

Solar Energy in Pakistan: Benefits of developing standalone projects for the industrial sector in the country.

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Abstract

In the rising trend for alternative energy sources as the world shifts to renewable energy, solar has become the most prominent of them. Using solar energy in the industrial sector of Pakistan has been the focus of the current study. The industrial sector remains the largest consumer for electricity within Pakistan. Selecting a sample size of 115 employees for the questionnaire and 5 managers for interviews made it possible for the effective data collection. Using the SPSS reliability was tested for the data as well. Findings from the research have led to the belief that standalone solar projects in the industrial sector are the new trend and are yet to be accepted widely. Awareness for such standalone projects of solar energy is available throughout the industrial sector with both employees and managers aware of its benefits. Benefits are cost-effectiveness, lack of dependence on the national grid and increased access to the uninterrupted power supply.

Keywords: Standalone solar projects, electricity consumption in the industrial sector, Pakistan energy consumption

Table of Contents

1	Introduction	4
1.1	Research Objectives	5
1.2	Hypothesis	5
1.3	Research Gap.....	5
2	Literature Review	6
2.1	Renewable source.....	6
2.2	Solar energy as a renewable source and its benefits	6
2.3	Pakistan energy sector and the role of renewable energy	6
2.4	The pervasive use of solar energy in Pakistan	7
2.5	Benefits of developing standalone projects for the industrial sector	7
2.6	Government policies for electricity via solar energy	8
2.7	Empirical study	8
2.8	Conceptual framework.....	9
3	Methodology.....	9
4	Discussion and findings.....	10
4.1	Demographic Analysis	10
4.2	Cost Effective.....	10
4.3	Lack of Dependence on National Grid.....	11
4.4	Uninterrupted Power Supply	11
4.5	SPSS Analysis.....	13
5	Conclusion.....	14
6	References	16
7	Appendix	18
7.1	Questionnaire	18
	Questionnaire	18
7.2	Interview Questions.....	19

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1 Introduction

In the view of Khan & Pervaiz (2013), in current era, different renewable energy is considered by management because of increase in energy demand. At the global scale, authorities are concentrated because of the lack of energy resources and to overcome future problem authorities are likely to use different renewable sources. Solar energy is one of the convenient sources which is considered by the citizens of the world because it is cost-effective and does not require too much technology. The solar projects are considered as they can be implemented at small or large scale. However, solar project requires sunlight, solar PV, battery and activators. It has been observed that Pakistan is facing issues of lack of energy due to which government, as well as firms, are considering the solar projects as a solution. The industry managers are likely to use a standalone project because the cost of operations will be reduced, and management can fulfil energy needs of industry in operations effectively.

As per the study of Zafar et al. (2018), energy is playing a crucial role in the development of the economy. Moreover, energy demand is increasing rapidly in each sector. Most of the countries are facing energy issues, and citizen is suffering because of insufficient supply. In addition, the government and energy sector management is focused on internal operations as it has a negative effect on the environment. The managers of the energy sector, as well as industry managers, are

looking for the solution as it is impacting economy of the country negatively. The industry manager of Pakistan is likely to use a solar project to enhance the operations and perform activities with sustainability.

In Pakistan, shortage of electricity affected lives of an individual as well as the overall economy of the country. It has been observed that in the past few years, energy demand is increasing and major reason behind it is technology development and changes in working practices. The other renewable resources which are considered by the people of the country include wind energy, solar energy and biomass. However, before taking any action, management is concerned about infrastructure as proper planning is required before adopting any of the solutions. Along with infrastructure, experts of the fields are likely to adopt a solution which does not effect on environment negatively such as fossil fuel is one of the solutions which can fulfil energy needs but, it has a negative impact on environment (Zafar et al., 2018).

According to Khan & Khan (2010), energy issues are raised in each sector, and one of the major industry that is affected because of load shedding is textile. Moreover, load shedding in textile is a common issue as due to which 30% of the production of the overall industry has been reduced. The load-shedding become barrier as managers of the textile industry are not able to fulfil their orders. The increase in the cost of operations is also one of the major issues that are faced by the managers of the industry.

However, to eliminate the issues industry managers are working on alternative sources

which can fulfil the needs as well as it boosts the economy of Pakistan. The industry managers are working on renewable energy sources and likely to work with their own standalone projects as it improves the operations and contributes to the growth and profitability (Alter & Syed, 2011). One major issue which will be resolved with the help of renewable energy is that tariffs of the energy sector are also increasing which is creating further problems. However, renewable energy reduces cost of operations as well as with the help of standalone solar project needs of the business will be fulfilled, and management gets uninterrupted energy supply.

1.1 Research Objectives

The research objectives are designed to complete study systematically and evaluate the topic of a study appropriately.

- To understand and develop importance related to solar energy as a renewable source of energy.
- To analyze the support of industrial consumption by the pervasive use of Solar Energy in Pakistan.
- To evaluate the benefits of developing standalone projects for the industrial sector within Pakistan.
- To provide recommendations for the industrial sector in order to promote the pervasive use of standalone solar projects.

1.2 Hypothesis

H₁: There is a significant impact of solar energy standalone projects on the industrial sector in Pakistan

H₀: There is no significant impact of solar energy standalone projects on the industrial sector in Pakistan

H₂: There is a significant rise in the persuasive use of solar energy and its impact on the industrial sector in Pakistan

H₀: There is no significant rise in the persuasive use of solar energy and its impact on the industrial sector in Pakistan

H₃: There is a beneficial impact of standalone solar projects on the industrial sector of Pakistan

H₀: There is no beneficial impact of standalone solar projects on the industrial sector of Pakistan

1.3 Research Gap

According to Irfan *et al.* (2019), the energy needs in modern era has been increased due to rapid development in technology and changes in business operations. In the past few years, industry sector of Pakistan faced numerous challenges due to lack of energy supply. However, the country is rich in the natural resources but, allocation of resources is not done appropriately. The researcher highlighted that solar energy as a solution as it reduces cost of the operations. However, there is a need for awareness in Pakistan market related to solar projects implementation. The prior studies are mainly conducted on the lack of energy in Pakistan, but, in past information is not gathered related to the industrial sector. The current study, fulfil the gap by gaining information about the benefits of standalone solar projects and highlight its benefits to enhance the findings of the study.

2 Literature Review

2.1 Renewable source

The practices of the working changed at global scale due to changes in the overall business operations, and demand of the energy has been increased. The technology is implemented in each sector, which increase the needs of energy. The multiple countries are shifting their operations of energy management towards renewable sources. The energy needs can be fulfilled with the help of hydroelectric, solar energy, wind technology, geothermal, biomass and ocean. All of renewable sources have different requirements due to which government are likely to consider new sources as per the infrastructure to utilize all benefits effectively (Black, 2018).

2.2 Solar energy as a renewable source and its benefits

Solar energy is one of the renewables, which is considered as it is free of cost. The economies are facing challenges because of energy. The solar energy is one of alternative sources, which is considered as it is cost-effective. The solar energy is one of renewable source which help the economies to overcome the challenges (Kabir et al., 2018). In addition, solar energy has multiple benefits which are being considered at the global scale. Anyone can develop the solar project as it works on both scales small and large. It fulfils the demand of the industry sector and does not impact the environment negatively. The solar energy enhances the productivity of overall operations which also affect positively on the economy of a country. It is one of the ways through which governments can get uninterrupted power

supply and fulfil the need of each sector effectively (Kannan& Vakeesan, 2016).

2.3 Pakistan energy sector and the role of renewable energy

Pakistan is one of the countries that are rich in the natural resources some of the natural sources are hydro, liquid, oil, nuclear, natural gas and LPG. However, authority members are working on energy sector development and likely to utilize natural resources effectively as it provides long-run benefit. The management is likely to consider solar energy as primary solution because sunshine in the country for around 300 days which is an ideal situation for solar projects. The management of the industry, as well as experts of the firms, are likely to consider solar energy as a solution because needs of energy are increasing and resources are limited as management does not work on alternative source yet.

As per the climatic condition of Pakistan citizen can implement solar energy setup at the rooftop of their home as sunlight is at 24 to 35 degree most of the days (Shaikh *et al.*, 2013). It has been derived from the study of Devabhaktuni *et al.* (2013), the solar project has a significant impact on the economy of Pakistan. The PV cell prices are also declining, which is one of the major tools for the solar project. Further, it is added by the Zafar et al. (2018), the location of Pakistan can be considered as ideal for the solar project. The management of Pakistan can design a proper plan to implement solar projects as it allows overcoming the future challenges of energy effectively.

2.4 The pervasive use of solar energy in Pakistan

According to Aslam et al. (2015), the energy needs in Pakistan is increasing rapidly, and it has been estimated that demand will reach to 49,018 MW by the year 2025. However, more issues are rising because the demand for energy is increasing, but, supply is at the same level. Due to lack of supply of electricity entire industrial sector has been affected negatively. The authorities are working to derived energy from different resources as it allows management to overcome the problem. The government of Pakistan is supporting pervasive use of solar energy in the country as it is cost-effective and helps management to fulfil the needs effectively.

The industry managers are concerned about energy needs as well as want to make the country green because of which they are taking the initiative for future. It has been observed that PTCL management started working on a solar project, and they implemented it in their headquarter. PTCL has an alternative source which allows them to get energy from their own standalone project, as well as it reduces the dependency on the national grid (Phone World, 2019). Further, solar energy is considered as a solution by some other companies as well, such as the Danish company is likely to spend money in solar panels to resolve the issues. The current share of renewable energy is only four per cent which is likely to increase to 20% till the year 2030. The government authorities are further moulding the policies to increase the adoption of solar energy (Radio Pakistan, 2019).

2.5 Benefits of developing standalone projects for the industrial sector

As per the Pakistan Observer (2019), the changes in Pakistan industry has been observed to promote renewable energy. It has been added by Minister for Science and Technology, Fawad Hussain Chaudhary, the government is focused on solar projects and likely to invest more to overcome the problems. In Pakistan, the government is also showing concern towards the industrial sector because growth of the economy is dependent on industries. Further, in the view of The Nation (2019), solar projects are encouraged because it reduces per unit cost, which reduces overall operational cost. In the past few years, it has been observed that managers of the firm are likely to invest money in a standalone solar project. It is estimated that through solar project operations in the industrial sector will increase, which further create jobs. The government is also working on grid policies and focus on the development of infrastructure.

As per The Express Tribune (2019), it has been estimated that around \$700 million is invested in Pakistan Power Sector. Further, the government is also working on the cost of operations because per unit electricity cost in Pakistan is quite high. The government is likely to take benefit from renewable energy as it allow authorities to eliminate the energy-related problem in future and perform activities with sustainability. It has been observed that Pakistan have best geographic location for standalone solar projects which allow the industry managers to start their own plants and take benefit for long-run.

2.6 Government policies for electricity via solar energy

The energy-related issues in Pakistan are getting worse day by day due to which authorities members are concerned. The government is likely to promote solar energy practices and also creating awareness among the people because national grid is not able to fulfil the demand. According to Mukhtar (2019), the government of Pakistan is supporting the people who are working on solar projects. In future, the government is likely to eliminate tariffs from the solar project operations as it encourages more people to invest in the technology. The solar project is a one-time investment that provides benefit in the long-run. It has been derived from the data of Alternate Energy Development Board (AEDB) that in Pakistan, around 6% of the energy is generated through renewable sources. The government is working to increase the numbers of renewable project. The tax reeducation is used as a strategy by authority members as it might fulfil the demand of electricity in future effectively.

Ministry of Energy Power Division Government of Pakistan (2019), the policies are designed for solar projects and most of them are developed in favour of the citizens to encourage them so they can shift towards solar energy. The government kept complete information on the solar project as it helps management in designing strategies. According to the Ministry of Energy Power Division Government of Pakistan (2019), \$2 billion has been invested by the government of Pakistan for next three years and managers is likely to work on multiple solar

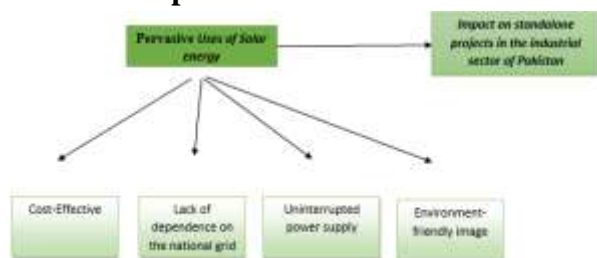
projects to fulfil the electricity demand of each sector.

2.7 Empirical study

As per the study of Irfan et al. (2015), energy is one of the sources that contribute significantly to the economy of Pakistan. However, each individual needs energy for some of the purpose. Pakistan is one of the developing countries and economy of the country is also growing. However, the demand for energy is increasing rapidly, but, sources of the supply are limited due to which issues are raised. The government is working on the policies as a shortage of energy becomes a common problem in Pakistan. All sectors in Pakistan is facing issues from the past few years. It has been highlighted by the author that renewable energy becomes the need of Pakistan.

On the other hand, the energy shortage problems aroused in the world, and it is faced by commercial, agriculture and even residential sector is facing issues related to lack of electricity. To eliminate the problem for the long-run government of Pakistan is likely to invest the money in solar energy and encouraging others as well. The government is promoting development of the energy sector because it is impacting on export negatively as well as the overall economy (Khalil & Zaidi, 2014). In contrary, as per the study of Asif (2009), the energy needs are common in Pakistan; however; government can overcome it easily by using the natural resources. Some of the potential sources of renewable energy that are available in Pakistan include solar energy, geothermal energy, hydro-power and wind energy.

2.8 Conceptual framework



3 Methodology

The methodology is the step by step approach, which is considered by researchers to complete the study in an appropriate manner. It allows the researchers to select appropriate techniques to complete the requirement of the data collection effectively. According to the Silverman (2016), approach of the study is considered by researchers to gain knowledge from where further information will be gathered. The two main approaches are inductive and deductive. The inductive approach is used when the researcher is likely to study variables in detail and likely to develop new theories. In the current study, the researcher has been used deductive approach because data is collected in the numerical form, and the researcher is likely to test the relationship among variables. The study has been based on the existing concepts because of which the researcher selected inductive approach as the hypothesis of the study were design at the start of the research. Further, positivism philosophy is considered by the researcher because data is gathered in quantitative form. The researcher presents logical information as data is presented in a numeric form, which has been tested further with the help of software. The researcher

also collects information through the interview as it creates a better understanding and help in concluding the findings of the study appropriately.

Research design allows the researcher to gain information from the required sources in a systematic manner. The common designs of research are descriptive, explanatory and exploratory. The descriptive design is considered by researchers when they derive information only from a secondary source and likely to conclude results without mentioning any kind of reasoning (Smith, 2015). In the present study, the researcher followed explanatory design because it allowed the researcher to provide information about each variable in detail. The researcher is likely to highlight relationship among the variables as well as to full requirement the researcher provide proper reasoning. In addition, to complete the study effectively, the researcher has been used mixed technique. The mixed technique has been selected as it allows the researcher to gather information from the questionnaire as well as from the interview. The quantitative information has been collected as it allows the researcher to collect a large number of data in a limited time period. Further, with the help of the interview, the researcher can gain information related to solar energy in Pakistan and the benefits of developing standalone projects for the industrial sector in the country in detail.

Taylor et al. (2015). The researchers consider strategy as it is a complete action plan to gather information from accurate sources. Some of the research technique are case study, survey and ethnography. For the

present study, the researcher used a survey approach as it allows the researcher to gain data from numerous respondents in a short period of time. However, ethnography strategy allows the researcher to gain information from the experts of the field with the help of interview. The sample size and technique is also considered by the researcher to gain knowledge from appropriate respondents. The sample size presents the population of the study. However, for a survey, the researcher gathers data from 115 employees, and convenience sampling technique has been used. The sample size for an interview is five, and the snowball technique has been adopted. The data of interview is gathered from manager of industries. The information has been gathered from both primary and secondary sources as it allows the researcher to fulfil all requirement of objectives effectively.

4 Discussion and findings

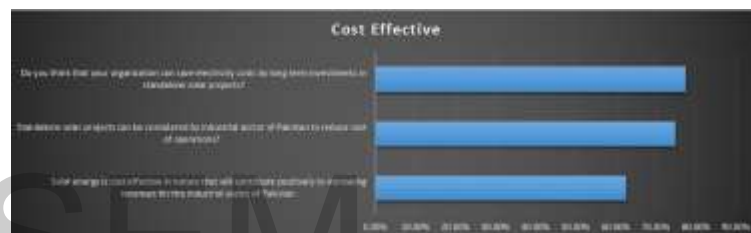
4.1 Demographic Analysis

The total respondents of the survey are 115, and further detail is mention related to responses in the table below:

Departments	Responses
Project management department	18 respondents
Financial department	38 respondents
Engineering department	16 respondents
Quality assurance department	15 respondents
HR department	15

	respondents
Maintenance department	13 respondents
Year of Employments	Responses
Less than one year	19 respondents
1-3 years	53 respondents
3-5 years	31 respondents
More than five years	12 respondents

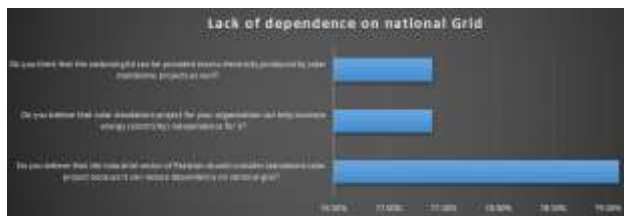
4.2 Cost-Effective



In light with literature, it has been found that multiple countries are likely to use solar energy to fulfil the needs of the citizen. The one common reason behind it is that solar energy is cost-effective and does not require any kind of high-tech (Kabir *et al.*, 2018) as it can be observed from the primary source that the organization can save electricity costs by long term investments in a standalone solar project. Further, it is added that standalone solar projects can be considered by industrial sector of Pakistan to reduce the cost of operations. According to Kannan & Vakeesan (2016), changes in the demand of the industry is rapid related to the energy needs, and it has been derived that renewable energy is a solution. It has been found that solar projects are supported by industrial and non-industrial sector of Pakistan, and it can fulfil the needs of

energy effectively as well as the cost of operation will be reduced. It has been derived from the interview analysis, development of a standalone project is promoted by the industry managers of Pakistan because it fulfils the needs of energy and reduces the cost of operation. However, with the help of solar energy cost of final goods will be decreased and it allows management to perform production activities smoothly.

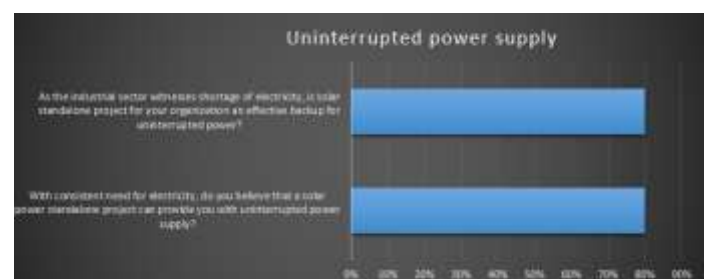
4.3 Lack of Dependence on National Grid



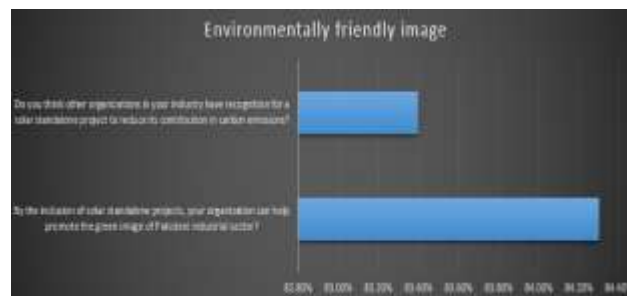
The actions are taken by the industry manager to reduce the dependency on the national grid of Pakistan because of shortage issues. The initiatives are taken by experts of the industry to work on their standalone projects. It has been found that initiative is taken by the PTCL government for further enhancement of the operations. PTCL management started working on a solar project. It has been added by the Chief technology and information officer, that PTCL can fulfil their need for electricity which reduce allow management to perform with new project as it eliminates the dependency on national grid. It provides long-term benefit and make an image of Pakistan greener (Pakistan World, 2019). Most of the respondents agreed that they believe the industrial sector of Pakistan should consider standalone solar project because it can reduce dependency on the

national grid. On the other hand, participants of questionnaire acted positively that standalone solar project in an organization can help increase energy (electricity) independence for it. Participants of the survey agreed that they think the national grid can be provided excess electricity produced by standalone solar projects as well. According to Radio Pakistan (2019), Danish Company is likely to invest in the manufacturing of solar panel, which provides convenience to other citizens also. The government of Pakistan is also working on the sources of renewable energy and likely to mould policies for further development. The government is supporting the people who are likely to implement stand solar projects. Moreover, it is added from the primary source that the industrial sector of Pakistan is focused on the development of renewable energy. It is added by an expert of the industry that management is performing operations at large scale due to which alternative source of energy become the need of an organization. The management is designing strategies and allocating resources to work on standalone solar projects for further development.

4.4 Uninterrupted Power Supply



In light of the secondary source, the industrial sector of Pakistan is facing multiple challenges from the past few years due to lack of energy production. The current condition of Pakistan is not in favour to perform the business operation at a larger scale because management is not able to fulfil the needs of citizens. It has been suggested by the energy sector authorities to the industrial sector that they should consider standalone projects to perform business activities effectively. The major benefit is highlighted that with the help of a solar project, the industry managers get an uninterrupted power supply for long-run (KC, 2019). As per the survey result, most of the respondents agreed that consistent need for electricity solar power standalone project could provide industries uninterrupted power supply. Similarly, respondents acted positively on the statement that the industrial sector witnessed's shortage of electricity is a standalone solar project is an effective backup for uninterrupted power. However, it is added by the expert of the industry that solar projects are a game-changer because it resolves the major issues which have been faced by the firms. The managers of the firm can perform operations without any problems and get uninterrupted electricity supply which impacts positively on overall operations. The managers of firms are likely to invest in solar projects.



The last variable of the questionnaire is environments friendly image, as it has been observed from the secondary source that solar project does not affect the environment negatively and develop a greener image of the country. In addition, as per the study of Kabir et al. (2018), solar projects are considered on a global scale because it is environment-friendly. By the inclusion of standalone solar projects, your organization can help promote the green image of Pakistani industrial sector, on the statement, around 83.40% of respondents agreed. However, around 84.30% of participants acted positively on the statement that they think in their industry have recognition for a standalone solar project to reduce its contribution to carbon emissions. .Kannan& Vakeesan, (2016), the demand for the solar project has been increased because it enhances the productivity of the industrial sector of Pakistan. Also, the source develops an eco-friendly image which provides a long-term benefit to the overall country. It has been found that with the help of solar project balance developed in nature which positively impacts on the living environment.

4.5 SPSS Analysis

Reliability Statistics

Cronbach's Alpha	N of Items
.679	14

Figure 1: Reliability Statistics

The data of the study is reliable because, after the testing of the data, it has been derived that value of Cronbach Alpha is 0.679, which is more than 0.50. If the value was less than 0.50, the researcher needs to conduct a survey of the study again.

		Production of Solar Panels in Pakistan	Cost Effective	Uninterrupted Power Supply	Environmentally Friendly Image	Lack of Dependence on National Grid
Production of Solar Panels in Pakistan	Pearson Correlation	1	.713	.713	.939	.939
	Sig. (2-tailed)		.001	.001	.000	.000
	N	115	115	115	115	115
Cost Effective	Pearson Correlation	-.318	1	.862	-.216	.587
	Sig. (2-tailed)	.001		.000	.003	.257
	N	115	115	115	115	115
Uninterrupted Power Supply	Pearson Correlation	.713	.862	1	.096	.819
	Sig. (2-tailed)	.001	.000		.830	.000
	N	115	115	115	115	115
Environmentally Friendly Image	Pearson Correlation	.939	-.216	.096	1	.790
	Sig. (2-tailed)	.000	.003	.830		.000
	N	115	115	115	115	115
Lack of Dependence on National Grid	Pearson Correlation	.939	.587	.819	.790	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	115	115	115	115	115

Figure 2: Correlation Test

The correlation test has been conducted by the researcher to gain knowledge about the relationship among variables. The uninterrupted power supply and use of solar energy in Pakistan derived value is 0.713, which concludes that the relationship among the variable is strong as value is more than 0.40. Further, the value has been derived for the environment-friendly image and standalone solar project it has a strong relationship because with the help of test Pearson value is around 0.939. Lack of dependency also have a strong relationship

as derived value is 6.88, and the cost-effective have a negative correlation with the impact on the standalone project.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.951 ^a	.904	.901	.24748

a. Predictors: (Constant), LackOfDependenceOnNationalGrid, CostEffective, UninterruptedPowerSupply, EnvironmentallyFriendlyImage

Figure 3: Model Summary

The R square value should be more than 0.50 to measure the impact. In the current study, the value of R square is 0.951, which shows variation among the dependent and independent variables.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.754	4	15.939	260.234	.000 ^b
	Residual	6.737	110	.061		
	Total	70.491	114			

a. Dependent Variable: ImpactOnStandaloneProjectsForIndustrialSectorInPakistan
b. Predictors: (Constant), LackOfDependenceOnNationalGrid, CostEffective, UninterruptedPowerSupply, EnvironmentallyFriendlyImage

Figure 4: Anova

The value of F test should be greater than 3.5, and in the current test recorded value is 260.234.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Betas		
1	(Constant)	.701	.081		8.624	.000
	CostEffective	-.115	.027	-.166	-4.304	.000
	UninterruptedPowerSupply	.153	.038	.186	3.935	.000
	EnvironmentallyFriendlyImage	.353	.035	.657	10.096	.000
	LackOfDependenceOnNationalGrid	.118	.037	.149	3.182	.002

a. Dependent Variable: ImpactOnStandaloneProjectsForIndustrialSectorInPakistan

Figure 5: Co-efficient

The alternative hypothesis of the study is accepted as the sig value of all variable is less than 0.05.

Y (standalone projects for industrial sector in Pakistan) = $\beta - \beta_1 (0.115) + \beta_2 (0.153) + \beta_3 (0.353) + \beta_4 (0.118) + e$

5 Conclusion

The above study is mainly focused on Solar Energy in Pakistan: Benefits of developing standalone projects for the industrial sector in the country. The information has been gathered from the prior studies, questionnaire survey and interviews. It has been concluded that solar energy has been considered by the world as it is cost-effective. The solar energy is one of the renewable sources that is considered because its implementation does not require too much technology, and it creates ease in the life of people. However, it has been concluded that solar projects can be implemented by the industry sector managers because it allows them to perform operations with sustainability without any problem of shortage or interruption. It has been suggested that the Pakistan government is considering the solar project as a solution because it eliminates the problem of shortage for long-run and it develops a greener image of the country. The solar energy also decreases dependency of the industrial sector on the national grid. Government of Pakistan is supporting the solar projects and eliminating the taxes for the development of solar projects as it motivate people to shift towards it. Solar standalone projects increase the revenue of

industry as well as exports which positively impact on the economy of the country. It also allows the industry managers to perform the operation without interruption and reduced the problem which they are facing related to tariffs.

H₁: There is a significant impact of solar energy standalone projects on the industrial sector in Pakistan

The hypothesis of the study is accepted as it has been observed that solar energy standalone projects have a significant impact on the industrial sector of Pakistan. It is one of the solutions which has been considered by the industry managers as well as the government also. It reduces the cost of operations and promotes sustainable development in the operations which affect positively on the revenues of the entire industrial sector of Pakistan.

H₂: There is a significant rise in the persuasive use of solar energy and its impact on the industrial sector in Pakistan

It has been observed that there is a significant rise in the persuasive use of solar energy and its impact on the industrial sector in Pakistan because of which hypothesis is accepted. It has been derived from the primary and secondary source that solar project will become common in the future because the government of Pakistan is encouraging its implementation and eliminated further taxes from standalone projects. Further, industry managers are considering solar projects as an ultimate solution because Pakistan has an ideal geographic location for solar projects.

H₃: There is a beneficial impact of standalone solar projects on the industrial sector of Pakistan

Solar projects have multiple benefits, and one major benefit is it eliminates the future problem of energy from the country. Further, each individual in the country can take benefit from solar energy because it can be used at both scales small and large. The above mention hypothesis has been accepted because industrial sector operations get enhanced from solar energy and cost of overall operations will be reduced. The management can perform operations with sustainability and likely to perform actions at a large scale. Also, it eliminates taxes from the electricity operations as well as

reduce the dependency of the industry on the national grid.

It has been concluded from the above study that renewable energy becomes the trend. It fulfils the needs of the people easily, and citizens of Pakistan are likely to shift towards the standalone solar projects. The solar projects provide benefit to the industrial sector of Pakistan and contribute to the growth of the economy. However, it reduces the pressure from the energy authorities related to the shortage of electricity. There is a significant scope of a solar project in Pakistan because of the ideal geographic situation.

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7 Appendix

7.1 Questionnaire

Questionnaire					
Department					
Project management	Financial department	Engineering department	Quality assurance department	Maintenance department	HR department
Years of employment					
Less than one year	1-3 years	3-5 years	More than 5 year		
Statements					
Cost-effective					
Solar energy is cost-effective in nature that will contribute positively to increasing revenues for the industrial sector of Pakistan:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Standalone solar projects can be considered by industrial sector of Pakistan to reduce cost of operations?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Do you think that your organization can save electricity costs by long term investments in standalone solar projects?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Lack of dependence on national Grid					
Do you believe that the industrial sector of Pakistan should consider standalone solar project because it can reduce dependency on national grid?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Do you believe that solar standalone project for your organization can help increase energy (electricity) independence for it?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
Do you think that the national grid can be provided excess electricity produced by solar standalone projects as well?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	

Uninterrupted power supply				
With consistent need for electricity, do you believe that a solar power standalone project can provide you with uninterrupted power supply?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
As the industrial sector witnesses shortage of electricity, is solar standalone project for your organization an effective backup for uninterrupted power?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Environmentally friendly image				
By the inclusion of solar standalone projects, your organization can help promote the green image of Pakistani industrial sector?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Do you think other organizations in your industry have recognition for a solar standalone project to reduce its contribution in carbon emissions?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

7.2 Interview Questions

1. What role has your organization played in promoting the use of solar energy in Pakistan?
2. Is your organization involved in developing standalone projects pertaining to solar energy? What benefits do you think it is likely to offer?
3. Is the role of the government of Pakistan justified or do you think they need to take into consideration the projects that promote solar energy?
4. Are other firms working in your industry contributing well, why or why not?
5. Is a standalone solar project the result of necessity or as an initiative for greener operations?