

THE ROLE OF VISUAL IMAGES IN THE PLANNING/DEVELOPMENT PROCESS FOR THREE WIND FARMS IN COLORADO: CASE STUDIES - TWO BUILT, ONE DENIED

MOGEN, ELIZABETH

Colorado State University, Department of Horticulture and Landscape Architecture, Fort Collins, CO
80523-1173, e.mogen@colostate.edu

1 ABSTRACT

Visual images are used by developers to inform the public of the impact a proposed wind farm would have on the landscape and could mean the acceptance or rejection of a project. Today's wind farm can easily consist of over 150 turbines with towers reaching over 300' tall topped off with a whirling 250' diameter pin wheel. Preliminary studies have shown that visual impact has been a source of contention in the development of wind farms internationally and in the United States (Ball 2009, Wizelius 2007). This paper compares the use of visual images within the development process of three wind farms in Colorado. The three projects represent early development (Colorado Green completed in 2003), recent construction (Cedar Creek 2006), and recently denied (Silver Mountain 2009). A telephone survey was conducted of county planners involved with each project and submission materials were reviewed. Requirements for approval varied in each county however visual images were used during public hearings and within general impact statements. The focus of this study is on the type of images actually used and the manner and circumstance in which they were presented. This paper is intended to help educators and those involved in wind farm development understand the most effective use of visual images in terms of timing and method within the approval process.

Currently there are more sophisticated 3D modeling software packages available than those used by the developers involved in this study.

1.1 Keywords

wind farms, visual impact, development process

2 BACKGROUND

2.1 International

The development of wind farms as a renewable energy source has been embraced as a viable alternative to carbon burning fuels throughout the world (GWEC, 2013). Preliminary studies have shown that one of the main areas where wind farms do encounter resistance internationally as well as in the United States is in regard to site selection primarily in terms of visual impact (Williams, 2007). It is noteworthy to look at this issue from an international perspective to consider the status of visual impact from a larger perspective (Mogen, 2009). In this way we may perhaps learn lessons from those who have tackled this issue before and judge the overall significance of the subject.

The Scottish Natural Heritage has been refining and updating their “Visual Representation of Wind Farms Good Practices Guidance” (2006) since 2002 and is considered one of the most comprehensive and a standard bearer in the field internationally. Scotland has also developed a country-wide priority method for site selection that has promoted wind development in an orderly and relatively smooth process in terms of public acceptance. This method includes visual impact along with many other attributes such as historic significance and wind speeds. In New Zealand, where there is a more case by case approval process, Visual Impact Assessment (VIA) Guidelines are currently being developed. Without recognized VIA standards typically every new wind farm that is proposed eventually goes to their “Environmental Court” for further review to settle disputes concerning visual and landscape impact. In the province of Ontario, Canada’s largest wind power producer, legislation was passed in 2008 to expedite the building of renewable energy sites by allowing opponents to wind farms sites to challenge only on environmental or safety grounds, and not for “aesthetic.” The basis cited for Ontario’s legislation was the lengthy delays wind farms were encountering due to local resistance created by fears of negative visual impact (Ball 2009). These are a few examples of the importance visual impact has in the review and approval process for wind farms internationally.

2.2 United States and Colorado

In recent years wind power in the United States has begun to develop in a manner approaching its true potential. In the 90’s and the early part of the first decade of the 21st century its development was sluggish at best. However, the United States installed capacity more than tripled between 2007 at 16,824 Megawatts (MW) to 51,630 MW by 2012 (AWEA, 2013). Until recently the United States was ranked first in global wind production however China has recently taken that position (GWEA, 2013). Wind power faced a severe obstacle to growth in 2012 because Congress did not renew the Production Tax Credit (PTC) for renewable energies until January of 2013 as part of the ‘fiscal cliff’ negotiations. This created an insecure business environment causing wind developers to stop plans for proposed projects in some cases as well as layoffs in turbine production facilities.

The United States has been considered a global leader in environmental assessment regulations because of the National Environmental Policy Act (NEPA) of 1969. This document sets forth the structure for what the modern day Environmental Impact Statement (EIS) would require such as adverse environmental effects, alternatives to proposed actions, consultation with other agencies and visual impact assessments, typically done by a landscape architect. However NEPA requirements are only enforced on federal lands. In general the main document for wind farm siting guidelines is “Permitting of Wind Energy Facilities,” prepared by the National Wind Coordinating Committee (NWCC, 2002). This is a useful handbook as an introduction to the process for permitting wind farms and is general in nature. It does discuss visual impact along with other permitting considerations such as noise and wildlife. The main visual considerations it highlights are spacing, lighting, roads and storage structures.

Some states in the United States have developed their own environmental protection regulations that incorporate the siting of energy facilities and vary significantly from state to state. Some states have siting boards authorized by legislation, others have state-level agencies that develop voluntary guidelines, and others require permits. Some of these requirements do not include visual standards, whereas others set strict requirements. In primarily rural and agricultural states in the central and mountain west region of the United States where wind speeds are some of the best in the country private properties are regulated at the local level, by governing bodies such as county commissioners and planning and zoning boards. Often in rural areas the land is zoned for agriculture uses and there can be few regulations. Thus in terms

of siting and visual assessments the requirements are extremely variable across the United States. This has also created a wide range of reactions and results from community to community.

Iowa, the second largest state in terms of built wind capacity at 4,536 MW is a rural/agricultural state and relies on city and county planning and zoning ordinances as the siting authority for wind farms. Massachusetts, a much more urban and densely populated state, has an independent state review board. The Massachusetts Energy Facilities Siting Board, along with a variety of state agencies that review any energy projects planned for over 100 MW of production. Massachusetts is the home of the first off-shore wind farm in the United States, Cape Wind off Cape Cod. It was delayed for years due to visual impact concerns. View sheds were one of many issues used to stop construction with lawsuits. A general 'lack of clear siting regulations' is often cited as the reason for the Cape Wind project being taken to court. The issues were finally resolved at the federal level in 2010. Another example is Wabaunsee County Kansas where the County Commissioners imposed a ban on commercial wind farms (on private land) until concerns involving "rural character" and "undisturbed vistas" were resolved due to private citizen concerns.

Wind potential in Colorado is ranked 11th in the United States and far exceeds in-state needs. Installed capacity has grown from 22 (MW) in 1999 to 1,805 MW in 2011 (AWEA, 2013). The State of Colorado has declared that embracing renewable energies is a critical step in moving toward a stronger state economy and offering its citizens a healthier environment. Colorado increased their state wide Renewable Portfolio Standard (RPS) policy in 2010 calling for a goal of 30% of its energy to be supplied by renewable energy sources by 2020. To fulfill this goal the state created initiatives and incentive programs such as financial grants, the Wind for Schools program, and the anemometer loan program all of which have already begun to bear fruit. Wind farms are complementary to agricultural uses in Colorado due to their small footprint, low water use and historical familiarity. In general wind farms and their economic advantages have been welcomed in Colorado's agricultural communities, far from population centers. However, as more renewable energy sources are needed closer to population and scenic areas, it becomes necessary to look more closely and to ask what role visual/landscape impact has on wind farm development.

3 CASE STUDIES

3.1 Introduction

A telephone survey was conducted of county planners involved with each project and submission materials were reviewed. Although requirements varied by county, visual images was used during public hearings and within general impact statements. Planners were asked the type of permit and the time required for the review process. It was established whether visual assessment studies were required or provided by the developer voluntarily. A summary of the number and type of meetings with county staff, the public and approving bodies such as Zoning Boards and County Commissioners was noted including the manner in which visual images were used. Planners also describe the community response to the images. Also recorded were other venues where images were available to the public such as printed materials and the internet. This helped to develop a fuller understanding for the use of images during the approval process.

3.2 Colorado Green Wind Power

The Colorado Green Wind Power Project (Colorado Green) was the first utility scale wind farm to be built in Colorado and came on line in 2003. It is located 30 miles south of Lamar in Powers County (population 13,400), southeastern Colorado. The ranchers and farmers in this area had been struggling with drought for many years before the idea of a wind farm was introduced to the community. The owners and developers of Colorado Green are Iberdrola Renewables and Shell Wind Energy. It was built and is operated by GE Energy. The wind farm consists of 108, 1.5 MW turbines which produces enough energy to serve approximately 52,000 homes. Each turbine is 389' from the ground to the tip of the highest blade or about the height of a 30 story building. The project covers 11,840 acres of windswept rangeland and some dryland farming which includes 14 different landowners. The wind farm itself only uses 2% of the land area for the turbine foundations and roads leaving the remaining area for grazing or other uses.

In Powers County the land for the Colorado Green project is located in an area classified as a Non-Irrigated Agricultural District which required a Special Use Permit (SUP) to be reviewed by the

County Planning Commission before submission to the Board of County Commissioners. Prior to officially applying for the SUP the developers had conducted site visits, analyzing wind power potential and conferring with landowners in their homes for several years. At the time of application the developers followed the procedures and notice requirements in the "Prowers County Zoning Regulations" (2006). A visual impact study was not required however visual impact was voluntarily addressed as part of the submission package and at public hearings. The developers went beyond the minimum in terms of public information meetings by conducting more than were required. At these meetings they used large photographic images (approximately 36" x 48") depicting the impact of the wind farm from various viewpoints such as roads that were most commonly used. The photographic images were also left on display in public places such as the County Building for the public to view at their leisure. From the survey and interviews conducted with the head of the Prowers County Lands Use Office, Mary Root, it seemed the community had responded well at the meetings with more concern directed at transmission line locations. It was reported that one landowner did express apprehension about the visual impact of the wind farm on a dude ranch he was thinking about developing however he never followed through with an official complaint. Ms. Root also made the comment that she thought the developers must be used to dealing with the California planning process and not Colorado in regards to the amount of visual images they provided the community.

As a result of the developer working with landowners and the community long before an official application was submitted, it appeared there was an initial positive reaction. Also, the willingness to meet and display the images by the developer was key in providing the community with a sense of comfort that they understood what the turbines would look like and that they were well informed. This is highlighted by the community's reaction of uneasiness toward the transmission lines that were not discussed as thoroughly as the turbine locations prior to the official public meetings. Other points beyond visual imaging that were an integral part of the acceptance of the wind farm that are necessary to mention include economic impact. Powers County is in an area of Colorado that periodically suffers from drought conditions which in turn creates economic hardships on landowners and the community at large. According to John Stulp, one of the county commissions, Colorado Green increased the county's tax base by more than 33%. And, individual landowners are able to lease the land the turbines stand on and can earn approximately \$2,000 - 4,000 a month of passive income. From interviews and comments made by the planning staff it appears the community has become quite proud of their wind farm and would welcome an extension or other wind farms in the area. Another interesting by-product of the Colorado Green project was the opportunity the county of Powers and town of Lamar took by developing their own five turbine wind farm while Colorado Green was being built. The energy from this small wind farm is used to power schools and local government buildings. In summary it appears that using visual images as part of the public examination process was a significant tool for developers to use primarily to mollify community fears regarding the impact of 108 thirty-story tall structures would have on the landscape.



**Figure 1. Example of Turbines Coexisting on Leased Ranchland at Cedar Creek Wind Farm (2013).
Photo by the author**

3.3 Cedar Creek Wind Farm

Cedar Creek Wind Farm is located eight miles east of Grover adjacent to Pawnee National Grasslands in Weld county (population 252,300), northeastern Colorado. Although the immediate surrounding area is made up of a vast grassland landscape the landowners are primarily ranchers with some dryland to irrigated farming. The county seat Greeley is approximately 75 miles to the southwest and has a significant population of 95,000. Cedar Creek was built in two phases. Phase one consisted of 221, 1 MW turbines reaching just over 300' from ground to top of blade and 53, 1.5 MW turbines at approximately 390' tall creating a 300.5 MW wind farm that could power roughly 81,000 homes. Phase II consist of 63, 1.6 MW turbines, total height 390' and 60, 2.5 MW turbines at 411' in height producing 250.8 MW in entirety. Phase I was built on 32,000 acres, Phase II on 30,000 acres and included several different landowners. The developer was BP Wind Energy and Infigen Energy with Infigen remaining as the operator. Phase I became operational in 2006, Phase II in 2009. For this article I will focus on Phase I of the Cedar Creek project because the most intensive scrutiny particularly in terms of visual impact and the approval process came with Phase I.

Cedar Creek is located in an area already occupied by a scattering of oil and gas wells long before a wind farm was conceived. However as mentioned, it borders the Pawnee National Grassland and most importantly Pawnee Buttes, probably the only landforms of any visual significance in the area and a prime area known for viewing birds. On the east side of the dirt road approaching Pawnee Buttes the buttes stubbornly squat on the rolling prairie and to the west are hundreds of wind turbines sited in arrays along the tops of ridges needed for optimal wind exposure. It is because of this proximity to Pawnee Buttes that I first became interested in the approval process for this wind farm. As a landscape architect and with the research I had done on wind farms internationally I was amazed there hadn't been more controversy. Originally the developers had planned on putting part of Cedar Creek within the National Grassland borders but when they discovered the amount of NEPA as well as other regulations that were part of the federal approval process they soon decided to focus on private lands. In Weld County a SUP including a "Major Facility of Public Interest" was required for approval by the County Commissioners. A visual impact statement was not required and only a partial environmental impact statement was needed for the permitting process. However, the developers went ahead and prepared visual impact assessments and did remove some turbines during staff meetings with planners and public works personal. They also used the visual images in power point presentations at several area resident meetings, open house exhibits, and public hearings. The developers also produced several pamphlets, brochures and booklets that described a variety of issues such as an overview of the workings of wind energy, expected timelines,

wildlife considerations and visual impact was included with images. This printed information was easily accessible to the public and on the internet. (BP Alternative Energy, 2008)

Again we see the developer's decision to do more than was required, created a sense of security and transparency that helped immensely with public as well as county staff acceptance. While interviewing Chris Gathman the county planner in charge of the Cedar Creek project, he said he did not record one complaint or sign of animosity toward the wind farm in relation to visual impact and felt the power point presentations with images depicting the landscape with turbines in place was the main reason for this. The most controversial facet of concern that emerged from public meetings was the potential disturbance the turbines would have on wildlife. This is substantiated by recent research I have done looking into post construction comments (after Phase II) in public outlets such as area newspapers and websites where I consistently found concerns voiced about wildlife and only the occasional comment on the visual aspect. It is interesting to note that the concerns articulated are typically travelers from outside the area or those that have a historical memory of the area for example; they passed this landscape as a kid going to Grandma's house and the turbines are ugly. The economic impact is also similar to what was found for the Colorado Green project area. Another interesting yet shocking addition to the landscape I saw during my last visit to Cedar Creek is the amount of fracking wells that are being developed in the same general area. Overall it appears that the developer's commitment to introducing a wind farm project to the public with plenty of images accessible in a variety of forms allayed community concerns in terms of visual impact.

3.4 Silver Mountain Wind Farm

The proposed Silver Mountain Wind Farm was to be located in Huerfano County (population 8,100), near the town of LaVeta (population 780), 160 miles south of Denver, Colorado. Interstate 25 (I-25) runs through this area at the foot of the Rocky Mountains and more specifically to the project area where Highway 160 travels west into the Sangre de Cristo Mountains. The landscape consists of rolling grasslands and ranching to the east of I-25 and dramatic mountain vistas to the west where the town of LaVeta is supported by tourist trade and a strong artist community. Highway 160 is also a County designated Scenic Conservation Zone. The wind farm was to have an energy output of 150 MW, consisting of 50-100 turbines, maximum height of 450' on a site of 7,000 acres. There was only one non-resident landowner involved. A General Land Development - Conditional Use Permit was required and a visual assessment study was requested although not mandatory by county planners. The developer was Renewable Energy Systems Inc., with Walsh Environmental Services preparing the Prefeasibility Study for land use and CH2M Hill was preparing the visual assessment studies.

Before Silver Mountain was introduced to the Huerfano planning department, the county had already established "preferred areas" for wind farms. The basic principle for the preferred areas designated land on the east side of I-25 as appropriate for wind farm development and land on the west was not. When the developer made initial contact with the county planning staff they were receptive and even willing discussed land options that might include moving the small local airport. However, when the preliminary application was submitted the developer chose to go with a parcel of land on the west side of I-25 where the wind speeds were best in the area. In the application packet visual resources were highlighted in the Environmental Analysis and Mitigation sections. (Walsh, 2009) However, it was stated that the visual impact analysis was in a preliminary stage. The developer did express mitigation in terms of removing turbines that infringed on views for neighboring landowners and confirmed they were willing to do so. There was an "Open House" for the public where "D" size images were used and a public hearing where power point images were presented. The negative public response was quite raucous particularly from the town of LaVeta where they felt the wind farm would detract from natural scenic beauty of the area and reduce tourist traffic their main economic driver.

In November, 2009 the Huerfano County Board of Commissioners denied the Silver Mountain Wind Farm and requested that the Applicant not proceed to the final application stage. The Board had a variety of criteria stated for denial however visual impact was acknowledged boldly in the introductory remarks of their resolution.

"One resource that is mentioned repeatedly in the land use guide is the natural beauty of the County. To preserve that resource, the Board recently identified a "Preferred Wind Area." However, this Preliminary Application does not conform either to the land use guide's goal

of preservation of scenic resources or the identified Preferred Wind Area.” (Huerfano County, Resolution No. 27, 2009)

After the denial of Silver Mountain, Huerfano County placed a moratorium on all wind farm applications until the county could strengthen their land use guidelines in relationship to wind farms. To my knowledge this was a first in Colorado for a utility scale wind farm. Perhaps the developers tried to move too fast without the time needed to prepare the community and present the completed visual analysis and subsequent information and images. Or the fact that they were working with only one nonresidential landowner may have narrowed the beneficial economic impact thus reducing the incentive for the entire community. A similar problem was encountered during the planning process for an Iowa wind farm and after discussions with community members the developers expanding the leasing agreements to include not only those who owned the land where the turbines were to stand but also to landowners that could see the turbines. Another thought is that the developers didn't present or consider any alternate perceptions. For example using the wind farm as another attraction, as is done in Germany by creating wind parks where educational nodes, bicycle paths and other recreational uses are incorporated into the design of wind farms is encouraged. Overall this developer may simply have needed to give more thought and consideration toward the existing land use codes and realized even more importantly that the local natural landscape beauty was simply too valuable to risk for this community.

4 CONCLUSION

In comparing the importance of visual images in relation to the approval process for the three case studies presented first some general characteristics will be discussed followed by more specific patterns that emerged. Weld County the home of Cedar Creek has a much larger population (252,300) and a more extensive planning office which could infer more sophisticated requirements than the two smaller counties. However, Huerfano County with a much smaller population (8,100) required more from the developers during the approval process in terms of visual analysis. Cedar Creek and Silver Mountain were both located near areas of scenic significance in their respective regions. Pawnee National Grasslands which contains Pawnee Buttes in Weld County is relatively comparable to Silver Mountain located at the foot of the Rocky Mountains. However, the community in Huerfano County considered the preservation of the scenic resources vital to the overall economic health of the area than was found in Weld County. Also, the pre-existing presences of oil rigs in Weld County points to a community that views the landscape first as a working economic resource as opposed to a scenic economic resource. In general economic terms the wind farms benefited much larger groups of people in the cases of Cedar Creek and Colorado Green than the sole nonresidential landowner at the Silver Mountain site.

In comparing the specific use of visual images it became clear that the developers that went beyond the minimal requirements requested by the local planning bodies were successful with their applications. It seemed the method of presentation or type of images whether they were large hard copy type photographs, brochures size or power point presentations didn't seem to matter as much as amount of access the public had to the images. The images were left on display in libraries and other public building for the public to peruse. Also, the successful developers spent several years prior to their applications holding public meetings and spending time with individuals in the community. In all three cases the county planners involved with each specific wind farm said the visual images were invaluable tools in creating a sense of transparency or not and a feeling of trust or mistrust toward the developers from the community.

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