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Visual Impact Assessment for Utility-Scale Solar Energy Development on BLM Lands

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Large Solar Projects Have Large Visual Footprints

- Large projects can exceed 10 mi^2.
- Structure heights range from 3 ft. for PV systems to 650 ft.+ for power towers.
- Solar thermal plants have power plant, cooling towers, and water handling facilities.
- All plants have control buildings, a substation and transmission lines, fences, and lights.
- Solar is often co-located with gas or other power plants.
- Non-PV systems have thousands of highly polished mirrors subject to glare.
- Power tower receivers are brilliant light sources hundreds of feet in the air.

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Solar Areas Have Low Visual Absorption Capability

- **Most solar areas have very low relief, very little screening from vegetation.**
- **Many solar study areas for Solar PEIS in valleys with good visibility from nearby roads and mountain ranges (elevated viewpoints).**
- **Some study areas show little disturbance and are mostly natural appearing landscapes; solar facilities very angular/regular.**
- **Elevated viewpoints may change perceived impacts markedly.**

Impact Comparisons by Technology Type

- **PV**
  - Lowest profile, lowest reflection potential
  - No power plant, cooling towers, or plumes
- **Stirling dish**
  - Taller, some reflection potential
  - No power plant, cooling towers, or plumes
- **Parabolic trough**
  - Lower profile then Stirling dish
  - Some reflection potential
  - Power plant, cooling tower, may have plumes, more water-related facilities
- **Power tower**
  - By far, highest profile
  - Some reflection potential, tower “glow”
  - Power plant, cooling tower, may have plumes, water-related facilities

Collector Glare / Receiver "Glow"

- **Specular reflection (glare) is a concern, e.g. Ivanpah, Nevada Solar One**
  - At low sun angles or elevated views, e.g. on roads, in mountains
  - May extend range of significant impact
- **Special concern for power tower – receiver "glow"**
  - Some quotes: "**… it's painful to look at…**" referring to Solucar http://www.youtube.com/watch?v=c9Uo3KlWNng
  - **"I couldn't look at it."** BLM staff member, referring to Solar One (Daggett)
- **Power towers also subject to "dust glow"**
- **Little hard data, further research needed**

Visual BMPs for Solar

Effective mitigation a real challenge

- **Consider visual concerns early in project planning.**
- **Encourage low-profile technologies and components.**
- **Site as far from sensitive areas as possible.**
- **Use slight variations in topography to screen solar collectors.**
- **Blend arrays with contours to harmonize where concealment is impossible.**
- **Move mirrors, adjust mirrors, or screen to reduce glare.**

Trough Facility Ground-Level View

- **Low profile**
- **Repeats horizon line**
- **“Lake” effect**

but…

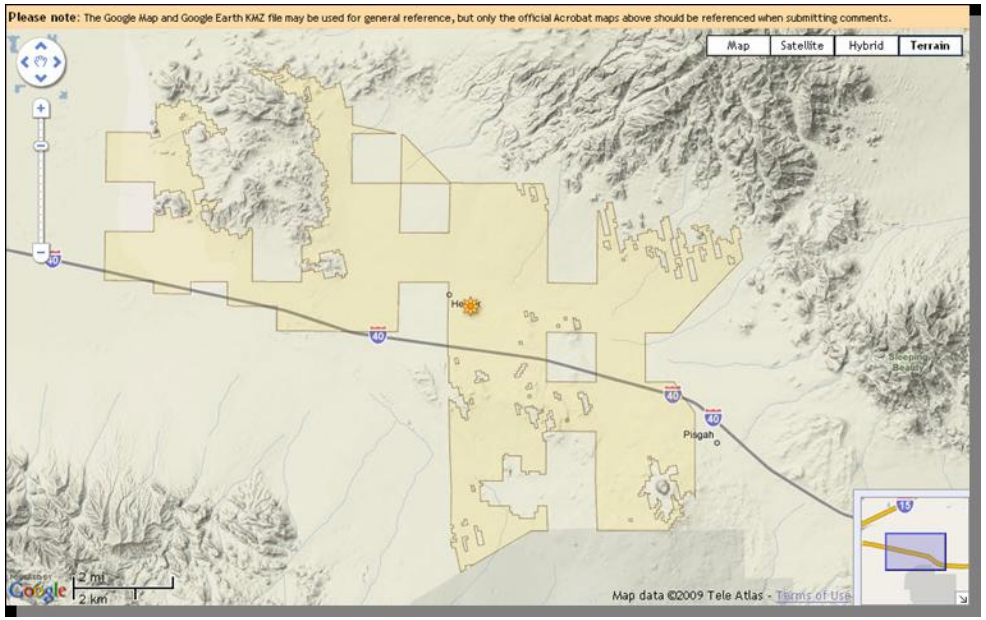
- **Strong reflections**
- **Power block sticks up above horizon**

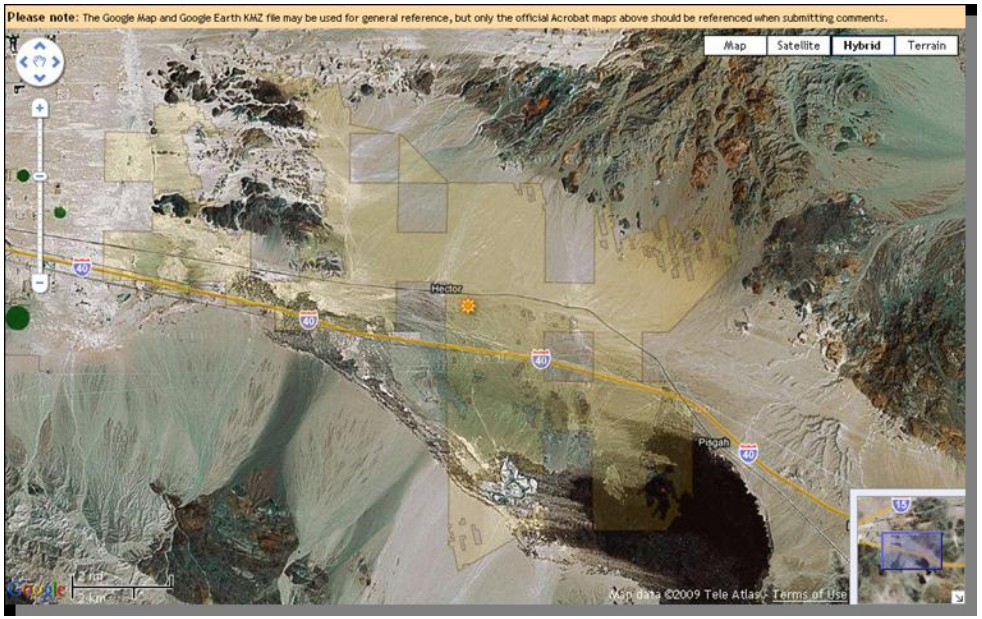
- **Imagine PV facility in this view…**

Google Maps GIS Mashup

- **BLM solar study area GIS maps integrated with Google Maps data and interface**
  - Analysts and public can pan and zoom maps, aerial imagery and relief maps of study areas via the Web, using the familiar Google Maps interface and no downloads.

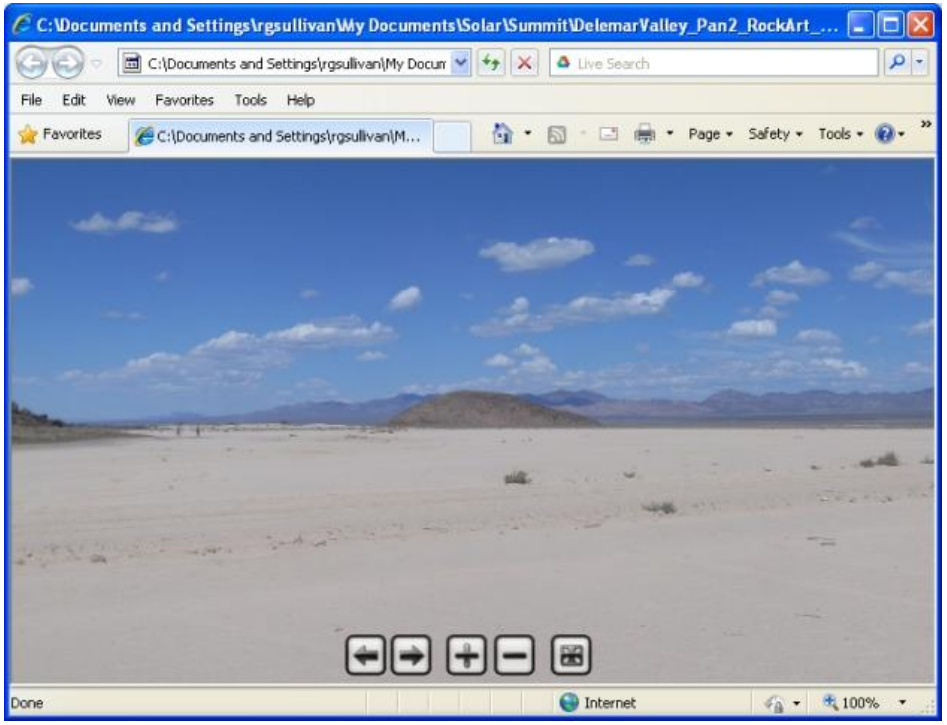
- Available now at http://solareis.anl.gov





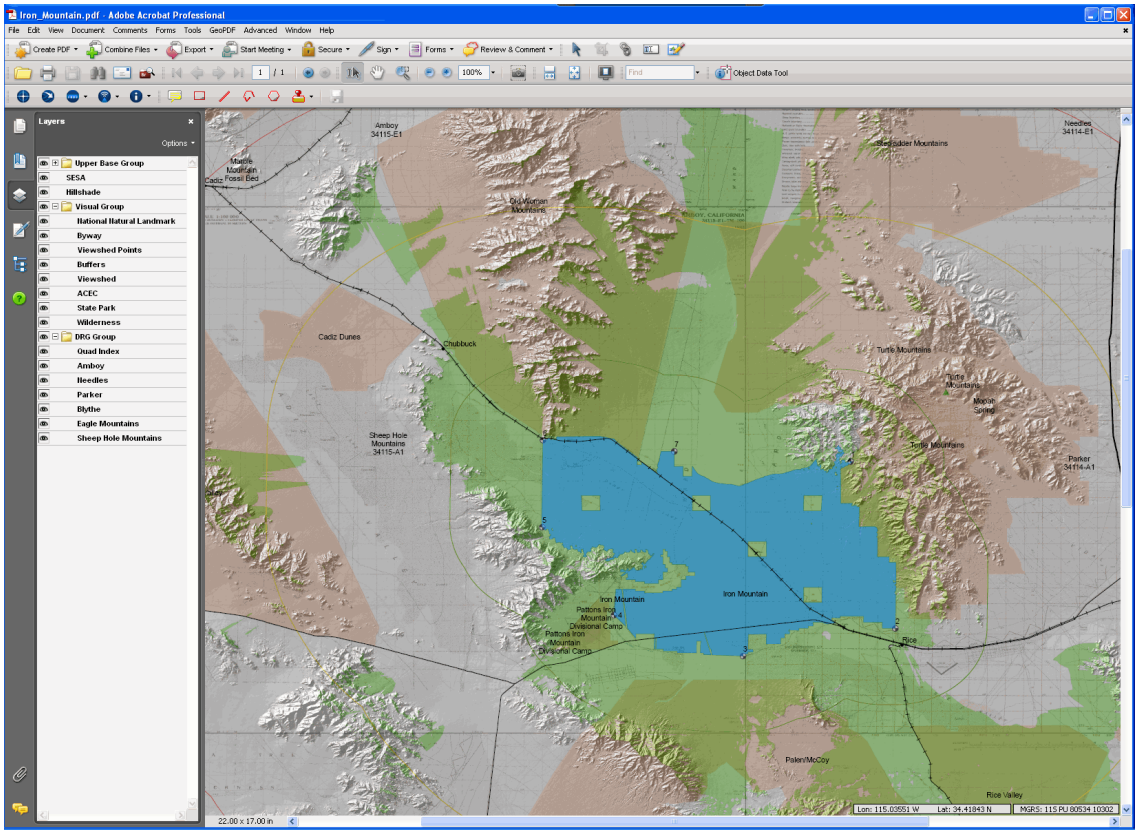
Interactive Web-Based Photo Panoramas

- **Web-enabled GPS-mapped 360 degree photo panoramas of study areas**
- **GPS-enabled camera and photo stitching software**
  - **Analysts and public can pan and zoom full 360 degree panoramas via the Web**
  - **Planned to integrate with Google Maps mash-up**



Adobe Acrobat GeoPDFs

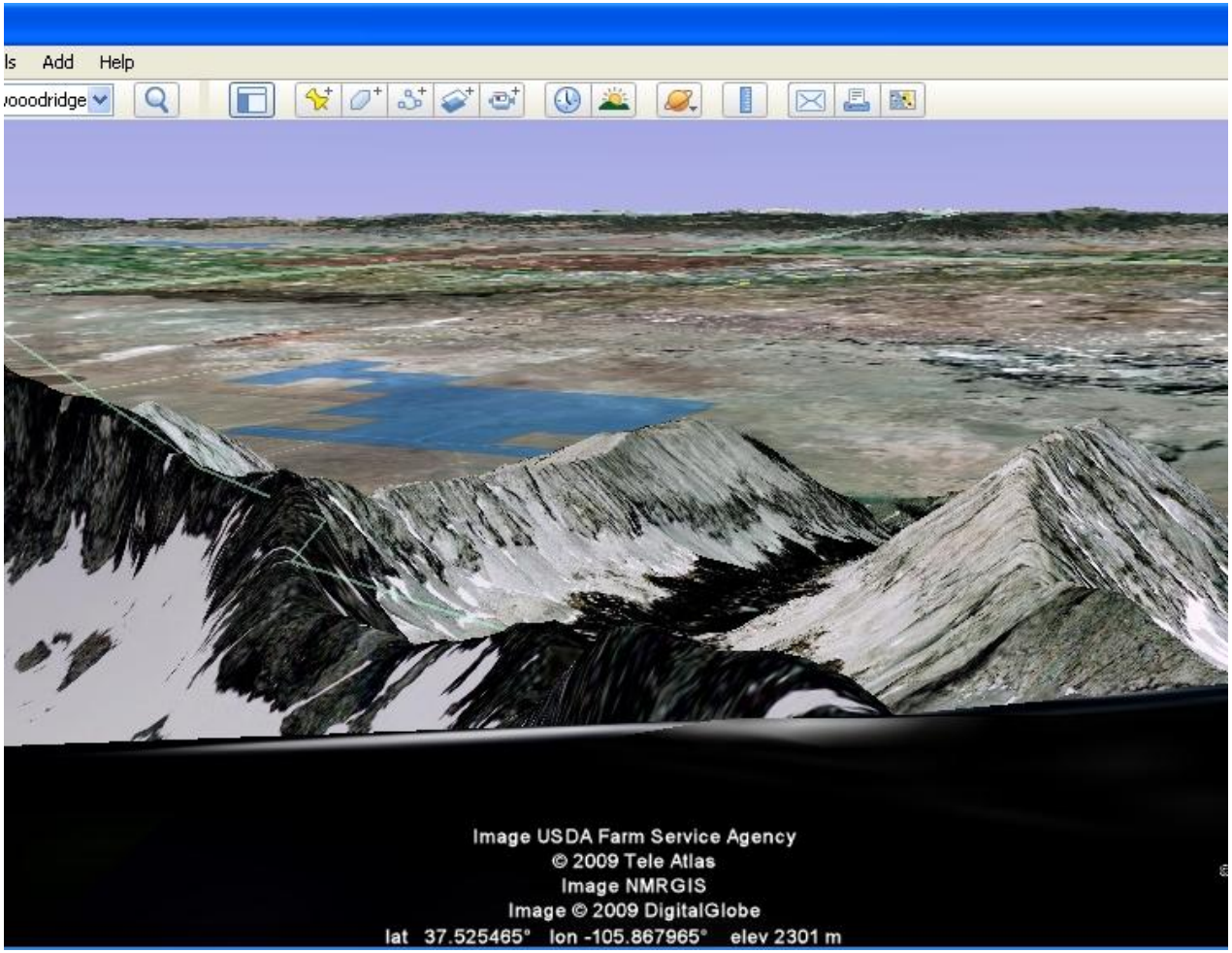
- GIS data displayed in "spatially-aware" Adobe Acrobat file
  - Map layers (including viewsheds)
  - With free plug-in, can do live GPS tracking
  - Add annotations, measure distance and area
  - Integrate with other PDF documents



- Used heavily in site visits, can distribute via the Web.

Google Earth Visualizations

- Too many KOPs to visit them all
- No specific project locations or designs
- Will use Google Earth to visualize study areas from selected KOPs
- Available now at solareis.anl.gov



PEIS Impact Analysis Data Needs

- **Large scale of solar projects means impacts outside of study areas must be considered – 25 miles for Solar PEIS**
- **Accurate, up-to-date VRI data important for description of affected environment and describing impacts to visual resource**
- **VRM data needed for determining acceptable impacts and appropriate mitigation**
- **BLM FO input needed to identify local concerns around solar study areas**
- **Good elevation data critical for viewshed analysis**

Argonne Research (with BLM and MMS participation)

- **Funded by DOE to develop GIS-based wind energy planning tool**
  - **"Visual impact risk" maps that incorporate BLM VRM tools to indicate areas with high or low risk of visual impact from wind energy development**
  - **Location-specific BMP/mitigation measures tied to both facility components and environmental factors**
  - **Developers and agencies could use tool to reduce both impacts and mitigation costs through optimal siting**

- **Proposed to DOE: regional wind energy impact threshold distance study**
  - **Determine limits of visibility and impact thresholds in different regions of the U.S.**