Final Year Project Showcase Batch 2016

Department of Civil Engineering Civil Engineering Program		
1	**Project Idea**	**AN ANALYSIS OF ROOFTOP SOLAR PHOTOVOLTAIC POTENTIAL**
2	**Process**	Today solar energy, is one of the most popular renewable energy source. Solar Photovoltaic (PV) is rapidly gaining popularity in recent years because of reduction in cost. However, its deployment requires large land requirement. Further, it has water requirements for the cleansing of PV panels, to maintain their efficiency. Another perspective of this research work is to highlight a profound environmental issue of carbon emissions due to burning of fossil fuel for the production of electricity.
3	**Outcome**	The work proposed a manual technique for the extraction of useful rooftop area of 19100 m^2. Shading analysis was done to extract unshaded area by using Revit 2019. PV power generation by utilizing this rooftop area was 5055 MWh per year. Water requirements for efficiency maintenance were estimated as 26,290 gallons per year. Carbon dioxide emissions can be avoided by installing PV system and it resulted in 989,516 kg per year CO_2 reduction.
4	**Evidences (Theoretical Basis)**	Increasing population, changing climate and environmental pollution are the profound issues of this century. Burning of fossil fuel is the major cause for the production of CO_2 and other gases that intensify the greenhouse effect. Many researchers have highlighted that renewable energy provides an alternate solution for sustainable electricity production by replacement of hydrocarbon based fossil fuels with renewable sources. Comparatively renewable energy sources may have a higher cost disadvantage, but their environmental friendless make them a preferable energy source.
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what. You can select one or more from following dropdown and delete rest of them) Please keep relevant options, delete rest of them and correct the sequence	
b	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of whole process** (e.g. What is issue is current process and what improvement you suggests)	Among different renewable energy sources, solar photovoltaic (PV) is among the most revolutionary renewable energy source. Different countries have introduced various incentives and policies to develop and promote solar PV. The major obstacles in the way for solar PV system implementation is the availability of land, and water requirements to maintain the efficiency of the panels. Karachi, the mega city of Pakistan, has witnessed intense urbanization during the last decades. Increasing population and constant load-shedding, makes solar

		PV a viable option. Further, Karachi has a great potential for solar PV installation, to fulfill the energy requirements of its millions of urban households due to the significant solar resource availability throughout the year. Because of urbanization, space is limited so placement of PV panel is usually only possible on rooftops. This project deals with the interconnection of these major issues.
c	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	SDG Goal 7 affordable and clean energy SDG Goal 11 sustainable cities and communities SDG Goal 12 responsible consumption and production They are achieved through the following objectives. To find suitable amount of roof area available for the installation of PV panels. 1. To estimate the rooftop PV potential considering shading analysis, solar insolation levels, inclination angle and efficiency of PV module. 2. To estimate the operational water requirement for PV panel for maintenance of efficiency. 3. To estimate the carbon emissions reduction because of PV installation Study area selected was a section of Bahria Town, Karachi. Houses of same architectural plan were selected to replicate calculation of a single house to multiple houses having same orientation. Operational water requirements were estimated for cleaning the solar panels for efficiency maintenance, as well as reduction in carbon emissions due to PV installation. This project is necessary for a city like Karachi, since Karachi is a mega city of Pakistan, and has witnessed intense urbanization during the last decades. Increasing population and constant load-shedding, makes solar PV a viable option. Further, Karachi has a great potential for solar PV installation, to fulfill the energy requirements of its millions of urban households due to the significant solar resource availability throughout the year. Because of urbanization, space is limited so placement of PV panel is usually only possible on rooftops. Further, Karachi has issue of high levels of atmospheric dust; dust settlement on the PV panels for extended period can lead to significant reduction of PV energy generation potential. Thus, operational water requirements were estimated for cleaning the solar panels for efficiency maintenance.
f	**Any Environmental Aspect** (e.g. carbon reduction, energy efficient etc.)	Installation of rooftop solar PV would lead to reduced carbon emissions, which were also estimated.
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about user of the product, process or service	This study can benefit design engineers, researchers, as well as Karachi residents as a guide for estimation of rooftop PV potential, operational water requirements and reduction of

		carbon emissions.
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