CHAPTER 1 | INTRODUCTION AND METHODOLOGY

BACKGROUND

Renewable energy projects in the United States are on the rise. Technologies that received limited attention in the 1970s, such as solar and wind power, are experiencing significant growth today due to the perception of national interest to increase energy efficiency, reduce dependence on fossil fuels, increase domestic energy production, and curb greenhouse gas emissions. This perception of national interest has been made evident by the range of new policies and incentives that spur renewable energy research and development. Policies aimed at increasing the use of renewable energy include the Renewable Energy Production Tax Credit, adoption of a renewable energy portfolio standard (RPS) by many states, and creation of markets for Renewable Energy Certificates and Credits (RECs).

In 2002, the State of California adopted its own RPS and now depends on the development of new, utility-scale solar energy installations to help reach its goal of 20 percent of electricity generation from renewable sources by the end of 2010.[1] Utility-scale solar development began in California with the construction of Solar Electric Generating Station I, called SEGS I, which was built in the town of Daggett in 1985.[2] Between 1985 and 1991, eight additional SEGS facilities were constructed in California's Mojave Desert.[3] Although these nine solar energy power plants totaled over 353 megawatts (MW) capacity, they only represented 0.8 percent of California's overall electricity generation capacity. Since these were facilities constructed by the U.S. Department of Energy (DOE), their primary purpose was for scientific testing rather than commercial electricity production and they have since been decommissioned.

California has received national attention for solar energy development for two reasons. First, the state has some of the best solar resources in the world and contains several major cities, or load centers. Second, California has sufficient amounts of available land needed to make these projects viable. The Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) are in the process of evaluating more than 150 applications for wind and solar projects on federal lands in California, covering more than 1.3 million acres.[4] In particular, the BLM has 54 applications for solar projects in the California desert.[5] In order to judge the cumulative impacts of so many projects, the BLM and the DOE began developing a nationwide Solar Energy Development Programmatic Environmental Impact Statement (PEIS) in early 2008 to guide future application decisions.

"Green" Versus "Green"

The impending development of utility-scale solar power facilities on public land in the California desert is creating a conflict between conservation and industry groups and elected officials. For example, in

December 2009, Senator Diane Feinstein (D-CA), introduced legislation to establish nearly 1.1 million acres of the California desert as two national monuments, thereby conserving these areas while prohibiting solar or wind development.[6] Conflict also exists among conservation groups, who are struggling to define the value of desert conservation when compared to the value of developing new renewable energy facilities, in essence creating a "green" versus "green" conflict. The sense of urgency surrounding development has caused some conservation organizations to raise questions concerning the most appropriate use of land desired for solar development and to question whether the tradeoff between conservation and development is understood well enough to make siting decisions.

Some environmental groups, such as The Wilderness Society (TWS), are supportive of renewable energy development and want to be involved in decisions about permitting solar projects in order to ensure that they minimize ecological impacts and maximize energy gains. As Pam Eaton, deputy vice president of the TWS Public Lands Campaign, states, "You've got the short-term impact of a project versus a long-term problem, which is climate change."

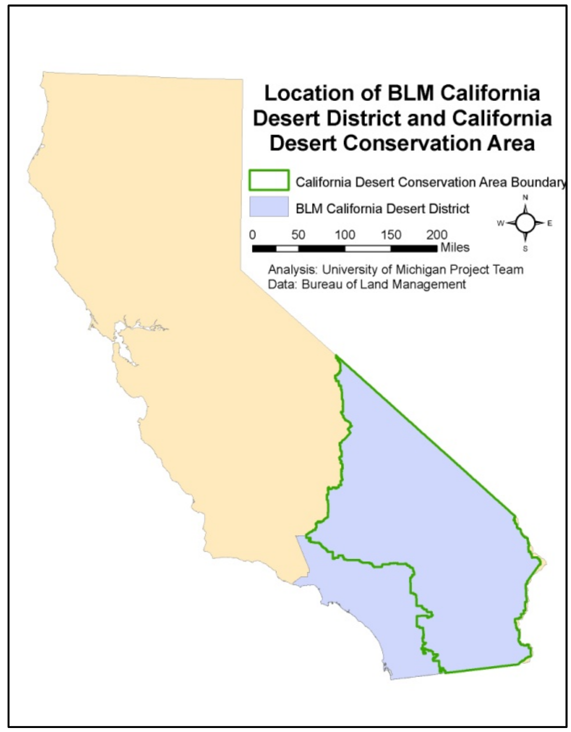
In the face of growing electricity demand, the relative scarcity of renewable energy development in the California desert provides public land managers with an important opportunity to solicit comment from stakeholders about appropriate locations for new solar facilities as they develop the PEIS and process existing solar applications. The rapid progression of energy policy decisions and pressing need to meet aggressive RPS standards requires a method to quickly and effectively identify and evaluate trade-offs inherent in many existing permit applications. Environmental groups, including our client, TWS, struggle with ways to support renewable energy development while protecting fragile desert lands. This may ultimately lead them to support some individual facilities and to oppose others.

Purpose and Scope of the Study

The rapid rise of interest in solar development in California has made it imperative that the technological, social, political, and environmental costs and benefits of solar development be analyzed. Decisions with long-term effects are currently being made, at a relatively fast pace, and with an incomplete understanding of the full range of potential impacts. The goal of this report is to present a series of qualitative and quantitative analyses that together provide a framework for evaluating proposed utility-scale solar energy projects in California. We also present recommendations and guidelines that will enable stakeholders to evaluate potential impacts of these utility-scale solar developments. The analysis and recommendations ultimately provides guidance for the selection of the best proposals for utility-scale solar facilities in desert locations that allow for both solar energy generation and conservation of ecosystems.

This study focuses on *utility-scale* solar development on public lands in the California desert. Utility-scale solar facilities generally have a nameplate capacity of over 50 MW and produce electricity, which is bought by an electric utility provider to be fed into the electric grid. To generate this electricity, solar modules are placed directly on the ground and aligned to catch sunlight.

The geographic boundary of the study area is the California Desert Conservation Area (CDCA), a 25 million acre area in southern California that encompasses the Colorado desert and the portion of the Mojave desert that lies within the state (Map 1.1). The study examines the policy and economic drivers, ecological and socioeconomic impacts, and decision-making processes of utility-scale solar facility development on public lands in the CDCA.



Map 1.1 Location of the BLM California Desert District and California Desert Conservation Area.

In addition to land requirements, proposed solar facilities will require infrastructure to connect to the electrical grid. Though we recognize the critical role transmission plays in siting decisions, an analysis of transmission was beyond the scope of the study. The processes, regulatory agencies, and decision-making structures are different from facility siting, and they represent added layers of complexity in the larger issue of utility-scale renewable energy generation. In addition, relevant transmission data were unavailable for a variety of reasons, including those related to concerns over national security. Also, transmission is being adequately researched by other groups. Two professional working groups are developing models and assessments of transmission development: the Renewable Energy Transmission Initiative (RETI) model and the Planning Alternative Corridors for Transmission (PACT) model (see Chapter 11 for further details).

RESEARCH QUESTIONS

To guide our research, we developed the following questions related to utility-scale solar development on public lands in the California desert:

What are the policies and incentives driving utility-scale solar in the California desert?

- How are policy decisions and incentives driving the development of the solar industry and how do they favor either distributed generation or utility-scale solar?

- How do the policy and management incentives and disincentives at the federal, state, and local levels affect siting solar projects on public lands?

How will the different forms of solar energy development affect the ecology of the California desert?

- What are the resource and infrastructure needs of various proposed technologies?
- What are the relative land use efficiencies of each of the "fast-track" solar-energy facility proposals?
- What current stressors should be considered in order to understand the impact that utility-scale solar development might have on California desert ecosystems?
- What direct and indirect impacts of utility-scale solar development on key species, natural communities, and landscape-level ecological processes should be taken into consideration by decision makers?

Can landscape suitability and desert-wide impacts be identified and analyzed spatially?

- What areas may be in high conflict with solar development in the California desert due to land management designation?
- What areas of the desert present a high degree of conflict for building solar facilities due to known occurrences of species habitats?
- What areas of the desert would be visually affected by solar development?
- How can solar facility impacts and needs be analyzed spatially given alternative development scenarios?

How will solar development affect desert residents, and are their opinions and information gaps being addressed?

- What are the socioeconomic impacts of utility-scale solar facilities?
- How can demographic data and facility location be used to predict socioeconomic impacts?
- What are the socioeconomic impacts of existing utility-scale solar facilities and how might the impacts of future facilities be similar and/or different?
- How do existing communities view proposed solar developments?
- What are the knowledge gaps for local stakeholders?
- What sources of information do stakeholders use?
- What are the perceived types and likelihoods of a range of impacts?

How are decisions being made in the solar energy siting process?

- What is the current process for siting solar facilities on public lands?

- What are the strengths and weaknesses of the process?
- Are local stakeholders aware of and using BLM public commenting opportunities?
- What aspects of existing alternative processes would be beneficial for the solar siting process?

What changes and improvements can be adopted to more effectively site solar facilities with minimal ecological impact?

- How should the current solar siting process be changed and improved?
- What mitigation and design measures can developers take to reduce the ecological impacts of utility-scale solar development on the California desert?

METHODOLOGY

We utilized the following methods to collect and analyze data. Methods are organized by research question:

What are the policies and incentives driving utility-scale solar in the California desert?

How are policy decisions and incentives driving the development of the solar industry and how are they driving development of utility-scale solar?

We reviewed historical and current federal and state policies affecting investment and development decisions within the solar industry. Further insights were gained by attending the Greentech Media Solar Summit conference held in Phoenix, Arizona, on March 30 and 31, 2010.

How do the policy and management incentives and disincentives at the federal, state, and local levels affect siting solar projects on public lands?

We performed a literature review of existing federal, state, and local policies that affect siting solar projects on public lands. Additionally, policies were identified through interviews with BLM staff and environmental organizations.

How will the different forms of solar energy development affect the ecology of the California desert?

What are the resource and infrastructure needs of various proposed technologies?

We performed a literature review of sources such as peer-reviewed journal articles, news articles, and policies and memos from the CEC and interviewed nine developers and other industry professionals working in this field by phone and in person.

What are the relative land use efficiencies of each of the "fast-track" solar energy facility proposals?

Our analysis began by summing the total area of the site that is to be developed either with roads, transmission lines, solar panel systems, main building complexes, or other planned infrastructure. This total then is referred to as the "direct disturbance area". We calculated the "actual annual electricity production" that will be generated by the facility by multiplying the nameplate capacity in total MW by the capacity factor. The capacity factor is the average percentage of time that the solar facility is expected to operate at full capacity.[7] In order to quantify the relative impact of the facility footprint size and the actual amount of energy produced by the facility, the analysis then used two metrics:

1. The amount of "direct disturbance area" required per megawatt-hour (MWh) produced as the "actual annual electricity production".
2. The amount of energy produced in MWh per amount of land area used as "direct disturbance area". These two metrics are the inverse of one another, but provide two different perspectives on how efficiently the proposed facility will utilize the landscape.

All of the data compiled into this analysis tool were taken directly from the documentation submitted by the applicant as part of the Application For Certification (AFC). The reader should note that the AFC documents for photovoltaic (PV) projects were not readily accessible online and we were unable to obtain copies of the applications from the BLM. Therefore, in order to estimate the land-use efficiency of PV projects, we relied on two assumptions: first, that the ratio of disturbed area to total site area of PV projects was similar to Concentrating Solar Power (CSP) projects, and second, that the estimated capacity factor for PV projects was 11 percent. For the first assumption, we calculated the average ratio of disturbed land to total site area for the 10 other projects listed below and converted this to a percentage (in this case, on average 53 percent of the site area was disturbed), which we then applied to the PV projects to estimate disturbance area. As PV systems are similar to parabolic trough systems, they have to be constructed in long, contiguous rows and are therefore likely to have similar footprints. For the second assumption, we calculated an estimated thin-film PV capacity factor of 11 percent.[8] This estimated capacity factor is based on the operating capacity factors of PV facilities that were built in Germany in the past three years.

What current stressors should be considered in order to understand the impact that utility-scale solar development might have on California desert ecosystems? What direct and indirect impacts of utility-scale solar development on key species, natural communities, and landscape-level ecological processes should be taken into consideration by decision makers?

We performed a literature review of desert ecology and conducted in-person and telephone interviews of 20 scientists with expertise in California desert ecology from universities, federal and state agencies, and environmental organizations to obtain qualitative data on the potential impacts of solar development and how these impacts may exacerbate current stressors in the California desert. We asked experts about their primary concerns, predicted impacts to key species, natural communities, and ecological processes, potential cumulative impacts, mitigation of potential impacts, policy barriers, and areas where research is lacking. These interviews helped us identify the ecological processes that are both essential for ecosystem functioning as well as those most at risk to impact. We also identified the types of impacts species are likely to face as a result of development. We combined the knowledge from interviews and the literature review with our research on technology-specific site engineering, landscape modifications, and facility parameters to extrapolate the likely impacts of utility-scale development in the CDCA.

Can landscape suitability and desert-wide impacts be identified and analyzed spatially?

What areas may be in high conflict with solar development in the California desert due to land management designations? What areas of the desert present a high degree of conflict for building solar facilities due to known occurrences of species habitats? What areas of the desert would be visually affected by solar development? How can solar facility impacts and needs be analyzed spatially given certain development scenarios?

We used Geographic Information Systems (GIS) and gathered publicly available data from the BLM, U.S. Fish and Wildlife Service (FWS), and U.S. Geological Survey National Map Seamless Server, as well as an academic subscription to the California Natural Diversity Database (CNDDB). We developed and assigned quantitative ranking and classification systems to spatial data using ESRI ArcGIS and analyzed results in Excel. We analyzed spatial categories that included land management designation, rare and endangered species occurrences, visual resources, percent slope, and distance to transmission. The context for our analyses was three potential development scenarios:

1. Only proposed solar facilities labeled as "fast track" applications are built (10 projects total).
2. Only proposed solar facilities located in Solar Energy Study Areas (SESAs) are built (22 projects total).
3. All currently proposed solar facilities (as of March 2010) are built (54 projects total).

How will solar development affect desert residents, and are their opinions and information gaps being addressed?

What are the socioeconomic impacts of utility-scale solar facilities?

We conducted a literature review of academic, government, and industry studies on the socioeconomic effects of solar energy development. Several studies used models to predict solar development job creation; these job predictions were compared to job creation projections for several proposed facilities in the California desert. A review of academic literature on the socioeconomic effects of oil, gas, and wind energy development was completed. From these results, inferences were made about solar development's likely effects on nearby communities.

How can demographic data and facility location be used to predict socioeconomic impacts?

Using two California desert communities as examples, demographic data were analyzed to predict the effects that solar development might have on the local workforce and housing market. Drawing on observations from a solar facility in operation in Nevada, inferences were made on how a community's distance from a facility, the project site's previous land use, and the site's owner (a public or private entity), will influence the facility's community effects.

What are the socioeconomic impacts of existing utility-scale solar facilities and how might the impacts of future facilities be similar and/or different?

We completed an in-depth case study of Nevada Solar One, a solar facility in Nevada. Our research goal was to infer the socioeconomic effects of utility-scale solar facilities proposed for the California desert by researching the impacts of facilities already in existence. Because many of the proposed facilities have nameplate capacities of at least 50 MW, we limited our research to facilities with comparable output. We assumed it would be difficult to locate individuals knowledgeable of older facilities. We therefore limited our research to facilities built within the past 10 years.

Data collection was mostly comprised of interviews. Our questionnaire, designed to be administered over the phone, covered a variety of topics, including general impressions of the facility and surrounding areas. The questionnaire also asked the interviewees to give their opinion on how the facility may have affected the local area, in such areas as traffic, public roads, employment, municipal revenue, and local stores. Questions covered impacts both during facility construction and operation. Over the course of the project, eight individuals were interviewed. We identified individuals to interview through internet searches and from recommendations made by other interviewees. All interviews took place from July to November 2009. Interviewees included a Boulder City elected official, a community development planner, a representative from Acciona Solar Power (the facility developer), a representative from NV Energy (the utility purchasing Nevada Solar One's power), and an individual from a local business development organization.

How do existing communities view proposed solar developments? What are the information gaps for local stakeholders and what sources of information do they use? What are the perceived types and likelihoods of impacts?

A stakeholder survey was conducted on residents in these communities in the California desert. Prior to this study, little research had been done to assess local communities' attitudes about utility-scale solar energy development. Basic methodology is provided below. Further information on the survey, including more detailed methodology, can be found in Appendix A.

Target Respondents

Three communities in the California Desert region were selected to receive the stakeholder survey: El Centro, Lucerne Valley, and Newberry Springs. Three criteria were used to select these communities.

1. Current stage of the proposed project: To capture the most informed opinions possible, we selected communities that had already held at least one public meeting regarding the proposed solar project.
2. Proximity to a proposed solar project: To ensure that those surveyed were representative of true community stakeholders, we only considered locations within 25 miles of a proposed solar energy project. This proximity requirement was designed to maximize the likelihood that the individuals surveyed in fact had a vested interest in the construction of these projects.

3. Population size: For statistical reasons, we chose to only survey communities that were 1,500 residents or more. The community of Newberry Springs did require a partial exception to this rule. Though Newberry Springs included land parcels that were owned by over 1,500 unique persons, many of these were "absentee owners", meaning that they owned the land and title, but did not permanently reside in the community.

Survey Instrument Development

Prior to identifying locations and developing survey questions, we developed research objectives to guide our work and to form the basis of the survey instrument. The objectives, designed as a set of questions, were in part derived from what we identified as underexplored or altogether missing information from academic literature and current discourse. These questions were pre-tested by representatives from environmental organizations and desert communities. The questions developed in the stakeholder survey addressed these questions and captured demographic information to allow us to perform statistical analyses that explored the relationship between each community's perceptions and the respondents' age, education, and length of residence in the California desert region. Overall, there were 14 questions asked, three of which were demographic in nature. Of the 14, two were open response: "What do you think are the positive impacts of these facilities?" and, "What do you think are the negative impacts of these facilities?" The remaining 12 questions required respondents to either choose one of a set of ranked options, or to check all that applied, most of which offered the option to fill-in a response.

Survey Instrument and Dissemination

The survey instrument was distributed by mail and included both a paper copy of the survey with a stamped and addressed return envelope, and a website link that respondents could use if they preferred. A total of 5,079 surveys were mailed; households received two copies of the survey, one in English and one in Spanish, as census figures indicated a high level of Hispanic populations in these communities. 624 response were received, between early December 2009 and the end of January 2010.

Survey Response Analysis

We analyzed the results of our survey in three primary ways: first, we calculated the mean response for each question as an aggregate number from the sample and by four demographic categories using a contingency table; second, we placed those in favor of and those opposed to solar into two groups, and calculated the means and variances of each question using two-sample t-test to identify divergence of opinion and statistical significance; third, we read each open-response question and assigned a numerical value to individual words or phrases as they appeared, such as "jobs" or "green," which we then coupled with a qualitative analysis to identify issue gaps in our close ended questions. Where we spotted patterns in the data, we conducted chi-squared tests and regression analyses to ensure statistical significance and dependence or correlation. See Appendix A for additional detail.

How are decisions being made in the solar energy siting process?

What is the current process for siting solar facilities on public lands?

In order to determine the current process for siting solar facilities on public lands, 22 in-person and telephone interviews were conducted with BLM staff involved in solar facility siting at the state office, California Desert District (CDD) office, and all field offices within the CDD, as well as with staff members of the California Public Utilities Commission (CPUC), California Energy Commission (CEC), Department Of Defense (DOD), National Park Service (NPS), and FWS involved in the solar facility siting process or with management jurisdiction within the CDCA. All interviewees were asked to explain their roles in the current siting process.

What are the strengths and weaknesses of the process?

A critical evaluation of the BLM's right-of-way process as it is being applied to solar facilities was conducted using a set of normative criteria. These criteria included: efficiency of the process, clarity of process, consideration of a robust set of options, level of environmental protection, consideration of spatial and temporal scale, and public engagement. The evaluation of the process was supplemented by interviews with staff from the BLM, CEC, CPUC, DOD, NPS, and FWS. Interviewees provided their opinions on the strengths and weaknesses of the current solar siting process. Additionally, a targeted internet-based survey of desert-region city and county governments, citizens groups, chambers of commerce, environmental organizations, recreation organizations, and tribes was conducted. This organizational survey was designed to determine the level of participation in the BLM process by organizations and what these organizations considered strengths and weaknesses of the BLM's process as well as the most important aspects of the process. Two hundred and sixty five surveys were sent and 41 responses were received. Additionally, the stakeholder survey was used to determine the level of public engagement by individual residents.

What aspects of existing alternative processes would be beneficial for the solar siting process?

We conducted a literature review of two processes used for energy generation, the wind energy right-of-way process. This knowledge informed a comparative analysis of these two processes, using the set of normative criteria identified for the solar right-of-way process analysis. The comparative analysis looked at which parts of the processes can be or are already used for solar and if they would work with the CEC process.

What changes and improvements can be adopted to more effectively site solar facilities with minimal ecological impact?

How should the current solar siting process be changed and improved?

Recommendations were formulated following analysis of data collected to answer our research questions on how decisions are being made in the solar energy siting process. These recommendations stemmed from the strengths and weaknesses identified through the evaluation of the current process, as well as from our analysis of alternative processes used for siting energy development on public lands.

What mitigation and design measures can developers take to reduce the ecological impacts of utility-scale solar development in the California desert?

Six proposed solar facility applications were selected for an analysis of Biological Resources Best Management Practices (BMPs) and mitigation measures. In our analysis, we differentiate between the terms “best management practice” (BMP) and “mitigation”: BMPs are used on site to reduce the impacts of development on biological resources, while mitigation is used off site. The same six facilities were used in both the BMP and mitigation analysis. BMPs were not attributed to specific solar facilities, though some language from the applications was used to describe the BMPs. Our ecological analysis and interviews with scientists provided the background information necessary to construct informed recommendations for BMPs and mitigation measures.

REPORT OUTLINE

The economic and policy drivers, proposed technologies, and ecological impacts and implications of utility-scale development in the California desert are described in the following chapters (Figure 1.1).

- Chapter 2 provides geographic, jurisdictional and ecological context for our research. Also included is an overview of the ecology of the California desert, including the ecological processes that may be sensitive to development and play an import role in ecosystem functioning. This chapter concludes with a discussion of the current anthropogenic stressors to desert ecology to which solar development may contribute.

- Chapter 3 describes the various solar technology options and key considerations that guide project developers when determining which technology is best suited for their utility-scale solar project.

- Chapter 4 describes economic drivers for utility-scale development and the policies affecting siting on public lands in California. This chapter also dicusses the role of distributed generation in meeting California's RPS goals.

- Chapters 5 and 6 discuss the ecological impacts of solar development at the site-level and landscape-level respectively. These chapters include the types of site engineering that are performed by developers and the associated ecological effects of these at the project site and the larger landscape scale.

- Chapter 7 examines potential ecological and visual impacts using spatial analyses. This chapter includes an analysis of individual facilities and using three different development scenarios: only Fast Track facilities are built; only SESA facilities are built; and All Proposed facilities are built. These analyses were used to draw conclusions on landscape level impacts for multiple facilities.

- Chapter 8 couples a case study of an existing solar facility with academic and industry research to predict the socioeconomic impacts of proposed projects.

- Chapter 9 analyzes the results of a stakeholder survey conducted in three California desert communities with close proximity to utility-scale solar facilities. Differences in attitude were explored between those who support and oppose solar. Respondents were asked about the likelihood of possible outcomes, concern for negative consequences, value they place on potential positive impacts, their level of participation in the BLM process, and use of a variety of information sources.

- Chapter 10 examines the decision-making processes of the BLM and CEC, evaluates the BLM permitting process, and analyzes the oil and gas leasing and wind right-of-way processes for solutions to weaknesses of the solar permitting process.

- Chapter 11 highlights our key findings and makes recommendations on ways to improve the solar permitting process, mitigate the impacts of utility-scale solar development on habitat and wildlife, and promote expanding the use of distributed generation.

CHAPTERS	DISCUSSION AND ANALYSIS	METHODS
CHAPTER 2 WHERE ARE THE PROJECTS BEING PROPOSED?	A discussion of the management of the CDCA, the local ecology, and current stressors to the desert ecosystem.	LITERATURE REVIEW INTERVIEWS
CHAPTER 3 WHAT EXACTLY IS BEING PROPOSED?	An overview of various solar technologies that are being proposed for public lands in the California desert.	LITERATURE REVIEW INTERVIEWS
CHAPTER 4 WHY IS SOLAR BEING PROPOSED?	The policies and incentives driving utility-scale solar on public lands in the California desert.	LITERATURE REVIEW POLICY RESEARCH
CHAPTER 5 WHAT ARE THE SITE-LEVEL ECOLOGICAL IMPACTS?	An analysis of the site-level engineering processes and the potential associated impacts on the local ecology.	APPLICATION ANALYSIS INTERVIEWS
CHAPTER 6 WHAT ARE THE LANDSCAPE-LEVEL ECOLOGICAL IMPACTS?	An analysis of land and water use efficiencies of solar development and the implications for cumulative ecological impacts across the desert.	EFFICIENCY ANALYSIS LITERATURE REVIEW
CHAPTER 7 WHAT ARE THE SPATIAL IMPACTS?	A spatially based analysis of ecological and visual impacts of the proposed facilities.	GIS ANALYSIS GIS MODEL CREATION
CHAPTER 8 WHAT ARE THE SOCIOECONOMIC IMPACTS?	An analysis of how solar development has affected and will likely affect nearby communities.	LITERATURE REVIEW CASE STUDY ANALYSIS
CHAPTER 9 HOW DO DESERT RESIDENTS VIEW SOLAR?	Results of a stakeholder survey on attitudes about and knowledge of utility-scale solar, and their participation in the BLM process.	STAKEHOLDER SURVEY DATA ANALYSIS
CHAPTER 10 HOW ARE DECISIONS BEING MADE?	An evaluation of how decisions are being made for solar energy facility permitting.	INTERVIEWS POLICY RESEARCH
CHAPTER 11 WHAT DO WE RECOMMEND?	Recommendations for the permitting process, BMPs, mitigation, distributed generation, and areas for future research.	ANALYSIS INTEGRATION CONCLUSIONS

Figure 1.1. Flow Diagram of Full Study