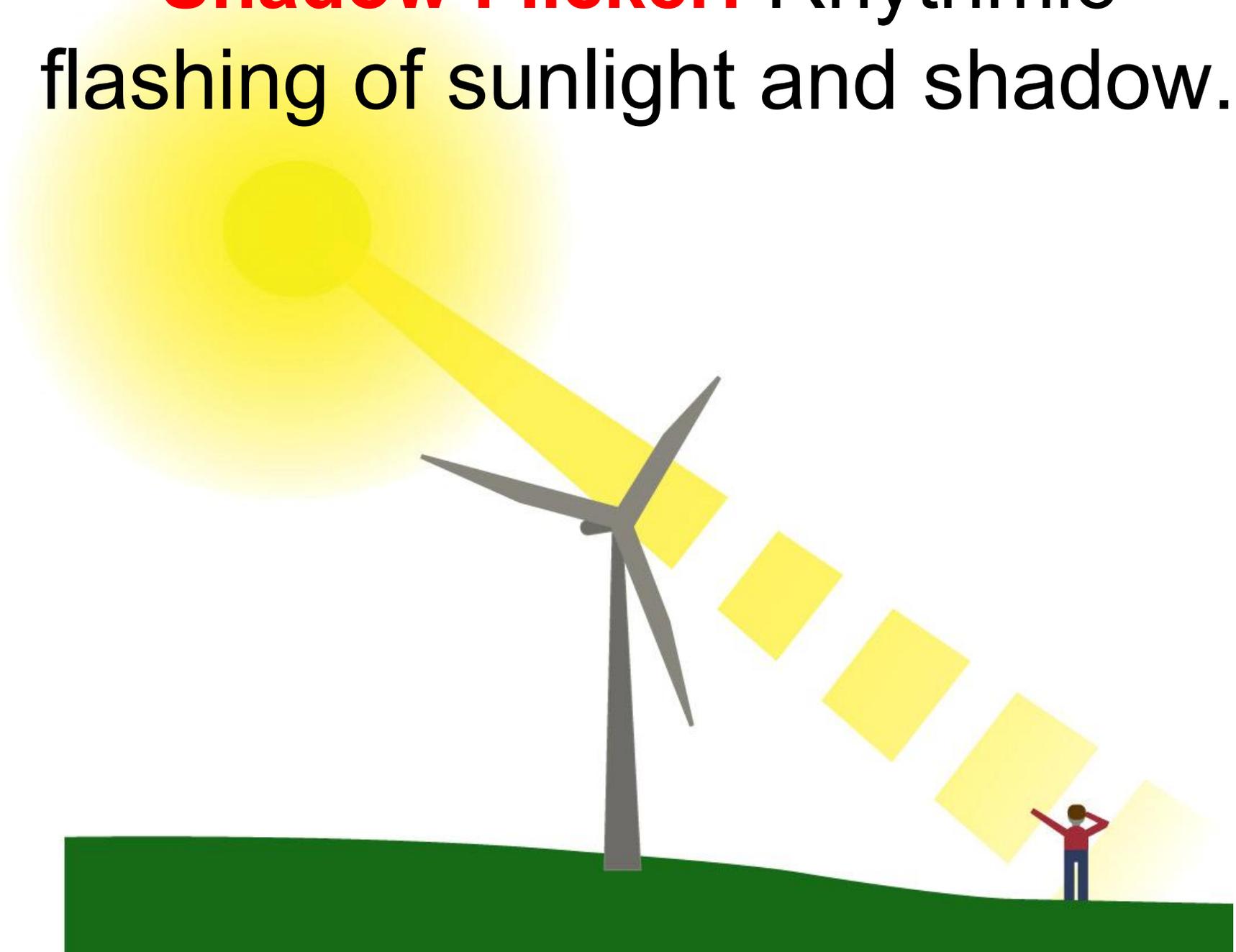


Falmouth Wind Turbine Shadow Flicker & Safety

Presentation
to
Falmouth Board of Selectmen
June 6, 2011

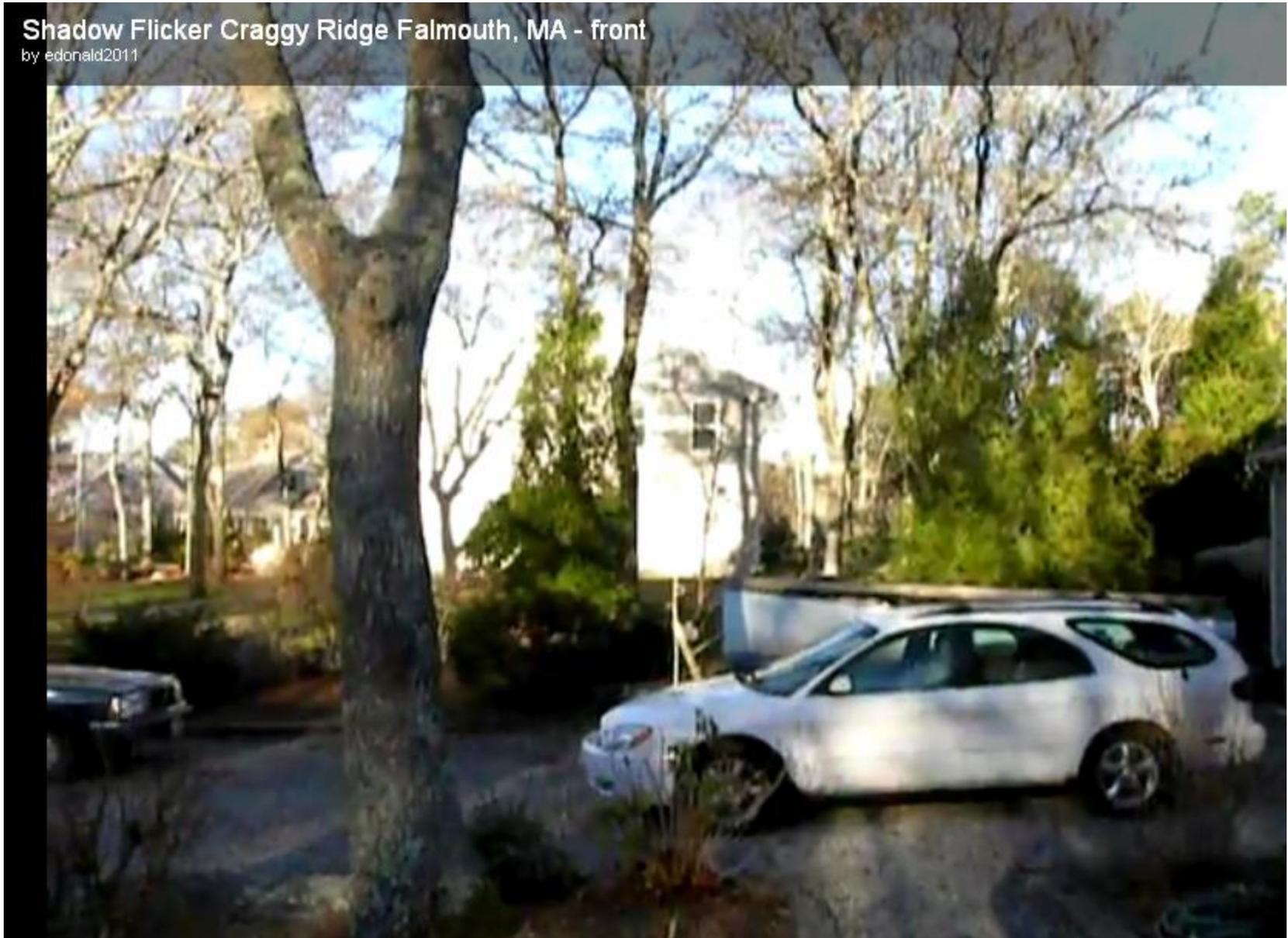
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Shadow Flicker: Rhythmic flashing of sunlight and shadow.



Shadow Flicker Craggy Ridge Falmouth, MA - front

by edonald2011



<http://www.youtube.com/watch?v=U0i0E3SgoQU&NR=1>

Shadow Flicker

What causes it?

- The sun comes into a position in the sky placing the wind turbine between you and the sun.
- The revolving blades obstruct the sunlight casting rhythmic moving shadows across your environment.
- Shadow flicker is dependent on both the time of day and the time of year as the sun travels a path both up and down as well as north and south along the horizon

Shadow Flicker Craggy Ridge Falmouth, MA - inside

by edonald2011



<http://www.youtube.com/watch?v=aMf-Dgvl3b8>

Shadow Flicker Craggy Ridge Falmouth, MA - back

by edonald2011



<http://www.youtube.com/watch?v=RsmiHHbSu1s>

Shadow Flicker – *an illegal taking*

- According to a Falmouth attorney, shadow flicker “*consists of a taking of property without compensation.*”
- According to the fifth amendment of the U.S. Constitution: “*nor shall private property be taken for public use, without just compensation*”.

Safety

- Public Safety Hazards of Wind Turbines:
 - Ice Throw
 - Blade Throw
- Blades are moving at a nominal rate of 138mph.
- When ice forms and breaks off or if a blade were to break, fragments of ice and/or blade can be thrown.
- The fragments become missiles propelled away from the wind turbine.
- Fragments can weigh hundreds of pounds.
- Due the risk of ice throw and blade throw, it's important to site wind turbines safe distances from people.

Safety: Ice Throw

Wind Turbine Ice Throw

by betterplan141



<http://www.youtube.com/watch?v=4EmYe2u6J6g>

GE
Energy

Ice Shedding and Ice Throw – Risk and Mitigation

David Wahl
Philippe Giguere
Wind Application Engineering

GE Energy
Greenville, SC



Risk Mitigation

The risk of ice throw must be taken into account during both project planning and wind farm operation. GE suggests that the following actions, which are based on recognized industry practices, be considered when siting turbines to mitigate risk for ice-prone project locations:

- **Turbine Siting:** Locating turbines a safe distance from any occupied structure, road, or public use area. Some consultant groups have the capability to provide risk assessment based on site-specific conditions that will lead to suggestions for turbine locations. In the absence of such an assessment, other guidelines may be used. Wind Energy Production in Cold Climate^[6] provides the following formula for calculating a safe distance:

$$1.5 * (\text{hub height} + \text{rotor diameter})$$

Wind-2 Ice Throw Setback Requirement

As stipulated by *GE Ice Shedding and Ice Throw - Risk and Mitigation* manual:

1.5 * (hub height + rotor diameter)

1.5 * (262 ft + 82m)

1.5 * (262 ft + 269ft) = **769 ft**

769 ft **is the required setback** from people and structures around Wind-2

Wind-2 subjects Rte. 28 to Ice Throw



Falmouth Wind-2

- WES Construction proposed a GE Energy wind turbine for Falmouth's Wind-2
- GE declined to support the project due to safety concerns citing the proximity of the highway as too close to Wind-2.
- As a result, the Town had to get a waiver from the EPA in order to use Federal Stimulus \$ (your federal tax dollars) to buy a foreign wind turbine from Vestas, a Danish company

Why GE Declined the Wind-2 Project

According to Ken Vogel, President of WES Construction:

- GE “wouldn’t support the project” and “wouldn’t provide a wind turbine in that area.”
- GE said the location was “not suitable” because of “ice throw, ice build up.”
- “The highway was too close.”

Jack Sullivan, GE Energy:

- Confirmed that GE had indeed declined to bid on the project because they deemed the site “too close to Route 28.”
- Mentioned “ice” and said the site is “under the GE setback” requirements.
- Said “GE is serious about protecting the public.”
- GE was concerned about “the unsuspecting general public driving on Route 28.”

Questions

The Town of Falmouth clearly knew that **GE Energy**, a major contractor for industrial wind turbines, had **refused to support the Wind-2 project**, having deemed the **site** to be **unacceptably close to Route 28** and therefore **unsafe**.

- ***Why would the Town of Falmouth proceed with construction of the wind turbine?***
- ***What basis did the Town have for concluding that the concerns of GE Energy were unwarranted?***

Safety: Blade Throw

Nordtank (Vestas) wind system fail and crashes.

by dborup



<http://www.youtube.com/watch?v=CqEccgR0q-o>

2.6.1 Special vehicles

Important: Protect the environment: stop engines when vehicles are not in use.

- Drivers of special vehicles, such as extra wide or high vehicles, must only drive onto the site with prior agreement with the supervisor/site manager who will advise as to the preferred route and possible site risks.
- The supervisor/site manager will also arrange for auxiliary vehicles, if necessary.

2.7 In Case of Runaway Operation

A runaway operation is almost impossible, as it would require several circumstances to happen at the same time

- If a runaway operation should occur, the plant must be evacuated immediately by running upwind, and access to the surrounding area in a radius of at least 500 metres must be restricted.

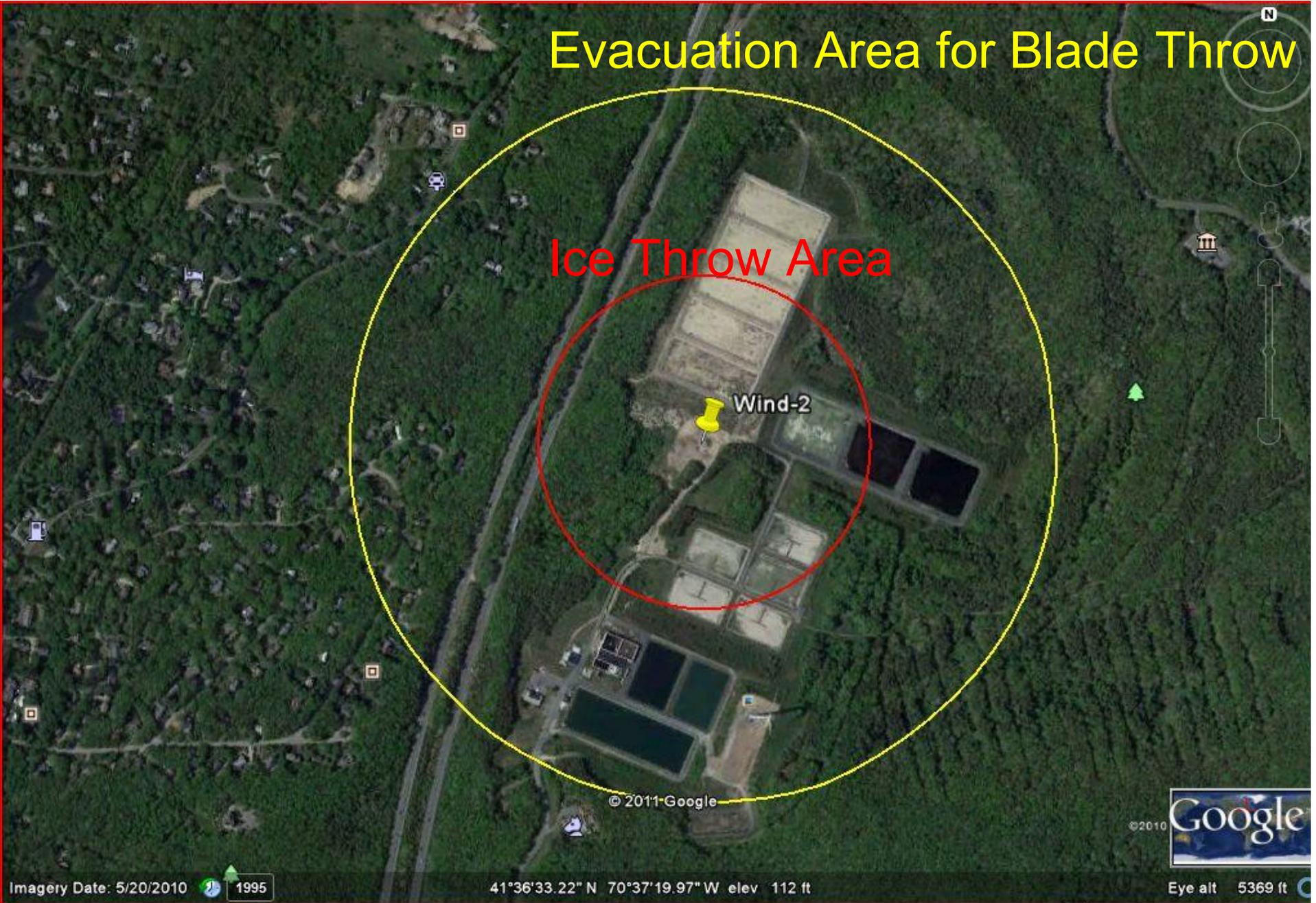
Vestas advises to **“evacuate by running upwind
...access to the surrounding area in a radius of
at least 500 meters [1640 ft.] must be
restricted.”**

Vestas required Evacuation Area for Wind-2

Evacuation Area for Blade Throw

Ice Throw Area

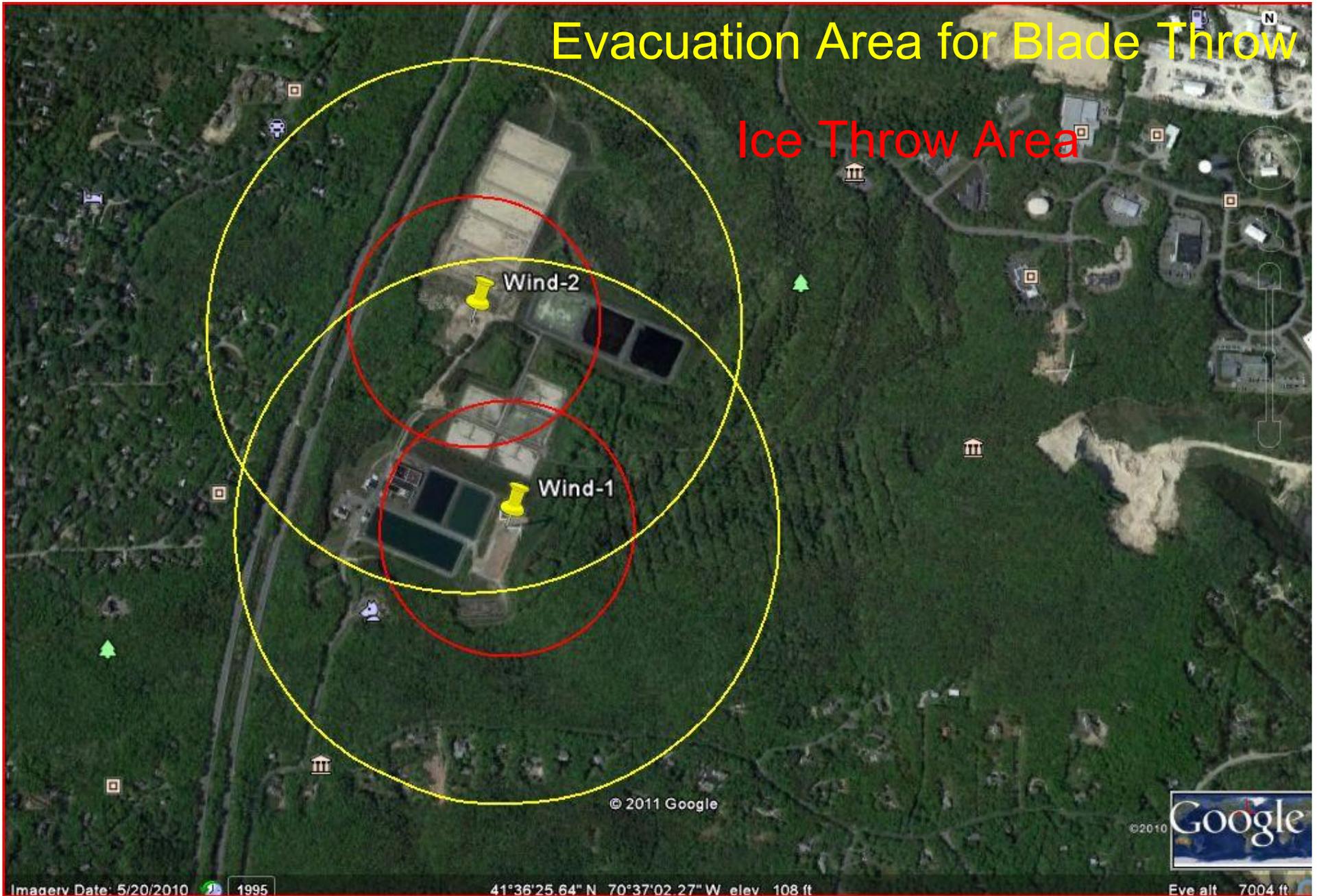
Wind-2



Vestas required Evacuation Area for both turbines

Evacuation Area for Blade Throw

Ice Throw Area



Highway 58 closed on Sunday by runaway windmill

BY GRETCHEN WENNER, Californian staff writer

gwenner@bakersfield.com | Sunday, May 03 2009 01:40 PM

Last Updated Monday, May 04 2009 09:40 AM

IMAGES



Henry A. Barrios / THE CALIFORNIAN

Motorists traveling on Highway 58 near Tehachapi can see the electricity-producing windmills from the highway.

A runaway windmill in Tehachapi closed Highway 58 — a major east-west freeway connecting California's southern Central Valley to Las Vegas, Nevada and Arizona — for most of the day Sunday.

Around 11 p.m. the highway was reopened, although it remained unclear whether the windmill had been stopped, according to Officer Ed Smith of the California Highway Patrol.

Wind turbines are subject to catastrophic failure when their brakes fail, allowing blades to spin uncontrollably. The resulting vibrations can cause them to explode, spewing propeller blades and debris hundreds of yards, as a YouTube video of an incident in Denmark last year shows.

People at Risk

- Within the 1640 foot "evacuation area" that is prescribed by *Vestas* to surround Wind-2 as well as Wind-1 there are a good number of **residents** in Falmouth, **drivers on Route 28**, and **employees and users of the wastewater treatment plant that all fall within Vestas' prescribed safety zone.**

Safety: Fire

Fire



<http://www.youtube.com/watch?v=MOFHxINzGeo>

Evacuation

Falmouth has NO evacuation plan!

If there were a plan:

- How would an operator know that a problem is occurring?
- How and who would the operators contact to start an evacuation?
- How long would that take?
- Who would warn us?
- How would we be notified?
- How much time would it take to evacuate residents?
- How much time would there be before debris would be hurled from the wind turbine?
- Which direction should we “run”?

What was the Town's safety review process?

- *What information did the Town of Falmouth have that it considered more authoritative than the [Vestas Health & Safety Instruction](#) manual which **requires**, in the event of a problem, **evacuation of “surrounding area in a radius of at least 500 metres [1640 ft.]”** around its turbines, **Wind-1 and Wind-2?***

?

- *What safety review process did Falmouth conduct to determine that it was **acceptable to violate the safety precautions** prescribed by **Vestas**?*

?

- *What sources or authorities did the Town of Falmouth refer to other than the **Vestas** safety manuals and **GE's** refusal to bid the project due to concerns about safety, in making the determination that it could safely **ignore Vestas' prescribed safety perimeter**?*

?

- *Isn't it time to **take down and move Falmouth's wind turbines?***

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