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### Managing The National Landscape: Opportunities And Challenges

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# MANAGING THE NATIONAL LANDSCAPE: OPPORTUNITIES AND CHALLENGES

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## **ABSTRACT**

This plenary presentation summarized the principal landscape challenges and opportunities that accompany the human need for energy. Drawing from 50 years' examining what I call "energy landscapes," this presentation focused on land use conflicts resulting during the development of four types of renewable energy (solar, wind, geothermal, hydro), fossil fuels (mainly coal), and nuclear power (particularly siting of waste repositories and the decommissioning of generating stations). Many of the challenges derive from inherent resource characteristics, some from differences to cultural mores and histories, varying public perceptions of risk and fairness, demographic patterns, as well as jurisdictional and political differences. Many of the opportunities to better manage landscapes will result from more meaningful and calibrated public involvement, the growth of demand in developing world and totalitarian countries, rising worries about personal and national security, competition for water resources, and climate change. Recommendations are offered as to how to move forward, given these challenges, to simultaneously meet our resource needs while serving as caretakers of landscape quality. This paper is more of a reflective piece and does not include all of the original plenary content.

## **INTRODUCTION-A MOUNTAIN IN VIEW**

I once lived at the base of Mt San Jacinto, a magnificent fault-block mountain towering two miles above the desert oasis of Palm Springs, California (Figure 1). It was a small community of just 15,000 when my wife's family moved there after World War II. Popular with winter visitors and Hollywood celebrities, it was largely vacated during the brutally hot summers between the end of May and the end of October. Emboldened by reliable air conditioning, people nowadays visit during all seasons, explaining the string of upscale resorts that dot the Coachella Valley to the southeast. So numerous are resorts in cities such as Rancho Mirage, Palm Desert, Indian Wells, and La Quinta, that golfers can play every day for months without stepping up to the same tee twice, with the mountain in the distance (Figure 2).

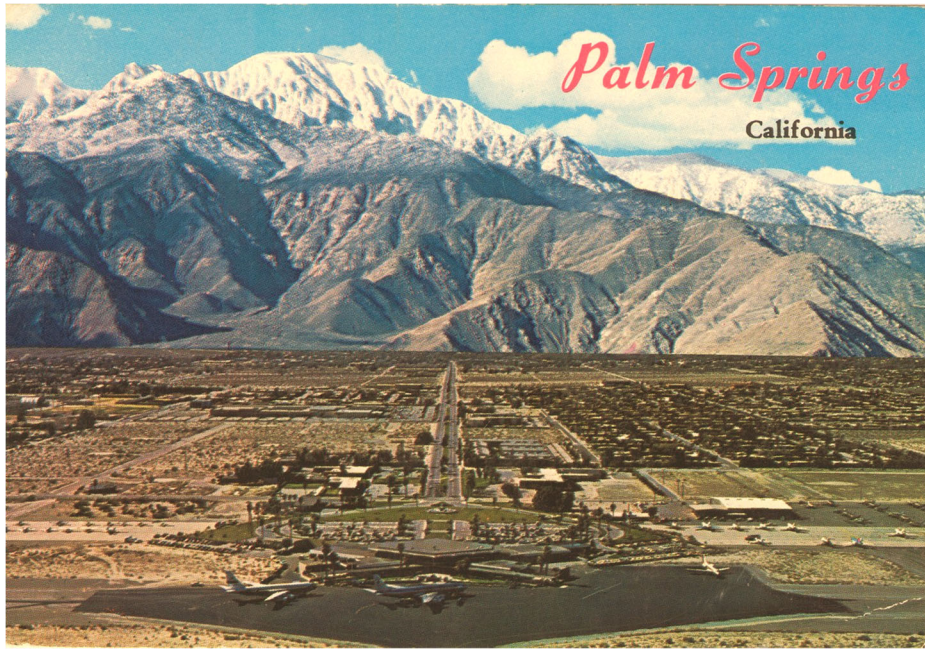


Figure 1 - A 1960s postcard of Palm Springs with Mt. San Jacinto in the background. Wikipedia. Public domain.



Figure 2 – Mt. San Jacinto dominates the view from the Encena Golf Club, Palm Springs.

Photo: M.J. Pasqualetti

Having grown up under a blanket of cool San Francisco fog, I never imagined someday living in such a hot and cloudless place. But I came to delight in huffing up the 11,000-foot mountain and rambling across the stark desert landscapes nearby. Even after moving to Arizona in 1977, we enjoyed frequent visits, each arrival adding another snapshot to a time-lapse record of change. As people continued extruding eastward from the Los Angeles metropolitan area, housing developments and evermore golf courses crept across the desert. Although we always found the speed of growth a bit disconcerting, the closer we drove to Palm Springs, the more the view of the mountain provided its usual solace. Then, one day, everything changed.

In 1985 after returning to LAX from a teaching year in London, we were driving eastward with my in-laws, ready for a layover of conversation and recuperation at their house, which was only a couple of blocks from where we used to live. As we neared the Palm Springs turnoff, hundreds of wind turbines suddenly came into view. They had not been there 12 months before when we had taken the reverse trip to the airport. But now, bracketing I-10 was a jumble of lattice towers more than 100 feet tall, each topped by whirling, glistening blades.

Having passed this same spot hundreds of times before, I found the new scene not only unexpected but disconcerting. Just as I was forming some questions, my father-in-law – mid-century-modern architect E. Stewart Williams – gave words to my discomfort when he said: “The turbines have ruined the landscape.”

He had reason to mourn the loss; it had been this very landscape – dominated by Mt San Jacinto – that had attracted him to Palm Springs decades earlier. More significantly, it was this landscape that influenced how he designed the many homes, churches, colleges, banks, and museums that still grace the community.

A few days later, pondering his comment during the routine drive back to Tempe, I wondered if his opinion had broader saliency, especially to my professional interest in the impacts of energy development and consumption. While crossing the Colorado River into Arizona, I realized that what he had identified was a fundamental question of our time: Given our rapidly growing need for energy, how can we protect our precious national landscape from the harm that energy development brings? The seed of this question was planted 30 years earlier with my first road trip to the empty landscapes that lay in the rain shadow of the Sierra Nevada. The seed blossomed anew with each subsequent solo visit, but particularly during energy field trips that I would lead each year for four decades. Each trip revealed new changes.

My first journey into this part of the United States was in the late 1950s, a less complicated time. The population of the country was half what it is now, and California was not yet bulging with people. It was before many of the roads between the Sierra Crest and the Continental Divide were paved, before gasoline reached 30 cents a gallon, and before anyone was raising the alarm about the accumulating perils of burning fossil fuels.

It was before international travel was routine, before air-conditioned cars were the norm, before anyone “surfed the web,” before cell phones held us hostage, and before there was much worry about energy security, resource wars, global warming, or damaged landscapes.

Today, more than 7.7 billion people crowd the planet, the price of gas is 1000 percent higher, internet use is ubiquitous, and it is increasingly urgent that we identify a clear path that will take us from our present reliance on fossil fuels to a future sustained by low-carbon alternatives.

The time necessary to clear this path may not be on our side. Despite the clanging of alarm bells warning of an approaching environmental catastrophe, our preparations and corrective responses have been spotty at best. We typically have labeled landscape damage as “unavoidable” or just “the cost of doing business.” We have had a hard time letting go of the trope that the recuperative powers of the oceans and the atmosphere will forever give them immunity to the impacts from the endless barrage of wastes we dump into them. We have had an even harder time believing our national landscapes are vulnerable to damage.

More than our naive belief that water and air always cleanse themselves naturally, we persist in our belief that our landscapes are immutable and impregnable. We adhere to the fallacy that we can always simply move somewhere else when environmental conditions become unhealthy, unproductive, or dangerous.

As we recognize the need to manage what remains of our natural endowment, we must relegate such beliefs to the past. We must admit that much of our national landscape has already drifted outside the lane of sustainability. We now find ourselves heading toward a future of perpetual “catch-up.” We hope we can repel new threats and effect meaningful repairs to those lands that have already suffered the insults of our need for energy.

Given the large size of the country, we have been slow to realize the scale of what has already been lost in the U.S., but here and there we have had some movement in the direction of reversing these trends. Power plants are better at controlling their emissions, lakes and streams are generally less acidic, forests are reestablishing themselves, and we are beginning to step away from carbon-based fuels.

All these improvements are welcome, but despite such successes, we have a long way to go before we approach a balance between energy development and environmental quality. Finding such a balance should guide us in how we treat our national landscapes. Four reasons explain this pattern: our faith in landscape permanence, the scattered and immovable nature of energy landscapes, frustrating legislative inattention, and the virtual absence of first-hand knowledge of the landscapes that energy developments produce.

To underscore the last of these assertions, test yourself: Have you personally watched a dragline strip overburden off the deep coal seams of the Powder River Basin in Wyoming? Have you witnessed the massive operations that remove mountaintops and expose hidden coal reserves in West Virginia? Have you driven the windy roads linking coal towns on the Cumberland Plateau? Have you descended into an underground coal mine in Kentucky? Have you tramped around oil fields in West Texas?

Few people in the U.S. have had any of these experiences because such operations are typically in places of low population density, shielded from view by vegetation, topography, or obscured by sheer distance from where people customarily reside and journey. When we do see such places, it is by intent rather than chance. Why is that? The most likely explanation is that we seldom venture far from urban neighborhoods or major highways.

Even with the plethora of digital news sources and the ubiquity of social media, energy landscapes are seldom noticed and even more rarely discussed. They are most commonly tucked out of sight, away from our most frequent routes of travel. For the longest time, out of sight has meant out of mind in our big country. But things are changing: after decades of wanton disinterest, the intimidation of our national landscapes by energy developments is attracting more of our attention.

Ironically, the catalyst of our newfound focus on energy landscapes was the surge in renewable energy development, the very alternatives that have been long celebrated as environmentally friendly. For decades we have been predicting that the public would, without question, embrace renewable energy resources for their softer imprint on the environment. Its many forms were the promise, the expectation, and the hope for the future, and we welcomed them.

However, in an unexpected turn, their proliferation stimulated public resistance in one place after another. Renewable energy landscapes, we realized, were not going to be as universally accepted as we had expected. We found that the smooth road to a renewable energy utopia was littered with potholes. Despite its many advantages, renewable energy would challenge – in ways no one predicted – the integrity of the national landscape.

## **PALM SPRINGS WIND DEVELOPMENT**

Soon after the installation of the first batch of wind turbines just north of Palm Springs in San Geronio Pass, the city gained substantial notoriety by resisting renewable energy development. It was here that the accumulating momentum for renewable energy development started bumping into the inertia of those bent on protecting their local piece of the national landscape. The speed with which hundreds of wind turbines appeared at the site of this collision caught many people by surprise. Alarmed by the new scene, local landowners contacted everyone who would listen to their complaints, including neighbors, newspapers and politicians. Sensing a groundswell, civic leaders decried that the turbines amounted to an “industrialization” of the entryway into their world-famous resort (Figures 3 and 4).



**Figure 3 – Aerial view of the Palm Springs area from a commercial airliner showing the area of wind development at the base of Mt. San Jacinto. Photo: M.J. Pasqualetti**



**Figure 4 - Mt. San Jacinto, looking west, from among the wind turbines at Palm Springs. Photo: M.J. Pasqualetti**

The Palm Springs rebuke of renewable energy development had identified a public distaste for any interference with the national landscape. Despite years of broad – if abstract support – for alternative energy, once the wind turbines were up and running, such professed enthusiasm dimmed. It was not

long before the city was filing lawsuits against developers and responsible jurisdictional authorities, claiming that there had been insufficient attention paid to the environmental costs of wind development in that location.

These legal actions resulted in several concessions and adjustments. For example, the use of lattice towers was replaced in favor of monopoles, given that they were easier on the eye and provided fewer tempting nesting perches for vulnerable birds. Over the years, the support structures are not only sleeker, but the wind turbines are more powerful, fewer, taller, slower, quieter, and not as prone to sparkle and glint in the sunlight. Despite such improvements, hundreds of wind turbines are still there, interfering with the natural conditions of the landscapes that surround them.

## **DISCUSSION -THE CHALLENGES**

The genesis of conflicts over the existence of the wind turbines starts with the resource itself. Commercial wind power development is inescapably site-specific. Not only are most of the phases of the fuel chain concentrated in a single location, but also the wind resource must be developed where it is found, or not at all. It cannot be poured into a tanker, a pipeline, or a railroad car. This difference means that all the impacts of the fuel chain are in one place, resulting in the potential for land use conflicts between development and whatever else is in the same location or might be in the future. In the case of San Geronio Pass, the conflict was the interference of wind turbines with the long undisturbed vistas that have always been one of the attractions of the area.

San Geronio Pass is notoriously breezy and ideal for wind power development, but there is a limit to what can be done to reduce the intrusive nature of the turbines. Although wind machines have been successfully redesigned in many ways over the years to render them less invasive, they cannot be made invisible. They are large, they are numerous, they spin, and they rotate as wind direction shifts. It is human nature to glance toward movement, and with wind power, there is plenty of movement to go around. There is simply no avoiding it; wind power installations change the landscape.

These changes can take several forms. Sometimes, it is interference with open space and scenery. Other times it is an incompatibility with residential housing and recreational activities. Still other changes include degradation of the otherwise dark sky from the installation of numerous aircraft warning lights, flickering and moving shadows during the day, assertions of low-frequency and intermittent noise, depressed property values, and negative impacts on wildlife, particularly birds.

One of the ironies of many of these objections is that the location was anything but untouched before wind turbines were installed. The Pass has been and continues to be a corridor between the coastal areas of southern California to the west and the low desert regions to the east. Aboriginal people migrated through the area from present-day Yuma, Arizona to the coast for at least 2000 years. It is superimposed by one of the busiest highways in America, a critical railroad route between eastern and western states, a conduit for the Colorado River Aqueduct to Los Angeles and beyond, and the preferred pathway for several long-distance transmission wires that conduct electricity to Los Angeles-area cities from power plants to the east and northeast. The very area where the wind turbines now spin has long been busy and well used. Nevertheless, although the wind turbines were not the first intrusion on the local national landscape, they were the most noticeable.



Objections to the development of wind power in San Gorgonio Pass are in most ways a classic NIMBY problem; permanent residents, governments, and visitors railed against the abruptly and significantly changed landscapes that the wind turbines produced. It was not just a single turbine project, but a vast expanse of them. The low-energy-density of the resource requires a lot of land, and the turbines cannot be camouflaged. The development challenged the national landscape in a way rarely experienced anywhere else, and the residents would not have it.

Every landscape – from mountains and plains to forests and shorelines – has its unique charms and values. In addition, everyone harbors personal opinions of what changes in the national landscape they are willing to tolerate, which they will support, and which they will dismiss or actively oppose. It is precisely such a broad range of opinion that creates challenges and opportunities from renewable energy development. These conditions are especially noticeable with site-specific resources such as wind power where all the impacts are local and immobile. To emphasize the significance of this point, consider the opposite extreme with fossil and nuclear-fueled developments; they are widely scattered and usually away from concentrations of population. With wind power, almost every step is in the same locations, thereby further impacting the landscape in which they are placed. Such concentration and its locational immobility amount to one of the inherent challenges of wind power development.

Counterbalancing such challenges are many opportunities that accompany wind power development. Not only are wind resources more common than fossil and nuclear fuels, they can be used to produce electricity without cooling water, without air or water pollution, without long-lived wastes. Moreover, unlike solar power, they can generate electricity at any time, day or night. In addition, the turbines can be erected and decommissioned quickly, and they are domestic; i.e., they displace the need to import other fuels or develop the elaborate infrastructure needed to support them, such as ships, pipelines, and processing facilities. These are major advantages, despite wind's obvious intermittency.

Yet, these advantages and opportunities are offset by various challenges from the public, usually associated with the landscape changes that wind turbines produce, such as noise, harm to birds, flickering and shadowing. Regardless of the specificity of the objections, however, objections have been fundamentally about aesthetics in the NIMBY sense. Five common threads run through all the objections (Table 1), objections that are fully discussed in *The Renewable Energy Landscape* (Figure 5).

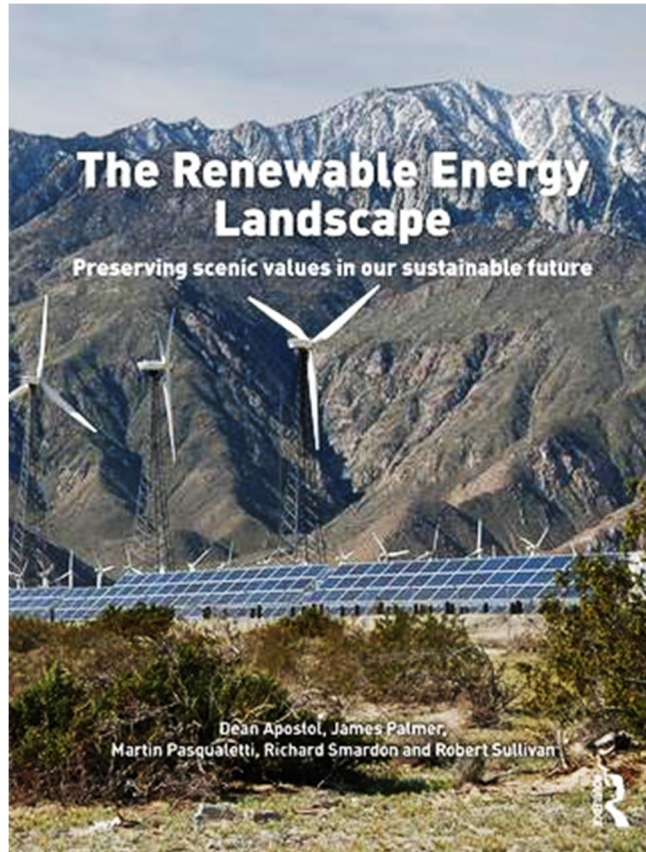


Figure 5 – Cover of *The Renewable Energy Landscape*, illustrating the imposition of renewable energy on the desert landscape in Palm Springs.

Table 1- Five Common Threads of Opposition to Wind Energy Developments

- IMMOBILITY (the site specificity of wind power as a resource)
- IMMUTABILITY (an expectation of landscape permanence)
- SOLIDARITY (the close relationship between people and their land)
- IMPOSITION (a sense of marginalization)
- PLACE IDENTITY (a loss of security)

Given objections to such relatively benign sources of electrical generation as wind power (or other renewables), how should we work to integrate sensitive management of national landscapes? The first step is to recognize resource characteristics and limitations (Figure 6; Table 2).

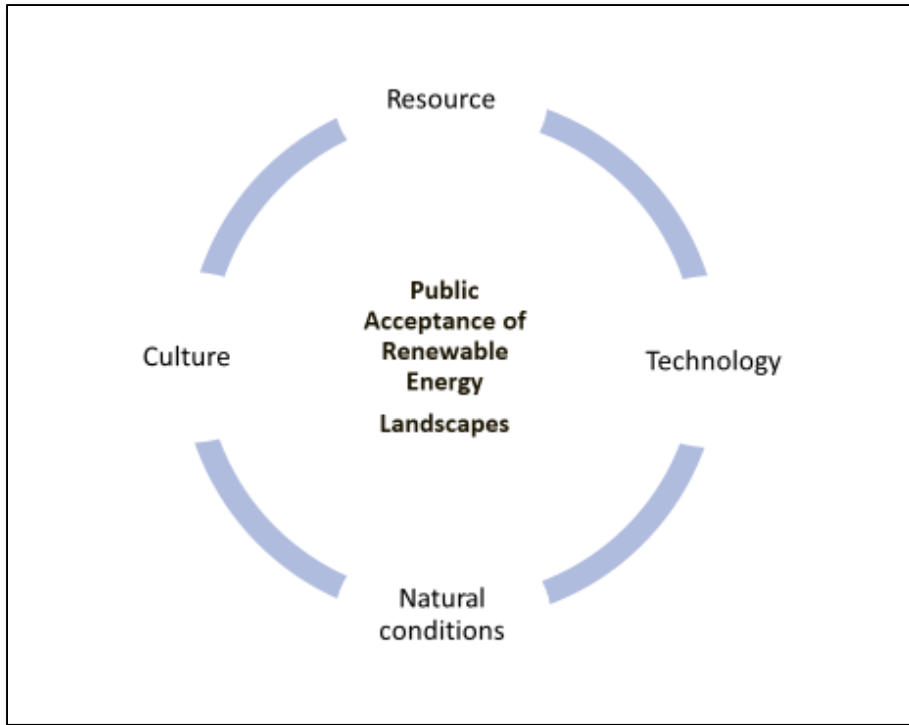


Figure 6 – Public acceptance of renewable energy landscapes requires considering and adjusting to four conditions

Table 2 - Recognizing resource characteristic and limitations

<p><b>Resource Factors</b></p> <ul style="list-style-type: none"> <li>Site specificity</li> <li>Sensitivity to diameter</li> <li>Sensitivity to wind speed</li> <li>Movement (spin, rotate)</li> <li>Emission-free</li> <li>Waste-free</li> <li>Water-free</li> </ul>	<p><b>Technical Factors</b></p> <ul style="list-style-type: none"> <li>Height</li> <li>Sweep Diameter</li> <li>Blade design</li> <li>Finish and Color</li> <li>Support Structure</li> </ul>
<p><b>Natural Factors</b></p> <ul style="list-style-type: none"> <li>Topography</li> <li>Vegetation</li> <li>Climate</li> <li>Wildlife</li> <li>Water depth (offshore)</li> </ul>	<p><b>Cultural Factors</b></p> <ul style="list-style-type: none"> <li>History of settlement</li> <li>Land use and tenure</li> <li>Population density</li> <li>Economic returns</li> <li>Quality of life</li> <li>Community values</li> </ul>

A subsequent step is to accept that wind power (or any other renewable energy) is not appropriate for all types of landscapes, regardless of whether there are undeniable opportunities and promises present. This can be reflected in a pre-development evaluation of landscapes at all levels, from local to national (Figure 7).

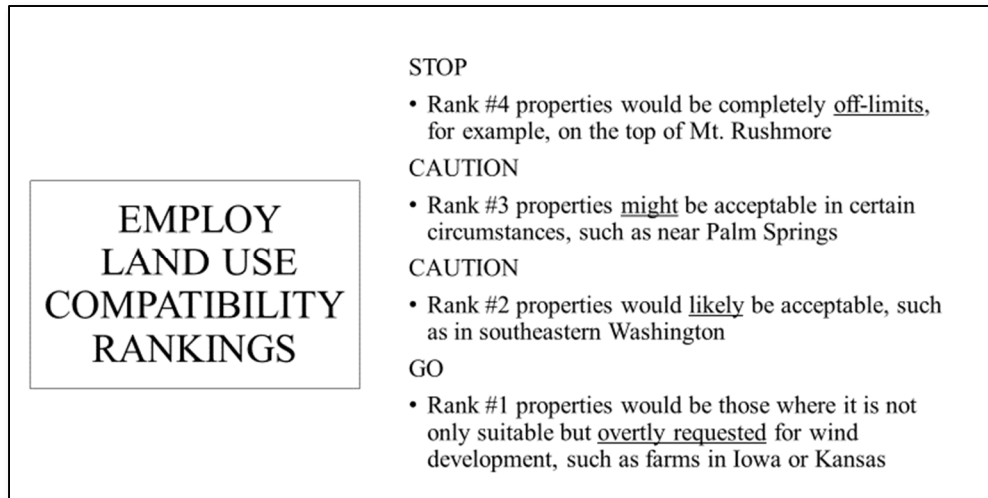


Figure 7 – Compatible rankings for renewable energy developments

## CONCLUSIONS

We have had a rich learning experience since the early days of wind development in Palm Springs. The principal benefit of that experience – and similar experiences in many places elsewhere – is that we value the national landscape, and we do not want it disrupted, even in the name of renewable energy. We also realize our responsibility for finding ways to limit any intrusions that renewable energy might produce on the landscape.

Renewable energy is an essential component of the next energy transition, and its development is progressing through the usual learning curve, not just in terms of technology and profitability, but also in terms of public acceptance and landscape sensitivity. While we will hopefully succeed in reaching a sustainable energy future, we cannot afford to stumble along the way.

In the Palm Springs area, wind power is now an accepted part of the landscape. It is generally preferred over other options such as fossil-fueled and nuclear plants. The public has come to accept it in ways no one could have predicted in the mid-1980s. The wind turbines are in view, but it is OK; after all, our electricity must come from somewhere, and wind power is the lesser evil. The Palm Springs example reminds us that “energy is a social issue with a technical component, rather than the other way around” (Figure 8). Remembering that maxim is the key to a renewable energy future.



Figure 8 – Acceptance has displaced rejection of wind turbines at Palm Springs. Photos: M.J. Pasqualetti