Middle-East Journal of Scientific Research 8 (3): 674-676, 2011
ISSN 1990-9233

Study of Different Models of Efficient Photovoltaic Systems

Ahmad Zatirostami

Department of Science and Engineering, Behshahr Branch, Islamic Azad University, Behshahr, Iran

Abstract: Understanding combined with trustworthy knowledge about PV module performance under different working conditions, have great importance in choosing the right product and accurately predicting its performance for the production of energy. Factors include crystalline silicon PV module performance, physical parameters of the function module materials PV, PV module temperature and solar radiation on PV module surface. Many efforts to analyze the environmental factors affecting the performance module/PV arrays are undertaken. Their work on the effect of temperature on silicon photocell parameters is specified. For comparison, the results related to Beck crystalline solar cells and photo diodes with large light sensitive area are used. In increasing temperature coefficient, the annual energy output of about 1% will increase.

Key words: Photovoltaic · Power · Systems · Energy · Model

INTRODUCTION

In order to simulate photovoltaic systems, reviews of their performance in different positions depending on the design and limitations and conditions governing photovoltaic systems of different models can be used [1-2].

Photovoltaic Module Temperature Model: Temperature influence on the performance of electrical responses is photovoltaic modules. More local observatories around the air temperature only are considered so an estimate of the temperature of photovoltaic modules is needed. The module temperature model is estimated by considering the difference between thermal energy modules with the environment. In addition, radiant heat transfer surfaces in the front and back modules are considered when the heat of the array is driven to the structural framework. Effective solar energy that reaches the surface of the front module, a function of the incoming short wave solar radiation and absorption capabilities is the module level. Absorbency Structure and function of the module material [2-7].

$$QG = \alpha.A.G \quad (1)$$

Total long-wave energy changes between photovoltaic module and the space around are as follows:

$$Qradia = \alpha.A.\sigma\,(\epsilon_{sky}.T^4_{sky} + \epsilon_{ground}.T^4_{ground} - 2\,\epsilon_{pv}\,T^4_{pv}) \quad (2)$$

Heat transfer is free and compulsory and may be a combination of transition effects. So transition energy changes for photovoltaic modules are as follows:

$$Q_{conoutput} = h_{c,free} + h_{c,forced} \quad (3)$$

$$Q_{conoutput} = 2A[1.31(T_{pv}-T_{air})^{1/3}+0.5].(T_{pv}-T_{air})$$

Photovoltaic module so stable temperature can be calculated by energy balance:

$$\alpha.\ A.[G+\ \sigma\ ((\epsilon_{sky}.T^4_{sky} + \epsilon_{ground}.T^4_{ground} - 2\,\epsilon_{pv}\,T^4_{pv}) = 2A[1.31(T_{pv}-T_{air})^{1/3}+0.5].(_{pv}-T_{air})+P_{module} \quad (4)$$

Some parameters are as follows:

ϵ_{sky} = 0.95 for clear condition
ϵ_{sky} = 0.95 for overcast condition
ϵ_{ground} = 0.95
T_{sky} = T_{air}-20 for clear sky condition
T_{sky} = T_{air} for overcast condition

Model Yang: A simulation model can be used to produce a photovoltaic system and is composed of three parts: photovoltaic modules, photovoltaic arrays and solar

Corresponding Author: Mr. Ahmad Zatirostami, Department of Science and Engineering, Behshahr Branch, Islamic Azad University, Behshahr, Iran.

radiation on each mile in each direction photovoltaic panel, photovoltaic array model can display the model used in photovoltaic systems.

Model Photovoltaic Modules: Crystalline silicon PV module performance, physical parameters of the function module PV materials and solar radiation on PV module surface is described and a simple model is applied to achieve maximum power output [7-9].

Photovoltaic Array Model: For practical applications, a certain number of photovoltaic modules that require the needs of consumers are connected to each other. Total number of series to connect the system performance by DC voltage is determined while the total number of photovoltaic modules for the photovoltaic array capacity by parallel connection is determined. In this case, the photovoltaic's voltage provided is calculated as follows:

$$V_{PVA}=N_{PVS}.V_{PV} \quad (5)$$

Photovoltaic array output power is as follows:

$$P_{PVA} = N_{PVP}.N_{PVS}.V_{PV}.I_{PV}.F_{com}.F_{oth} \quad (6)$$

N_{PVS} = Number of series connections photovoltaic modules,
N_{PVP} = Number of parallel connections photovoltaic modules,
F_{com} = Factors connection loss,
F_{oth} = Connection loss factor.

Model Total Solar Radiation Absorbed by the Photovoltaic Modules: Electric power produced by photovoltaic systems can be directly solar energy absorbed by the photovoltaic panels, which are linked. While photovoltaic panels can be place in any direction and at any angle. Thus, an estimate of the total solar radiation hitting the surface photovoltaic modules is needed [9-16].

Model 4: One such function that the manufacturer of photovoltaic maximum power drivers, models the behavior of four modules, photovoltaic maximum power output of the more practical photovoltaic systems are estimated and are described. Using solar radiation on the surface miles, temperature and constructive information for photovoltaic modules as input model, the photovoltaic power output producers can be calculated (7).

$$P_{PV} = \eta_g N A_m G_t \quad (7)$$

All energy losses in a photovoltaic manufacturing process, including loss connection, wiring losses and other losses are deemed zero.

$$\eta_g = \eta_r\ \eta_{pt}[I- \beta_t(T_c-T_r)] \quad (8)$$

$$T_c = T_a+G_t(\hat{o}\ _{\acute{a}} / U_L) \quad (9)$$

$$(\tau\ _{\acute{a}} / U_L) = (NOCT-20)/800 \quad (10)$$

Thus, producing photovoltaic efficiency is calculated.

$$\eta_g= \eta_r\ \eta_{pt}*[1- \beta_t(T_{\acute{a}} -T_r) - \beta_t\ G_t((NOCT-20)/800)\ (1- \eta_r\ \eta_{pt}) \quad (11)$$

CONCLUSION

In order to simulate photovoltaic systems, reviews of their performance can be used in different positions, depending on the design and the limitations and conditions governing photovoltaic systems of different models. Understanding and knowledge about the reliability of PV module performance under different working conditions, lend great importance in choosing the right product and accurately predicting its performance for the production of energy. Crystalline silicon PV module performance, physical parameters of the function module PV materials and solar radiation on PV module surface all indicate that we need to know many measures to analyze the environmental factors affecting the performance module / PV array, which have been analyzed.

REFERENCES

1. König, D., M.A. Green, G. Conibeer, Y. Takeda, T. Ito, T. Motohiro and T. Nagashima, Proc. 21st, European Photovoltaic Solar Energy Conference, Dresden, pp: 164.
2. Omer, A.M., 2010. A review of non-conventional energy systems and environmental pollution control. J. Soil. Sci. Environ. Manage., 1(7): 127-154.
3. Omer, A.M., 2010. Sustainable energy development and environment, Research. J. Environ. Earth Sci., USA, 2(2): 55-75.

4. Oxburgh, E.R., 1975. Geothermal energy. Aspects of Energy Conversion, pp: 385-403.
5. Rawlings, R.H.D., 1999. Technical Note TN 18/99 - Ground Source Heat Pumps: A Technology Review. Bracknell. The Building Services Research and Information Association.
6. WRAP, 2006. Environmental benefits of recycling: an international review of life cycle comparisons for key materials in the UK Recycling Sector, pp: 1-40.
7. Abdeen, M.O., 2010. Chapter 3: Utilisation and development of solar and wind resources, In: Dust Storms: Elemental Composition, Causes and Environmental Impacts, Editors: Sinisa Brstilo and Quentin Madunic, 2010 NOVA Science Publishers, Inc., New York, USA, pp: 111-147.
8. Abdeen, M.O., A.O. Siddig and B.R. Saffa, 2010. Design and installation of direct expansion ground Source Heat Pumps, pp: 32-48.
9. Brain, G. and S. Mark, 2007. Garbage in, energy out: landfill gas opportunities for CHP projects. Cogeneration On-Site Power, 8(5): 37-45.
10. Federal Ministry for the Environment (FME), 2005. Nature conservation and nuclear safety. Waste Incineration- a Potential Danger, pp: 32-48.
11. Fordham, M., 2000. Natural ventilation. Renewable Energy, 19: 17-37.
12. Nafeh, A.A., 2010. An Effective and Safe Charging Algorithm for Lead-Acid Batteries in PV Systems. World Eng. Appl. Sci. J., 1(1): 09-17.
13. Lennie, H. Abdullah, Z.M. Shila and M.A. Hannan, 2010. Modelling and Simulation of SiO_2/SiN as Anti-reflecting Coating for Silicon Solar Cell by Using Silvaco Software. World Appl. Sci. J., 11(7): 786-790.
14. Rashid, A. and S.F. Shaukat, 2009. Effect of internal strain on the lifetime of filled insulation. World Appl. Sci. J., 7(1): 86-93.
15. Khan, M.E., S.F. Shaukat, S.Monk, 2009. Monte Carlo GPS based solution for speed limit indicator. World Appl. Sci. J., 6(12): 1691-1697.
16. Shah, S.A.A. and S.F. Shaukat, 2009. Neural network solution for secure interactive voice response. World Appl. Sci. J., 6(9): 1264-1269.