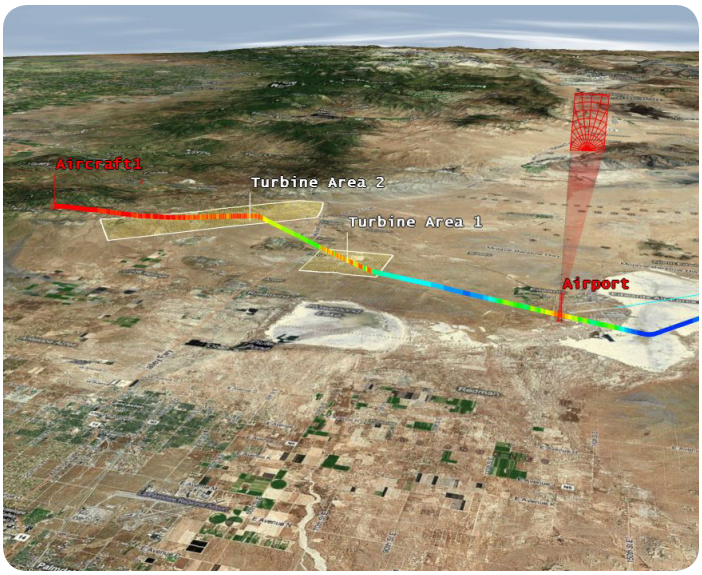
WIND TURBINE SITING
AND RADAR OBSTRUCTION ANALYSIS

Accurate modeling of wind turbines and their interaction with defense, weather and air traffic control (ATC) radar systems is a vital component of the wind farm planning and siting process. Often, the impact of planned wind farms on radars is overlooked until too late, costing money and time on projects that get delayed. Many gigawatts of planned capacity are currently on hold as developers await a thorough analysis of the impact of the intended wind farm on nearby radar systems. Wind farm developers armed with the right software tools are in a position to understand and plan for this impact.

AGI is addressing this problem in the form of a high-fidelity, radar/wind interaction analysis plugin to its STK software.

KEY CAPABILITIES OF THE WIND TURBINE/RADAR MODELING AND SCREENING TOOL:

- 3D immersive geometry environment and output
- Articulation of wind turbine CAD models
- Ground and airborne radar support
- Dynamic Doppler and energy analysis of clutter
- Aircraft routes and/or land areas considered

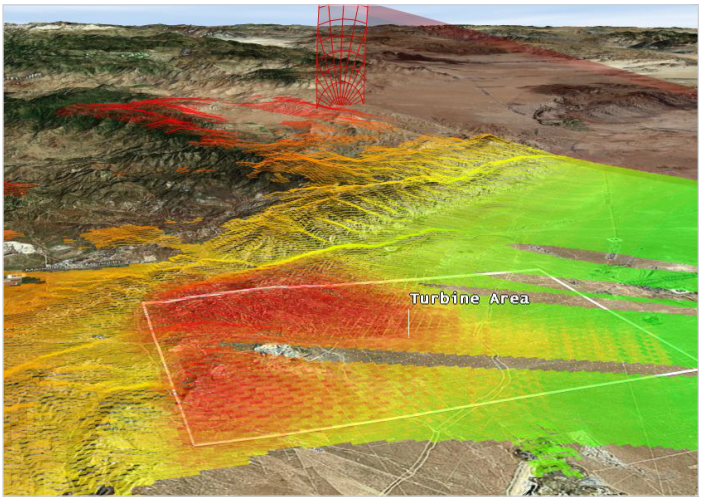


Clutter can be shown along an aircraft route – useful analysis for predefined aircraft routes, and for exploring different approach routes.

STEP-BY-STEP ANALYSIS USING AGI SCREENING TOOL:

1. Insert the turbine CAD models, radar (and associated operating characteristics) and aircraft physics models into the 4D modeling environment.

2. The most significant interaction between radar systems and wind turbines is the Doppler shift created by the quickly moving, massive turbine blade tips. This is a result of the rotational blade velocity and the RF transmission frequency. Animating the simulation in the AGI screening tool shows how the rotation of the turbine blades causes a Doppler shift to the RF energy emitted by the radar, as well as the RF energy returned.



AGI's plugin tool examines clutter from wind turbines relative to an aircraft traveling at any point over a predefined area. High clutter levels are shown in red.

3. The received RF signal appears to the radar operator as a rapidly moving object such as an aircraft. This can create confusion for the operator as actual aircraft or weather patterns can become difficult to track within the area of clutter produced by the turbines.

4. The AGI software analysis and depiction tools allow the radar clutter levels (RF shift and energy) to be predicted for potential wind farms, and thus for the operational impacts of the wind farm on the radar system to be qualified over an aircraft route or defined area, ultimately providing improved wind turbine siting information.

LEARN MORE:

Beyond this radar/wind plugin tool, STK is being integrated with technologies from Raytheon and Remcom to provide a web-based analysis tool for the U.S. gov¬ernment. This new radar siting tool combines a 4D interface with dynamic models of turbines and moving aircraft to explore the clutter produced by the wind farms, and how it may affect a radar in advance of wind farm construction. It will model radar specifics; the emission and pathloss of RF energy; and reflections, multi-path and multi-bounce from the turbine model (including RCS models). Radar filter models for many types will interpret this radar return to determine the impact to radar operators and efficacy. From there, developers may consider wind farm or turbine location changes, or radar modifications.

For additional information, visit agi.com/windfarm or write to Peter Aves at paves@agi.com.