CHAPTER 8 | SOCIOECONOMIC IMPACTS

In today's society, proposed industrial facilities are scrutinized for their impacts on the environment. Local residents, elected officials, and environmental groups ask how a new facility will affect the air, water, and wildlife. NEPA and CEQA require environmental assessments, which typically include an assessment of the local social and economic implications of such facilities.

This chapter investigates the socioeconomic effects of utility-scale solar facilities proposed for the California desert. Limited research has been conducted on this topic;[1] thus, we used several other methods and data sources to predict the social and economic impacts of solar development:

- A literature review of the socioeconomic impacts of other energy developments- oil and gas and wind energy- and an analysis of how these observations may inform predictions for the impacts of solar development.
- A case study of the socioeconomic impacts of the utility-scale solar facility Nevada Solar One, a 64 MW solar thermal facility located approximately 15 miles from downtown Boulder City, Nevada. The facility, which came online in 2007, uses solar trough technology and covers approximately 400 acres. Data collection for the case study consisted of eight interviews with individuals familiar with the facility.
- A summary of government, industry, and non-profit predictions for solar development and job creation.
- An analysis of demographic data to predict how two California desert communities, Lucerne Valley and El Centro, will be affected by solar development.
- An analysis of how project location can help influence a facility's socioeconomic effects.

Based on these analyses, it appears likely that utility-scale solar development in the California desert will have limited long-term socioeconomic impacts. Unlike Boulder City, which benefits greatly from solar facility Nevada Solar One's annual lease payments, communities in the California desert will not receive rent payments; this is because facilities sited on BLM land will make lease payments directly to the U.S. Treasury. Solar development will also have little effect on employment, as each facility will require relatively few full-time employees once in operation. Construction impacts may be greater in the California desert than they were in Boulder City, though the relative distance from facilities to population centers helps to mitigate impacts on traffic levels and public services. Nevertheless, there may be impacts from some projects and a full range of potential social impacts (considering the categories of impacts described in this chapter) should be analyzed during the project-level siting process.

THE SOCIOECONOMIC IMPACTS OF OIL AND GAS AND WIND ENERGY DEVELOPMENT

Although research on the socioeconomic impacts of utility-scale solar is scarce, an abundance of research exists on the impacts of oil and gas and wind energy development. By considering the effects and similarities that oil, gas, and wind energy share with the solar industry, we can make predictions about the socioeconomic effects of solar facilities proposed for the California desert (Table 8.1).

Table 8.1 Socioeconomic Effects in the Oil and Gas, Wind Energy, and Solar Energy Industries.

Community Effects	Oil and Gas	Wind Energy	Solar on Public Lands
Job Creation	+ +	Negligible	Negligible
Population Growth	− −	Negligible	Negligible
Lease Payments	+	+	None
Property Taxes	+	+ +	Negligible
Tourism	NA	+/−	+/−
Recreation	NA	+/−	+/−
Quality of Life	NA	+/−	+/−
Social Cohesion	NA	+/−	+/−

A "+" indicates a benefit while a "−" indicates a cost. A "+/−" indicates the effect could be a cost or benefit and a double symbol indicates a significant effect.

The Oil and Gas Industry

The social and economic effects of energy-producing facilities have been studied extensively. Extractive industries, such as mining and oil and gas drilling, have historically occurred in rural areas with few nearby towns. In cases where the facility or site was far from existing settlements, the organizations heading the effort (either a private company or a government agency) would build a new town to house the workers. Since our study focuses on the effects of utility-scale solar facilities upon existing population centers, this literature review will exclude information on towns built purely for a new facility.

Literature review suggests that traditional resource development facilities, such as those based on petroleum, affect existing rural areas in a variety of ways. Effects vary greatly among different industries and facility locations; thus, quantitative data on impacts is hard to come by. However, studies often focus on three broad areas:

- Job creation
- Population growth
- Local fiscal impacts

Job Creation

Proponents of resource development often extol the positive effects these facilities will have on local employment. However, job creation is often dependent on several facility characteristics, including project scale and technology. While the local labor pool may be qualified for less-skilled jobs, often local hiring will not satisfy the demand in professional, technical, and supervisory areas.[2] While local laborers may be hired, local unemployment levels may not necessarily decrease, especially when the unemployed do not have the skills required for the new positions. Just as the quality of local labor plays a part in employment impacts, so does the quantity of available labor. A town will likely experience greater employment effects if its job applicants do not have to compete with the job applicants in other nearby towns.

Similarly, oil and gas facilities may also generate secondary employment effects. Secondary employment refers to jobs created indirectly by the facility. For example, if a new facility attracts workers to the area, local stores will likely see an increase in business, which may lead to new jobs at the stores. The magnitude of indirect employment effects are largely determined by the new project and are dependent on factors such as employee wages and the company's likelihood of purchasing local goods.

Population Growth

Rapid population growth is a common experience in rural towns near new resource extraction facilities. Examples of small towns experiencing rapid population growth because of energy development can be seen as early as the 1800s and up through modern times. In the late 19th century, an oil boom in Scio, Ohio, caused the town's population to skyrocket from 900 to approximately 12,000.[3] More recently, Uinta County, Wyoming's population grew from 7,100 to 13,021 residents between 1970 and 1980 as a result of oil and gas development and the construction of gas processing plants.[4] Similar trends are evident in towns experiencing other types of energy development, including coal mining and power plant construction.[5]

When an area's labor pool is inadequate for an energy project, outside labor will likely move to the area to fill the gap. Like a facility's impact on employment, in-migration is also dependent on several facets of the project, including the facility's scale. Towns with larger populations (greater than 1,000 individuals) and with developed services will likely experience greater rates of population growth than areas without developed services.[6] Generally, such towns may see their population grow as much as 10-15 percent annually.[7] With the influx of new individuals, secondary industries in the town may also begin to grow; more individuals will move to the area to fill these secondary positions.[8]

Rapid population increase often corresponds with decreased availability of public services. Demand for education, water and sewer, health care facilities, fire and police protection, and transportation systems may increase as a result of population growth.[9] The term "boomtown" is used to describe towns where "rapid population growth associated with energy and other resource development creates social disruptions, cultural conflicts, and pathological behaviors."[10] Increased rates of mental illness, school dropout rates, child abuse and drunkenness have all been observed, though other research suggests that the social deviancy associated with new resource extractive facilities may be overblown.[11,12,13,14] Decades of research suggest boomtowns are the result of inadequate services, because they are either antiquated and/or unable to absorb the increased demand.[15] Eventually, increased tax revenue may cover the costs of expanded services.[16]

Sweetwater County, Wyoming, exemplifies the boomtown phenomenon.[17] In the early 1970s, mineral extraction and processing ramped up significantly. Population and employment nearly doubled in four years, to 36,900 and 15,225 respectively. Also during that time, the number of mental health clinic caseloads increased eight-fold and there was a drastic shortage of schoolrooms. Furthermore, growth in municipal water and sewage services, as well as roads and electric service, could not keep up with demand. During the boom, crime rates increased by 60 percent.

Local Fiscal Impacts

It is difficult to generalize the fiscal impacts of extractive facilities because taxation systems vary by state.[18] However, most states impose a severance tax, which taxes a facility by the amount of a resource extracted. A portion of severance tax revenue may be funneled to an "impact fund" for affected communities.[19] States may also levy a corporation income tax. Facilities on federal land may pay lease fees and production royalties. However, taxes and fees collected at both the state and federal level may not specifically benefit local municipalities affected by the extractive facility.

In addition to funds that come from state or federal government, local municipalities may benefit from a facility's indirect and induced effects. Local workers hired by the facility will likely live in town, thereby increasing the demand for housing and possibly spurring construction of new housing stock. Local workers will spend their earnings in town, boosting the economy. An influx of new workers will create a demand for more stores and restaurants, which will in turn hire workers who will spend their incomes locally.

The Wind Energy Industry

The above review suggests that many of the negative effects experienced by local towns are caused by extreme population growth spurred by job opportunities at energy facilities. However, utility-scale wind facilities employ relatively few individuals post-construction; for this reason, wind farms may not

have the same socioeconomic effects as oil and gas facilities, though perhaps may be more similar to the effects from solar facilities. Wind farms also differ in their local fiscal impacts. This literature review focuses on wind energy development's affect on:

- Job creation
- Population growth
- Fiscal impacts
- Tourism
- Recreation
- Quality of life
- Social cohesion

Job Creation

Wind farms may produce between 0.4 and 1.4 jobs per MW of facility nameplate capacity during construction and 0.06 to 0.2 jobs per MW for operation and maintenance (O&M).[20] Wind farms can vary greatly in nameplate capacity, so it is difficult to say how many jobs the "average" wind farm will create. However, a 50 MW wind farm might create 20 to 70 jobs during construction and three to 10 jobs during O&M. A 2006 NREL study found that while wind farms do generate jobs, local labor must have specific skills if they are to be hired.[21] If local residents are unqualified for the jobs, labor will be brought in. Since wind farms create relatively few jobs, and the bulk of these jobs are temporary, wind energy development has little effect on population growth.

Fiscal Impacts

Private citizens often benefit financially from a wind farm. Individuals may benefit from lease payments of $2,000 to $5,000 per turbine per year when turbines are sited on their land.[22] In terms of facility nameplate capacity, landowners may receive lease payments of $2,500 to $4,000 per MW per year.[23] Due to their small footprints, wind turbines may not decrease the land available for agricultural purposes;[24] therefore, landowners can benefit financially both from lease payments and agriculture. Property taxes may be assessed at the county level, and typically run from one to three percent of the wind farm's assessed value.[25]

Wind farms may benefit the local rural economy especially when the economy was previously supported by one industry, such as agriculture. Wind farms create another industry and contribute greatly to the local tax base.[26] Wind farms may also be community owned. In this case, the facility's owners, which may be a group of landowners or a municipality, would benefit directly from the sale of electricity to the local utility.

Because wind turbines may be several hundred feet tall, and are sited in open areas such as plains and ridgelines, they are often highly visible to the nearby population. Compared to oil and gas, concerns over negative impacts to the view have been particularly prevalent in the wind industry. Property devaluation is a common concern among residents who live within view of the wind farm, an area often referred to as the viewshed. However, two separate studies have found that this concern may be unfounded. A 2009 study conducted by the Lawrence Berkeley National Lab found that view of and distance to a wind energy facility had no statistically significant impact on home sale prices.[27] A 2003 study of 10 wind farms found that "for the great majority of projects the property values actually rose more quickly in the view shed [sic] than they did in the comparable community."[28]

Tourism

Views of the turbines may negatively affect local tourism, particularly in areas where tourism is dependent on rural views. For example, a town in France saw a coalition of winegrowers and tourism industry representatives form in response to a proposed wind farm. The coalition worried that the turbines would ruin the view's "authenticity," and result in fewer visitors and wine sales.[29] An economic impact study of a wind farm in Australia assumed there would be reductions in local tourism, particularly for farms within sight of the wind farm that provide lodging during holidays.[30]

In contrast, a wind farm may serve as a tourist attraction, drawing tourism dollars to the local economy, as tours may be organized to visit the wind farm. Although some believe wind turbines negatively affect the view, others find the structures to be beautiful. Wind farm proponents may find wind turbines are "sleek, futuristic and a handsome symbol of an environmentally healthier future."[31]

Recreation

Similarly to the way a wind farm may impact local tourism, area recreation may also be affected. On one hand, a wind farm may be detrimental to the ability of an area to be used for recreation. For example, impacts to the view or noise generated from the turbines may negatively affect a community's ability to hike and camp in the area.[32] In contrast, turbines may boost a recreational area's appeal if individuals are drawn to the site because of the turbines.

Turbines may negatively affect residents living in the viewshed. Though noise is generally not an issue, there are several examples of wind farms in which area residents have been disturbed by the noise generated by nearby turbines.[33,34,35] Shadow flicker, which occurs when the rotating blades create a moving shadow, may also disrupt neighboring residences. However, because the amount of time a turbine will create shadow flicker can be calculated, turbines can be sited so as to minimize or negate this issue.[36]

Quality of Life

Wind farms may also be detrimental or beneficial to local quality of life. Residents who live within the viewshed may experience a decrease in their quality of life due to the change in view. An economic analysis of a wind farm in Australia found that concern over view fell into two categories: 1. Impacts to the landscape, and 2. Impacts on the community's visual amenity.[37] The first category refers to sentiments expressed by several residents that wind turbines would disturb the pristine natural setting. The second category captures residents' opinions that the wind turbines would alter the area's character, making the area seem less rural. In contrast, proponents of wind energy may experience an increase in quality of life once a wind farm is built.

Social Cohesion

Tension may form in communities where the economic benefits of a wind farm are not shared equally among the residents. Such may be the case when the wind farm is sited on private property; the property owner may receive lease payments while the neighbors do not. This conflict may be localized such that only properties that are in close proximity or direct view of the turbines are involved.[38] Tension may also form between wind farm supporters and opponents. One economic analysis noted, "the greatest tensions have occurred between the landholders who would have turbines on their properties and community members campaigning to stop the project."[39]

Implications for Solar Development

Oil and gas and wind energy development have a multitude of socioeconomic effects on nearby communities. Since oil and gas and wind, like solar, are all forms of energy development, it is possible that the socioeconomic impacts of these industries can inform the future impacts of solar development (Table 8.1).

From the Oil and Gas Industries

An analysis of the effects of the oil and gas industries can provide insight into the effects of solar development. If the local workforce cannot satisfy the solar facility's demand for labor, the area may experience an influx of new residents who may move to the area looking for job opportunities. Employment at oil and gas facilities, compared to solar, fluctuates differently; while employment at oil and gas facilities fluctuates continuously with production, employment at a solar facility peaks during construction, and significantly declines during operation. Since solar facilities need relatively few workers while in operation, solar facilities will not create long-term boomtowns. Though there may be an influx of workers during construction, these workers are largely temporary.

Lastly, in contrast to the oil and gas industries, local municipalities will not benefit from lease payments or property taxes paid by facilities on public lands. All lease payments for facilities on BLM

land will go directly to the federal government. Federal land is exempt from local property tax assessment, thus solar development on public lands will have no effect on local property tax rolls. Solar development will also have no effect on Payments in Lieu of Taxes, which the BLM pays to local communities to help offset losses to property taxes because federal land is non-taxable.

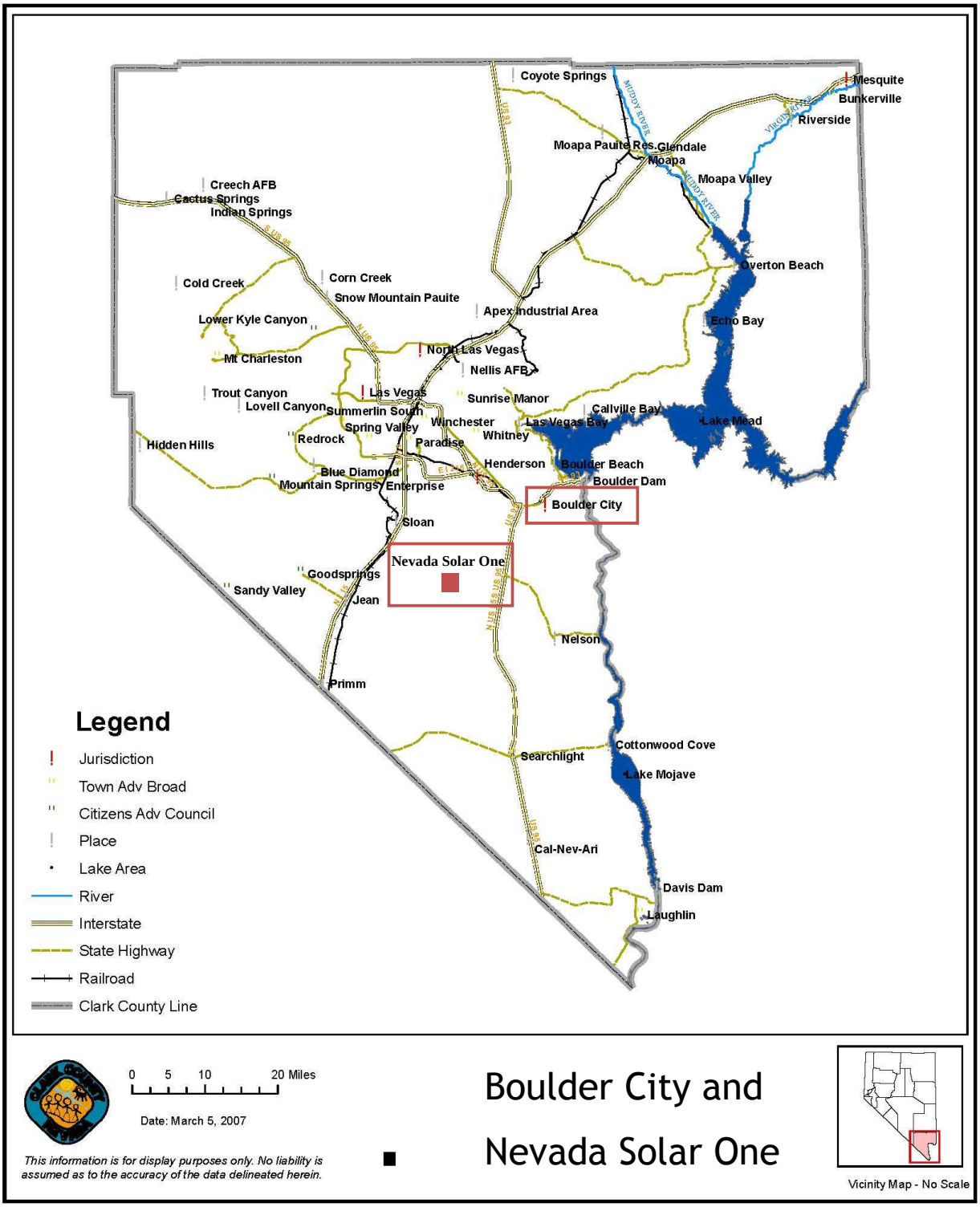
From the Wind Energy Industry

Utility-scale solar facilities will likely share impacts similar to wind farms. Like wind farms, solar facilities will create several permanent O&M positions. Solar and wind facilities may also negatively affect the viewshed, possibly decreasing residents' quality of life and negatively affecting tourism. Like wind farms, solar facilities may also be detrimental to area recreation, particularly if they are sited in areas popular for outdoor activity. Similarly to the way a politically contentious wind farm may spur community members to organize, area residents may also organize in support of or opposition to a proposed solar facility.

THE SOCIOECONOMIC IMPACTS OF NEVADA SOLAR ONE ON BOULDER CITY: A CASE STUDY

In an effort to further understand the socioeconomic impacts of future utility-scale solar facilities on California desert communities, we researched the impacts of existing solar facilities. Our research focused on Nevada Solar One, a 64 MW solar thermal facility located approximately 15 miles from downtown Boulder City, Clark County, Nevada (Map 8.1). The facility, which came online in 2007, uses solar trough technology and covers approximately 400 acres.

Overall, Nevada Solar One's socioeconomic impacts on Boulder City have been minimal (Table 8.2). During construction, impacts on local traffic, stores, and public services were minor. Though the facility required over 1,000 construction workers, it is likely that few workers came from Boulder City and that few workers utilized the city's short-term rental housing. Post-construction impacts on local industry, employment, and public services have also been minimal. Although Nevada Solar One has helped to increase local tourism, the biggest impact has been the facility's lease revenue, which helps to keep Boulder City's taxes low. Boulder City also receives a portion of the facility's annual property taxes, which the project developer pays to Clark County. Except for the lease revenue, Nevada Solar One has not greatly changed Boulder City or affected the town's character.



Map 8.1 Locations of Nevada Solar One and Boulder City. Boulder City is approximately 25 miles east of Las Vegas and 15 miles northeast of Nevada Solar One. The facility's location is represented by the square (square not to scale). Base map source: Clark County GIS Management Office.

Table 8.2 Summary of Nevada Solar One's Socioeconomic Impacts.

Community Effects	Magnitude of Effect
During Construction	
Job Creation	Negligible
Rental Housing	Negligible
Local Restaurants and Stores	Negligible
Transit	Negligible
Public Services	Negligible
During Operation	
Job Creation	Negligible
Lease Payments	++
Property Taxes	+
Local Tourism	+
Local Industry	Negligible
Public Services	Negligible

A "+" indicates a benefit, while "++" indicates a benefit with a significant effect.

Boulder City and Solar Development

Our research focused on Nevada Solar One's socioeconomic impacts on Boulder City, Nevada, to the exclusion of other urban areas in proximity to the facility. Initial research efforts identified two urban centers in Clark County close to Nevada Solar One: Boulder City, the jurisdiction in which the facility is located, and the nearby city of Henderson, Nevada. We assumed these cities had experienced the greatest impacts because they are located closest to the facility. However, early interviews with two Henderson urban planners revealed that the city had likely experienced few if any effects from the facility, and that our research should focus on Boulder City.

Located approximately 20 miles from Las Vegas, Boulder City, Nevada is a small town of about 16,000 people. Originally built to house the workers who built the Hoover Dam, today Boulder City encompasses over 200 square miles, making it Nevada's largest city by land area. Despite its sprawling size, Boulder City is known for its "small town feel." A local planner described Boulder City as a "typical Midwestern small town except in the west and in the desert." One individual said that city residents "like to keep their community somewhat small and quaint." The community is slow growth by ordinance, meaning that city laws discourage increases to the population. A city official noted the residents' strong sense of community and that many actively volunteer in the area.

Boulder City has several dominant employers and industries. The Bureau of Reclamation and Clark County school district employ many individuals, as do the Hoover Dam, Boulder City government, and

the local hospital. Tourism is also an important part of the city's economy; nearby tourist attractions include the Hoover Dam and Las Vegas.

Boulder City began planning for solar development in the mid-1990s. In 1995, the City amended its city charter to reserve 3.5 square miles of undeveloped land specifically for future solar development. Since then, Boulder City has set aside a total of about 14 square miles for solar development.

In 2003, Boulder City released a request for proposal to build a solar energy facility. Residents were generally supportive of the solar facility. As one interviewee put it, residents' primary question was, "'What's in it for me?'" The interviewee added that once residents began to realize the positive impacts a solar facility would have on the city, such as the lease payments, they were all "very supportive." Approximately four years later, in June 2007, Nevada Solar One began producing power. At that time, the developer, Acciona Solar Power, billed the facility, which has a nameplate capacity of 64 MW, as the largest solar electric project in 14 years, as well as the third largest in the world.[40] Nevada Solar One is approximately 15 miles from downtown Boulder City.

Impacts of Facility Construction

Conversations with individuals familiar with Nevada Solar One indicate that the facility's construction had minimal impacts on Boulder City. Though it is unclear how many individuals may have moved to Boulder City to work on the facility's construction, the information gathered from the interviews suggests that workers who did move to the city had little impact on the rental housing market. Construction also had little impact on Boulder City's stores, transit, and public services.

Job Creation

During the 13 months of construction, there were between 800 and 1,300 workers onsite at any one time. Most of these jobs were temporary full-time. Tradesmen needed onsite included electricians, plumbers, pipefitters, and general laborers. Lauren Engineers and Constructors served as Acciona's main contractor, and subcontracted firms from throughout the Las Vegas metropolitan area to construct the facility.

It is unclear how many workers hired during construction were already living locally and how many came from out-of-state. During the construction period, union organizations in the state complained that Acciona was not hiring enough Nevada residents given the lucrative state tax incentives the $250 million project had received.[41] Two interviewees alluded to this controversy, one noting that hiring practices were "a bone of contention" and that he believed that Acciona had hired "a considerable amount" of imported labor. Another interviewee said she thought Acciona's employment practices

were one of the negative aspects of the project; to her knowledge, not many of the workers were local.

Regardless of who filled Nevada Solar One's construction jobs, these positions likely had little impact on Boulder City due to the size and demographics of the city's workforce. Given that over a third of the city's 16,000 residents are retired, Boulder City's workforce is relatively small in comparison to the Las Vegas metropolitan area's workforce;[42] as one interviewee noted, "We're right next to a large metropolitan area, with two million people, and quite a few people looking for work…. [Acciona] had a large employment base to choose from in the region as a whole." Furthermore, Boulder City's residents are generally highly educated and white collar;[43] the city's workforce likely did not have the skills or desire to hire into the facility's construction jobs.

Rental Housing

During facility construction, interviewees reported there was little effect on Boulder City's rental housing market. Though it is unclear how many workers were already living in the Las Vegas Metropolitan area when construction commenced, no interviewees observed a large influx of new residents to the area. Hence, it is unlikely that construction stimulated demand for rental property in Boulder City.

Additionally, workers that moved to the area for facility construction probably did not move to Boulder City because the city's rental property is relatively expensive and scarce in comparison to rental stock available throughout the Las Vegas metropolitan area.[44] One respondent noted that, "Being a slow growth community… [Boulder City has] a very low vacancy rate and … high rents." Individuals that did move to the area for construction jobs likely did not live in Boulder City. Of workers that moved to Boulder City, one individual noted that several senior employees from Lauren Engineers and Constructors "actually lived in Boulder [City] because they could afford the rent." However, this group likely included "maybe only a dozen people all together."

Local Restaurants and Stores

Interviewees gave mixed responses as to whether Nevada Solar One construction had an impact on Boulder City's local stores and restaurants. A representative from Acciona said the construction crews "absolutely" had an impact. Though he qualified his response as an "assumption," he believed, "People ate lunch in the restaurants. For purposes of hardware stores and other businesses, there was a need for materials that weren't ordered in large scale." A Boulder City elected official also noted a "flurry of activity" during the construction period.

However, other individuals were more skeptical of impacts the facility's construction may have had on downtown businesses. Some interviewees said stores saw little change in demand because they believed few individuals moved to Boulder City because of construction. Workers that did move to Boulder City likely shopped where the local residents shopped- in Las Vegas. As one interviewee noted, "Even people in Boulder [City] go over the hill to Las Vegas and Henderson to do their shopping." As for the construction workers that commuted to Boulder City, a city planner said, "I wish I could say it affected us a lot, but because it literally is out in the middle of nowhere" workers generally could not drive to Boulder City for lunch because the commute would consume most of their break. Instead, he believed most workers packed their lunch: "They would come to the job site for work, do their thing, and then go home."

Transit

Interviewees generally thought Nevada Solar One's construction had very little impact on local traffic and public roads. One respondent said no "city-maintained roads" were affected by facility construction. With regards to increased traffic, individuals cited the facility's location, approximately fifteen miles away from downtown, as the reason why construction vehicles were not much of a presence in town. One individual also noted that US 95, the highway near the site of Nevada Solar One, is a main corridor for freight trucks; in his words, the facility's construction vehicles were "not even statistically relevant" compared to the amount of traffic normally on the highway.

In terms of wear and tear, the facility also had little impact on public roads. No additional public roads were built for the project and, as stated previously, the main road to the facility was designed for heavy truck traffic.

Public Services

Facility construction had little to no impacts on Boulder City or Clark County's ability to provide social services. Given that construction only lasted 13 months and that construction workers lived throughout the Las Vegas metropolitan area, impacts on Boulder City schools and other services were minimal.

Impacts During Facility Operation

While in operation, Nevada Solar One's socioeconomic effects have been more substantial. Twenty-eight full-time positions were created for facility operation and lease payments and property taxes will provide a steady stream of revenue for many years to come. Post-construction, the facility has had minimal affect on local tourism, industry, and public services.

Job Creation

A representative from Acciona said that there are between 28 and 32 full-time equivalent individuals that work at Nevada Solar One. There is always a minimum of 28 staff, but this number fluctuates as contractors are brought in for short-term work. The facility is staffed 24 hours a day, 7 days a week. Individuals that work at the facility year-round serve a variety of functions. Field workers are required for general maintenance and to wash the mirrors while others are needed to work inside of the power block and control room. A business development professional said every full time employee is a Nevada resident and is paid equal to or above the Nevada state average wage, which in 2007 translated to wages of $18 per hour or more. A representative from Acciona said "more than half the people" now working at Nevada Solar One come from the Las Vegas metropolitan area.

Local Fiscal Effects

Local governments, including Boulder City and Clark County, benefit from the long-term revenue stream created by Nevada Solar One. Acciona's lease payments add an additional $700,000 annually to Boulder City's general fund. These lease payments will increase over the project's 40-year lease period in step with increases to the Consumer Price Index. A city planner noted that Acciona's lease payments, which in 2007 accounted for approximately 2.3 percent of the city's budget, allow Boulder City to decrease the tax burden on individual residents while still maintaining a high level of services. Clark County and municipalities within the county benefit from Nevada Solar One's property tax payments, which total approximately $400,000 annually.

Local Tourism

When asked how Nevada Solar One may have affected local tourism, interviewees gave mixed responses. A community development planner noted that Nevada Solar One had "put us on the map internationally." He added, "The solar facility has indirectly helped our tourism by bringing us to the attention of people who normally wouldn't have paid attention to Boulder City." He explained that the city gets "quite a few requests" for tours of the facility, noting an upcoming tour with a group of Australian solar developers. Furthermore, a portion of a popular television show was filmed in Boulder City, likely as a result of the publicity the city received because of Nevada Solar One. He added that international tourists are attracted to Boulder City because of recognition the city has received from the solar facility, but come to enjoy the city's other tourist attractions. An employee at NV Energy was less optimistic; in reference to the millions of tourists drawn to the Las Vegas area, he did not think that Nevada Solar One "moved the needle at all."

Impacts to outdoor recreation at the facility site have not been an issue. Prior to facility construction, the project site area was unpopular for outdoor activities. Thus, one interviewee believed that Nevada Solar One did not negatively affect recreation in the area.

Local Industry

In general, interviewees did not believe that Nevada Solar One has had lasting impacts on the area's industry. One interviewee noted that Nevada Solar One was "small in comparison to other things going on" in the metropolitan Las Vegas economy. Since Nevada Solar One came online, solar development has progressed rapidly in Boulder City; as of fall 2009, several solar developers had expressed interest in leasing land within the city. Given this continued interest to build utility-scale solar in Boulder City, one area planner speculated that the trend is more likely a result of the city's prime location than a result of Nevada Solar One: "We have three major transmission corridors that go through town" as well as a substation that transmits power to Los Angeles. He added, "Nevada Solar One may not have been *the* reason [for increased solar development], but I think it may have been a contributing reason." In contrast, another interviewee believed Nevada Solar One has helped draw other solar developers to the area.

Public Services

It is unlikely that Nevada Solar One will be a burden on city and county public services, such as the fire and police departments. Interviews with solar developers suggest that utility-scale solar facilities similar to Nevada Solar One pose a minimal fire hazard at worst. Additionally, none of the interviewees were familiar with any vandalism, theft, or safety problems related to the solar facility.

Electricity rates in Boulder City were unaffected by Nevada Solar One. NV Energy, a large electric utility that serves parts of Nevada and California, purchases Nevada Solar One's power; however, this entity does not serve Boulder City electric customers.

Conclusion

Nevada Solar One's socioeconomic impacts on Boulder City have been minimal. Facility construction had few to no impacts on local traffic, stores, and public services. Construction also had little impact on Boulder City's workforce and rental housing market. Post-construction impacts, with the exception of the lease payments, and to a lesser extent property taxes, were also minimal. Nevada Solar One has not greatly affected Boulder City or changed the town's character.

When asked if they thought, considering everything, Nevada Solar One had been good or bad for Boulder City, interviewees overwhelmingly replied that Nevada Solar One had either positive effects or no effect on Boulder City. Several interviewees cited the lease revenue as a positive long-term project impact. Of Nevada Solar One, a local business development professional said, "I think it's been a positive attribute for Boulder City" because it has created some positive awareness of the solar industry. He also cited the lease revenue. Similarly, when asked if they thought the town's character had changed as a result of the facility, interviewees believed that it had remained intact. On the topic

of future solar development in the area, one respondent noted that residents "literally" ask, "'Where's the next one?'"

UTILITY-SCALE SOLAR DEVELOPMENT AND JOB CREATION

Although little research exists on the broad community impacts of utility-scale solar development, several recent studies have sought to understand the employment impacts of such facilities. NREL, the Large-scale Solar Association, and the Vote Solar Initiative have all funded research that predicts how many construction and O&M jobs a solar facility will create. Many solar developers with proposed projects in the California desert have also predicted the number of jobs their facilities will create upon construction and operation. The following analysis compares the results of these research studies with several developer job projections and the actual employment effects of Nevada Solar One. This analysis focuses on the employment impacts of CSP facilities because most facilities proposed for the California desert utilize CSP technology.

A Review of Past Research

A utility-scale solar facility will generate job opportunities during facility construction and O&M. Facility construction requires expertise from ironworkers, carpenters, pipefitters, electricians, construction equipment operators, construction managers, boilermakers, millwrights, and skilled and unskilled laborers.[45] Developer interviews have indicated a "strong preference" for local labor if the local individuals have the requisite skill sets.[46] Most facility workers are employed during the construction phase, with comparatively few full-time workers required during facility operation. CSP technology is generally more labor-intensive than PV technology; hence, CSP facilities generally employ more people during construction and operation.

Government, industry, and non-profit entities have all researched the employment impacts of utility-scale CSP facilities. In the past six years, NREL has contracted at least two studies on the subject.[47,48] The Large-scale Solar Association, a solar advocacy association, and the non-profit group the Vote Solar Initiative have also funded studies to investigate the issue.[49,50] Table 8.3 summarizes the results of these four studies. Unfortunately, a difference in units among the various studies makes it difficult to generalize construction job creation. However, during O&M, a CSP facility can be expected to create anywhere from 0.25 to 0.6 jobs per MW of nameplate capacity.

Table 8.3 Summary of Four Studies on CSP Facilities and Job Creation.

Study Author	Facility Nameplate Capacity (MW)	Construction Duration (years)	Estimated Job Creation			
			During construction	Per MW	During O&M	O&M Jobs/MW
Schwer and Riddel (Contracted by NREL)	100	3	817 jobs/year	8.17 jobs/year	45 jobs	0.45
Applied Analysis (Contracted by Large-scale Solar Association)	100	2	800 job-years	8 job-years	25-45 jobs	0.25-0.45
Stoddard et al. (Contracted by NREL)	100	2	455 job-years	4.55 job-years	38 jobs	0.38
The Vote Solar Initiative	2,000 (in 8, 250 MW facilities)	6	5,900 jobs/year	2.95 jobs/year	1,200 jobs	0.6

Please note the two different units, jobs/year and job-years, used to describe construction job creation. Construction jobs are often measured in the unit job-year, which refers to one person who is employed full-time (at least 40 hours worked per week) for one year. Without detailed information on each job, such as job duration, it is impossible to convert from jobs/year to job-years.

Developer Projections for Proposed Facilities

Solar developers are also predicting the employment impacts of their proposed facilities. Employment projections are available from a variety of sources, including developer web sites, facility Applications for Certification (AFCs), Environmental Impact Statements, and California Energy Commission Final Staff Assessments. Table 8.4 summarizes the findings for 14 proposed facilities, including three PV facilities.

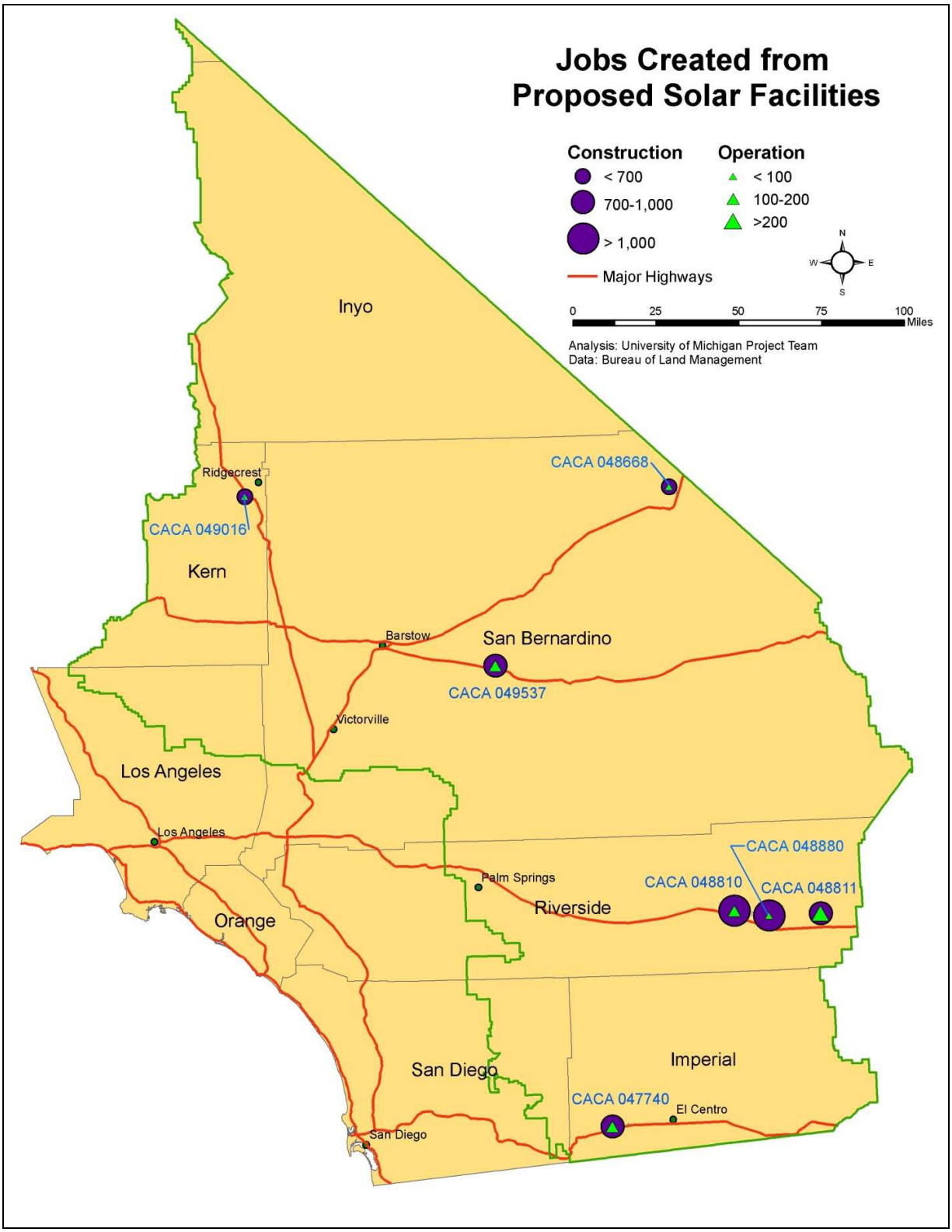
The CSP facilities reviewed for this study expect to create 0.83 to 4.65 peak construction jobs per MW. Generally, this figure declines as facility nameplate capacity increases. CSP facilities are expected to create 0.18 to 0.34 O&M jobs per MW. Nevada Solar One had greater employment impacts during both construction and operation than are predicted for any of these facilities. PV facilities are expected to create 0.91 to 1.3 peak construction jobs per MW and 0.05 to 0.09 O&M jobs per MW.

It is interesting to compare the results of the funded research studies with the developer predictions. Unfortunately, differences in units prevent a comparison of construction job creation. Considering O&M jobs, the four research studies reviewed for this analysis generally predict more job creation per MW of nameplate capacity than do the solar developers. Study estimates are in line with the actual number of

O&M jobs created by Nevada Solar One. Map 8.2 shows predicted job impacts for five proposed CSP facilities.

Table 8.4 Comparison of projected employment impacts for 14 proposed facilities.

Project Name	Technology	MW	Construction jobs (peak)	Construction jobs/MW	O&M jobs	O&M jobs/MW
Rice Solar Energy Project	CSP	150	438	2.92	47	0.31
Beacon Solar Energy Project	CSP	250	836	3.34	66	0.26
Abengoa Mojave Solar Project	CSP	250	1,162	4.65	68	0.27
Solar Millennium Ridgecrest	CSP	250	633	2.53	84	0.34
Genesis Solar	CSP	250	1,085	4.34	45	0.18
Agua Caliente (if built with CSP)	CSP	280	1,000	3.57	50	0.18
Solar Partners Ivanpah SEGS	CSP	400	637	1.59	90	0.23
Solar Millennium Palen	CSP	484	1,141	2.36	134	0.28
Imperial Valley Solar Project (Formerly SES Solar Two Project)	CSP	750	731	0.97	164	0.22
Calico Solar Project (Formerly SES Solar One Project)	CSP	850	703	0.83	180	0.21
Solar Millennium Blythe	CSP	1000	1,000	1.00	221	0.22
Agua Caliente (if built with PV)	PV	330	300-400	0.91-1.21	15-20	0.05-0.06
Lucerne Valley Solar Project	PV	45	45	1	3	0.07
Solar Ranch One	PV	230	300	1.3	20	0.09
Nevada Solar One	CSP	64	800-1,300	12.5-20.31	28-32	0.44-0.5



Map 8.2 Predicted Job Creation for Five Proposed CSP Facilities.

PREDICTING THE IMPACTS OF FUTURE SOLAR FACILITIES

Lessons learned from the Nevada Solar One case study and job creation estimates, coupled with demographic data, may be used to predict how proposed utility-scale solar development will impact nearby communities. The Nevada Solar One case study is helpful in understanding the role facility location plays in effects on community. Demographic data helps us to infer what costs and benefits the community's labor market and rental housing market will likely experience. This analysis also includes a review of why Nevada Solar One's greatest socioeconomic benefits, lease payments and property tax revenue, may not be factors for California desert communities.

This analysis uses two California desert communities, Lucerne Valley and El Centro, as examples for how to use demographic data to project socioeconomic impacts. As discussed below, we surveyed these same two communities, as well as an area known as Newberry Springs, in an effort to understand the local public opinion of utility-scale solar. The following socioeconomic analysis builds on the results of this survey. Due to a lack of available demographic data, Newberry Springs is excluded from this analysis.

Located in the Mojave Desert, Lucerne Valley is an unincorporated community in southwest San Bernardino County. El Centro is located in the southern part of Imperial County, near the border with Mexico. These residents were chosen for the survey because utility-scale solar facilities are proposed for public land nearby both communities. Chevron Energy Solutions has proposed a 45 MW PV power plant approximately eight miles from Lucerne Valley to be called "Lucerne Valley Solar Project."[51] Tessera proposed a 750 MW CSP facility "Imperial Valley Solar" about 14 miles west of El Centro.[52]

Using Demographic Data to Predict Socioeconomic Impacts

Using demographic and economic data, it is possible to hypothesize how future utility-scale solar facilities may affect Lucerne Valley and El Centro. For example, using information about population, median income, age, and education is useful for understanding how a community may benefit from construction jobs at a solar facility. Furthermore, statistics describing the area's housing market could indicate if a community is able to provide a suitable housing stock for the hundreds of workers needed to construct a utility-scale solar facility.

Much of the data used in this document, including all of the housing data, comes from the U.S. Census 2000, and hence is somewhat dated. Regardless of how these statistics have changed over the last decade, this information is still helpful in comparing localities to one another and for demonstrating how this data may be used to predict future impacts (Table 8.5).

Table 8.5 Comparison of Demographic Data for Boulder City, Lucerne Valley, and El Centro.

	Boulder City, NV (Clark County)	Lucerne Valley, CA (San Bernardino County)	El Centro, CA (Imperial County)
Population	16,000	7,500	44,000
Median Annual Household Income (1999)	$50,523	$24,969	$33,161
Percent of population 25 years or older with at least one year of college education	48	33	36
Percent of population 60 years of age or older	30	30	13
Percent of housing units renter occupied (vs. owner occupied)	24	34	52
Number of renter occupied housing units (1999)	1,522	456	6,986
Median rent asked (1999)	$605	$377	$450
Cities/towns greater than 10,000 residents, in a ~25-mile radius	Henderson City (243,000) Las Vegas (560,000)	Victorville (109,000) Apple Valley (69,000) Hesperia (88,000)	Imperial (13,000) Calexico (39,000) Brawley (27,000)

This table uses a variety of data sources: the U.S. Census 2000, the 2006-2008 American Community Survey, the "Draft Environmental Impact Statement and California Desert Conservation Area Plan Amendment for the Proposed Chevron Energy Solutions Lucerne Valley Solar Project: Volume 1"[53], and the "E-4 Population Estimates for Cities, Counties and the State, 2001-2009, with 2000 Benchmark."[54]

Effects on the Local Labor Pool and Rental Housing Market

By comparing population, income, education, and age demographics among Boulder City, Lucerne Valley, and El Centro, we can gauge what costs and benefits the latter two communities may experience with regards to the local labor pool and rental housing market if a utility-scale solar facility was built nearby. A community will obviously benefit if its workers are hired at the facility. However, the area may incur costs if the labor pool cannot satisfy the workforce demand and the area's rental housing market cannot accommodate workers who move to the area.

Generally, Boulder City's workers did not benefit from Nevada Solar One, the primary reason being that Boulder City residents must compete for jobs with metro Las Vegas' extensive workforce. It is also possible to infer why by interpreting the city's demographic data. Boulder City's high median annual income and high percentage of educated individuals may reflect a population uninterested in construction work and/or lacking the skills needed to fill such positions.

An interpretation of demographic data may also explain why Boulder City's rental housing market was largely unaffected by Nevada Solar One's construction. For instance, Boulder City has a small percentage of rental housing stock. A conversation with a Boulder City community development planner suggests the city's rental market is tight and expensive in comparison to rental housing stock in the nearby Las Vegas metropolitan region. Individuals who moved to the area to build Nevada Solar One found a greater variety of housing with cheaper rent outside Boulder City.

Lucerne Valley

Demographic information from Lucerne Valley sheds light on what costs and benefits the area might experience if a solar facility is constructed nearby. Lucerne Valley's workforce may benefit from unskilled labor jobs created during facility construction. This hypothesis is based on the community's low levels of education; Lucerne Valley's percentage of adults 25 years of age or older with at least one year of college (33 percent) lags behind both the state (50 percent) and national (45 percent) averages, which suggests the community workforce may be interested in unskilled work.[55]

However, the possibility that Lucerne Valley residents would benefit from solar facility jobs diminishes when considering the competing labor pools in the area and the number of jobs the facility is predicted to create. Lucerne Valley residents will have to compete with workers in three nearby population centers: Victorville, Apple Valley, and Hesperia. Furthermore, Chevron's facility is expected to create 45 construction jobs and up to three O&M jobs, hardly a job creation boon for the area.[56] Though Lucerne Valley's workforce will not greatly benefit from the small number of jobs, this minimal job creation also means that the community's rental housing market will not be unduly stressed. Even if all 45 of Chevron's construction workers were to move to Lucerne Valley, there would not be a significant impact on short-term housing in the community.

Despite this, it is helpful to use Lucerne Valley's housing data to predict how similar communities may be affected by a large influx of temporary workers. If hundreds of workers were to move to a community like Lucerne Valley, the demand for rental housing would quickly and vastly exceed the available supply. Victorville, Apple Valley, and Hesperia, which together have thousands of rental units, would likely accommodate the excess demand. With median rent asked around $450 to $500 in the three neighboring communities, Lucerne Valley's rental stock (median rent asked $377) would remain economically competitive. This situation sharply contrasts with the situation in Boulder City, where comparatively high rents helped to push rental-housing demand into the surrounding metro Las Vegas area.

El Centro

Based on the city's large population and relatively small percentage of retirees, El Centro has a sizable workforce. El Centro's education data also suggests that residents might benefit from the creation of unskilled labor positions. However, it is unlikely the city's workforce will benefit from Imperial Valley Solar since the city's labor pool must compete with workers in nearby Imperial, Calexico, and Brawley. Considering that Imperial Valley Solar is projected to create 731 jobs during peak construction and 164 operation positions, and that the populations of the four urban centers sum to over 120,000 people, the number of new jobs is largely insignificant.[57]

Similar to Lucerne Valley, El Centro's rental housing market will be largely unaffected by the new solar facility. The number of construction workers needed for Imperial Valley Solar is largely insignificant in comparison to the considerable population of the area. However, if all 731 workers added to the demand for temporary housing, El Centro's nearly 7,000 rental units may not be enough to accommodate the increase. In that situation, temporary workers may also choose to rent less expensive units in one of the three nearby cities, where median rent asked ranges from $186 to $406 per month.

Using a Facility's Location to Mitigate Socioeconomic Impacts

Depending on where a utility-scale solar facility is sited, the project will have different socioeconomic impacts on nearby urban areas. Several aspects of Nevada Solar One's siting, such as distance to downtown and how the community utilized the site prior to facility construction, influenced how the project affected Boulder City. Drawing on these observations, one can infer how a proposed utility-scale solar facility would affect neighboring communities. These inferences suggest changes be made to the siting process so that facility impacts are mitigated.

Increase Community Distance from Facility

Several individuals interviewed for the Nevada Solar One Case Study noted that the solar facility's construction likely had so few impacts on Boulder City because it was sited over 15 miles from the downtown area. As one community planner put it, the facility "is out in the middle of nowhere." An employee of the utility purchasing Nevada Solar One's power said, "If the project were closer it would have definitely had a greater impact on the town."

Had the facility been closer, the socioeconomic impacts to Boulder City could have been very different. The hundreds of construction workers on site every day would have been able to go downtown for lunch, thereby stimulating demand at the local restaurants and stores. Public infrastructure could have been damaged, particularly if heavy construction vehicles had to drive local public roads to get to the facility. If the facility had been built closer to residents, there may have been negative impacts to the

view. Workers driving to and from the facility might have caused traffic problems at certain times of the day.

Increasing the distance between the community and the facility may be a way to mitigate some of a facility's negative impacts. However, as was the case for Boulder City, siting a facility farther from downtown may also decrease some of the facility's positive effects. Ultimately, communities may find that avoiding negative effects outweighs the forgone benefits.

Consider Previous Land Use

Solar facilities may be sited to avoid affecting areas that are popular for recreation. According to a local planner, Nevada Solar One was built on land unpopular for outdoor activities, such as driving off-highway vehicles (OHV's) and hiking. In contrast, a facility sited in an area popular with outdoor enthusiasts could draw backlash and be detrimental to the community's quality of life.

For example, the facility near Lucerne Valley is proposed on land that BLM has not designated for recreation, though areas in the vicinity are used for hiking and off-highway vehicle use.[58] If these recreational areas are in the facility's viewshed, they could be negatively affected. Imperial Solar Valley could also negatively affect recreation, as off-highway vehicle use is popular on the project site.[59]

Consider Implications of Landownership

In broad terms, Nevada Solar One's lease payments, which add $700,000 each year to the city's General Fund, have had a very positive fiscal impact on Boulder City. Specifically, the extra revenue has allowed the city to maintain a high level of services while keeping the tax burden low. Boulder City also benefits in small part from the property taxes Nevada Solar One pays to Clark County, a portion of which goes to Boulder City.

Generally, a solar facility sited on both public and private land will have greater direct fiscal benefits to the community than will a facility sited solely on federal public lands. It is unlikely that many municipalities and private landowners will benefit from lease payments or property taxes paid by new solar facilities sited solely on public lands. Although developers who build utility-scale solar facilities on BLM land will owe lease payments, this money will go into the general US treasury, as opposed to directly benefiting the local community. However, a developer whose site covers both public and private land will owe lease payments to the private landowner(s) as well. For example, the Imperial Solar Valley project site covers approximately 360 acres of private land.[60]

California and Nevada also have different laws for assessing solar infrastructure for property taxes, which has repercussions for how California municipalities may benefit economically from future solar facilities. Under Section 73 of the California Revenue and Taxation Code, developers who build utility-scale solar facilities in California are not assessed property taxes on their solar infrastructure.[61]Since federal land is exempt from local property tax assessment, the code does not affect facilities sited solely on public lands. However, this law has implications for projects that span both public and private land. Solar developers with projects on private land will owe property taxes on buildings and other infrastructure not directly related to energy production, although the project's assessed value drops dramatically when the solar infrastructure is excluded. This property tax exclusion does not carry over if a facility is sold; if the original project developer sells the facility to another entity, the facility's solar infrastructure will no longer be protected from property tax assessment. In this case, the new entity will be assessed property taxes on the entire facility, which could translate into a significant amount of revenue for the county. Solar infrastructure could also become assessable if the tax exemption, which is set to sunset January 1, 2017, is not renewed.

CONCLUSION

Although there is a lack of academic research on the socioeconomic impacts of utility-scale solar development, there are many other sources of data with which to infer the impacts facilities will have in the California desert. A review of wind energy development suggests that solar development may have comparable socioeconomic effects. For example, like wind energy development, solar development will have minimal impact on job creation and population growth. An in-depth look at Nevada Solar One revealed that the facility had few long-term socioeconomic impacts, with the exception of annual lease payments. However, communities in the California desert will not benefit directly from lease payments paid by facilities sited on public lands. Housing and demographic data can help predict the effects of temporary construction jobs. Lastly, facilities should be sited in recognition of the role that location plays in mitigating facility impacts.

Given the range of potential impacts, the BLM does a good job taking into account the socioeconomic impacts utility-scale solar facilities may have. Among the developer AFCs and EISs reviewed for this study, socioeconomic impacts were thoroughly addressed. The BLM should continue to support a NEPA process in which such impacts are adequately addressed.

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