CASE STUDIES FOR EVALUATING PHOTOSIMULATIONS FOR VISUAL IMPACT ASSESSMENT

Principle
Photosimulations of glare are ineffective.

Statement
Photosimulations cannot adequately represent glare because they lack sufficient light intensity.

Explanation
Glare is any continuous bright light that disturbs visual perception and causes discomfort. A glint is a similar phenomenon occurring as a momentary flash of bright light. The source may be direct or reflected sunlight or artificial light, such as oncoming headlights. The human eye can adapt to a wide range of light intensity, from starlight (approximately .01 lux) to bright sunlight (over 100,000 lux). However, it can accommodate only a small portion of this range at any time and it can take a few minutes for the eye to adjust between large changes in brightness. As a rule of thumb, glare occurs when a light source is at least a 1,000 times brighter than the average visual field (or the conditions to which the eye has adjusted).[1]

Case Study. Ivanpah Solar Energy Project
The Ivanpah Solar Electric Generating System (ISEGS) is a concentrated solar thermal plant (a.k.a. power tower) located in the California Mojave Desert. The plant consists of 173,500 heliostats that track the sun's path and focus sunlight to three solar power towers that are each 459 ft (140 m) tall. The nominal electric generation capacity is 393 MW. At the time of construction, it was the largest solar power tower facility in the world, and the first operational solar power tower facility on BLM-administered lands.

The view in Figures 1 and 2 are from KOP 6 located near the eastern edge of Ivanpah Dry Lake, almost due east of Tower 2. The KOP is located 4.1 mi (6.6 km) from Tower 1, 4.7 mi (7.6 km) from Tower 2, and 5.5 mi (8.9 km) from Tower 3. Figure 1 makes a reasonable attempt at simulating the "dust halos," but it underrepresents glare from the power tower and includes no indication of heliostat flares. Glare is apparent in Figure 2 from both the power towers and heliostats, however, it lacks the defining perceptual discomfort.

Discussion
Printed photosimulations are perceived because of reflected light which lacks sufficient intensity to produce glare. However, the photograph did record the "bloom" and "flare lines" characteristic of photographed glare. The reason for this is that the light source is overexposed relative to the rest of the image. The camera sensor is overpowered just as the human eye is, the difference being the photograph can not record the human discomfort. While glare may represent a very small area in the view, it becomes important because it is very uncomfortable to look directly at it. As a result, it influences our viewing behavior — we either avoid looking in that direction entirely or we find ourselves taking quick glances or looking with our peripheral vision. The point is that neither the simulation nor the photograph can represent these aspects of the perception.

[1] *Benya, J. A. 2010. Controlling glare. Architect Magazine. https://www.architectmagazine.com/technology/lighting/controlling-glare_o*

Figure 1. Visual simulation of ISEGS facility Towers 2 and 3 (of seven proposed) as they would be seen from the Final EIS KOP 6, Ivanpah Dry Lake Bed, Eastern Side.



FIGURE 2. Photograph of the ISEGS facility Towers 2 and 3 (of 3 built) as seen from ISEGS Visibility Study SOP 6, Ivanpah Dry Lake Bed, Eastern Side.



Statement of Limitations: The simulations presented here were entered into the public record as part of a permitting process. They were prepared to be printed on 11-by-17-inch paper. However, in the process of distribution as PDFs they may have been substantially compressed. The figures presented here were clipped from these PDFs, converted to high quality JPGs and their resolution reduced. The original photosimulation has been substantially changed and as presented here should be used only as learning material.

Source: The figures used in this case study are taken from materials submitted to the U. S. Department of Energy and the U. S. Department of Interior, Bureau of Land Management.