RECLAIMING VISUAL STEWARDSHIP IN TUCSON, ARIZONA: IS IT POSSIBLE?

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Abstract.—The Sonoran Desert landscape surrounding Tucson, Arizona, consists of sweeping skies punctuated by mountain ranges and saguaro silhouettes. As development occurred decades ago, land use codes and design practices were developed to protect this scenery. More recently, these codes have been ineffectual at integrating utilities into the urban landscape. Using overhead power lines in Tucson as an example, this paper discusses the decline of visual stewardship and impediments to halting this trend. As utility poles have increased substantially in size due to new regulatory requirements and efficiency standards, mitigation practices that visually integrated utility poles into the landscape have been discontinued. Additionally, old poles remain after replacement, cluttering urban streets. Visual decline related to overhead power lines is not inevitable, however. This paper discusses examples of communities that are successfully improving power line design and presents evidence that visual stewardship as a value has begun to emerge in the energy industry.

INTRODUCTION

My involvement in visual resource issues began 5 years ago when I received communication tower plans to review. Before becoming a landscape architect for the county transportation department, my work over the previous 20-plus years in the private sector focused on site design, as opposed to larger landscape concerns. The communication tower I was reviewing would be located adjacent to Saguaro National Park in a designated Scenic Route. A weathering steel pole, 15 feet taller than the existing wood pole and with an increased circumference, would replace the existing pole that was unable to support the antenna. The plans said the new pole would match the adjacent wood poles and the antenna would be painted to match the new pole. After requesting a visual simulation, I received it with the third submittal (Fig. 1). The code required visual simulations; these were provided only after several appeals. The code also required that cell towers be "stealth" by design (Pima County 2017b). As the proposed pole was conspicuously profiled against the sky, I was confused about how this design could be classified as "stealth."

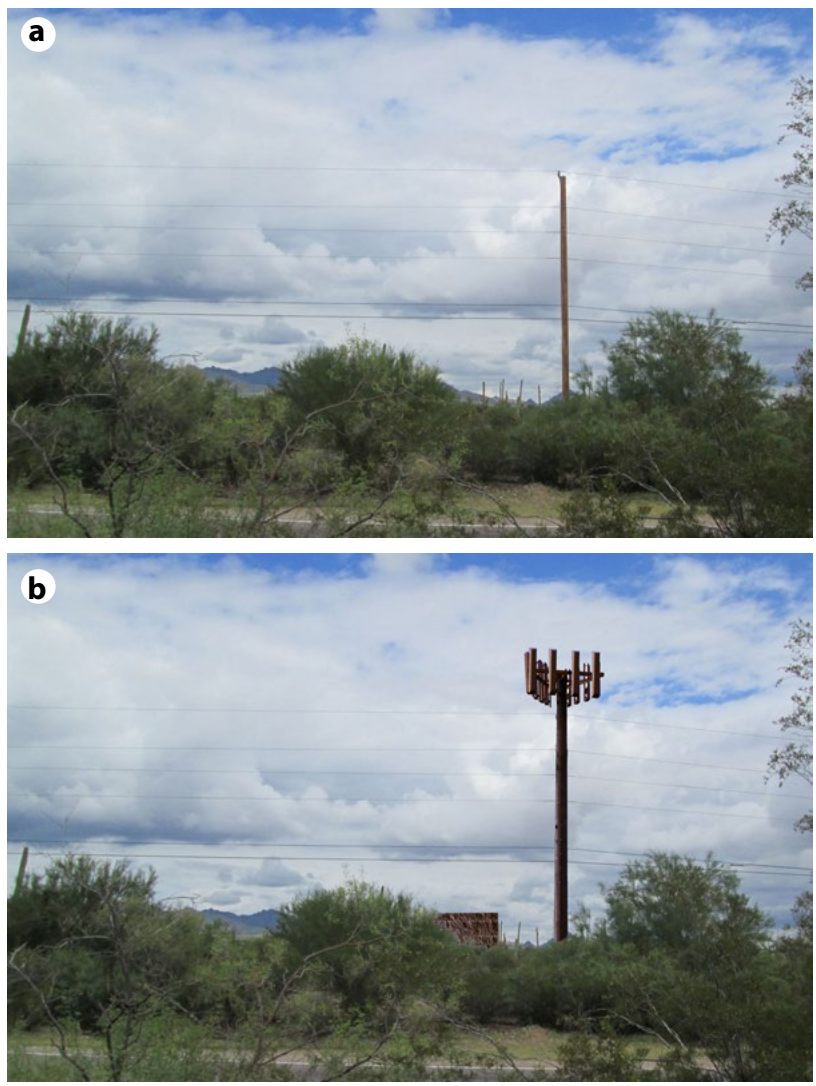

Figure 1.—Existing wood pole (a) and visual simulation of replacement weathering steel pole with communication antenna (b). Photos from permit application on file with Pima County (Arizona) Department of Transportation.

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Communication towers, while conspicuous, occur intermittently. The weathering steel poles, meanwhile, dominate the skyline along many of Tucson's urban corridors (Fig. 2). While poles were previously painted in environmentally compatible hues, minimizing contrast with the surroundings (Fig. 3), this practice was discontinued. According to Ed Beck[2], Tucson Electric Power (TEP)'s position is that painted finishes do not last and repainting processes have negative environmental impacts.

TEP adopted weathering steel for all new and replacement poles citing durability, low maintenance, and ease of use. These poles contrast with rather than blend into the landscape. It is unknown whether the switch to this material was discussed with or agreed to by urban designers, government officials, or members of the public. Increasing in both height and girth due to updated standards from the National Electric Safety Council, these taller, larger poles cause an even greater visual impact.

Redundant poles (i.e., poles that remain after the pole owner has relocated wires to a new pole) clutter roads throughout Tucson (Fig. 4). Cable and communication providers sharing the original pole typically fail to relocate to the new poles. Instead, the original pole is left in place and cut off at the height of the highest remaining utility provider, increasing the number of poles.

The Federal Communication Commission promotes the use of poles by multiple utilities, granting cable and communication carriers nondiscriminatory access to any pole, duct, conduit or right-of-way owned or controlled by a utility (Telecommunications Act of 1996). Pole modifications, both by the original utility and by cable and communication carriers attaching to the pole, add to the visual clutter (Fig. 5).

The public often requests underground utilities, especially when roads are widened and utilities are relocated. In the past 15 years, this has rarely

Figure 2.—Weathering steel poles in metropolitan Tucson, AZ, dominate the urban streetscape. Photos by Ellen Barth Alster, used with permission.

[2] Director of Transmission, Tucson Electric Power, Tucson, Arizona. Telephone conversation, May 27, 2015.

Figure 3—Poles around Tucson used finishes that minimized contrast, receding into the landscape. The practice of painting the poles was discontinued. Photos by Ellen Barth Alster, used with permission.

Figure 4.—Poles that remain after the pole owner has relocated to a new pole are known as redundant poles. Photos by Ellen Barth Alster, used with permission.

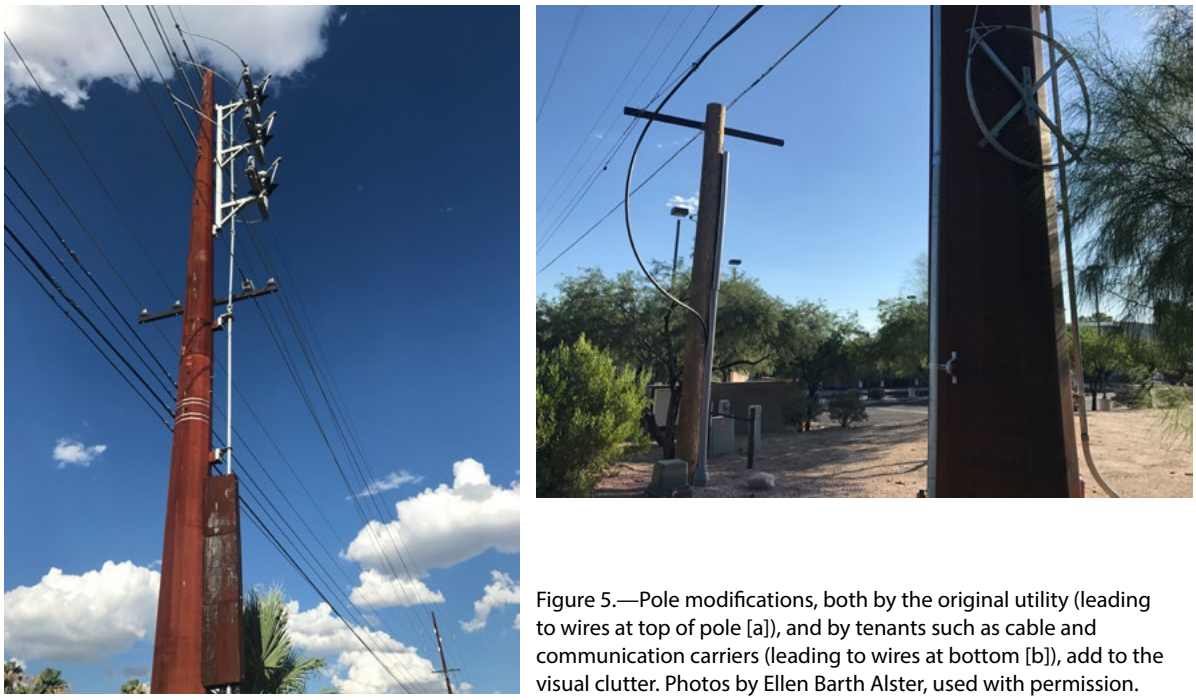

Figure 5.—Pole modifications, both by the original utility (leading to wires at top of pole [a]), and by tenants such as cable and communication carriers (leading to wires at bottom [b]), add to the visual clutter. Photos by Ellen Barth Alster, used with permission.

happened. Utilities are typically responsible for their own relocation costs when road projects occur. If utility poles are overhead, utility companies cannot be forced to relocate them underground. The added expense of undergrounding falls on the jurisdiction. Funding sources usually do not cover expenses related to utility relocation, so undergrounding seldom occurs.

How has the hodgepodge of utility poles developed? Has past planning addressed these issues? Was the current situation unanticipated?

I asked these questions to Corky Poster,[3] Professor Emeritus of Architecture at the University of Arizona and Principal of Poster Frost Metro Architects. Utility discussions occurred decades earlier, I learned, and he provided to me the urban design reports from 1986 for both Pima County and the City of Tucson, which he had helped to authorCo.

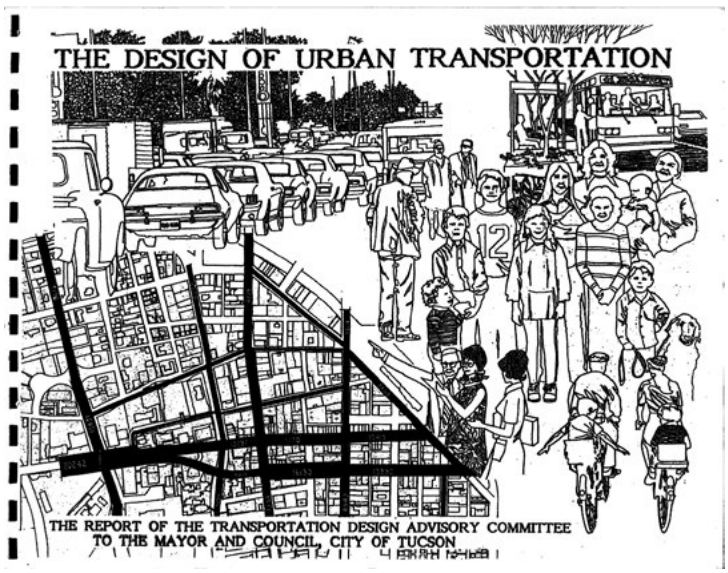

Figure 6.—Cover of City of Tucson Urban Design Report (Locard 1986b). Preservation of views is listed as a priority for Tucson's citizens in the urban design reports for both the City of Tucson and Pima County. Image courtesy of Corky Poster.

While the reports' typewritten text and hand drawn sketches seem quaint (Fig. 6), the design directives are startlingly fresh. A report notes that as far back as 1969, Tucson's citizens valued view protection: "The distant view of mountains, skies, and the surrounding desert afforded by the form of the Tucson Basin is first priority in a citizen survey of Tucson's environmental values. It should become incumbent upon all future planning that these views be kept open for the benefits and enjoyment of everyone" (Locard 1986a, p. 29).

The reports include comprehensive guidelines concerning utilities. "The wires and poles of utility systems—electricity, cable TV, telephone, and public lighting—bring a tremendous clutter to the public

[3] Architect and Principal Planner, Poster Frost Mirto, Tucson, Arizona. Personal interview, July 19, 2017.

right-of-way. Prioritizing underground and sensitive location of unavoidable above ground utilities will greatly improve the visual quality of our streets" (Locard 1986b, p. 17).

Subsequent policy made its way into Pima County and City of Tucson code. Chapter 10.48 of the Pima County Code establishes Underground Utility Districts (Pima County 2017a) where overhead wires are prohibited. Scenic and Gateway Corridor designations (Pima County 2017c and 2017d) were developed, incorporating building height and color palette restrictions. However, the code abounds with exceptions for utilities. Concerning mitigating utilities' effect on the landscape, the codes' intent fails. By limiting building heights along gateways and scenic corridors to 24 feet, utility poles, often 90 feet high or more, soar above the skyline.

Why has visual awareness declined so dramatically in recent years? According to retired Tucson City Planner, Roger Howlett[4], efforts to improve Tucson's appearance began in the mid 1960s with recognition from the public and elected officials "that the built part of the city was relatively ugly." In 1970, Life Magazine branded Speedway Boulevard, a major corridor, the "Ugliest Street in America." This sparked comprehensive plans, a "Major Streets and Routes Plan", and landscape requirements in the zoning code. Howlett calls 1992 the "high water mark" of visual awareness, led by "a generation of people who came out of the '60s wanting to change the world. Since then there has been a consistent effort to chip away at these policies, codes, and funding that has escalated since the 2008 recession. Most of those people have moved on. Funding for infrastructure is in such short supply that visual quality does not even register."

STRATEGIES TO INTEGRATE UTILITY POLES INTO URBAN ENVIRONMENTS

This paper investigates strategies for integrating utilities into urban environments. Can utility design have a more holistic, context-sensitive approach than is currently in practice? Sensitive routing is often used in less populated and/or urban areas with large swaths of undeveloped open space. Urban areas frequently do not have the appropriate space to use this strategy. The use of specialty finishes shown in Figure 3 is currently in general disfavor for reasons that are discussed here. Undergrounding and improved overhead line design remain viable and will be explored.

Utilities offer rationales for discontinuing previous mitigation methods, claiming for example that underground lines cost five to ten times more than overhead lines (U.S. Energy Information Administration 2012) and that painted and/or galvanized finishes that make poles less conspicuous add additional cost and negative environmental impacts. The validity of these claims will be examined. Are there communities burying power lines and how do they overcome funding issues? Is the energy industry making any effort to address visual quality issues? If so, which companies are doing this and where? Lastly, are redundant poles inevitable?

Finishes and Coatings

Poles become less conspicuous when finishes and coatings are applied to minimize contrast with the surrounding landscape (Fig. 3), but this practice is in decline. Paint fades, peels, and has undesirable environmental impacts, according to critics. Corrosion control expert Curtis Hickcox says that utility companies consider repainting a maintenance expense. Since deregulation, utilities have capital "to build stuff" but scant maintenance money. He attributes the negative environmental impacts to delays in maintenance (Paint Square 2017).

Hickcox has written industry standards for the National Association of Corrosion Engineers (NACE) and Institute of Electrical and Electronics Engineers (IEEE) and spent over 35 years in coatings and corrosion management for the utilities industry (Paint Square 2017). In a 2017 interview, he said:

> There's a million towers in North America; in a good painting year, 5,000 might get painted. The problem is, nobody has any maintenance money to spend. The work doesn't get done, the towers get worse and worse and worse. Especially if there's lead involved, then it comes to the point where now you have to do more surface preparation; you've got to do power-tool cleaning. If you have to do power-tool cleaning, now you have to take

[4] Retired City Planner, City of Tucson, Arizona. Email correspondence, September 30, 2017.

an outage on the line. Now you have to do more containment. The cost, the effect on the worker and the environment, gets a lot more significant.

Some utilities are very proactive and have a long-term program, and paint them every year. But they're the exception. More often, it's "I'd better keep my head in the sand and let the next guy do it." Or, "I've got all kinds of capital money; I'll just replace them!" They'll spend $200,000 to replace a tower instead of $10,000 to paint it (Paint Square 2017).

Galvanizing, a process that can last up to 50 years if applied correctly, is maligned as environmentally harmful. Supporters claim contamination issues are attributable to poor clean up practices (Hinton 2017). Weathering steel and stainless steel do not require protective coatings. Weathering steel, the less costly option, has risen in popularity. According to Majid Farahani, Transmission Supervisor at TEP, weathering steel is the most versatile choice due to frequent field modifications of poles. Galvanized poles receiving field modifications require regalvanizing to protect against rusting, a costly and complicated process.[5] Weathering steel poles in the landscape are shown in Figures 2, 4, 5, 7, 11, and 20. TEP does add galvanized parts when modifying the weathering steel poles (Fig. 5).

Undergrounding

Communities often request placement of utilities underground, particularly when road widening occurs. In Tucson, during a 2013 public meeting for a road that is designated as a Scenic Route and is part of the De Anza National Historic Trail from Mexico to California, TEP's response to a question about undergrounding utilities was that they were not required to place lines underground because the utility existed prior to the Scenic Corridor Code designation. Project funding would also not cover undergrounding costs (Tucson Electric Power 2013). The built roadway is shown in Figure 7.

Successful undergrounding programs do exist in some U.S. communities, usually run by municipally owned power companies or locally based investor-owned companies with strong local government partnerships. Most of these programs began decades ago.

[5] Smith, David. Tucson Electric Power Project Manager, Resource Team. Email correspondence, September 30, 2015.

Figure 7.—Silverbell Road and Grant. Weathering steel poles are the dominant skyline feature. Photos by Ellen Barth Alster, used with permission.

San Diego Gas & Electric (SDG&E) in partnership with the City of San Diego began an extensive undergrounding program in the 1970s. It is partially funded by a 2.5 percent surcharge on utility bills that San Diego voters approved in 2003. The program is responsible for removing more than 5,000 power poles and undergrounding over 200 miles of power lines (City of San Diego 2017). Approximately 75 percent of San Diego's power lines are now underground (Fig. 8). San Diego has "the highest percentage of underground power lines of any investor-owned utility in the State with an undergrounding percentage that is three times the National average" (T&D World 2014). According to Associate Engineer Breanne Busby[6], the undergrounding program's staff of eight determines the schedule, neighborhoods, and order that the undergrounding projects are carried out. It also manages and distributes funds.

The City of Anaheim, California, also runs a successful undergrounding program through its municipally owned electric utility (Fig. 9). In 1990, voters approved a 4 percent surcharge on utility bills, funding a 50-year underground conversion program (City of Anaheim 2017a, 2017b). According to Program Manager Tim Bass[7], approximately $14 million to $15 million are

[6] Associate Engineer, City of San Diego, California. Telephone interview, August 28, 2017.

[7] Underground Conversion Manager, City of Anaheim, California. Telephone interview, July 13, 2017.

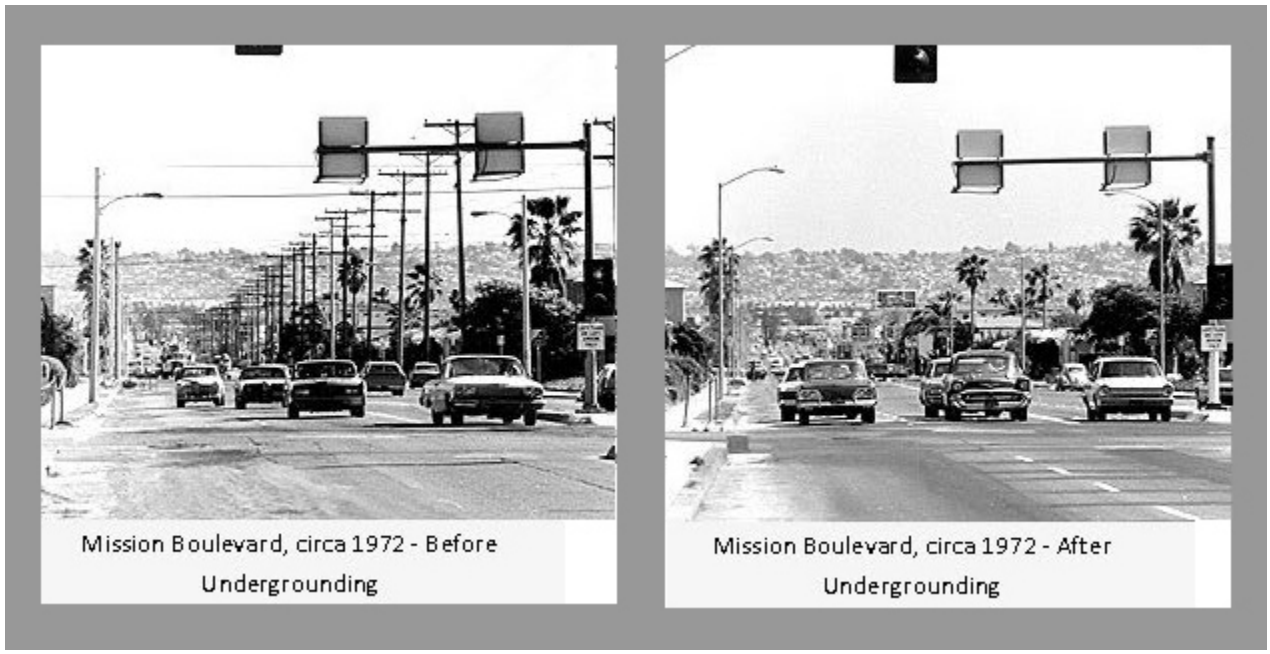

Figure 8.—Before and after illustration of Mission Boulevard in San Diego from the Master Plan, Utilities Undergrounding Program. Photos from City of San Diego 2017.

Figure 9.—Before and after photos, Underground Conversion Program, Anaheim (CA) City Council presentation, July 25, 2017. Photos from City of Anaheim 2017b.

invested in the program each year, with $8 to $10 million spent on a typical project. Undergrounding typically occurs on roads slated for repaving and is done in coordination with Anaheim's public works department.

San Francisco's undergrounding efforts have been less successful. Utility customers pay a monthly dollar amount for undergrounding but the City has gone into debt on undergrounding projects, with many more lines to bury (Ashly 2015). To speed up the effort, San Francisco allows residents to organize assessment districts where residents assume design and construction costs, which are then added to property tax assessments (San Francisco Public Works 2017). Other cities in California with underground conversion programs include Palo Alto, Rancho Palos Verdes, Costa Mesa, La Mesa, and Laguna Beach.

There are only limited examples of successful programs through which customers bear the undergrounding costs. The City of Seattle began a voluntary

Figure 10.—The design pylon, the first pylon developed by the architectural firm Bystrup, is 60 percent the size of a traditional lattice tower. This design won a Danish government design competition in 2001. Referred to by local residents as "magic wands." Photos by Bystrup Architects, used with permission.

undergrounding program 15 years ago (Seattle City Light 2012). Teif Weller[8], Residential Supervisor for Seattle City Light, the municipally owned power company that serves Seattle, says that few residents follow through after hearing the price tag, typically $30,000 to $50,000 per residence, paid by the property owner. This also includes undergrounding electric lines only. There may be additional costs to underground cable TV, telephone, and any other equipment that currently uses the overhead system.

Improved Overhead Power Line Design

Improving overhead power line design is an alternative to burying power lines and keeping them hidden. With greater design effort, could overhead power lines become a neutral visual element or even an asset, while improving function and efficiency?

Increased emphasis on overhead line design began in the last decade in Europe, moving in this decade to the United States. While aesthetics seemed to drive technical innovation in Europe, technical improvements and aesthetics appear to have begun on equal footing in the United States. The Danish architecture company Bystrup leads pylon design in Europe. American Electric Power's (AEP) subsidiary, BOLD™ Transmission, leads this movement in North America. Lastly, Choi+Shine Architects' fanciful "Land of the Giants" transmission tower design, which was entered in a design competition in Iceland in 2008, will also be discussed below.

Bystrup

In 2001, the Danish Ministry of Energy and Environment along with the Danish operator launched a competition to create a pylon design for the future. This came after numerous complaints and local protests about proposed lattice tower pylon designs over a 10-year period. The new pylons, called the Design Pylon, shrunk the traditional lattice tower to 60 percent of its original size (98 feet in height vs. 164 feet for the lattice tower). With a goal of being "more submissive in the landscape," the tops of the Design Pylon structures merge into the sky, making the tops almost invisible (Fig. 10). Energized in 2006, locals helped select the Design Pylon's material and labeled them "magic wands." Since then, Bystrup's practice has focused on the design, development, and construction of power pylons (Bystrup et al. 2017).

[8] Residential Supervisor, Seattle City Light. Telephone interview, August 21, 2017.

Figure 11.—When presented with two options, the public choose galvanized (a) over weathering steel (b) for the Bystrup eagle pylon. Photos by Bystrup Architects, used with permission.

Erik Bystrup asks: "What do we really expect from a power line structure? Is it only a technical necessity, an object of design excellence or a piece of land art?" The best answer, according to Bystrup, lies somewhere in the middle:

> In our part of the world, electricity is regarded as a basic necessity. It is a paradox that we cannot imagine living without it while we do not accept the power pylon, which distributes this electricity, as a part of our cultural landscape. "Bury them!" "Camouflage them!" or simply, "Make them go away!" is the general outcry. But why? Highways and railroads have been accepted as parts of the landscape; both are necessary in order to travel and to move. Why then can we not accept the equally vital lines of power pylons? …
>
> We put significant effort into the design of motorways and railroads, merging them carefully into the landscape. We hire talented designers to create railway stations and to design trains, overhead lines, bridges, and motorway junctions. Ignored are the power pylons that perform another vital function but which most people regard as threat. They are perceived as messengers of electricity, high voltage, and danger. To some they even symbolize the growing pollution from modern civilization. …
>
> Should we not try to create overhead transmission lines (OHTLs) that dignify the power pylon and restore it as a worthy part of the landscape around us? We could let them radiate the hope and possibilities of sustainable power production. …
>
> It is this change in our electricity production and transmission grids that presents a unique opportunity: the opportunity to make a difference in the landscape and to create new pylons with a strong design profile, allowing power pylons to be an acceptable part of our present as well as our future (Bystrup 2012, p. 36).

An estimated 100,000 pylons are needed by 2020 in Europe alone, according to Bystrup, calling for a new pylon that is "easier to erect, less costly, and better looking than the old ones" (Bystrup 2015, p. 6-7). Bystrup also discusses the advantage of using materials without protective coatings, such as weathering steel and stainless steel (Bystrup Corp. 2015, p. 32). However, as Bystrup's marketing director Mette Hauge Mikkelsen[9] admits, the public has not yet chosen weathering steel when it is presented as an option (Fig. 11).

Bystrup pylons have now been installed throughout Denmark and across the United Kingdom (Fig. 12) and are in the process of being introduced in North America. Sinopa Energy, an Ontario-based project management company that focuses on the energy sector, will soon replace lattice towers on highways leading into Toronto with pylon-type towers that are expected to be a Bystrup design. Ron Collins[10], CEO of Sinopa Energy, says energy companies in general

[9] Marketing Director, Bystrup, Copenhagen, Denmark. Telephone interview, August 10, 2017.

[10] CEO Sinopa Energy, London, Ontario, Canada. Telephone interview, August 10, 2017.

Figure 12.—A test line using the T-pylon, by the architectural firm Bystrup, won a design competition in the United Kingdom in 2011 as its national grid expands, moving away from coal, oil, and gas, toward newer sustainable energy sources. A test line is shown here. Photo by Bystrup Architects, used with permission.

Figure 13.—The composite pylon, currently under development, is half the size of a conventional lattice tower, while carrying the same amount of power. It can be assembled on site and erected in a day. An existing line (a), with two lines each carrying 1x400 kV; the proposed improvement (b) with a single pylon carrying 2x400 kV. (Bystrup 2015). Photos by Bystrup Architects, used with permission.

are not pushed to be innovative. The Bystrup pylons require less right-of-way and are substantially shorter. Despite the decreased height, the number of towers remains the same due to improved cables with less sag. Newer designs will increase standardization among angle towers that are used when overhead utility lines change direction. Currently angle towers are designed for specific loads, resulting in differing pylons within a single viewshed. Newer towers will accommodate a range of loads and various placement requirements.

Collins attributes the lack of design innovation in the energy sector to increasing pole height and girth. The basic electricity distribution technology has not changed for decades but poles increased in size to meet newer safety standards. Older technology is proven, reliable, and low cost so providers have little incentive to change. However, today, improved insulators and new composite materials can dramatically decrease pole profiles (Fig. 13). Newer poles also incorporate wireless internet into the product line. Collins said the energy industry is being "pulled, not pushed" to be innovative.

BOLD™ Transmission

With 40,000 miles of transmission lines, American Electric Power (AEP) has the largest transmission system network in the United States. Built decades ago, a large portion of the network requires upgrade. Rather than replace declining infrastructure with old technology that would require a larger footprint to meet increased demand and newer safety requirements, AEP invested millions of dollars in research and development and set up a subsidiary called BOLD™ (Breakthrough Overhead Line Design). This approach anticipated issues related to right-of-way acquisition and public opposition. "Investing in the design of a better tower, using smart engineering that would be visually appealing, seemed a smart option to AEP leadership," says David Rupert[11], Vice President of Business Development for BOLD. "No one wants permanent scaffolding in their backyard," he said, referring to the typical lattice towers.

Figure 14.—Robison Park-Sorenson simulation of BOLD design. Photo by BOLD Transmission, used with permission.

Figure 15.—Robison Park-Sorensen project during construction. Photo by BOLD Transmission, used with permission.

"If trend-setting Apple Inc. were to design a transmission line, I am pretty sure it would look like BOLD," a moderator said while introducing the design at an Edison Institute Meeting in 2015 (Fig. 14) (BOLD 2017). Because the U.S. transmission system is in the midst of its biggest building boom since the 1970s, AEP invested $9 billion between 2017 and 2019, driven by the need to increase reliability, replace aging infrastructure, improve security, relieve congestion, and accommodate generation retirements and renewable power sources (American Electric Power 2017). Developed in 2012, the BOLD design received its first patent in 2013.

The Robison Park-Sorenson project in Fort Wayne, IN, that used the BOLD design for the first time, was energized (i.e., put into service) in November 2016 (Fig. 15). If an older technology had been used, 50 additional feet of right-of-way would have been required, expanding the width from 150 feet to 200. Instead of a 150-foot tall pylon, the newly designed pylons are 100 feet. The Robison Park-Sorenson project replaced a 1940s era 138 kV line with a double-circuit 138/345 kV BOLD line, providing five times the megawatts of the earlier line in the same corridor.

BOLD Transmission holds 14 patents (granted or pending) worldwide and is licensed to sell the technology to other utilities. The first double-circuit 345 kV application of BOLD is a line rebuild between AEP's Meadow Lake and Reynolds stations in northern Indiana that was energized in July 2017. Both BOLD and Bystrup have focused on transmission lines. BOLD plans to add lower voltage poles in the future.[11]

BOLD's work is setting new standards for the energy industry in the United States. In February 2016 the National Association of Regulatory Utility Commissioners (which represents the State Public Service Commissioners) passed a resolution supporting advance electric transmission technology.

[11] Vice President for Business Development, BOLD, Columbus, Ohio. Telephone interview, July 24, 2017.

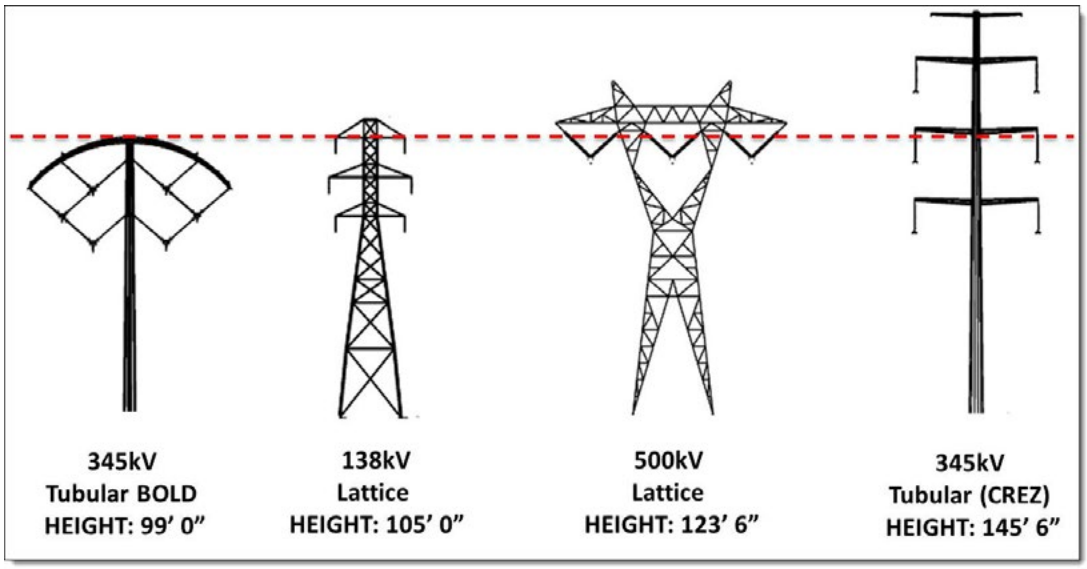

Figure 16.—Comparison of BOLD design with conventional towers. BOLD designs (far left) are significantly lower in profile than conventional designs. Photo by BOLD Transmission, used with permission.

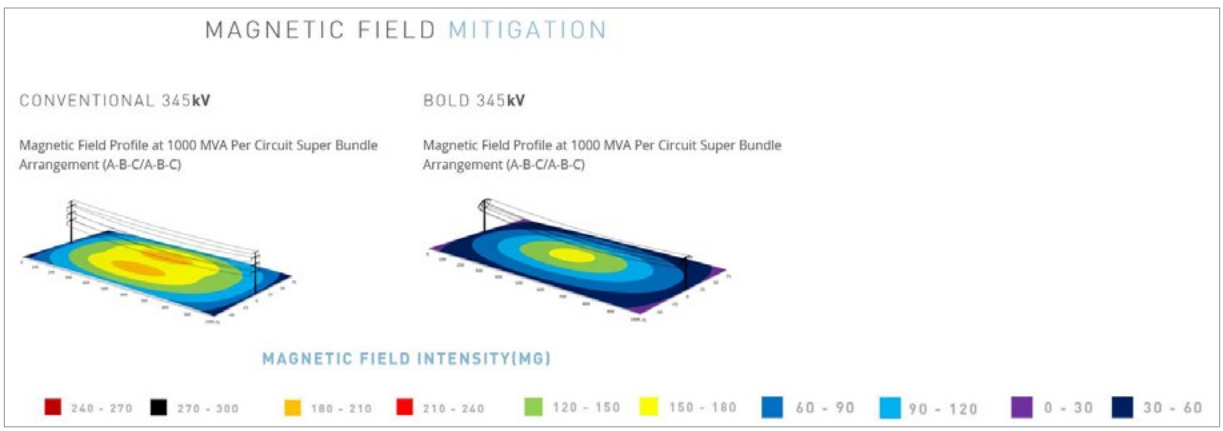

Figure 17.—BOLD designs reduce magnetic field in addition to improving aesthetics and efficiency. Photo by BOLD Transmission, used with permission.

Recognizing that a significant portion of the Nation's transmission facilities are aging and require replacement, the resolution calls for new facilities to consider new technologies that are reliable, cost effective, and more efficient, use less right-of-way, and reduce environmental and aesthetic impacts on communities (Fig. 16) (National Association of Regulatory Utility Commissioners 2017). An additional environmental benefit of the BOLD technology is that it reduces the size of the magnetic field around the towers and wires (Fig. 17).

Choi+Shine

While the Bystrup and BOLD pylons make aesthetics a primary design focus as a kind of sculpture, the forms are highly abstract. In contrast, the "Land of the Giants" transmission towers by the architecture firm Choi+Shine have purposefully representational forms (Fig. 18). In 2008, Land of the Giants won a "Recognition Award" in the Icelandic High-Voltage Electrical Pylon International Design Competition offered by Iceland's Landsnet power company (Choi+Shine 2008). Numerous other awards followed in ensuing years. Images of the figures marching across the landscape have received attention worldwide. Thomas Shine says of the project, "Construction of the Giants has been planned many times and they have been taken through engineering, but they have not yet been built. The resistance has not been to the Giants, which are almost universally loved, but to the new lines themselves. Indeed, in one district in Norway, the mayor of the town would not allow a new line to be

Figure 18.—"Land of the Giants" transmission towers take on a human-like form. Photo by Choi+Shine, used with permission.

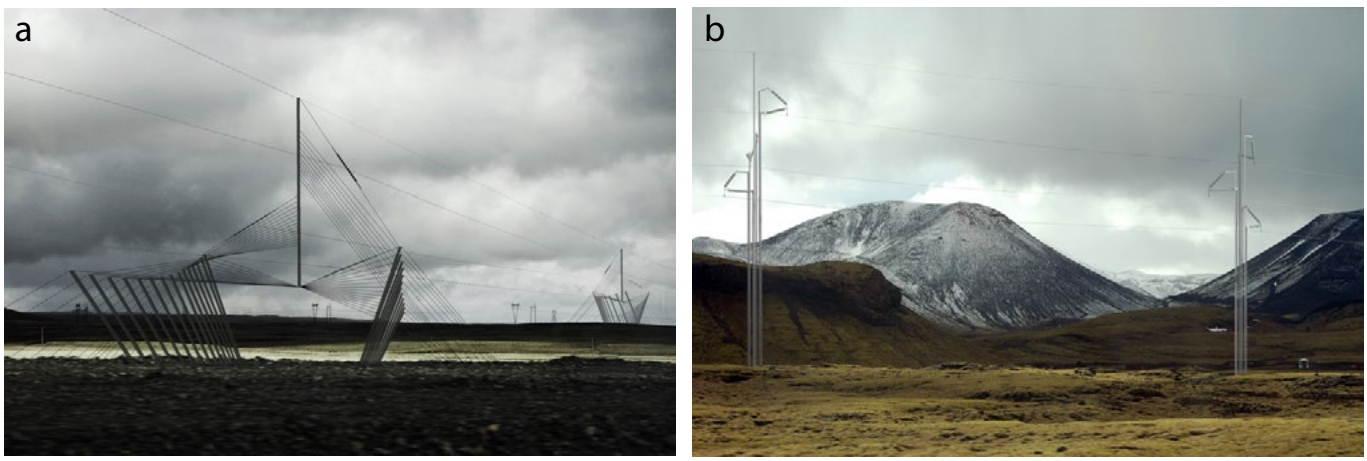

Figure 19.—Choi and Shine have developed concepts for other transmission towers, named "centipede," (a) and "bamboo" (b). Photos by Choi+Shine, used with permission.

built through his district unless the new line included the Giants."[12]

Choi+Shine have developed additional transmission line concepts. The names of the newer designs are suggestive: "mantis," "centipede," and "bamboo." These tower designs have a higher degree of abstraction than Land of the Giants, however (Fig. 19).

Redundant Poles

While improving aesthetics in utility design appears complex, eliminating redundant poles seems straightforward. Why is it so difficult for pole tenants to relocate to new poles in Tucson and other communities? Whose responsibility is it? The original pole owner or local government?

According to David Barth[13], retired counsel for a major electric and gas company in Michigan, when utility companies in that State upgrade or replace existing poles, they require any existing pole tenants to relocate to the new pole and they typically comply.

However, this is not true in many regions of the country and some are beginning to pass legislation regarding superfluous poles. After communities in

[12] Shine, Thomas. Principal, Choi+Shine Architects. Email correspondence, August 24, 2017.

[13] Retired principal attorney, Consumers Energy Company, Jackson, Michigan. Telephone conversation, July 23, 2017.

Massachusetts complained, 2016 legislation started requiring companies to complete the transfer of wires and remove the pole within specified periods of time (Commonwealth of Massachusetts 2016).

Individual communities across New York State are also passing their own legislation. To assist the Town of Wallkill, New York, U.S. Senator Chuck Schumer sent a letter to Frontier Communications, Time Warner, and Orange and Rockland Utilities:

> I am writing regarding the 546 double utility poles that are currently out of use in the Town of Wallkill, NY. I understand that the Town of Wallkill has requested, on a number of occasions, to work with Orange and Rockland Utilities to remove these poles throughout the Town. I urge you to work closely with the Town of Wallkill to remove the poles, as they are duplicative and could reasonably pose a number of safety risks.
>
> As you can imagine, besides being unsightly, these poles are an immediate and ongoing hazard to motorists, pedestrians, and property throughout the Town. Additionally, the unnecessary poles increase the chance of power outages during storms and increase the hazard of falling poles due to storms, snow, rain, wind or other weather-related events.
>
> I respectfully request you work with the Town to identify the poles for which your company is responsible and immediately work with the Town to remove the poles and eliminate this public safety concern. Please find enclosed the list of poles, as identified by the Town of Wallkill Department of Public Works which are duplicative, potentially hazardous, and must be removed. My office stands ready to assist you to prepare a plan to remove these poles (Schumer 2016).

In February 2016, Wallkill also passed an ordinance requiring the removal of double poles (Town of Wallkill 2016). According to Louis Ingrassia, Jr.[14], Commissioner of Public Works, the redundant pole issue has significantly been resolved.

[14] Commissioner of Public Works/Highway Superintendent, Town of Wallkill, New York. Voice message, September 8, 2017.

DISCUSSION AND CONCLUSION

In numerous discussions with both design professionals (landscape architects, architects, urban planners, and engineers) and lay people over the past 2 years, I found little awareness of the many aesthetic concerns related to the design of modern utility transmission systems. After being shown several images, including those in this paper, lay people's reactions included the following:

- Resignation: They found utility clutter unsightly, but were unaware of mitigation options other than undergrounding.
- Outrage: They were outraged that utility poles were becoming a significant part of the landscape and claimed to want to get involved and initiate change.
- Indifference: They would want improved utility design only if it would come at no additional expense.
- Unanimous agreement that redundant poles should be removed.

Landscape architects' responses, in particular, were as follows:

- Lack of awareness that they could comment on aesthetics related to utilities.
- Unwillingness to get involved, since commenting on utilities and aesthetics was not part of their project scopes of work. On transportation projects, the landscape architecture scope of work as a subconsultant typically includes planting and irrigation only. Since they are often competitively selected by the engineering prime based on fee, they are not eager to add additional services or be perceived as causing delays to a project.
- Frustration: Landscape architects often do not receive utility system design information until right before final plans are due. In addition, visual impact assessments are typically done at the beginning of the project before utility impacts are part of the design. Utility-related impacts are typically not mentioned in visual impact assessments, so no mitigation options are offered.

Figure 20.—Grant Road is the first phase of a Tucson project envisioned as a "state-of-the-art, multi-modal corridor" (Tucson 2015). So far, power poles dominate the corridor. Photo by Ellen Barth Alster, used with permission.

Grant Road is a major corridor in Tucson currently undergoing expansion to increase vehicular capacity, support alternative transportation, and encourage economic development (City of Tucson 2017). The project vision statement includes the goal of creating "an aesthetically pleasing, comfortable, and inviting environment" (City of Tucson 2015, p. 11). Yet most weathering steel poles are placed at intervals ranging from 200 feet to 325 feet apart with some as close as 150 feet apart. These poles dwarf the adjacent trees, which at maturity will be a fraction of the pole height (Fig. 20). Whether Grant Road will become the vibrant "complete streets" thoroughfare envisioned in the vision statement will be seen in years ahead.

In conclusion, tools exist for Tucson and similar communities to improve visual quality related to utilities. In order for this to occur, there needs to be increased awareness among citizens and professionals about the aesthetic issues and the range of available design alternatives. While undergrounding utilities is commonly believed to cost 10 times the price of building them above ground, this is open to dispute. In places where roads are being widened, undergrounding should not automatically be discarded as an option. That said, communities with effective undergrounding programs generally began those programs decades ago and voting in assessments of a few percentage points on a utility bill seems less likely to be approved today. Experience suggests that when property owners or communities are asked to shoulder undergrounding costs themselves, undergrounding is unlikely to take place.

Above ground utility design need not be a blight on cities and landscapes. As owners and overseers of the tallest vertical element in many communities across America, energy providers and local governments should collaborate to create thoughtful designs, not just for new transmission lines, but for upgrades and replacements as well. Selecting appropriate finishes and removing redundant poles should receive greater attention. Better integration of pole modifications deserves consideration from both pole owners and pole tenants. Overhead power line design, as seen in the innovative work of the architectural firm Bystrup in Denmark, and American Electric Power's subsidiary, BOLD, remains a design frontier. This author hopes that many more companies follow the lead of these design pioneers.

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