



الجامعة الهاشمية



The Hashemite University Renewable Energy Center

Environmental Research 2021-2023



Table of Contents

Introduction:	3
Recent Research Sustainability	4
Book	4
Journal	4
Conferences	5
Funded Projects	6
Student Experience and Scientific Trips	8



Introduction:

At Hashemite University, our commitment to scientific research and projects is driven by a profound dedication to serve the local community and industry while elevating research quality and educational outcomes. As a key component of the Climate Policy at our institution, the Research and Education for Sustainability program takes center stage in empowering both staff and students with comprehensive knowledge and skills in sustainability. Our primary goal is to promote cutting-edge research that informs and guides our sustainable practices, enabling us to embrace environmental stewardship wholeheartedly. To achieve this, we have established a set of priority actions that shape our endeavors:

- ✓ Investing in Sustainable Research: Hashemite University allocate 5% of the university budget to scientific research in alignment with sustainability goals, emphasizing the importance of advancing knowledge in this crucial field.
- ✓ Integrating Sustainability Education: By collaborating closely with faculties, we prioritize the inclusion of sustainability education within diverse academic curricula. Our aim is to seamlessly integrate sustainability principles across disciplines, nurturing a generation of informed and responsible global citizens.
- ✓ Equipping Students for Sustainability: We are committed to offering a range of teaching and learning opportunities that equip both staff and students with essential sustainability skills. Our focus is to empower them to contribute effectively to sustainability efforts both within and beyond the university's boundaries.
- ✓ Sharing Best Practices: Leveraging social media, website, conferences, and seminars, we actively promote and share sustainability best practices. Through these channels, we inspire collective action and continuous improvement in our sustainability initiatives.
- ✓ Establishing Collaborative Networks: Building a collaborative environment, we establish networking platforms that encourage interdisciplinary research. These platforms facilitate impactful collaborations on sustainability-focused projects.
- ✓ Nurturing a Culture of Research and Innovation: We actively engage and support undergraduate and postgraduate students in their sustainability research. This nurturing approach fosters a culture of research-driven inquiry and innovation at Hashemite University.



Recent Research Sustainability.

One of the main aims at the Hashemite University is to encourage and improve scientific research and projects to serve local community and industry and to elevate research quality and educational outcomes. The following list of recent publication (2021-2023) and project at the Renewable energy center:

Book

- Holderbaum, W.; Alasali, F.; Sinha, A. Energy Forecasting and Control Methods for Energy Storage Systems in Distribution Networks. *Springer Cham, Switzerland*, Edition 1, 2023, p. XVI- 204, <https://doi.org/10.1007/978-3-030-82848-6>.

Journal

- Alasali, F.; Saidi, A.S.; El-Naily, N.; Smadi, O.; Khaleel, M.; Ghirani, I. Assessment of the impact of a 10-MW grid-tied solar system on the Libyan grid in terms of the power protection system stability. *Clean Energy* 2023, 7 (2), 389-407, (open access).
- Alasali, F.; Saidi, A.S.; El-Naily, N.; Smadi, M.A.; Holderbaum, W. Hybrid Tripping Characteristic-Based Protection Coordination Scheme for Photovoltaic Power Systems. *Sustainability* 2023, 15, 1540. <https://doi.org/10.3390/su15021540>, (open access).
- Alasali, F.; Saidi, A.; El-Naily, N.; Alnaser, S.; Holderbaum, W.; Saad, S.; Gamaledin, M. Advanced Coordination Method for Overcurrent Protection Relays Using New Hybrid and Dynamic Tripping Characteristics for Microgrid. *IEEE Access* 2022, 10.1109/ACCESS.2022.3226688, (open access).
- Zarour, E.; Alasali, F.; Alsmadi, O.; El-Naily, N. A new adaptive protection approach for overcurrent relays using novel nonstandard current-voltage characteristics. *Electric Power Systems Research* 2023, 216, 109083.
- Alasali, F.; Zarour, E.; Holderbaum, W.; Nusair, K. Highly Fast Innovative Overcurrent Protection Scheme for Microgrid Using Metaheuristic Optimization Algorithms and Nonstandard Tripping Characteristics. *IEEE Access*, 2022, 10.1109/ACCESS.2022.3168158, (open access).
- Alasali, F.; Salameh, M.; Semrin, A.; Nusair, K.; El-Naily, N.; Holderbaum, W. Optimal Controllers and Configurations of 100% PV and Energy Storage Systems for a Microgrid: The Case Study of a Small Town in Jordan. *Sustainability* 2022, 14, 8124.



<https://doi.org/10.3390/su14138124>, (open access).

- Abeid, S.; Hu, Y.; Alasali, F.; El-Naily, N. Innovative Optimal Nonstandard Tripping Protection Scheme for Radial and Meshed Microgrid Systems. *Energies* 2022, *15*, 4980. <https://doi.org/10.3390/en15144980>, (open access).
- El-Naily, N.; Saad, S.; Elhaffar, A.; Zarour, E, Alasali, F. Innovative Adaptive Protection Approach to Maximize the Security and Performance of Phase/Earth Overcurrent Relay for Microgrid Considering Earth Fault Scenarios. *Electric Power Systems Research*, 2022, 206, 107844.
- Waleed Hammad, Thaer Sweidan, Mohammed I. Abuashour, Haris M. Khalid, SM Muyeen, "Thermal Management of Grid-Tied PV System: A Novel Active and Passive Cooling Design-Based Approach" *IET Renewable Power Generation* Vol. 15, No. 12, pp. 2715-2725, 2021.
- Aljdaeh, E., Kamwa, I., Hammad, W., Mohammed I. Abuashour; Sweidan, T., Khalid, H.M., Muyeen, S.M, "Performance Enhancement of Self-Cleaning Hydrophobic Nanocoated Photovoltaic Panel in Dusty Environment". *Energies* Vol. 14, No. 02, pp. 1-18, 2021.
- Nagy Osman, Haris M. Khalid, Tha'er O. Sweidan, Mohammed I. Abuashour, S.M. Muyeen, "A PV Powered DC Shunt Motor: Study of Dynamic Analysis Using Maximum Power Point-Based Fuzzy Logic Controller", *Energy Conversion and Management: X*, Vol. 15, August, 2022.
- Derar Al Momani, Yousef Al Turk, Mohammed I. Abuashour, Haris M. Khalid, S.M. Muyeen, Tha'er O. Sweidan, Zafar Said, M. Hasanuzzaman, " Energy saving potential analysis applying factory scale energy audit – A case study of food production", *Heliyon*, Volume 9, Issue 3, 2023.
- Mohamed R. Goma a,b , Waleed Hammad c, Mujahed Al-Dhaifallah d, Hegazy Rezk e,f,* "Performance enhancement of grid-tied PV system through proposed design cooling techniques: An experimental study and comparative analysis" in *Solar Energy*, Vol. 211, DOI: 10.1016/j.solener.2020.10.062, Pp: 1110-1127.

Conferences

- Aldalameh, S.; Hayajneh, A.; Alasali, F. Power Load Estimation in Smart Grids via k-



Means Clustering using Sensor Networks. IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT), Amman, Jordan, 2023.

- Alasali, F.; Zarour, E.; AL-Hayajneh, A.; Alsamadi, O. Optimal Protection Coordination Scheme of Overcurrent Relays for Microgrid System. IEEE International Conference on Renewable Energy Research and Application, Turkey, 2021.
- Saad, S.; Alasali, F.; El-Naily, N.; Elhaffar, A.; Hussein, T.; Mohamed, F. Coordination of Mixed Overcurrent and voltage-Restrained Overcurrent Relays to Avoid Miscoordination Problems Considering IEC time-Current Curve Limitations. IEEE International Renewable Energy Congress, Tunisia, 2021.
- Tha'er O. Sweidan, Mohammed I. Abuashour, Nagy Osman, "Transient Analysis of DC Shunt Motor Supplied by Stand-alone PV System Employing FOCV for MPPT", 2020 Advances in Science and Engineering Technology (ASET) International Conferences. IEEE Xplore.

Funded Projects

- **Project title:** Analyzing Smart Grid Resilience Under Cyber-Physical Threats, **January 2023-January 2025**
 - **Project group:** Dr. Feras Alasali (**investigator**), Dr. Anas Almajali, Dr. Ali Hayajneh, Prof. Awni Itradat
 - **Source:** Ministry of Higher Education and Scientific Research - Jordan, Scientific Research and Innovation Support Fund, **Budget:** 132000 USD.
 - **Abstract:** Our initiative is centered on assessing the resilience of smart grids to a variety of cyber-physical threats at High Voltage (HV), Medium Voltage (MV), and Low Voltage (LV) levels. We are using simulations to study different threat scenarios and their impacts on the power protection system, particularly at HV/MV levels, while also addressing the often underappreciated threats on LV networks. The ultimate goal is to enhance the power grid's resilience at all voltage levels, leading to the development of a more robust cybersecurity strategy for the energy sector. Further information is available at <https://cyberssgridhu.github.io/>



- **Project title:** Research Experience in Life Sciences for High School Girls from Jordan Disadvantaged Regions, **May 2023-May 2025**
 - **Project group:** Dr. Lubna Tahtamouni (**investigator**),
 - **Source:** the Hashemite University, **Budget:** 5000 USD.

- **Project title:** A Water-Energy-Food Nexus Toolkit (WEF-Tools) to support sustainable and inclusive socio-economic development in water scarce regions, **January 2022-April 2024**
 - **Project group:** Dr. Dheaya' Alrousan (**investigator**),
 - **Source:** the Hashemite University, **Budget:** 9250 USD.

- **Project title:** Solar Desalination for Sustainable Brackish Water Management in Jordan for Agriculture and Drinking Water (SoDeS), **January 2022-May 2023**
 - **Project group:** Dr. Ahmed Bdour (**investigator**),
 - **Source:** the Hashemite University, **Budget:** 57540 USD.

- **Project title:** Nutritional Status of Children with Cerebral Palsy in Jordan, **Dec. 2022-Dec. 2024**
 - **Project group:** Dr. Amin Eleimat (**investigator**),
 - **Source:** the Hashemite University, **Budget:** 12500 USD.

- **Project title:** Genetic factors affecting the susceptibility of diabetic patients to bacterial infections in Jordan, **Feb. 2023-May 2026**
 - **Project group:** Dr. Narmeen Elawwad (**investigator**),
 - **Source:** the Hashemite University, **Budget:** 64285 USD.

For more information please visit:

<https://hu.edu.jo/en/facnew/index.aspx?typ=329&unitid=18000000>

<https://hu.edu.jo/en/facnew/Default.aspx>



Student Experience and Scientific Trips

Within the context of the Climate Policy at Hashemite University, our paramount focus is to enhance the student experience by fostering a learning environment that emphasizes sustainability.

To achieve this goal, the following priority actions have been identified:

- ✓ All projects in the campus have a direct positive capacity building and social impact.
- ✓ We are committed to empowering our students to become responsible and active participants in the local community, engaging in initiatives that promote sustainability and contribute positively to the environment.
- ✓ Through diverse opportunities, we promote student engagement in sustainability-related initiatives, enabling them to develop a comprehensive understanding and practical skills in this critical field.
- ✓ Active collaboration with student clubs and organizations fosters a strong network of sustainability advocates, amplifying our collective impact and driving meaningful change.
- ✓ Ensuring our campus is accessible and safe for individuals with disabilities or special needs reflects our commitment to inclusivity, ensuring everyone can actively participate in sustainability efforts.

Since the commencement of PV projects at HU, and through commissioning and operation of the projects, it has had a strong social impact on the campus, and has positively impacted the perceived image of the university as a whole. The PV project has received more than 2000 visitors from outside the university in 75 visits, including official visits by the ambassadors of USA, Sweden, and the Netherland. Students from universities, public and private universities, elementary and secondary schools visited the project to learn about its importance, environmental impact, and the ease, safety and transferability of renewable energy technologies. In 2022/2023, the renewable energy center and PV project has received more than 300 visitors from outside the university in 40 visits. The center also holds a free two weeks training for the university student about designing and implementation PV system. Here are some of the photos from the training sessions and site visits:

