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The construction of technology and place: Concentrating solar power conflicts in the United States

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ABSTRACT

There is sufficient space in the United States to site large-scale renewable energy technologies, yet siting decisions are often highly contentious with conflicting land-use values. This paper examines conflicts surrounding large-scale solar power siting through the lens of place-making and the co-shaping of place and technology. It traces the place-based conflicts over the Ivanpah solar power plant in California over five years, from designed to operational, in order to understand the evolving public engagement process in issues of place. Place-making can aid in understanding conflicts over renewable energy siting by interpreting stakeholder values. Through the place-making process, both the place and technology were shaped but could only be bent so far until they became something else entirely, making the negotiation of trade-offs difficult and the object of the negotiation a moving target. Moving forward, the challenge should be addressed that the technology and place must be sufficiently concrete to engage the public in siting decisions but accomplished early enough to avoid polarization and to facilitate mutual accommodation. Innovative forms of place-based participation are needed that would help citizens to debate the properties and trade-offs of energy systems in constructive ways downstream without damaging or breaking trust.

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1. Introduction: place and place-making in renewable energy transitions

For those driving along Interstate 15, the Ivanpah Valley in California appears much the same as any other desert roadside, lined with billboards and even some trash next to the barren Ivanpah Dry Lake. The closest town is just over the border in Primm, Nevada. Primm is a less than an hour from Las Vegas and features cheap casino hotels, an outlet mall, and a golf course. The area is interspersed with a tangle of infrastructure—transmission lines, a natural gas plant, and an airport—with more development planned, such as the Xpress West train. From this perspective, the Ivanpah Valley is part of an interstitial zone in an expanding corridor of connectivity and commerce between Los Angeles and Las Vegas. Therefore, in 2007, developers and government regulators saw it as a logical place to site a large-scale solar power plant to provide low carbon electricity and construction jobs for California. The Ivanpah Solar Electric Generating System (ISEGS) was proposed for

3400 acres (5.3 square miles) across the highway from Primm (see the map in [Appendix A](#)).

A deeper look at the Ivanpah Valley illustrates that ISEGS would consume places that people value. Standing on the Ivanpah site, facing away from the highway, one can easily feel as though one is in a remote and pristine desert. Mountains edge the horizon as wildflowers, cholla, tortoise burrows, and creosote bushes blanket the landscape. It is eerily quiet for a place so close to civilization. Local activists argue that Ivanpah is an important site for preservation, especially considering its proximity to the Mojave Wilderness and its threatened plant and animal species, particularly the desert tortoise. A conflict resulted that weighed low carbon electricity generation and economic development against desert preservation and the worth of threatened species.

This conflict illuminates the extent and significance of the geographical dimensions of energy transitions in the United States and abroad. While energy systems are always in transition to a certain degree [12], significant changes are underway across the globe as renewable energy technologies are grafted onto existing energy systems, spurred by concern about changing climate, aging electricity infrastructure, and increasing electricity access. Understanding new energy technologies' effects on places illustrates how global energy transitions shape people's lives in particular localities. Energy siting debates also make visible competing societal val-

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Fig. 1. Desertec vision.

Courtesy: Desertec Foundation.

ues about both emerging energy technologies and the systems into which they are embedded. Furthermore, viewing new energy technologies in the concrete context of places renders their impact more apparent and immediate, often raising doubts about the intrinsic goodness of green technologies. These matters of renewable energy siting relate to broader themes explored in ERSS including “At what point does a project become “too big” so that potential benefits from economies of scale or cooperation become overwhelmed by cost overruns and challenges? Does a certain energy system harm the environment, degrade the social structure of local communities, or damage traditional culture?” [23].

The relevance of renewable energy siting conflicts is not limited to the United States but can be observed in Europe and more recently in North Africa and the Middle East, with the construction of Noor I CSP in Morocco and Shams I in Abu Dhabi. Noor I, for example, generated controversy in local villages where people wanted a greater say in how the benefits stemming from the power plant were distributed. The Desertec vision, pictured below, could multiply these effects, as it envisions siting many large-scale solar power plants in North Africa and possibly exporting part of the power to Europe. Therefore, it is crucial to understand the siting process as renewable energy transitions spread across the globe (Fig. 1).

Often people opposed to renewable energy siting decisions are called “NIMBYs” (not-in-my-backyard) who are backward, selfish enemies of progress. Recent research, however, has shown that NIMBY provides an inadequate explanation for opposition to renewable energy siting [7,25]; [26]. Energy siting controversies can be partly explained by understanding how publics interpret, value, and form attachments to places slated for renewable energy [7,14]. Place is a multifaceted term that can be concisely defined as space imbued with social meaning [6]. As places acquire meaning, people develop a “subjective and emotional attachment” or a “sense of place” (ibid). Place-based opposition to new land uses often arises from non-instrumental values, such as the perception that the technologies do not “fit” within the landscape [22]. A place-making approach can provide a more nuanced understanding of public opposition to renewable energy siting.

Human geography research contributes to scholarly understanding of the social shaping of place (see, for example, [5,6]). Places are constructed as important when humans imbue them with meaning through the process of place-making. Gieryn [8] argued that place-making occurs through collective action, stating that “people and groups, organized into coalitions, actively accomplish places” (p. 469). More specifically, Hays [11] illustrated that a variety of methods of place-making were used by tourists on safari and the indigenous Maasai to shape places. Place-making

occurred through emplacement (situating places on a map), erasure (removing places on the map), traversal (the landscape being experienced by car or foot), and categorization (to the Maasai, the road was a place of commerce; to tourists it was an entryway into the wild). Place was “imbricated” through “the continual layering and overlapping of meanings apprehended and established by safari participants and Maasai” (ibid, p. 263). Similarly, the Ivanpah case study illustrates how stakeholders with differing perceptions of a place’s value situated its worth spatially, temporally, and politically through a variety of place-making techniques.

In siting processes, the technology is shaped along with the place. Just as human geographers explain how people construct places, the field of science and technology studies (STS) examines how people construct technologies in ways that reflect their politics and values [3]. Nye [17] observed that landscapes are produced in part by technology, both materially and by the viewers’ perspectives, through the “constant interplay between sight and site.” Large-scale power technologies do not simply occupy places but indelibly shape and are shaped by them [17]. “Siting” is a misleading term because technologies are not merely situated in a place but are fundamentally transformed and transforming during the siting process. Moore [15] termed this mutual shaping of place and technology the “dialogic of place.”

Phadke [19,20] explored public participation in the dialogic of place through case studies of wind power siting. Visual representations of wind power sites reflect the politics of the maker, depicting offshore wind turbines as “beautiful and liberating” or eyesores within a pristine landscape (ibid). However, the politics and values behind these visual interpretations of sites are often obscured when they are released to the public, impeding frank and informed discussion of the issues at stake (ibid). Phadke’s work illustrates the deficiencies in polarized public engagement processes for renewable energy siting, as both the place and the technology are seldom influenced in a productive way by public engagement.

We argue that improved participatory practices are needed to engage citizens in designing technologies that would better fit places and electrical power systems. There is broad public support for solar power that could be fostered. Carlisle et al. [4] found through a survey that 90% of Southern California residents support utility-scale solar development and had a positive perception of sense of place due to economic development from solar. However, this study shows that the 10% who are opposed compose vocal activist publics who are deeply engaged in the siting process. The public engagement in science and technology literature has argued that these publics should be involved early, or upstream, and often in order to design socially robust technologies that even this vocal minority will embrace. Yet, this paper shows that upstream public engagement in solar siting is particularly challenging because place and the technology are fluidly redefined throughout this engagement process, so the target of the engagement is also continually redefined. The civic engagement in technology literature assumes that there is a stability in the technology and its environment that is in fact contested. In contrast, Ottinger [18] argues that the knowledge required for informing decision-making in public participatory processes evolves and is not necessarily available when it is needed in the process, complicating consent and procedural justice. We add to this that the technology and the place themselves are also in flux and that the implications of the solar power plant change from the imagined through to the operational phase.

This paper uses the lens of place-making to examine public engagement in the design, construction, and operation of a CSP plant over a five-year period, revealing how stakeholder participation in individual siting decisions makes and remakes the meaning of the place where the plant is built and the technology that is constructed there. Place-making is an analytical construct that can aid scholars and stakeholders in understanding renewable energy sit-

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