

## Charting of Wind Turbine Farms

### MEETING 22-01

Michael Rauchle, FAA/AFS-420, [briefed](#) on proposed enhancements to the charting of wind turbine farms on VFR charts. The Flight Procedures and Airspace Group is responsible for evaluating the VFR effect of any new obstructions in the National Airspace System (NAS), including wind turbine farms. Wind turbine construction has increased significantly in the NAS and along with the additional numbers of turbines, their heights are increasing. Wind turbines greater than 499' AGL present potential increased safety risk in the NAS as the unlit wind turbine blade tips affect flight operations in both Class G (uncontrolled) and Class E (controlled) airspace. The team hopes to mitigate the safety risk by making charting improvements.

[Slide 5](#) shows a current wind turbine farm depiction near Albuquerque, NM. [Slide 6](#) shows a wind turbine farm in a congested area near Palm Springs, CA. Michael pointed out that the dashed line that borders the wind farm is very similar to the line that borders the Class D airspace and that there is a lot of clutter making it hard to discern the wind turbine farm among the other features. Michael said his proposal is intended to increase visual conspicuity, making wind turbine farms stand out, particularly near congested areas, and to improve VFR pilot awareness without creating excess chart clutter. He explained that there were about 25,000 wind turbines in 2011. Most were below 499' AGL, with an average of 408'. Now there are over 75,000 wind turbine farms in the NAS and the average height is greater than 499' AGL. This creates an increased hazard to VFR pilots.

Shawn Smith, FAA/AFS-420, shared the team's two proposed depictions. In the first proposed examples ([slides 15-16](#)) the outline has been changed to a dotted outline and a diagonal line interior fill has been added. The boxed elevation is located within the confines of the wind farm, but there is latitude to move the elevation box where space allows. They propose depicting the turbine symbol itself in pairs. Lastly, they propose that a caution box be applied to all wind turbine farms greater than 499' AGL. For the second example at Palm Springs, ([slides 18-19](#)), the dashed outline is retained, but increased in line weight. It has the same fill as the other proposed example. In this example, the boxed elevation is located outside the wind turbine farm due to space constraints. The caution box is below the wind turbine farm. An alternate proposal for the same wind turbine farm ([slides 20-21](#)) uses a dotted line for the border and a horizontal fill instead of diagonal lines. Shawn said this proposal will be posted to the ACM website and feedback would be appreciated.

Kevin Allen, American Airlines, said chart clutter is the most important thing to consider. He thinks the caution box is unnecessary and adds to the clutter. He believes the highest elevation box is sufficient.

Rich Boll, NBAA, asked about the subtle color shift in the examples. Michael said the examples were done in a drafting environment and the colors are not true. He confirmed that they are not proposing any color changes. Rich asked if masking the area had been considered. Mike said that was considered but they didn't want to occlude any of the underlying features. He said Canada does something similar to

what Rich is suggesting ([slide 27](#)) and that if Rich feels strongly about it, he should send them that feedback. Rich said he would like to see more examples presented at the next ACM.

A number of audience participants voiced that without examples showing true chart colors, it is impossible to properly evaluate the charting changes and to provide good feedback. Valerie Watson, FAA/AJV-A250, agreed and asked if Visual Charting can provide prototypes in true color. Katie Murphy, FAA/AJV-A214, said her team will work on that so they can be included in the review document posted to the ACM website.

Mike Crim, GA Pilot, said he prefers the 45 degree fill versus the horizontal fill, but wonders if the fill is even needed and may add more clutter in already cluttered areas. Mike suggested they look at the fill on a big farm in an uncongested area to how the fill clutters the chart. He also asked if they can combine the caution box and the elevation box since there is duplicated information. Valerie agreed that showing both the boxed caution note and the highest elevation box is redundant and adds unnecessary clutter. She also said that it may cause a legal issue if someone hits an unlit blade at a location that doesn't carry the caution note. She believes the single boxed numerical elevation is sufficient and the information about unlit blade tips should be handled through pilot education. Michael said Aeronautical Information Manual (AIM) updates and outreach are part of the implementation plan.

Mike Stromberg, IPA/UPS, said he prefers the dotted outline, but noted that the dotted leader line connecting the wind farm to the elevation box was confusing. He also suggested the proponents take this proposal to Air Venture in order to get feedback from more GA pilots.

Jim McClay, AOPA, pointed out that there is a Document Change Proposal (DCP) regarding wind turbine radar interference. Shawn said they had also seen the DCP and were working with the submitter, as well as with Rune Duke, FAA/AFS-001, on the update.

Gary Fiske, FAA/AJV-P310, asked whether it was a good idea to allow the wind turbine farms to continue to increase in height and how much control the FAA has over limiting the vertical height. Michael said they have similar concerns. Their group evaluates for VFR effect and thinks it might be a good idea to have an offline discussion with the Air Traffic Obstruction Evaluation Group as they set the policy.

Valerie summarized Michael and Shawn will work with VFR Charting to create true color examples that will be posted on the ACM website with the proposal to solicit input.

\*Post-ACM Note: The presentation has been updated to include true color examples. See [slides 29-34](#).

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## MEETING 22-02

Michael Rauchle, FAA/AFS-420, [briefed](#) on proposed enhancements for the charting of wind turbine farms on VFR charts. He reported that the team received significant feedback from ACM participants

and his team has evaluated the feedback. They identified some minor enhancements and discarded some of the proposed features presented at the last meeting.

Michael then showed several examples of the current wind turbine farm depiction and the final proposed depiction. The proposed symbology for the farm is a dotted “zipper” outline to define the outer parameter with a 45° degree hatched line pattern inside the defined area. A masked elevation box with both the MSL and AGL of the highest wind turbine will be placed within or near the farm area.

The audience expressed support for the proposed depiction and Jim McClay, AOPA, said AOPA would be happy to help with outreach on this change.

Allison Miller, FAA/AJV-A213, stated that the Visual Charting team will submit an Interagency Air Committee (IAC) specification change for the revised wind turbine farm depiction. Once approved, the Visual Chart Team can begin the implementation. She said they are targeting June 2023 for implementation. Allison will report progress at the next meeting.

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## MEETING 23-01

Allison Miller, FAA/AJV-A213, briefed on proposed enhancements for the charting of wind turbine farms on VFR charts. She said that after significant feedback from the ACM audience, a final depiction has been determined. The symbology for the farm will be a dotted “zipper” outline to define the outer parameter with a 45° degree hatched line pattern inside the defined area. A masked elevation box with both the MSL and AGL of the highest wind turbine will be placed within or near the farm area (see [sample charts](#)). The new symbology will be documented in the Aeronautical Information Manual (AIM) and in the Aeronautical Chart Users’ Guide. Visual Charting will also issue a Charting Notice.

Mike Rauchle, FAA/AFS-420, reported that Flight Standards is working with Aeronautical Information Services to make sure the change is socialized. They revised the “Obstructions to Flight” section in the AIM. Flight Standards is also working with the Aircraft Pilots Association to publish an article in their publication and with the National FAA Safety Team (FAASTeam) to put out a FAAST Blast to subscribers and in their bimonthly publication.

Jeff Rawdon, FAA/AFS-420, asked how the published AGL value is calculated since the terrain within a farm could vary. Mike explained that the masked elevation shows the highest point (MSL and AGL) of the wind turbine in the wind farm, or blade tip. Shawn Smith, FAA/AFS-420, agreed with the concern that there can be variances in terrain, so the AGL value will not always be associated with the highest point. They said further discussion may be warranted on this topic.

Bill Tuccio, Garmin, noted that the text in the elevation boxes did not seem to be justified consistently in the examples that provided. Allison said Visual Charting will look into that.

*\*Post-Meeting Update: The Visual Charting managers met with Flight Standards and consensus was reached to maintain the current charting specification to only chart the highest MSL figure of the tallest wind turbine within the farm. Visual Charting will remove AGL from the proposal.*