Economic Impact of Power-line Siting in Anza-Borrego Desert State Park

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A Discussion Brief Prepared for the Anza-Borrego Foundation,
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Executive Summary

Bisecting Anza-Borrego Desert State Park with a high-voltage power line, as described in the California Energy Commission's May 2014 Environmental Feasibility Analysis of potential transmission options and corridor designations in Southern California, would have numerous economic impacts including loss of wilderness, diminished recreation and tourism revenue, damage to fragile desert ecosystems and wildlife habitat, eradication of viewsheds on scenic byways and reduced property values.

Using recreation as an example of only one facet of the total economic value of the park, the estimated minimum preliminary market-based *economic* cost of Alternative 5 (a transmission line that would essentially bisect the Anza-Borrego Desert State Park) is approximately $21.6 million to $216 million. The actual total *economic* cost of Alternative 5 will be higher than this estimate since it must include all potential market costs (such as reduced property values; use of groundwater; changes in visitation; loss of employment; etc.), as well as all potential non-market costs (such as loss of groundwater resources; loss of cultural resources; decreased air quality; health impacts of the large scale disturbance of the desert pavement and cryptobiotic crust; loss of natural resources such as wilderness; etc.).[1]

This *economic* cost would be the amount of the gift of public funds for the recommendation to proceed with Alternative 5. This gift of public funds would amount to a subsidy to the shareholders of the corporate entity that owns this transmission line and/or receives the energy transmitted though this line.

The amount of this subsidy by the taxpayers of California would not be offset by any public benefits of a transmission line being built. Not only are there other more viable alternatives to Alternative 5 according to the Aspen Report, but also the estimated economic costs to the public sector are real economic costs that would be assumed over time by the public if Alternative 5 is built.

In other words, if Alternative 5 is to remain in consideration, the corporate entity that owns the transmission line and/or receives electricity from this line should be required to pay, at a minimum, an amount equal to the potential economic costs associated with the choice of Alternative 5 as a transmission corridor to compensate the state for the loss of real *economic* value. Otherwise, Alternative 5 becomes an example of public subsidies to private industry where profits are privatized but real costs are socialized with the public paying the bill.

[1] In some cases the word economic is italicized to make the point that we are discussing *economic* costs in this brief, not project cost/benefit values or project financing amounts, numbers that are often framed as economic numbers but which do not take into account the impact of a project on the entire system or economy.

Introduction

Anza-Borrego Desert State Park (ABDSP) is the largest park in the California State Park system and one of the largest state parks in the continental U.S. It is located mainly in San Diego County (with portions in Riverside and Imperial Counties). The California Department of Parks and Recreation (DPR) managed parts of the park, as of January 2015, encompasses over 600,000 acres (over 940 square miles) of unique Colorado desert landscapes.[2] The park, which has been designated as a National Natural Landmark and as a World Biosphere Reserve, includes 12 state-designated wilderness areas (Figure 1), five sites on the National Register of Historic Places and a designated scenic highway (as well as two other highways deemed eligible for scenic designation). The park recently became a formal part of the University of California Natural Reserve System. For example, "The Anza-Borrego Desert badlands contain a record of…. diverse fossil assemblages [that] are an unparalleled paleontologic resource of international importance." (Jefferson and Lindsey 2006, xii)

Over 400,000 people visit the park each year (*California State Park System Statistical Reports,* various years) for hiking, camping, jeeping and wildlife and wildflower viewing. The park also contributes scientific and cultural resources valuable for research and education, and provides a scenic backdrop for surrounding communities.

The California Energy Commission (CEC) and the California Independent System Operator (CAISO) are currently in the process of assessing options for electric transmission due to the pending closure of the San Onofre Nuclear Generating Station. One of the options being considered, Alternative 5 (Imperial Valley to Inland), proposes placing a 500KV power line through the Anza-Borrego Desert State Park essentially bisecting the park (Aspen Environmental Group 2014).

Such development, whether above ground or underground, would have substantial impacts on ABDSP that should be accounted for in assessing the relative attributes of the various transmission alternatives.

Decisions regarding the siting of transmission corridors must be based on complete information, including a comprehensive analysis of the *economic* costs and benefits of each alternative, not just the financial costs and benefits of transmission line construction. It is especially important to assess the *economic* costs associated with Alternative 5, because it proposes siting transmission lines through lands which have been set aside for special protection for current and future generations. These designated wilderness, cultural, and protected lands would be irreversibly altered by the route proposed in Alternative 5. Much of the park is designated wilderness, which is of especially noteworthy concern for state tourism revenue.[3] These unique and valuable resources should not be treated as cost-free real estate for industrial development.

This report presents a brief summary of some of the potential *economic* costs associated with Alternative 5 focusing specifically on the portion of the proposed route that bisects ABDSP. It is intended as a preliminary review and not as a comprehensive accounting. Further defensible research is necessary to fully evaluate both the market and non-market *economic* costs of this alternative. The remainder of

[2] The park's protected desert ecosystems include land owned by DPR, private inholders, public inholders such as the University of California, Irvine, and the Anza-Borrego Foundation. The total size of this protected land as of January 2015 is approximately 1,000 sq. miles. For comparison, the state of Rhode Island's land mass is approximately 1,034 square miles; the Greater Yellowstone Ecosystem is 30,000 sq. miles; the Greater Los Angeles Metro area is approximately 33,954 square miles.

[3] The park contains approximately 85% of all State Designated Wilderness Areas in California (460,000 acres of the total 540,000 acres).

this report will consist of a review of the research literature on the economic value of protected lands, recreation and the impact of power lines and energy development on wilderness and recreation.

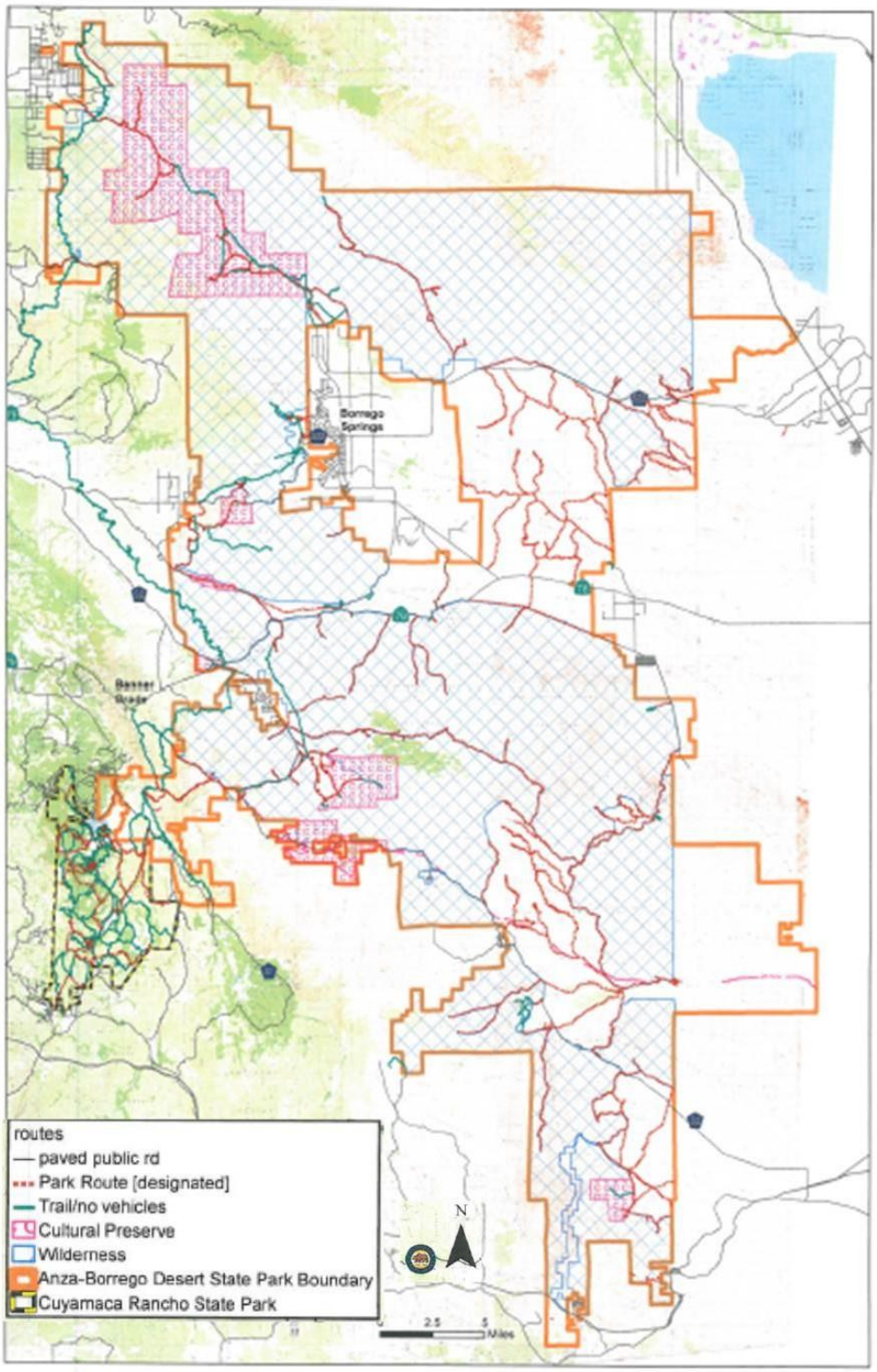


Figure 1. Anza-Borrego Desert State Park Map

Quantitative and qualitative results reported in the existing literature will be used to estimate a range of values demonstrating the potential *economic* cost of power line siting across the ABDSP.

Potential Impacts to ABDSP

Alternative 5 would have several well-documented impacts on ABDSP, including the encroachment of development into designated wilderness, damage to cultural resources, loss of recreational quality, loss of visual quality (whether the transmission lines were above or below ground) and the overall impact of industrial development essentially dividing the park into two parts. The potential environmental impacts of a power line through the park have been described by Aspen Environmental Group (2014) and by the California Public Utilities Commission (2008). However, little corresponding analysis has been performed on the *economic* impacts of this route through the park, whether the transmission lines are constructed above or below ground.

- *Impact on designated wilderness.*

The proposed route for Alternative 5 would require the acquisition of rights-of-way in areas that have been designated as wilderness that prohibits industrial development. There has, to date, never been a case of reversing such a designation at either the federal or state level and to do so would result in the loss of several large economic values detailed below.

- *Impact on cultural resources.*

Parts of the proposed Alternative 5 route also pass through designated cultural preserves within the park. Similar to wilderness designations, such preserves are intended to protect traces of history and our prehistoric past and prohibit developments and structures that would diminish these cultural values.

- *Loss of recreational and scenic values*.

One of the primary purposes of state parks including ABDSP is to provide recreation. The value of recreation experiences is often contingent upon the quality of the visual environment. The proposed route follows a designated scenic highway and would be visible from two other highways that have been found to be eligible for scenic designation. Construction of either an overhead or underground power line bisecting the park would result in a decrease in recreation and scenic values that cannot be mitigated with any known or proven technologies.

The proposed route for Alternative 5 closely follows the previously proposed Sunrise Powerlink (CPUC 2008). As described in the project EIR/EIS a power line through the park would have moderate to high impacts on all eight points identified as important visual resources. The proposed Alternative 5 would have similar detrimental impacts.

- *Impact of industrial development in ABDSP*.

As noted the park has been set aside to protect many public values and resources. Construction and use of a 500KV power line through the center of the park will negatively affect the wilderness, cultural, recreation and scenic values of the park. It will also result in negative impacts on wildlife in the park, including the desert bighorn sheep for which the park is named. Construction and operation of a large regional power line will also result in increased noise and traffic in the park.

The potential economic costs of these impacts will be described below, and estimates for the potential cost specifically to ABDSP will be derived from existing literature where available. These values presented in this report should be used as a starting point for a much more comprehensive analysis of the total cost of Alternative 5.

Review of the Literature

- *Economic Impact and Economic Value*

Economic ***values*** or ***benefits*** take many forms, including familiar market values (the price we pay in the store for example). Some goods and services have non-market values, which can be monetary or non-monetary. Some goods have both market and non-market value, which is often the case with places like ABDSP. Non-market values can sometimes comprise the largest portion of the value of certain goods and services, which makes the assessment of these values particularly important in policy-making and land use planning.

Economic ***impact*** refers to the market consequences of an action or situation; most often these impacts are measured as jobs, income and revenues. Parks and other protected areas generate jobs in the local and state economy, income from these jobs as well revenue from admission and other related transactions. These areas also stimulate additional economic activity in local and state economies that can be attributed either to the direct jobs and income or to the presence of the scenic and other amenities parks provide or sometimes to both.

Economists measure these values and impacts using a variety of techniques, including models which estimate direct and indirect impacts, surveys which measure purely non-market values and analyses of the price signals that come from related market transactions (such as property values).

There are several types of benefits and impacts that are attributable to parks and other natural areas such as Anza-Borrego Desert State Park (Morton 2000, Loomis and Richardson 2001). These benefits include such things as:

- Direct use benefits, such as recreation;
- Community benefits, such as jobs, income, new residents or business attracted by high quality of life;
- Scientific benefits, such as research and education;
- Increased property values;
- Biodiversity conservation and other ecological services, such as watershed protection; and
- Passive use benefits, such as the value of conserving lands in their natural state for future generations.

These park areas have been set aside to provide these benefits for the public because, although they are valuable, they are not provided by the usual operations of the market - that is, they are largely non-market values. The following sections review recent and seminal peer-reviewed research on these various benefits, focusing specifically on the direct and indirect economic impacts and the benefits of recreation and wilderness, all of which stand to be lost if Alternative 5 is developed and thus represent potential *economic* costs of the alternative.

- *Economic Benefits of Wilderness*

Wilderness, parks and other protected areas provide benefits to the public both on-site and off-site. On-site benefits consist mainly of recreation values that will be reviewed in the next section. Other on-site benefits include opportunities for education, scientific research, wildlife habitat and the protection of water quality and other ecological benefits. Clawson (1951) and Krutilla (1967) are some of the first authors to articulate the concept of considering the public non-market values associated with public lands. Since then, countless researchers have estimated values for specific places and types of non-market goods. Most of these estimates have focused on federal wilderness areas, however California's state wilderness designation is similar enough that the estimates of values should be comparable.

Loomis and Richardson (2001) compiled the literature to date and constructed estimates of the national benefits of the federal wilderness system. Their estimate of the recreational value of federal wilderness areas is $634 million dollars; the passive use values and ecological values are potentially many hundreds of millions of dollars more. Phillips et al. (2008) used similar methods to estimate of the value of Alaskan wilderness alone at over $2 billion. Loomis (2000) estimates the annual economic value of Western wilderness (not including Alaska) to be $168/acre.

At a minimum, Alternative 5 may directly disturb only about 446 acres of ABDSP wilderness land.[4] If we apply Loomis' figure, this results in an annual cost of $75,000. However, in reality the area of impact would be much larger since the power line, if built above ground, would be visible from great distances within the ABDSP. If we apply the per acre value developed by Loomis (2000) to just half the park's total wilderness acreage, the annual economic cost figure increases to over $38.6 million. However, even if the power line was built below ground, it is likely that the scar from this construction would last for many years and be seen from far distances and produce an annual economic impact only slightly less than the above ground power line option.[5]

Passive use values are defined by economists to include the value many hold for just knowing a wilderness area is protected from development and will remain so for future generations. These values have been found to account for as much as 94% of the total value of wilderness (Loomis 1987).

Wilderness areas and parks also stimulate local economic activity. Several studies find that strong economic and population growth is linked to an abundance of protected natural environments such as parks and wilderness areas. These studies examine a range of community attributes from jobs and income to the level of migration and entrepreneurship and find that these indicators are tied to protected public lands (See Rasker 2006, Johnson and Rasker 1995, Snepenger et al. 1995, Rasker and Glick 1994, Beyers and Lindahl 1996, Rasker 1994, Berrens et al. 2006, Holmes and Hecox 2004, Lorah 2000, Phillips 2000, Rosenberger and English 2005 and Rudzitis and Johnson 2000 for several examples).

Rasker et al. (2004) found that counties with higher levels of public lands devoted to industrial uses performed poorly compared with counties where more of the public lands were protected from industrial development. Two studies looked specifically at the impact of state parks on local economies (Duffy-Deno 1997 and Cordell et al 1992). Both found that state parks were associated with higher county employment and population.

Cline et al. (2011) studied a range of types of protected public lands and found that higher levels of protection resulted in higher quality recreation experiences which in turn produced higher levels of local economic benefits. Swedish researchers Reinius and Fredman (2007) found that designation of an area as a national park, Biosphere Reserve or World Heritage Site influenced tourists' decisions to visit these places. Increased visitation would be expected to produce increases in annual revenues from this visitation.

In 2005 Dr. Robert Richardson evaluated the economic benefits and impacts of California desert wildlands protected by the California Desert Protection act of 1994 (CPDA). These lands are included in Inyo, Riverside, San Bernardino and Imperial counties and are similar in terms of geologic, ecologic and

[4] Based on a 160 foot Right of way for 23 miles.

[5] Another potentially large non-market economic cost for the undergrounding transmission line option is the potential destruction of archeological and geological sites. For example, one likely route up Grapevine Canyon is "virtually a continuous archaeological site" according to a past president of the Colorado Desert Archaeology Society. Undergrounding would destroy these sites, some of which are burial/cremation sites. Archaeological resources are non-renewable - once lost they are gone forever.

economic characteristics to the region of ABDSP. The legislation of CDPA notes that the desert region of California deserves protection both because of the especially fragile nature of these ecosystems and because of increasing pressure from development. This is still true and relevant for the ABDSP as well. Richardson found that the federal lands set aside in the CDPA produce over 3,600 jobs and generate about $120 million annual income for the region. In addition to these economic impacts, the value of the non-market benefits from desert wilderness lands is potentially even larger.

- *Benefits of Outdoor Recreation at ABDSP*

One of the most readily measurable benefits of the ABDSP stems from recreational use of the area. Recreation produces economic impacts in the local economy along with non-market benefits. Non-market benefits include the benefits that visitors derive from their activities along with the off-site benefits that include knowing that places such as ABDSP exist and that they will be available for future generations. We will focus here on the tangible benefits attributable to recreation that result from spending in the local economies. BBC Consulting Inc. (2010) conducted extensive research in California and estimated the value of recreation at various types of public lands including state parks. BBC also examined the economic impact of recreation visits to ABDSP (BBC 2012) and found that the average expenditure per visitor is $88.16 in 2014 dollars (Bureau of Labor Statistics 2015).[6]

Using the current annual average visitation of nearly 500,000 (see Table 1) and the inflation adjusted per visit spending derived by BBC, the current annual expenditures by visitors to ABDSP total $43.2 million. Furthermore BBC (2012) estimated that visitation and visitor spending at ABDSP results in 666 jobs statewide, with 559 in the Southern California Region.[7]

Table 1. Annual Visits to Anza-Borrego Desert State Park

Fiscal Year	Day use *	Camping	Total
2006-07	351,243	109,979	461,222
2007-08	490,743	119,361	610,104
2008-09	422,986	120,027	543,013
2009-10	381,924	101,911	483,835
2010-11	311,856	90,695	402,551
2011-12	325,029	112,836	437,865
2012-13	360,074	131,924	491,998
Average	377,694	112,390	490,084

** Paid and free*
Sources: California State Parks System Statistical Reports (http://www.parks.ca.gov/?page_id=23308) and BBC 2012

- *Economic Costs of Development*

Construction of a 500kV power line through Anza-Borrego Desert State Park can be expected to have several types of negative impacts, many of which can be quantified and monetized as costs of Alternative 5. This section summarizes prior research on the impacts of power lines on visual quality, recreation visitation and tourism, and property values.

[6] BBC 2012 reported $83.77 in 2011 dollars
[7] Orange, Riverside, San Bernardino and San Diego counties.

Visual Impacts

Several studies have assessed the potential visual impact of power lines in either natural or wild settings and in residential settings. CPUC (2008) found that the proposed siting of the Sunrise Powerlink through ABDSP would have moderate to high visual impacts throughout the park, based on assessments at several important viewpoints. Similar findings have been found for a proposed power lines in Kenya (Holland and Gahdhi 2013), where the project analysts conclude that although the numbers of affected parties may be small the impact is likely to be high and mitigation measures unsuccessful or impossible.

Visual impacts from power lines affect property values as well as recreation values (which will be discussed below). In a study in the Montreal area, Des Rosiers (2002) found that properties with a direct view of high voltage power lines reduced property values by a range of 5-20%. Delaney and Timmons (1992) found that on average property values were lower by 10% for houses within sight of or adjacent to power lines. Jackson and Pitts (2010) compile previous research on property values and found that where an effect was found, decreased property values ranged from 2% to 9%.

Ragnarsdottir et al. 2010 surveyed residents in several Icelandic cities about their willingness to pay to reduce the visual impact of overhead power lines and found a mean annual value for improved aesthetic quality of 12.5000 ISK or about $0.09 U.S. Assuming similar values in California, this would amount to over $105,000 annually based on 1.2 million households in San Diego county (Census Bureau 2015).

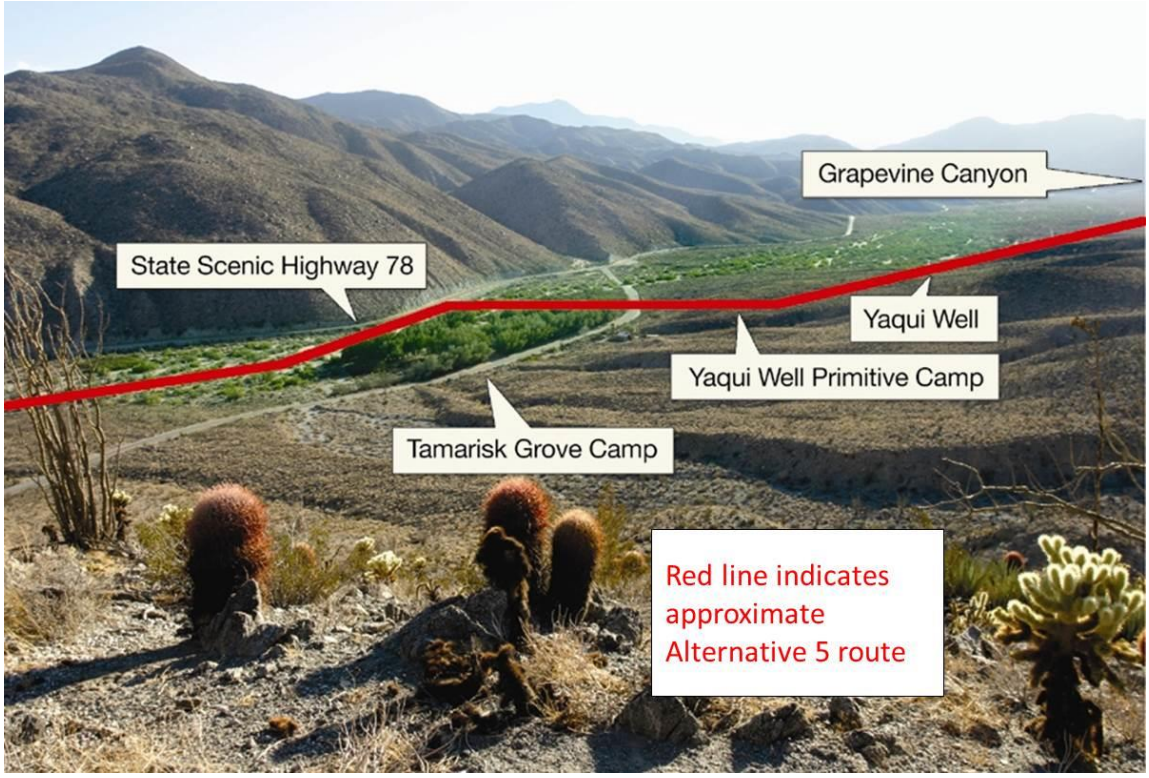
Recreation Impacts

Few studies exists which detail lost tourism revenue or expected decline in visitation directly attributable to power lines. One study documents the expected decline in tourism due to power line construction and operation in South Africa to be substantial (Seaton Thomson and Associates 2012). This report notes that the proposed power line would intrude on officially protected areas, much like the Alternative 5 route would do in ABDSP. These authors note that this would have economic impacts as well as qualitative impacts on tourism and on the quality of the area for wildlife habitat on which much of the tourism depends. One recent study done for a proposed power line in Scotland (Brian et al. 2009) indicated that as many as 15% of tourists would avoid visiting areas where the power lines were visible.

Despite the lack of research on the impact of power lines per se, industrial development has been shown to have an impact on recreation visitation and visitor preferences. Much of this research has focused on forested landscapes and on timber harvesting practices and most studies find the outdoor recreation participants prefer landscapes where the visual impact of forestry operations and other industrial development is minimized (Paquet and Belanger 1997, Hammitt et al 1994, Hands and Brown 2002).

Driving for pleasure and sightseeing are recreation activities engaged in by almost everyone. Data collected by the USDA forest service through the National Visitor Use Monitoring Program (Cordell et al. 2009 and also through the National Survey on Recreation and the Environment (USDA Forest Service

2013) consistently show these types of activities have among the highest participation rates. Scenic Byways are an important venue for these activities as well as providing access to sites for other recreation activities.



The proposed route for Alternative 5 follows a designated scenic highway. Scenic highways with protected viewsheds have been found to have positive economic impacts as well. Research on the economic impacts of Scenic Byways indicates that travelers have specific preferences for the attributes of these routes. Sipes et al. (1997) examined the criteria for Scenic Byway designation for ten states and each one included scenic or visual quality. Gartner and Erkkila (2004) surveyed tourists about the attributes of highways and roads that were important in choosing their routes. Respondents rated the natural scenery as the most important attribute of the road segments studied. Respondents also indicated in every case that they preferred that businesses be located in nearby communities rather than scattered along the roadway. It stands to reason that industrial development would also not be a desired attribute and in fact would eliminate the route from consideration as a scenic byway were it not already so designated (Sipes et al. 1997).

Scenic byways have positive economic impacts for communities along the routes. Sem et al. (1997) review of the literature found that scenic byway designations increased the level of both visitor traffic and visitor spending and that these increases were beneficial to communities along designated routes. Warder et al. (1994) studied the economic impacts of designated historic and scenic loop tours in Wyoming and also found that such special highway designations are beneficial to local economies.

Estimates of the Economic Cost of Alternative 5

As the above review of the literature demonstrates, protected areas such as the Anza-Borrego Desert State Park have considerable value and generate substantial economic activity in the state. Drawing on only one facet of this value - recreation and tourism - it is possible to demonstrate the magnitude of the potential economic costs of Alternative 5 that would bisect the park.

BBC Research and Consulting (BBC 2010) produced an estimate of the jobs and annual visitor expenditures at ABDSP as described above. Table 2 shows these estimates along with the expected reduction in economic impacts associated with various levels of reduced visitation.

Table 2. Annual Visitor Expenditures and Jobs Supported by Anza-Borrego Desert State Park and Potential Costs of Reduced Visitation

		Annual cost of a reduction in ABDSP visitation		
	Current * 500,000 visitors	5% reduction 24,500 fewer visitors	10% reduction 49,000 fewer visitors	15% reduction 73,500 fewer visitors
Visitor Expenditures ($88.16/visitor)	$43,205,805	- $2,160,290.27	- $4,320,580.54	- $6,480,870.82
Total Jobs				
Southern California	559	28 fewer jobs	56 fewer jobs	84 fewer jobs
Rest of California	107	5 fewer jobs	11 fewer jobs	16 fewer jobs
California Total	666	33 fewer jobs	67 fewer jobs	100 fewer jobs

* Source: BBC 2012.

Annual, perpetual costs require an adjustment to determine the net present value, which requires using a discount rate to account for costs that occur in the future. If a higher discount rate it used costs in the future will be smaller compared to costs now, if a lower rate is used the future costs will be higher. There are many things to consider when selecting an appropriate discount rate. If a cost is purely fiscal and can be reversed, the appropriate rate might be the expected rate of return one would expect on the next best alternative investment. For non-market costs, or the cost associated with an irreversible loss of public goods, a lower rate might be appropriate. Federal projects are often evaluated using a 6% discount rate. Table 3 shows the net present value of the estimated lost recreation revenue under several discount rate assumptions.

Table 3. Estimated Present Value of Economic Cost Due to Reduced Visitation at ABDSP Associated with Alternative 5

	Annual reduction in ABDSP visitation		
Discount rate	5% reduction 24,500 fewer visitors	10% reduction 49,000 fewer visitors	15% reduction 73,500 fewer visitors
3%	$72,009,675.73	$144,019,351.47	$216,029,027.20
6%	$36,004,837.87	$72,009,675.73	$108,014,513.60
10%	$21,602,902.72	$43,205,805.44	$64,808,708.16

The potential cost of siting a 500 kV power line through ABDSP would also include the lost value of recreation that accrues to participants, reduced passive use values, the loss of biodiversity, and irreversible loss of the values associated with scenic byways and wilderness, all of which are non-market values that have real economic costs. Based on our survey of the research literature, these non-market costs may be many times the value of market-based economic costs.

Using the example of the value of wilderness acres, the net present value of the cost of lost wilderness ranges from $749,000 (if a high discount rate is applied only to the value of directly impacted acres) to $1.3 billion (applying a low discount rate to half of the park's total wilderness). And this is only one of the non-market costs associated with Alternative 5.

Conclusion

In order to make a thorough assessment of the benefits and costs of Alternative 5, research on the full *economic* cost of the impacts should be conducted. This should include surveys of visitor preferences and expected visitation, including the use of visual analyses. The overall impact on the regional economy should be assessed using the findings of these surveys. Additional research should be conducted on the total market and non-market economic value of the ABDSP and its wilderness areas in order to make a truly comprehensive evaluation of the costs to the public of Alternative 5, if this alternative is one of those proposed.

This discussion brief has considered just one of the market factors, potential impacts on park visitation, that must be evaluated in order to calculate the full *economic* cost of Alternative 5. To arrive at a comprehensive accounting of the total *economic* cost of Alternative 5, a full economic analysis must be performed for each of the potential market impacts such as reduced property values; use of groundwater; loss of employment; etc. and non-market impacts such as loss of groundwater resources; loss of cultural resources; decreased air quality; health impacts of the large scale disturbance of the desert pavement and cryptobiotic crust; loss of natural resources such as wilderness; etc. Without such accounting of the total *economic* cost of Alternative 5, one might assume that any decision to pursue Alternative 5 would not necessarily be based on the best interests of all the people of California, but special interests.

Photo Credits

Cover Photo, Anza-Borrego Desert State Park, Dave Garmon

Page 10, Illustration of Alternative 5 route-Anza-Borrego Foundation, Sunrise Powerlink Brochure, 2007

Page 9 and Page 12, Sunrise Powerlink, Joe Raffetto

Figure 1, California State Parks

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