

Major project - II

Dissertation On

**DESIGN, PERFORMANCE AND ECONOMIC ANALYSIS OF 40 kW SOLAR
PHOTOVOLTAIC SYSTEM AT DTU ROOFTOP**

Submitted to Delhi Technological University in Partial fulfillment for awarding the

Degree of

**Master of Technology
(Thermal Engineering)**



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DECLARATION

I, hereby declare that the work embodied in the dissertation entitled “**DESIGN, PERFORMANCE AND ECONOMIC ANALYSIS OF 40 kW SOLAR PHOTOVOLTAIC SYSTEM AT DTU ROOFTOP**” in partial fulfillment for awarding the degree of **Master of Technology in Thermal Engineering**, is an original piece of work carried out by me. I have been working on this thesis under the supervision of **Dr.J.P.Kesari, Associate Professor**, and **Dr. R. S. Mishra Professor & Head**, Department of Mechanical Engineering, Delhi Technological University.

I also declare that the matter of this work either in full or in part have not been submitted to any other institution or University for the award of any other Degree or Diploma or any other purpose what so ever. All the literature sources which I have used are cited in the references.

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CERTIFICATE

It is to certify that the dissertation entitled “**DESIGN, PERFORMANCE AND ECONOMIC ANALYSIS OF 40 kW SOLAR PHOTOVOLTAIC SYSTEM AT DTU ROOFTOP**” submitted by **Mr. Pawan Sharma**, Roll No. **2K14/THE/14** in partial fulfillment for awarding the degree of **Master of Technology in Thermal Engineering** is an authentic record of student’s own work carried out by him under my guidance and supervision.

It is also certified that this dissertation has not been submitted to any other institute/University for the award of any degree or diploma.

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I am sure that the knowledge & information that I have gained during this period would be of immense value for growth in the field of engineering.

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ABSTRACT

Energy plays a very important role in our daily activities. The degree of development of any country is measured by amount of use of energy by the country. Energy demand is increasing day by day due to population and increasing technology utilization. The world's fossil fuel i.e. petroleum, coal and natural gas will be depleted in coming years. Also rate of energy consumption is increasing exponentially and to fulfill this demand we have to switch over to permanent energy resources i.e. solar, wind, geothermal, and other renewable resources. There has been a rapid growth in renewable energy which is clean and inexhaustible and our country has shown rapid deployment of RES projects. Today India is major world leader in extensive renewable energy program.

In India there are 300 sunny days in a year and receives 5 to 7 kWh/m²/day. At present total installed capacity of electricity in our country is 2,98,060 MW as on 31 March 2016 and total grid connected installed renewable capacity is 42752 MW in which solar power includes 6763 MW installed capacity which accounts for 16% of installed grid connected renewable energy. The Indian solar photovoltaic industry is growing at a pace of 25%. In my work I have studied performance of 40 KW grid connected solar photovoltaic system which is installed at administrative building at Delhi Technological University, New Delhi.

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NOMENCLATURE

PV	: Photo Voltaic
SPV	: Solar Photo Voltaic
DTU	: Delhi Technological University
RES	: Renewable Energy sources
MNRE	: Ministry of New and Renewable Energy
CEA	: Central Electricity Authority
GHI	: Global Horizontal Irradiance
DNI	: Direct Normal Irradiance
GEDA	: Gujarat Energy Development Agency
IEA	: International Energy Agency
W_p	: Peak power at STC
STC	: Standard Test Condition
kW	: Kilo- Watt
MW	: Mega Watt
kWh	: kilo Watt Hour
TWh	: Terra Watt Hour
P	: Power
IREDA	: Indian Renewable Energy Development Agency
JNNSM	: Jawaharlal Nehru National Solar Mission
V	: voltage
η	: Efficiency
FF	: Fill Factor
J	: Current Density

v_{oc} : Open circuit voltage
 I_{sc} : Short circuit current
 I_m : Current at maximum power point
 v_m : Voltage at maximum power point
AC : Alternating Current
DC : Direct current
MPPT : Maximum Power Point Tracking
RSSB : Radha Soami Satsang Beas