

REFERENCES

- [1] M. A. Usova and V. I. Velkin, "Possibility to use renewable energy sources for increasing the reliability of the responsible energy consumers on the enterprise," *Proceedings - 2018 17th International Ural Conference on AC Electric Drives, ACED 2018*, vol. 2018-April, pp. 1–4, 2018, doi: 10.1109/ACED.2018.8341682.
- [2] Z. Chen, Q. Liu, X. Xiao, N. Liu, and X. Yan, "Integrated mode and key issues of renewable energy sources and electric vehicles' charging and discharging facilities in microgrid," *Diangong Jishu Xuebao/Transactions of China Electrotechnical Society*, 2013.
- [3] T. Mikhail, S. Tatyana, and S. Petr, "Usage efficiency of renewable energy sources for charging passenger electric transport," in *3rd Renewable Energies, Power Systems and Green Inclusive Economy, REPS and GIE 2018*, IEEE, 2018. doi: 10.1109/REPSGIE.2018.8488844.
- [4] M. Riasetiawan, B. N. Prastowo, N. A. S. Putro, O. A. Dhewa, and F. Y. Baktiar, "G-Connect: Real-Time Early Warning System for Landslide Data Monitoring," *Proceedings of the 2019 6th International Conference on Instrumentation, Control, and Automation, ICA 2019*, no. August, pp. 127–130, 2019, doi: 10.1109/ICA.2019.8916747.
- [5] PT. PLN (Persero), "Electric Power Supply Business Plan (2019-2028)," pp. 2019–2028, 2019, [Online]. Available: http://gatrik.esdm.go.id/assets/uploads/download_index/files/5b16d-kepmen-esdm-no.-39-k-20-mem-2019-tentang-pengesahan-ruptl-pt-pln-2019-2028.pdf
- [6] A. Awasthi *et al.*, "Review on sun tracking technology in solar PV system," *Energy Reports*, vol. 6, pp. 392–405, 2020, doi: 10.1016/j.egyr.2020.02.004.
- [7] S. Ray and A. K. Tripathi, "Design and development of Tilted Single Axis and Azimuth-Altitude Dual Axis Solar Tracking systems," *1st IEEE International Conference on Power Electronics, Intelligent Control and Energy Systems, ICPEICES 2016*, pp. 1–6, 2017, doi: 10.1109/ICPEICES.2016.7853190.
- [8] H. M. Fahad, A. Islam, M. Islam, M. F. Hasan, W. F. Brishty, and M. M. Rahman, "Comparative analysis of dual and single axis solar tracking system considering cloud cover," *International Conference on Energy and Power Engineering: Power*

- for *Progress*, *ICEPE* 2019, no. c, pp. 1–5, 2019, doi: 10.1109/CEPE.2019.8726646.
- [9] I. H. Rosma, I. M. Putra, D. Y. Sukma, E. Safrianti, A. A. Zakri, and A. Abdulkarim, “Analysis of single axis sun tracker system to increase solar photovoltaic energy production in the tropics,” *Proceedings - 2018 2nd International Conference on Electrical Engineering and Informatics: Toward the Most Efficient Way of Making and Dealing with Future Electrical Power System and Big Data Analysis, ICon EEI 2018*, no. October, pp. 183–186, 2018, doi: 10.1109/ICon-EEI.2018.8784311.
- [10] G. M. Dousoky, A. H. M. El-Sayed, and M. Shoyama, “Maximizing energy-efficiency in single-axis solar trackers for photovoltaic panels,” *2012 IEEE Energy Conversion Congress and Exposition, ECCE 2012*, pp. 4113–4120, 2012, doi: 10.1109/ECCE.2012.6342264.
- [11] M. H. M. Sidek, N. Azis, W. Z. W. Hasan, M. Z. A. Ab Kadir, S. Shafie, and M. A. M. Radzi, “Automated positioning dual-axis solar tracking system with precision elevation and azimuth angle control,” *Energy*, vol. 124, pp. 160–170, 2017, doi: 10.1016/j.energy.2017.02.001.
- [12] F. I. Mustafa, S. Shakir, F. F. Mustafa, and A. T. Naiyf, “Simple design and implementation of solar tracking system two axis with four sensors for Baghdad city,” in *2018 9th International Renewable Energy Congress, IREC 2018*, 2018, pp. 1–5. doi: 10.1109/IREC.2018.8362577.
- [13] M. Huang and Z. Zhou, “Solar Tracking and Group Control System Based on EtherCAT,” *Proceedings 2018 Chinese Automation Congress, CAC 2018*, pp. 1959–1962, 2019, doi: 10.1109/CAC.2018.8623809.
- [14] N. T. Katrandzhiev and N. N. Karnobatev, “Algorithm for Single Axis Solar Tracker,” *2018 IEEE 27th International Scientific Conference Electronics, ET 2018 - Proceedings*, pp. 1–4, 2018, doi: 10.1109/ET.2018.8549644.
- [15] A. H. Mohaimin, M. R. Uddin, and F. K. Law, “Design and Fabrication of Single-Axis and Dual-Axis Solar Tracking Systems,” *2018 IEEE 16th Student Conference on Research and Development, SCOReD 2018*, pp. 1–4, 2018, doi: 10.1109/SCORED.2018.8711044.



- [16] N. Kuttybay *et al.*, “An Automated Intelligent Solar Tracking Control System with Adaptive Algorithm for Different Weather Conditions,” *2019 IEEE International Conference on Automatic Control and Intelligent Systems, I2CACIS 2019 - Proceedings*, no. June, pp. 315–319, 2019, doi: 10.1109/I2CACIS.2019.8825098.
- [17] G. Mehdi, N. Ali, S. Hussain, A. A. Zaidi, A. Hussain Shah, and M. M. Azeem, “Design and fabrication of automatic single axis solar tracker for solar panel,” *2019 2nd International Conference on Computing, Mathematics and Engineering Technologies, iCoMET 2019*, pp. 1–4, 2019, doi: 10.1109/ICOMET.2019.8673496.
- [18] C. Jamroen, P. Komkum, S. Kohsri, and W. Himananto, “A low-cost dual-axis solar tracking system based on digital logic design : Design and implementation,” *Sustainable Energy Technologies and Assessments*, vol. 37, no. October 2019, p. 100618, 2020, doi: 10.1016/j.seta.2019.100618.
- [19] X. Xu, Q. Liu, and Y. Zuo, “A study on all-weather flexible auto-tracking control strategy of high-efficiency solar concentrating photovoltaic power generation system,” *Proceedings - 2010 2nd WRI Global Congress on Intelligent Systems, GCIS 2010*, vol. 2, pp. 375–378, 2010, doi: 10.1109/GCIS.2010.70.
- [20] B. J. Zhang, G. H. Gao, and Y. L. Zhu, “Designment of automatic tracking system of solar energy system,” in *ICIMA 2010 - 2010 2nd International Conference on Industrial Mechatronics and Automation*, 2010, pp. 689–691. doi: 10.1109/ICINDMA.2010.5538213.
- [21] F. Xie and G. Zhang, “Simulation and analysis of computer control tracking system based on solar geometric for fresnel lenses concentration photovoltaics,” *Proceedings - 2011 3rd International Conference on Intelligent Human-Machine Systems and Cybernetics, IHMSC 2011*, vol. 1, pp. 101–104, 2011, doi: 10.1109/IHMSC.2011.30.
- [22] A. Ponniran, A. Hashim, and H. Ali Munir, “A design of single axis sun tracking system,” *2011 5th International Power Engineering and Optimization Conference, PEOCO 2011 - Program and Abstracts*, no. June, pp. 107–110, 2011, doi: 10.1109/PEOCO.2011.5970440.
- [23] K. Boudaraia, H. Mahmoudi, M. Abbou, and M. Hilal, “DC motor position control of a solar tracking system using second order sliding mode,” *International*



- Conference on Multimedia Computing and Systems -Proceedings*, vol. 0, no. 3, pp. 594–598, 2017, doi: 10.1109/ICMCS.2016.7905590.
- [24] X. Zhang *et al.*, “Two tracking control method to improve solar cell photoelectric efficiency,” in *Proceedings of the 28th Chinese Control and Decision Conference, CCDC 2016*, 2016, pp. 2446–2447. doi: 10.1109/CCDC.2016.7531396.
- [25] V. M. Jovanovic and I. S. Member, “Single Axis Solar Tracker Actuator Location Analysis,” *Conference Proceedings - IEEE SOUTHEASTCON 2016*, 2016.
- [26] Y. M. Safan, S. Shaaban, and M. I. Abu El-Sebah, “Hybrid control of a solar tracking system using SUI-PID controller,” *2017 Sensors Networks Smart and Emerging Technologies, SENSET 2017*, vol. 2017-Janua, pp. 1–4, 2017, doi: 10.1109/SENSET.2017.8125035.
- [27] X. Zhikun, “Research and and design of control system of the solar panel tracking,” pp. 1384–1388, 2016.
- [28] P. Rani, O. Singh, and S. Pandey, “An Analysis on Arduino based Single Axis Solar Tracker,” *2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering, UPCON 2018*, pp. 1–5, 2018, doi: 10.1109/UPCON.2018.8596874.
- [29] W. Diehl, V. Sittinger, and B. Szyszka, “Thin film solar cell technology in Germany,” *Surf Coat Technol*, vol. 193, no. 1-3 SPEC. ISS., pp. 329–334, 2005, doi: 10.1016/j.surfcoat.2004.08.219.
- [30] L. J. Geerligs *et al.*, “Progress in low-cost n-type silicon solar cell technology,” *Conference Record of the IEEE Photovoltaic Specialists Conference*, pp. 1701–1704, 2012, doi: 10.1109/PVSC.2012.6317923.
- [31] D. Verma, T. O. Saetre, and O. M. Midtgård, “Review on up/down conversion materials for solar cell application,” *Conference Record of the IEEE Photovoltaic Specialists Conference*, pp. 2608–2613, 2012, doi: 10.1109/PVSC.2012.6318129.
- [32] M. Y. A. Rahman, A. Ahmad, A. A. Umar, R. Taslim, M. S. Su’ait, and M. M. Salleh, “Polymer electrolyte for photoelectrochemical cell and dye-sensitized solar cell: A brief review,” *Ionics (Kiel)*, vol. 20, no. 9, pp. 1201–1205, 2014, doi: 10.1007/s11581-014-1211-3.



- [33] I. Reda and A. Andreas, "Solar position algorithm for solar radiation applications," *Solar Energy*, vol. 76, no. 5, pp. 577–589, 2004, doi: 10.1016/j.solener.2003.12.003.
- [34] R. Grena, "An algorithm for the computation of the solar position," *Solar Energy*, vol. 82, no. 5, pp. 462–470, 2008, doi: 10.1016/j.solener.2007.10.001.
- [35] R. Grena, "Five new algorithms for the computation of sun position from 2010 to 2110," *Solar Energy*, vol. 86, no. 5, pp. 1323–1337, 2012, doi: 10.1016/j.solener.2012.01.024.
- [36] P. Blanc and L. Wald, "The SG2 algorithm for a fast and accurate computation of the position of the Sun for multi-decadal time period," *Solar Energy*, vol. 86, no. 10, pp. 3072–3083, 2012, doi: 10.1016/j.solener.2012.07.018.
- [37] A. A. Rizvi, K. Addoweesh, A. El-Leathy, and H. Al-Ansary, "Sun position algorithm for sun tracking applications," *IECON Proceedings (Industrial Electronics Conference)*, pp. 5595–5598, 2014, doi: 10.1109/IECON.2014.7049356.
- [38] S. D. Hanwate and Y. V Hote, "Design of PID controller for sun tracker system using QRAWCP approach," 2018.
- [39] ESMAP, "Global Solar Atlas 2.0 Technical Report," Washington, 2019.