A COST BENEFIT ANALYSIS OF UTILIZING SOLAR PANELS ON BATES NUT FARM

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ABSTRACT

This study was done to determine the feasibility of installing solar panels on Bates Nut Farm. Bates Nut Farm was a great candidate for the project because they are an agricultural business in a small community in north county San Diego. They also meet the requirements for many government incentive programs and federal grants that are associated with utilizing solar power.

To determine the cost of installing solar panels on Bates Nut Farm there were many interviews and an appraisal was conducted with Western Solar. The initial cost of the project was estimated to be $930,224.40. After state and federal incentive programs at the end of the first year, the out-of-pocket amount owed by Bates Nut Farms totals $394,708.18. Looking further into the investment in solar power it was determined that there was a positive net present value and an internal rate of return of 18%. It is recommended that Bates Nut Farm make the investment in solar power

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Chapter 1

INTRODUCTION

The idea of using the sun's energy has been around since ancient times. Native Americans and the ancient Greek's built their houses into the side of hills to take advantage of the heat storage from the sun during the day that would then be released during the night. The Romans were the first people to use glass windows to trap the warmth of the sun in their homes. The first use of solar power the way we think of it today was not seen until 1860 when Auguste Mouchout, invented the first active solar motor. Since then, people have been fascinated with the idea of converting the sun's energy for everyday use (Higgins 2009).

The amount of energy that humans have been able to convert from the sun has been limited only by human technology. If humans were able to convert all of the sun's energy, we could run our homes, schools, and businesses. Solar power, as it is known today, had major advances around 1958 when it was used in space to power satellite's electrical systems. There has been talk of a solar revolution since the 1970's; yet the technology has proven to be expensive and not efficient until recently. The solar power industry is on the rise, and prices are dropping. There are more solar panels being installed every year, California being the leader in the United States' solar industry. Federal and State governments are now offering many incentives to increase the use of solar energy (SEIA 2010).

With the increase in population and pollutants being produced, it is likely that people will search harder for new and improved sources of clean energy in the near future. There will be a time when the energy sources that we use today will run out. With a rise in fuel prices, concerns about climate change, and an increase in demand for electricity, it is time to strongly consider all

options of alternative energy. According to Higgins (2009) solar power is the leading source of alternative energy for residential and non-residential properties. Farms are an ideal location to place solar panels because they often have large areas of open space. When solar panels are installed on residential or commercial buildings they are limited to the size of the roof of the building. Solar energy has the capability of decreasing or even eliminating energy bills at many levels. For instance, solar power could generate enough energy to power a well, a water heater, refrigeration units, lights inside of a workshop, drying systems for rice and beans, or even a home. If farmers are able to use some of the incentives offered by the state, they may be able to help them pay for the installation of solar panels.

In past few years, there have been many feasibility studies on solar power for residential and non-residential properties. The average payback period for a solar electrical system, without rebates, has been anywhere from 10 to 20 years depending on the size (Schmit 2007). It is important for feasibility studies like this to continued because technology is constantly advancing and incentive programs are becoming more appealing to consumers than ever before. Solar power companies are now able to offer leasing options and no interest payments for up to a year on the installation of a system. With the technological advancement and incentives being offered by the government, it may be the time to invest in solar panels.

Problem Statement

Would it be economically feasible to install and utilize solar power at Bates Nut Farm.

Hypothesis

At this point in time, with tax rebates and other incentives offered by the government, the cost to install solar panels on Bates Nut Farm would not outweigh the benefits that solar power has to offer.

Objectives

1) To determine the cost of installation and maintenance of solar panels on Bates Nut Farm.
2) To evaluate all state and federal solar power incentives that are applicable.
3) To determine the financial feasibility of installation and utilization of solar power on Bates Nut Farm.

Justification

Using solar power is driven by many different factors in the world today. Such as, global warming, sustainability, the search for new sources of fuel, and the basic human need to experiment to discover new technologies. Whatever the reason, it is an industry that is on the rise and California is leading the way (SEIA 2010). Solar power is an area that investors should consider, or investigate further.

The demand for solar power has been constantly growing over the past twenty years. The Solar Energy Industries Association (2010) recently released the 2009 United States Solar

Industry Year in Review, finding 2009 to be another year of strong growth despite the economic recession. In the United States, solar power capacity including both photovoltaic and concentrating solar power installations increased by thirty seven percent from 2008. The strong demand in the residential and utility-scale markets, along with state and federal policy advances and declining technological prices, primarily achieved this. As a result, SEIA (2009) calculated that total solar industry revenue reached $4 billion in the United States in 2008, a thirty six percent increase over 2008. Most impressive, is California's recent reputation of being the "solar capital" of the country. In 2009, California installed 200 megawatts of solar capacity, nearly four times the amount of New Jersey, number two solar state in the country. Altogether, California now boasts a total solar capacity of 1,102 megawatts; ten times that of New Jersey (Higgins 2009).

Solar power in the agriculture sector is not as common as in the residential sector; however, it can be a very practical way to cut cost. According to Glover (2010) of the Sacramento Bee, the Sutter Basin Growers Cooperative, comprised of 125 Northern California rice and bean growers, have installed 11,922 photovoltaic modules on five acres in Sutter-Yolo counties. At off-peak times, thanks to California's net metering system, power and energy credits will rack up for later use. This allows solar powered systems to be the perfect addition for rice and bean-drying operations, and also for agriculture-based companies that don't have to constantly run power; helping decrease the utility charges when harvest comes. This shows that solar panels are not just being used for home, but there are businesses and farms that can benefit as well.

Chapter 2

REVIEW OF THE LITERATURE

Renewable Energy and its Benefits

On the topic of renewable energy, there are many issues that are not clearly understood. Verbruggen (2010) addressed the present confusion by evaluating the cost, potentials, and the benefits of renewable energy. Renewable energy needs to be more clearly understood before people are willing to invest in the technology. He describes renewable energy as being obtained from the continuing or repetitive currents of energy occurring in the natural environment. This includes non-carbon technologies such as solar energy, hydro-power, wind, tide and waves and geothermal heat, as well as carbon-neutral technologies such as biomass.

Addressing the areas surrounding the issue of switching to renewable energy sources gives us a better understanding of its potential and benefits. Verbruggen (2010) shows all potentials of renewable energy including: economic, technological, socioeconomically, physical, and market potentials in detail. The potential benefits include: more jobs in the economy by the creation of a new market, fewer market failures, different lifestyles, new technology, and creating more sustainable environment for future generations. The study also gives examples of actions to overcome barriers that may be brought up by people unwilling to change. Some examples include: education, co-operative agreements, subsidy reform, new measure for tax and incentives, policy initiatives, and even alternative lifestyles.

How Solar Panels Work

Bates and others(2009) explain that solar cells, also called photovoltaic cells, they are used to convert the electromagnetic radiation from the sun into electricity that can be used to power today's electronic gadgets, as well as residential and commercial properties. This is done when silicon is mounted beneath a non-reflective glass to produce photovoltaic panels (solar panels). These panels collect photons from the sun, converting them into direct current (DC) electrical power. The power is created, and then flows into an inverter. The inverter transforms the power into basic voltage and alternating current (AC) electrical power. This is a very brief and general explanation of how solar power works

.

Feasibility:

Over the years, there have been many studies to determine the feasibility of solar power in all areas. Constant changes in technology, and in-state and federal subsidies change the feasibility factors. The results of these investigations are constantly changing from year to year. There are many factors to be determined when evaluating the cost of solar power.

Borenstien (2008) found that the primary cost was installation (parts and labor), which represents the majority costs of the system. After installation, the largest cost the owner of a solar photovoltaic system is expected to face is replacing the inverter. The average life expectancy of an inverter is anywhere from five to ten years. These issues need to be considered when making calculations on the net present value of a photovoltaic system. There are some other factors that Borenstien says need to be considered; the first is the aging effect. Photovoltaic cell production declines over time, with the best estimates in the range of one percent of original capacity per year. The second issue is the "soiling" effect: dirty solar panels absorb less solar radiation and

generate less electricity. This means that cleaning or maintenance fees need to be included in the net present value of the system.

Bates and others (2009), at Westchester Polytechnic Institute, conducted a study on feasibility and the use of solar power for a church. What they evaluate in their study is the startup costs, operating costs, revenue projections, and financing options installing a solar system. With all things being considered, a cash flow analysis and net present value calculations were determined. Based on current prices, a solar panel system installed at Wesley United Methodist church would have a nineteen-year payback period. Bates (2009) determined the break-even point by figuring out when the discounted value of future earnings is equal to the initial investment, in this case, the down payment. In the study, they decided that the church would pay the price of the system without any investors, incentives, or leasing options. Their study resembles the results of many other studies being done at this time.

Schmit (2007) found that the installation price to support an entire ranch would be $592,500. The cost of interest was ultimately the determining factor. If the family could pay for the installation without a loan, the panels would pay for themselves in twenty years and give the family a return of approximately $6,000 per year. This information is useful because it gives an idea of how long it will take owners to see the benefits of solar panels.

Net Metering:

Net metering is the system that measures the amount of energy being used, and has greatly helped the solar industry in California. It allows the system to produce more energy than needs in summer months and not go to waste. When winter comes and there is not as much sun people are

able to use that energy. The U.S. department of Energy (2006) says net metering refers to the method of accounting for a photovoltaic system's electricity production. Net metering is an electric agreement between consumer and their electricity provider, allowing the consumer to offset some, or all, of their energy costs by running the electric meter backward, producing a surplus amount of energy. Running the electricity meter backwards occurs when a client is producing more energy than is currently being used. As a result, in any month with a positive net difference, the customer may choose to receive a credit equal to the average monthly market price of generation per kilowatt-hour. The utility company cannot impose special fees on net metering customers.

The State of California (2010) has recently adjusted their net metering system regulations to help the solar power industry, making solar power more affordable for those who want to invest in alternative energy. On February 26, 2010 Governor Arnold Schwarzenegger signed AB 510, written by assembly member, Nancy Skinner (D-Berkeley), to raise the requirement on net metering in California. This was to help ensure that home and business owners continue to invest in solar power. The current net metering requirement is two and a half percent. This mean that only 2.5% ceiling of Californians are able to take advantage of this net metering system. With solar installations growing in California and more than 50,000 homes and businesses generating their own solar power, many utilities have reached, or are close to meeting this two and a half percent requirement. AB 510 doubles the requirement on net metering to five percent. This will encourage solar energy use.

Incentives for Solar Use

Hubbert (2007) indicates California is leading the United States in mega-watts installed. This has been possible because policies and financial incentives that federal, state, and local government have put in place. Hubbert gives an example of a pro-active community in Berkeley, California, where the city has decided to help pay for the installation, with no interest charge, for families who chose to install solar panels for their home.

Benthem, Gillingham, and Sweeney (2008) claim solar photovoltaic's has experienced rapid growth since 2000, with under five megawatts installed in 2000, nearly 198 megawatts were installed at the end of 2006. This was a result of California government incentive programs. California started solar rebates (a dollar amount per watt installed) and tax credits (a percentage of installation cost of a solar system paid by the state). One of the largest steps the government has taken in to support solar power in California has been the California Solar Initiative (CSI). In 2008 the California Solar Initiative provided more than $3 billion in incentives for solar-energy projects with the objective of providing 3,000 megawatts of solar capacity by 2016.

The program that is most beneficial to farmers who are interested in utilizing solar is the USDA's Rural Energy for America Program (REAP) grants. The program was enacted in 2008 by Congress, and is now administered by the U.S. Department of Agriculture. The Database of State Initiatives for Renewables and Efficiency (DSIRE 2010) statz that the program promotes energy efficiency and renewable energy for agricultural producers and rural small businesses through the use of grants and loan guarantees for energy efficiency improvements and renewable energy systems, and grants for energy audits and renewable energy development assistance. Congress has allocated the funding for the program as followed: $55 million for 2009, $60

million for 2010, $70 million for 2011, and $70 million for 2012 (DSIRE). REAP works by issuing a federal grant up to 25% of the total cost of the project. It is a long process to apply and there are many regulations including geography of the location, it must be for agriculture use, and a bank must guarantee a loan for the project. REAP is design to assist farmers, ranchers, and small rural business owners that are able to demonstrate financial need. According to the USDA Rural Development section 9007 (USDA 2010), all agricultural producers, including farmers and ranchers, who gain 50% or more of their gross income from the agricultural operations are eligible. Small businesses that are located in a rural area can also apply. The deadline to apply for this grant is June 30, 2010. So if farmers, ranchers of rural small businesses are interested in applying for REAP they must do so soon. This

Benthem, Gillingham, and Sweeney (2008) announce the goal behind all solar power financial incentives is to set a path of subsidies, maximizing the discounted present value of net social benefits. This, in turn, maximizes economic efficiency. Right now, the major problem with solar power is the installation price is too high for the average consumer. If the government wants the people to become more sustainable, they are going to have to help. In the article, Benthem (2008) addressed three important topics: (1) is solar currently financially attractive for consumers? (2) how economically efficient is the CSI (California Solar Initiative)? and (3) what would the "optimal" policy look like? In their findings, they conclude that investments in solar energy reduce the energy bill of consumers, resulting in a positive cash flow over the lifetime of the investment. Subsidy policies offered by the CSI reduce the initial installation cost, and thus, directly increase the net present value of the investment. Results suggest that subsidies should start above three dollars per installed watt and drop down to zero dollars in 2017, a very similar

magnitude to the CSI. These subsidies will lead to a self sufficient market and approximately 200,000 residential solar systems in 2018 (Benthem 2008).

Most of the information on solar incentives is directed toward residential properties; however, Bolinger (2009) thinks that non-residential properties are the ones that benefit the most from these government subsidies because of greater federal tax benefits and the larger project size. This would include the majority of agricultural properties. Federal policies that support non-residential photovoltaic development include: investment tax credits, accelerated tax depreciation, and tax credit bonds or clean renewable energy bonds (CREB). Non-residential properties can also include state and local incentives that are also available.

Solar Power in Agriculture

Solar power in agriculture is something that needs to be considered because it can help in many different aspects. New York State Energy Research and Development Authority (2005) talks about many ways that solar power could be used in agriculture, one of these areas is space and water heating. Many pig and poultry farms raise animals in enclosed buildings to control temperature and air quality in an effort to maintain animal health and growth. These facilities need to replace the indoor air regularly to remove moisture, toxic gases, odors, and dust. Heating this air, when necessary, requires large amounts of energy. Solar water heating systems can provide hot water for pen or equipment cleaning, or, for preheating water going into a conventional water heater. Other areas where solar energy can be used in place of gas or conventional electricity are: greenhouses, drying facilities, water pumps, lighting and ventilation for chicken coups.

A great example of a California farm operation that has decided to use solar power is in Sutter County. Glover (2010) explains how The Sutter Basin Growing Cooperative, comprised of 125 Northern California's rice and bean growers, has decided in 2010 to install five acres of 11,922 photovoltaic modules. The panels will help operate the rice and bean dryers during the September to November harvesting season. The co-op believes the system will work perfectly for the their operation because they do not constantly run their dryers. At off-peak times, power and energy credits are built up. Energy savings have been projected at eighty percent or $226,615 the first year, as well as an annual carbon dioxide offset or more than a thousand tons. The system's total cost came to four and a half million dollars; however, the cost has been subsidized by state and federal tax incentives and utility credits. The co-op is leasing the solar facilities through the Farm Credit System, with an option to purchase outright after ten years.

Financing Solar Power Systems

In trying to pay for solar power, consumers need to consider all of the options. The largest issue with solar power is how to finance the installation of photovoltaic systems, while taking advantage of all of the tax incentives. According to Bollinger (2009) there are three legitimate options: 1) balance sheet finance, where the site host finances the project on its balance sheets, 2) operating or capital leasing where the host finances the project through leasing, or 3) Power Purchase Agreements (PPA) host enters a PPA, which in turn is financed by a partnership agreement. All of these options need to be considered and evaluated when making the decision to invest in solar power.

The solar industry is on the rise. Sungevity, one of the leading companies in the solar industry, installed 156 megawatts of residential solar panels in 2009, a 101 percent increase from the previous year. The growth in the solar industry, especially in California, is largely due to the creative financing that the industry and government are offering. There are new ways to purchase solar panels to make them more affordable. A lot of which are talked about previously in the solar power incentives section; however private companies are offering ways to help people finance solar systems as well. According to Todd Woody (2010), a new lease option Sungevity recently began offering its customers represent this creative financing. Rather than purchasing a solar system, customers can lease the system through Sungevity for a monthly fee, thus, avoiding the considerable capital costs of buying the system outright. At the end of the lease agreement there is an option to buy the system at a reduced rate.

Chapter 3

METHODOLOGY

Procedure of Data Collection

The data comes from Bates Nut Farm, located in San Diego County. It is an agricultural business, selling a large variety nuts, dried fruits, and candy year round; as well as, growing 12 acres of pumpkins for the month of October. The company is a good candidate for the use of solar power because it is able to apply for the REAP federal grant. Bates has store lights that operate during the day, in addition to a constantly running three hundred square-foot refrigerated storage room to store inventory. Another advantage for solar power installation is that there is a lot of open land to place the solar panels. Bates Nut Farm will be further interviewed for more information on the company and the refrigeration units they use. Records on their utility bills will also need to be collected.

A variety of solar companies will need to be interviewed for the collection of data regarding the cost of installation and maintenance for photovoltaic systems. The information that needs be gathered from the interview includes: installation costs for a variety of different size systems, an estimate of maintenance charges over twenty to thirty years, and an average conversion rates for the systems in the area. Also, the companies will be asked about what type of photovoltaic system would work best for Bates Nut Farm in San Diego County. A price estimate on the installation of solar panels for Bates Nut Farm will also be necessary.

Information on federal, state, and local incentives for solar power and net metering are found through research on the Database of State Incentives for Renewable Energy, PG&E, Southern California Edison, and the U.S. Department of Energy. Some of the incentives that may be included for photovoltaic systems in San Diego County are: The California Solar Initiative, Southern California Edison's Non-Residential Energy Efficiency Program, and San Diego County's Green Building Program.

Procedure for Data Analysis

After receiving the estimate for the installation of solar panels on Bates Nut Farm, the total cost for the entire life expectancy of the solar panels can be determined. Making a table in Microsoft Excel will give a detailed itemized list of all the charges that will be included over the expected life. Expenses include installation and all maintenance fees, such as replacing converters and cleaning costs. Adding all of these charges together will give the total cost for the entire life expectancy of the solar panels.

The next step in weighing the cost of the solar system being installed on Bates Nut Farm is to calculate the savings that the panels will provide throughout their expected life. With the information given from solar companies and other utility companies in the area, the average per-month conversion of energy is known. It is also important to account for different seasons of the year. Winter months' conversions may be less than summer months' because of the refrigeration units. The next calculation includes determining that savings that will be earned from state and federal incentives. Many of the programs that are offered now have an expiration dates that needs to be included.

Determining how Bates Nut Farm will finance the solar panel project is a major concern. Either a loan or leasing payment structure will need to be determined. With all of this information compiled together, we can determine the net present value of the solar panel system. This will help determine the financial viability of the investment Bates Nut Farm is making. The formula that will be used to determine NPV is:

$$\mathrm{NPV} = \sum_{i=1}^{n} \frac{values_i}{(1+rate)^i}$$

The internal rate of return (IRR) will also be calculated to help determine the financial feasibility of the project. If the IRR exceeds the total cost of the solar panels, then the project should be avoided. The formula to calculate the IRR is:

$$CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_n}{(1+r)^n} = 0$$

After evaluating all of the costs that are included these calculations are the determining factors to whether the solar panels are economically feasible for Bates Nut Farm.

Assumptions

This study assumes that solar power can be used in agriculture at many different levels and not just at Bates Nut Farm. Demand for solar energy is also on the rise because of California's efforts to become a more sustainable state. Bates Nut Farms also have the ability to apply and receive a federal grant from the Government that will pay for up to 25 percent of the project cost. Lastly, all of the information that

Chapter 4

DEVELOPMENT OF THE STUDY

The first step in determining the cost of a solar power system to be utilized at Bates Nut Farm was to figure out how much energy Bates Nut Farm actually uses. After meeting with the owner of Bates Nut Farm and talking about their energy usage, I was able to collect a years worth of PG&E bills for the company. These PG&E bills represent all of the energy usage on the ranch which includes: 2 homes, 2 cold storage facilities, 1 barn, 1 warehouse, 3 water wells, and an administrative office. The total kilowatt usage from September 2009 to August 2010 was 245,840 kilowatts. With the price per kilowatt being $0.166 the total electricity charges with taxes and demand charges included was $40,990.01. (see Appendix 3)

After interviewing with many solar companies and discussing solar power options at Bates Nut Farm, Western Solar based in Poway, California far exceeded all the others. Western Solar specializes in agricultural solar installation. They are also the only company that was willing and able to help Bates Nut Farm apply for REAP (Rural Energy of America Programs) federal grant. This was a major factor in choosing which solar company to use for the project because of all of the extra work that is included in applying for the grant. Western Solar was also able to explain and include all of other incentives into their appraisal. (See Appendix 1)

Western Solar provided an estimated total price of $930,224.40. However there are many incentives that reduce this initial price in the first 10 years years. The REAP federal grant pays for 25% of the projects total cost. This makes the federal grant total $232,556.10, which would be given to Bates Nut Farm for the project. There is a federal tax credit consisting of another

$209,300.49 with the option to spread over 3 years. The Business Energy Investment Tax Credit is for any business with renewable energy use such as solar, wind, biomass, and etc. This credit is 30% for solar, with no maximum level set. Eligible solar powered property includes equipment that uses solar energy to generate electricity, to heat or cool (or provide hot water for use in) a structure, or to provide solar process heat (Database of State Incentives for Renewables & Efficiency, 2010). Lastly, The California Solar Initiative (CSI) offers a performance-based incentive, which accounts for approximately $20,741.32 for 5 years. After all of these incentive programs, the end of the first year the out-of-pocket amount owed by Bates Nut Farms totals $394,708.18.

Table 1. Total Benefits and Savings for 20 Years

Benefits	**Total Amount**
REAP Fed Grant	$232,556.10
Federal Tax Credit	$209,300.49
Performance Base Incentive	$103,706.59
Federal Rebates	$225,346.86
State Rebates	$66,278.49
Avoided SDPG&E Bills	$3,211,560.49

The estimated physical size of the system was approximately half an acre of land consisting of 630 modules with 21 inverters. Bates Nut Farm has this land available and would not take away from any of their current farming operations. The panels that would be used are

poly-crystalline solar modules model SLK60P6L manufactured in the United States by Siliken. The invertors used for the project are also made in the United States by Sunny Boy. The Sunny Boy invertors would give the owners of Bates Nut Farm the ability to go online at anytime to check how each inverter is performing.

Analysis of Investment

To determine the feasibility of the solar project for Bates Nut Farm, a net present value and an internal rate of return analysis for the next 20 years was done. The reason for using 20 years instead of 30 is due to the fact that the solar panels warranty expires after 20 years. Both of these calculations were done using the data organized in Microsoft Excel. The cash flows for each year were determined from the appraisal by Western Solar and include the REAP federal grant, CSI performance-based incentive, federal tax credits, and avoided SDG&E energy bill charges.

The Net Present Value was calculated using a discount rate of 5%, the values of the annual net cash inflows over 20 years, and the initial investment. The Net Present Value of the investment was calculated to be $886,624.16. The internal rate of return was calculated to be 18% using the net totals from the end of each year. The positive NPV with a high IRR means that the investment is beneficial for Bates Nut Farm.

Chapter 5

SUMMARY, CONCLUSION, AND RECOMMONDATIONS

Summary

The purpose of this study was to determine the feasibility of installing solar panels on Bates Nut Farm. Recently, there has been many discussions on creating alternative energies that are more efficient and affordable. Solar power is one of the leading alternative energies today. This is because of the new technologies being invented every year to improve solar power capabilities. Solar panels today are smaller, yet they are yielding almost double the amount of energy from panels ten years ago (SEIA 2010). Incentives for consumers to use solar power have made solar power very attractive to residential, commercial, and agricultural industries.

Right now in 2010 it is a great time for people in agriculture and rural areas to consider solar power, because of the incentives and benefits that are being offered by the government at all levels. The most important of which was the REAP federal grant. The REAP program will pay up to 25% of the total cost of the power efficiency project. Bates Nut Farm is a company that falls under the requirements for this grant. It is a small agricultural company in a rural area that spends over $40,000 on their electricity bills each year. The cost of a project this size is estimated to be $930,224.40; however, with all the federal and state incentive programs the price at the end of the first year is estimated to be $394,708.18. The savings alone from avoided SDP&G bills over 25 years is $3,211,560.49. This study is based on data collected from Bates Nut Farm and Western Solar.

Conclusion

Like many businesses, Bates Nut Farm was very skeptical of what solar power could do for their business. Some of the concerns Bates Nut Farm had about doing a solar project on their property included: where to put the solar panels and the amount of land that it would require, how to finance the project, and how expensive the project was going to be.

The amount of energy being used by Bates Nut Farm is 245,840 kilowatts costing them $40,990 in 2009. For a system this large the estimated physical size of the system was approximately half an acre of land consisting of 630 modules with 21 inverters. Bates Nut Farm has this land available close to their meter and would not take away from any of their current recreational park area or any farming operations. To finance this project, because of the REAP program, Bates Nut Farm would have to have a loan guaranteed by a bank even if they had the money to pay for it in full.

After reviewing the cost of the project and including all of the federal and state incentives that would be included in the project for Bates Nut Farm it was determined that that over 20 years, (the expected life of the solar panels) the project had a positive net present value of $886,624.16 and an internal rate of return of 18%. The main cash inflow that the company receives from this investment is the savings from what they would be paying for PG&E bills. As the price of energy is increased by an average of .08% each year the amount being saved each year increases dramatically over time for a project this size. The positive net present value and internal rate of return show that the investment of solar panels could be beneficial to the company.

Recommendations

Since there is a positive net present value and an internal rate of return of 18% it is recommended that Bates Nut Farm make the investment in solar power. They have the land available and the installation would not affect any of their current business. This was a major concern for the owners. In many cases people might actually like to see the panels on the property because it shows that you are a "green" company. If the Bates Nut Farm has the ability to finance the project now would be a good time to invest in solar power. Western Solar has offered to do all of the work necessary to apply for the REAP federal grant. It is important to take advantage of this grant before it expires in June of 2011.

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