

Aesthetic Impact of a Proposed Power Plant on an Historic Wilderness Landscape¹

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Abstract: In this assessment of the aesthetic impact of a proposed nuclear power plant, the historic foundation of American concepts of scenic beauty played a major role. The plant is planned to be located on the Hudson River at the foot of the Catskill Mountains, an area that was also the geographical center of and inspiration for the country's nineteenth century romantic movement. The meaning and quality of several particularly outstanding views became the ultimate focus in studying the visual impact of the plant. A computer-assisted model of the surrounding scenic quality and a visual preference survey conducted among the local citizens completed the assessment. This research concluded that building the power plant in this location would entail an unacceptable, negative aesthetic impact. This finding was the basis for the issuance of a final environmental statement by the U. S. Nuclear Regulatory Commission recommending that the utility's application for a license to build this plant be denied, an action unprecedented in the history of the nuclear power industry.

ORIGINS OF THE VISUAL RESOURCE IN AMERICA^{3,4/}

In a symposium such as this on applied techniques for analysis and management of the visual resource, landscape architects all too often can find it easy to get caught up in the tools of our trade and lose focus on what we are truly measuring. The following case study illustrates a fitting example of a problem in visual assessment which joins the working techniques of the profession with the very meaning and origins of the American perception of what qualifies as "pretty."

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The Proposed Greene County Nuclear Power Plant

As part of its federal licensing responsibilities under the National Environmental Policy Act of 1969 (NEPA), the U.S. Nuclear Regulatory Commission (NRC) performs independent environmental assessments of each application for a license to construct or operate a nuclear power plant. The NRC contracted with Oak

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Ridge National Laboratory to conduct an assessment of the projected environmental impacts of a \$1.8 billion, 1200 megawatt nuclear power plant proposed by the Power Authority of the State of New York (PASNY) to be built in Greene County, New York, on the west banks of the Hudson River about 40 miles south of Albany. The proposed Greene County Nuclear Power Plant (GCNPP) is located at the base of the Catskill Mountains while the primary alternative site that PASNY proposed is to be 10 miles north (fig. 1). The engineering designs called for a 450-foot tall natural draft cooling tower and a 205-foot domed reactor containment structure. PASNY, a state-owned, tax exempt utility, would transmit the electrical power produced by the plant to the New York City metropolitan area where its principal customer would be the subway system.

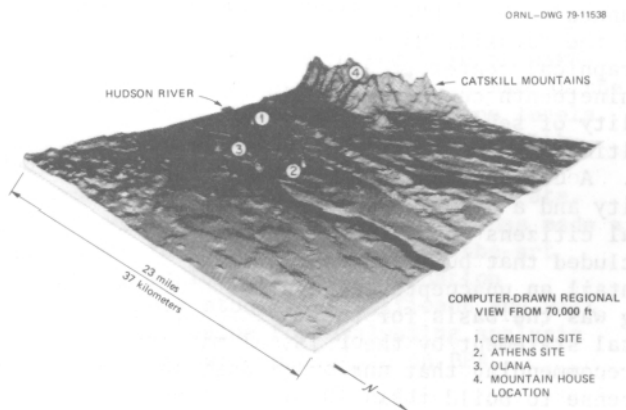


Figure 1--Computer-drawn view of the mid-Hudson River Valley and Catskill Mountains from northeast to the southwest. Topography and cooling towers have been exaggerated five times in the vertical dimension.

The Mid-Hudson Valley and the American Romantic Movement

In the first quarter of the nineteenth century the mid-Hudson Valley and the Catskill Mountains were considered the country's first wilderness. The American West and the southern Appalachians were quite inaccessible and largely unknown. When European visitors came to visit America, it was here that they were taken to see America's wild lands. Steamboats carried them up the Hudson River from New York City and then they proceeded by stagecoach or horseback into the mountains. In the second quarter of the nineteenth century the mid-Hudson Valley became the geographic center of the American romantic movement that launched the country's love affair with nature. It is

in this respect that it is particularly significant to landscape architects and other evaluators of the visual resource. Romantic attitudes still abound in the collective concept of the American front yard, curvilinear subdivisions, large city parks, preservation of wilderness, etc. These concepts found their initial inspiration in the Catskill Mountains area during the middle of the nineteenth century.

The colonists viewed nature as something to fear and subdue. Jeffersonian America viewed nature as something to embrace and transform in order to cultivate a new agrarian country gentleman life style. Romantic America, however, had to deal with a new force – the increasing industrialization that made the cities disagreeable but, on the other hand, seemed to make an agrarian idyll achievable for many. New technological advances such as the steamboat and the railroad (both reaching their earliest maturity in the commercial activity of the Hudson Valley) made the cities' hinterlands accessible both for escape and for exploitation. These two opposing aspects of technology were a chief source of the tensions pervading the immediate antebellum decade and the source of the country's first indigenous fine art: the writings of Emerson, Thoreau, Whitman, Poe, Bryant, Dana, Melville and Hawthorne; the photography of Jackson; the designs of Downing and Olmsted; and the landscape paintings of the Hudson River School. This art gave America its first cultural identity to complement its emerging industrial identity (based on the Erie Canal, the railroad, the telegraph, the steamboat, etc.).

James Fenimore Cooper's "Leatherstocking Tales" and Washington Irving's Tales of Sleepy Hollow and Rip Van Winkle, this country's first reputable novels, were inspired by and permanently grounded in the Catskills' wilderness setting. Thomas Cole recorded this landscape in a vivid, hold new style in his realist canvases which became the foundation of the Hudson River School. This groundwork enabled the great writers and luminist landscape painters to bring to fruition the romantic influence in America a quarter century later. New York City grew with the country and by the second quarter of the century became a business community capable of providing the patronage needed to support artistic endeavors. By turning to its abundant wilderness, America, as a nation of art, had separated itself from European themes. Nature, in general, and the Hudson Valley and the Catskills, in particular, were the new inspiration.

Portraying nature's glories and its revelation of divine plans for the country's immediate future consumed the artists' spirits during the entire romantic period. The cardinal belief of the romanticists was that technology

and the country's vast land resources would coalesce into a unique civilization, the climax of Western civilization, that would spread across the continent (Manifest Destiny). It was the mid-Hudson Valley that provided the combination of natural splendor and technological advance to inspire the leading figures of the romantic school. The people would live in a land not of the Jeffersonian country gentleman's dream, but of a middle area, a compromise between agrarian idyll and technological reality (Marx 1964). Few, if any, at the time truly foresaw what the dimensions of that technological reality might encompass only 10 to 20 years later (robber baron capitalism, mass production, urban blight, etc.). The tension between the agrarian dream and emerging industrialism spawned a romantic motif given image by the landscape painters. The image was one of an arcadian middle ground where man blissfully lived part in the city and part in the country (the still persistent suburban illusion). The public was looking for leaders to explain the new meaning of a nation dividing itself politically and of a paradise being invaded. The landscapists arose as the days' popular cultural leaders, giving the public what they wanted to hear and see — civilization was not merely stable, but was beginning to flower into a new Eden and all Americans were the new Adams (Huntington 1966). The American nation, as they popularized it, was on the threshold of a new Genesis. Because of this unique location, the aesthetic impact of the GCNPP must be viewed within this geographic and historic context.

ASSESSMENT TECHNIQUE

The aesthetic experience is dependent on an environmental stimulus, that which is seen, and the background and context of the observers, those doing the seeing. I employed three approaches, each centering on the landscape to be seen and on the context within which it is seen. This context encompassed the viewer's immediate geographical setting, expectations, attitudes about nuclear power and degree of affinity for and familiarity with the local landscape as well as a more detailed look at the historical and cultural context. The first two approaches, an analysis of the extant visual quality and an analysis, in part through use of a visual preference survey, of the potential viewers are heavily quantitative. The results of these two approaches (new and different applications of existing techniques) did not help to determine which of the chief sites was preferable. Therefore this account of the research will not dwell on these techniques used; the interested reader is advised to refer to the Final Environmental Statement (NRC 1979) which describes the details of

these approaches. The analysis of the historic and cultural context of the plant did point out a preferable site in terms of the aesthetic impacts and will be described in more detail (but still briefly). This represented an unusual twist in aesthetic impact analysis and is also described, therefore, for the background it gives to all visual resource assessment.

Evaluation of the Extant Scenic Quality

This facet of the assessment considered the scenic quality of the area surrounding the two proposed sites. I evaluated the unique scenic features as well as visual "misfits" in the landscape proximate to the proposed sites. My colleagues at the Laboratory aided in developing a computer-assisted model of the scenic quality surrounding the two sites that helped assess the quality of the landscape in which potential viewers would stand. "Before and after" photographs assisted in simulating the visual changes likely to occur in views from critical viewing points surrounding the two sites.

Scenic Features and Misfits

Existing studies (Greene County Planning Department 1971; Jackson et al. 1977) were the basis for assessing the relative quantity and quality of scenic features (e.g., waterfalls, scenic overlooks) or visual misfits (ill-placed visually noxious industries, unscreened junk yards) within 10 miles of either plant site. The primary site, near the hamlet of Cementon, had considerably more scenic features than the chief alternate site, near the village of Athens. This is due principally to the closer presence of the escarpment of the Catskill Mountains (fig. 1).

Model of Scenic Quality and Visibility

I assessed the existing scenic quality of the possible viewer settings surrounding the two sites and analyzed the results in terms of whether or not a proposed plant would be visible from an observer setting having a given level of scenic quality. From this criterion, an appropriate plant location is one having low visibility or, if visibility is high, the scenic quality of those lands having visual access is low. The assumption is that the higher the scenic quality of a given location, the more sensitive a viewer in that area is to any intrusion in his visual field.

I used the criteria of landscape preference developed by Zube and his colleagues from their Connecticut River Valley research (Zube, 1973a, 1973b, 1974, 1976; Zube et al. 1974; 1975) to map scenic quality. Individual landscape variables (e.g. relative topographic relief, land-use diversity, land-use height contrast) were evaluated for subareas within a 5-mile radius around each site, weighted, and scores for each subarea summed. By summing the scores of each subarea within a given radius from each site, I could, in part, assess the relative scenic quality of each site. Alternatively, I multiplied a given subarea's score by the percent of land within it from which the cooling tower at either site could be seen. This assessed the relative scenic quality of that land having visual access to the cooling tower at each site.

Modeling Result

The results of the modeling effort were not definitive (from this perspective) in terms of suggesting which site may be the preferable location. Results showed slightly higher scenic quality surrounded the Cementon site. When lands with visual access alone were considered, however, the Athens site had higher scenic quality. Reliance on visibility impacts alone is of limited value in aesthetic analysis. Although people may reside in a specific locale, their transportation patterns mean they live (work, shop, attend school) at a regional level. With people traveling at this modern scale and pace, topography cannot conceal features in the landscape very long or very well. The results of a visibility analysis alone could, therefore, be misleading.

Figure 2* shows, by color, those areas having visual access to either site and/or both sites and, by shading pattern, the scenic quality of that land relative to the remainder of the land in the study area. This map reveals which areas are the most sensitive to construction of the GCNPP.

Simulation of Plant and Plume

To superimpose the plant on photographs of the present landscape a professional artist airbrushed in the plant and its visible plume (both appropriately scaled from calculations) on photographs from critical locations. A computer model (Dunn 1978) of a broad variety of visible plume alternatives provided the artist appropriate wind directions and dimensions for a "typical" (not a worst case, yet still visible) plume (visible plumes consist of water droplets and are

Figure 2--Study area defined by 5-mile radii around Cementon and Athens sites. Color indicates visibility to a cooling tower at either site, and shading pattern shows scenic quality of all land or water units. Darker shades indicate higher scenic quality.

dependent on hourly as well as daily and seasonal variations in a site's micrometeorology). The model's output also helped to characterize the frequency and extent of the visible plume throughout the year.

With the help of the simulated plant and plume superimposed on photographs from critical viewing areas I described the projected aesthetic impacts based on traditional criteria of visual analysis (changes in line, texture, form, color, scale, etc.) and on the changes I felt likely to occur in the area's cultural and historical ambience.

Visual Preference Survey

The landscape is more than the aggregation of its component parts. Even an exhaustive set of relevant landscape variables could never totally explain all the variations in peoples' scenic preferences. I combined, therefore, a visual preference approach with the modeling and measurement techniques described above to assess the perceived whole.

A visual preference survey can assess, in part, how people feel about their environment and possible changes in it. People who live in the study area were surveyed because they are the prime group to be affected. In the survey, subjects expressed their preferences by rating (on a numerical scale, 1 to 5) forty photographs of the local landscape; some photographs had cooling towers or cement plants superimposed on them. Cement plants were chosen as intrusions comparable to the power plant because they represent heavy industry, make sense in terms of the regional economic base, and represent a taxable industry. Additionally, respondents completed two pages of written questions to provide information on their attitudes regarding the proposed facility, nuclear power, their frequency of use of local recreational areas, their appreciation and use of the area's historic and cultural resources and their individual backgrounds. The technique was based in large part on the approach developed at the University of Michigan by Stephen and Rachel Kaplan and their colleagues (Gallaher, 1977; Hammitt 1978; Kaplan, Kaplan, and Wendt 1972; Herzog, Kaplan, and Kaplan, 1976; Levin 1977).

*See color illustration on page 394.

The professional artist assisted in the superimposition of cooling towers and cement plants on 16 of the 40 photographs. The result was eight groups of three photographs (such as the triad in figure 3) and sixteen other photographs. All photographs were middle-to-long distance shots of the local landscape. The photographs were reduced to 2 by 3 inches, randomized, and printed by offset process, eight photographs to the page. A total of 154 valid responses (from randomly approached respondents) comprised the survey. The survey had a very satisfactory distribution of respondents by age, sex, income, occupation, education, time lived in region, present residence and where respondents grew up. Twenty-four subgroups from the original sample were derived from the demographic information supplied by each respondent or from the nature of their answers to certain questions. Statistical cross-tabulations by subgroup pairs were made on all photographs.

The results of the survey were augmented by personal interviews with local residents and by a search of newspaper files for clues to attitudes toward the local environment. The conclusions reached here were that the people most likely to view the proposed GCNPP are likely to be strongly opposed to any type of power plant at either location, are likely to be strongly opposed to large natural draft cooling towers in their landscape, have apparently adjusted through familiarity or some other mechanisms to the presence of cement plants in their landscape, perceive

their area of the Hudson Valley as having the highest scenic quality of any area between New York City and Albany, value and frequent the area's historic and cultural sites, strongly prefer the scenic quality perceived in natural or rural landscapes and, among other conclusions, perceive the proposed facility at Athens to be less of an aesthetic impact than it would be at Cementon. All in all, from the local resident's perspective, the GCNPP appeared to be highly unwelcome and inappropriate.

Historic and Cultural Context

In exploring the historic and cultural context within which the proposed plant would exist, I used an analysis that continually narrowed its scale from the larger New England landscape and nineteenth century times down to the actual importance and present-day quality of the view from an historic site near the proposed GCNPP site. In each incremental focal step, the important point was the emphasis on uniqueness or special quality. In this respect, all the focal steps began to interrelate and a cumulative uniqueness and special quality emerged. A detailed account of this study is presented in a separate document (Petrich 1979).

As stated above, the mid-Hudson Valley in the mid-nineteenth century was the seat of cultural inspiration in this country. From the group of Hudson River School painters who were the leaders of the romantic movement one emerged as the most popular and best able to give graphic image to the public's longings and feelings about nature and America's role in Western civilization. Frederic Edwin Church put his considerable talents to use painting the icons of the time — archetypal New World images such as South American volcanoes, north woods' wilderness, North Atlantic icebergs, Niagara Falls, etc. Church grew up in Hartford, was a cousin of Frederick Law Olmsted and was Thomas Cole's only pupil. He learned landscape painting at Cole's home and studio (still existing) in Catskill, five miles from the proposed GCNPP.

After Church became a wealthy world figure (in his early 30's), he bought land atop a steep hill on the east side of the Hudson. There he applied his design genius for the next 30 years in constructing a mansion and grounds that exist today as one of the few surviving Victorian estates still in a setting comparable to its nineteenth century environs. Art and architectural historians have called it the most spectacularly sited mansion in the country and

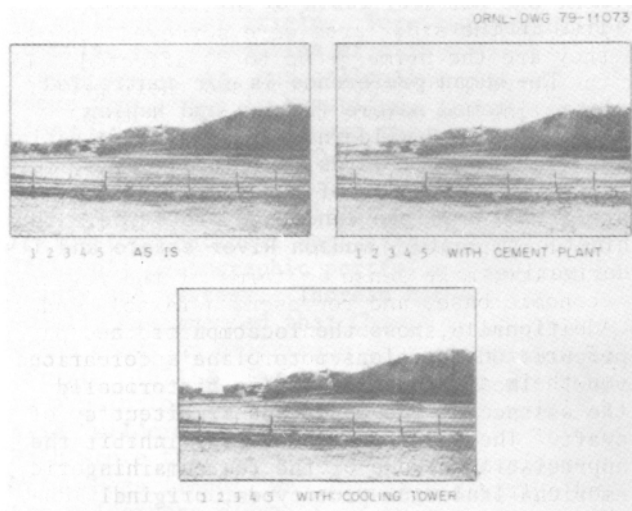


Figure 3--Typical triad of landscape photographs with superimposed industrial changes. Numbers indicate preference ratings respondents were to circle: 1 = not at all and 5 = liked very much.

termed it the best site in the eastern United States (see references and discussion in Petrich 1979). Olana, as the estate is known, is about 6 miles from the Cementon site (fig. 1). The New York Times (1966) editorially referred to Olana as "the essence of the Hudson River School of painting...one of America's great cultural monuments...the authentic aesthetic expression of a unique moment in art and time." An article in the Saturday Review referred to the Olana site as a symbol, even the apotheosis, of all Hudson River landscapes (Kuh 1965). Theodore Stebbins (1978), the Curator of American Painting at Boston's Museum of Fine Art, said that Olana "is the best place to feel the spirit of the artist coming together with nature as it was in the nineteenth century."^{5/}

This is the importance of Olana to the present day and especially to those of us involved in assessing, protecting and enhancing visual quality. Our roots in landscape architecture come from Olmsted and the other romantic artists of his time. His roots were in the natural English gardens and in the landscape paintings of Turner, Constable, Lorraine and other European masters who inspired garden designers such as Brown and Repton. The goal of nineteenth century landscape design was to create three-dimensional picturesque views which looked like a two-dimensional painting. The American perception of that which is pretty can be traced directly to the prototypal landscapes such as Olana's and other estates' built along the Hudson Valley at this time and indirectly to their European antecedents.

The landscaped views at Olana were created by a master painter, a close relative of and undoubtedly much influenced by Olmsted. The mansion itself was designed by Church along with the collaboration of Calvert Vaux, Olmsted's partner in the design of New York's Central Park. The principal view (fig. 4) which Church celebrated at Olana was that to the southwest, a consciously developed motif of looking across the continent (Manifest Destiny again). This view has been universally acclaimed in both the art history world and in popular literature. It is a view of classic composition, one which Church painted at least 35 times. One painting (fig.5*) of this view has emerged today with the critical blessing of John Howat (1972), the Curator of American Painting and Sculpture at the Metropolitan Museum of Art: "[It]

comes as close to perfection as anything done by American artists painting in the field."



Figure 4--Southwesterly view from first floor of Olana, landscape painter Frederic Church's mansion on the east bank of the Hudson River. Church called this view "the Bend in the River" view.

Church did not merely find a beautiful site and build his house there. He found a beautiful site and created a three-dimensional painting with stone, wood, glass, trees, bushes and lawn. It is in the highest romantic tradition to create the views you wish to emphasize – to enhance the natural. Through places like Olana we can today try to understand the romantic nineteenth century world and the very roots of our aesthetic sensibilities.

The human preference is for controlled vistas – tamed nature (Kaplan and Kaplan 1978). We need wilderness for raw inspiration, but for our front yards, our local parks, for the daily refreshing of our spirits, we prefer the American landscape prototype: the nineteenth century Hudson River estate and its derivatives.

Figure 6 shows the location of the proposed GCNPP relative to Olana's celebrated view. The making of views is historically the essence of the landscape architect's craft. The GCNPP would severely inhibit the appreciation of one of the few remaining American landscape prototypes, original source material for understanding the beginnings of the landscape designer's profession and a living embodiment of popular American landscape taste. I foresee the GCNPP at Cementon to be an unacceptable physical and symbolic intrusion into a unique national treasure.

^{5/} Verbal communication with Dr. Theodore E. Stebbins, Jr., Curator of American Painting at Boston's Museum of Fine Art, January 10, 1978.

*See color illustration on page 394.



Figure 6--Church's southwesterly "Bend in the River" view (see fig. 4) with the GCNPP and its vapor plume superimposed at the Cementon location.

SUMMARY

The American visual resource has its roots in the romantic period. The glorification of wild nature in written word and in oil on canvas was the country's first universally accepted fine art. The notion of the sublime that originates from the romantic period lives on in our expansive wilderness areas and national parks and forests. The notion of the picturesque lives on in our parks, old estates and pastoral rural landscapes. The two are intimately connected in philosophical origin. Together they comprise our perception of high quality visual resources, our collective attitude about that which is beautiful. The Hudson River School painters were the first to point out these resources. Two-dimensional creations inspired Olmsted as much as they did Congress when it passed the legislation creating the Yellowstone National Park after viewing Jackson's photographic portfolio of its beauty and mystery. Thoreau himself personally recommended that Church visit the Maine woods to experience Katandin country (Slavin 1974). The trip to Maine resulted in a painting in which Roderick Nash (1967) said "wilderness received triumphant portrayal." Nash wrote that this painting, *Twilight in the Wilderness* (1860), was instrumental in launching the wilderness movement in America.

Olana specifically and the mid-Hudson River area in general are the prototypal American landscape. As such in a highly industrialized region, they are endangered species. The NRC's Final Environmental

Statement (1979) concluded that the GCNPP at Cementon would unacceptably diminish these national historic, cultural and scenic resources. This is the first impact statement issued by the NRC ever recommending the denial of a license to construct a nuclear power plant. That this recommendation is primarily for aesthetic reasons documents the progress in credibility and defendability visual analysis has made.

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