SDG AT AIUB

American International University-Bangladesh (AIUB) is committed to achieve the United Nations 17 Sustainable Development Goals through different initiatives. These reports outline year-long different activities, such as research & publications, enhancing social inclusion, encouraging environmental sustainability, partnerships, good governance, and diversity among students and employees as well as its associated mapping to different SDGs.

American International University-Bangladesh (AIUB)

SDG Activity Report - 2022

SDG 7:

Affordable and Clean Energy

AIUB SDG Activity Report 2022

SDG 7: Affordable and Clean Energy

American International University-Bangladesh (AIUB) is actively contributing to Sustainable Development Goal 7: Affordable and Clean Energy through a combination of impactful university activities and pioneering faculty research. The university's commitment to clean energy is exemplified by a range of initiatives that not only raise awareness but also actively engage students and professionals in the field.

The university recognizes the importance of staying at the forefront of developments in clean energy technologies. The "Webinar On Solar PV Energy Towards Carbon Neutrality By 2050" reflects AIUB's dedication to disseminating knowledge about solar energy, a crucial component of the clean energy landscape. By organizing events such as this, AIUB ensures that its community is well-informed and equipped to contribute to a sustainable energy future.

AIUB goes beyond theoretical knowledge by facilitating practical exposure. The "Visit to Rooppur Nuclear Power Plant" and the "Faculty of Engineering's Industrial Tour to Rampura 230/132KV Substation" demonstrate the university's commitment to providing students with real-world insights into different facets of the energy sector. Such experiences not only enrich their education but also inspire them to become key contributors to the clean energy transition.

The "DR. ANWARUL ABEDIN LECTURE SERIES" further emphasizes AIUB's dedication to fostering a deep understanding of power systems. By providing overviews of the power system of Bangladesh, including current status and issues, AIUB ensures that its students are well-versed in the complexities and challenges associated with energy infrastructure. This knowledge is crucial for developing innovative solutions in pursuit of clean and sustainable energy.

AIUB's faculty is at the forefront of research that addresses the challenges and opportunities in the realm of clean energy. Research papers such as "Thermo-fluid Physiognomies of a Photovoltaic Thermal Collector" and "Forecasting Photovoltaic Power Generation with a Stacking Ensemble Model" showcase the university's commitment to advancing the scientific understanding of renewable energy technologies. These contributions not only add to the academic discourse but also have practical implications for the development and implementation of clean energy solutions.

Furthermore, AIUB's faculty is actively engaged in exploring diverse aspects of clean energy, from the optimization of solar cells to the design and analysis of microgrids. The research outputs, such as "Optimized Performance and Economic Assessment for Hybrid Island Microgrid System Considering Uncertainties," highlight AIUB's dedication to finding sustainable and economically viable solutions to energy challenges.

In conclusion, AIUB's holistic approach to SDG 7 encompasses not only theoretical education but also hands-on experiences and cutting-edge research. The university's proactive stance in organizing webinars, industrial tours, and lecture series, coupled with faculty research, positions AIUB as a key player in the global effort to achieve affordable and clean energy. The positive impact of AIUB's initiatives extends beyond its campus, preparing future leaders and innovators to address the pressing energy needs of the world.

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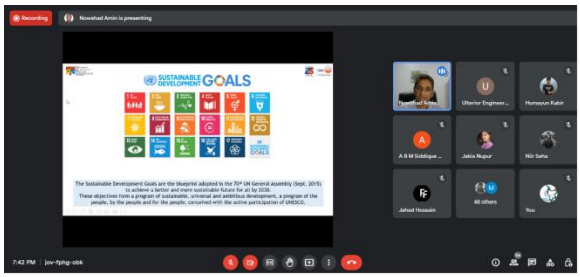
University Activities

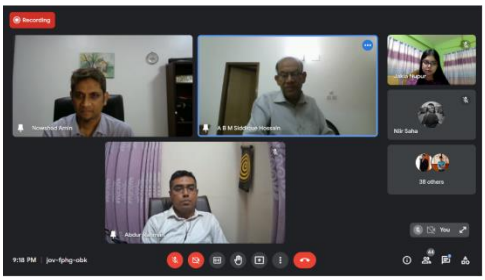
Webinar On “Solar PV Energy Towards Carbon Neutrality By 2050”

On Monday, November 7, 2022, the Engineering Students Association of Bangladesh (ESAB) AIUB Unit Face successfully organized a webinar on “Solar PV Energy Towards Carbon Neutrality By 2050” by using online platform google meet. The session began at 7:00 PM with more than 70 attendees. The program started with the opening remarks by Prof. Dr. A.B.M. Siddique Hossain (Dean, Faculty of Engineering, AIUB). In his speech, he emphasized the significance of carbon neutrality and the impact of solar PV on building a sustainable and environmentally friendly world.

After that, the floor was given to the distinguished speaker, Dr. Nowshad Amin (Professor, Institute of Sustainable Energy, Universiti Tenega Nasional |@UNITEN, The Energy University| & Chief Advisor Ulterior Engineering Intl). In his speech, he began by explaining the fundamentals of the solar cell and the potential of renewable energy to reduce the amount of carbon in the environment. In the middle, he discussed the various kinds of solar cells and their respective efficiencies. In addition, he addressed the evaluation of solar panel size, grid-connected solar PV residential systems, and several other problems. Aside from that, he spoke about the benefits of solar-powered technologies and their importance in the world's long-term development for people. Lastly, he talked about the steps we as humans need to take right now and the responsibilities that governments and other climate-related world organizations need to take to make the world a better place to live and ensure carbon neutrality by 2050.

After that, the Advisor of ESAB AIUB Unit Face, Prof. Dr. Md. Abdur Rahman (Associate Dean, Faculty of Engineering, AIUB), gave the closing remarks and shared his valuable experience and knowledge on solar PV and its importance to carbon neutrality by 2050 with the participants. Afterwards, a virtual token of appreciation was presented to the distinguished speaker.





Visit to Rooppur Nuclear Power Plant

On September 1, 2022, the Faculty of Engineering, American International University – Bangladesh (AIUB) organized a visit to the Rooppur Nuclear Power Plant (RNPP). RNPP is located at Ishwardi Upazila of Pabna District, on the bank of the river Padma and it's a very highly secured Key Point Installation (KPI) zone of the Bangladesh Government. 19 teachers from AIUB along with 47 students from Department of EEE visited this nuclear power plant. The team from AIUB reached Rooppur Nuclear Power Plant at 10:30 AM and stayed there for approximately 4 hours.

Engr. MD. Ashraful Islam (Chief Engineer & Director, CRNPP) wholeheartedly greeted everyone with a short speech. Afterwards, Mr. Irtiaz Mahmud (Manager, CRNPP), Mr. MD. Yamin Ali (Manager, CRNPP), Mr. Goutam Chandra Roy (Manager, CRNPP) introduced themselves and their domain of expertise. Furthermore, a brief presentation was presented by Engr. MD. Ashraful Islam where the master plan, history, construction, and capacity of the power plant was demonstrated. After that, a short Q&A session was held where the engineers answered the queries of the participants. Following that, Prof. Dr. Md. Abdur Rahman (Associate Dean, Faculty of Engineering, AIUB) thanked the engineers of RNPP for their well explained remarks. Then he presented the token of appreciation to the project officials.

Later, the visiting team was taken for a guided tour to the power plant construction site. The architecture and mechanism were explained by the proficient engineers Mr. Monoarul Islam (Senior Assistant Manager, CRNPP), Mr. MD. Rakibul Hassan (Assistant Manager, CRNPP), Mr. Md. Shazzad Dewan (Assistant Manager, CRNPP) and Mr Ali Hossain Abir (Assistant Manager, CRNPP). They went on to explain the different aspects of cooling towers, nuclear reactors, jetty, pump station, fire station, emergency evacuation plan. The AIUB team expressed their heartfelt gratitude towards the authority of the Rooppur Nuclear Power Plant for their tremendous support and cooperation. The tour ended with a group photo with all the participants from AIUB. It was a great learning experience and successful tour for the engineering students.

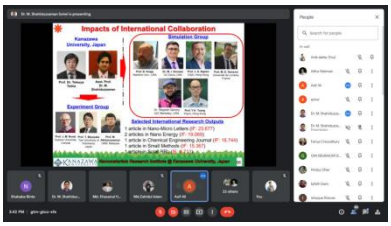


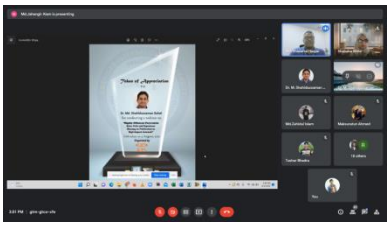
Webinar on "Highly Efficient Perovskite Solar Cells and Experience Sharing on Publication in High Impact Journals"

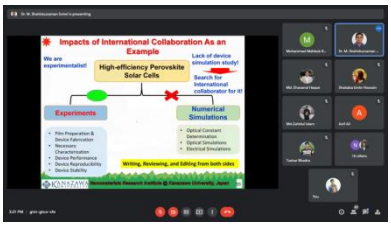
AIUB Community of Engineering Students (ACES) organized a webinar titled "Highly Efficient Perovskite Solar Cells and Experience Sharing on Publication in High Impact Journals" on August 4, 2022 (Thursday). The program started at 2:00 PM with 52 pre-registered IPE students on Google Meet. The purpose of the webinar was to assist students to publish in high impact journals as well as to prepare them to learn about highly efficient perovskite solar cells.

The program started with the inauguration speech by Prof. Dr. A.B.M Siddique hossain (Dean, Faculty of Engineering, AIUB) where he emphasized the benefits of attending such webinar for students and preparing themselves for the increasing opportunities in research field of highly efficient perovskite solar cells. The distinguished speaker Dr. Md. Shahiduzzaman Sohel (Assistant Professor, Nanomaterials Research Institute, Kanazawa University, Japan) briefly explained structure of highly efficient perovskite solar cells. He demonstrated research paper writing procedure and provided effective tips and tricks to get acceptance for publications. Then, a short Q/A session was held for the participants. Finally, Dr. MD. Ehasanul Haque (Senior Assistant Professor, Faculty of Engineering, AIUB) concluded the seminar by thanking the honourable speaker to conduct the session.

The webinar was graced by the presence of Dr. Mohammad Mahbub Rabbani (Associate Professor, Department of Chemistry & Deputy Director, Center for Nanotechnology Research, AIUB) and Mr. Md. Aynul Hoque (Lecturer, Department of IPE, AIUB).







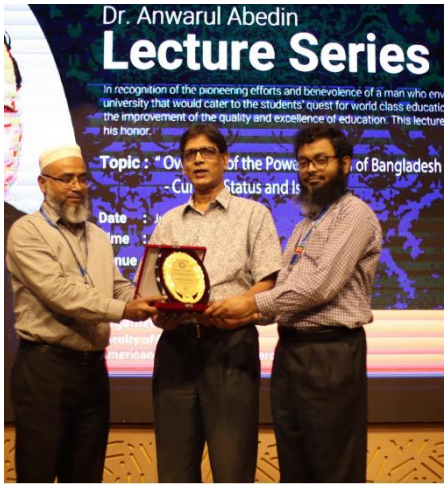
DR. ANWARUL ABEDIN LECTURE SERIES: Overview of the Power System of Bangladesh – Current Status and Issues

On July 28, 2022 (Thursday), an informative technical talk titled 'Overview of the Power System of Bangladesh-Current Status and Issues' was held as a part of "Dr. Anwarul Abedin Lecture Series" at the American International University-Bangladesh (AIUB). The seminar was organized by the Faculty of Engineering (FE) in the honour of AIUB's visionary Founder Chairman Dr. Anwarul Abedin who catalysed substantial transformation in the educational sector of the country.

The seminar started at 3 PM in the Auditorium, D-Building, AIUB with the participation of teachers and students from across the faculties. Prof. Dr. Muhammad Riazul Hamid (Multi-sector Consultant) was the esteemed guest speaker for the occasion. The talk was on the overview, status, and issues regarding the power system of Bangladesh. The event was initiated by Prof. Dr. Muhibul Haque Bhuyan (Professor, Department of EEE, Faculty of Engineering, AIUB). Prof. Bhuyan welcomed the distinguished speaker to start his technical talk.

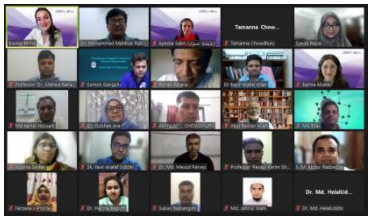
Prof. Hamid began his presentation by talking about Bangladesh's main energy sources and power generation over past 13 years. He also explained system loss, technical and non-technical loss, installed capacity rate, and per capita generation. After that, he discussed about the combined load curve, minimum generation of power, demand of power, and energy curve on July 24, 2022, in different zones of Bangladesh. Finally, the distinguished speaker discussed about the current scenario of imported power support to Bangladesh, public and private power generation by gas, and the contribution of the micro power grid in Bangladesh. The number of power plants in Bangladesh that are currently operational was also presented on a map. The speaker also covered the causes and challenges regarding geopolitical products such as coal and liquid natural gas, and potential solutions associated with the current load shedding.

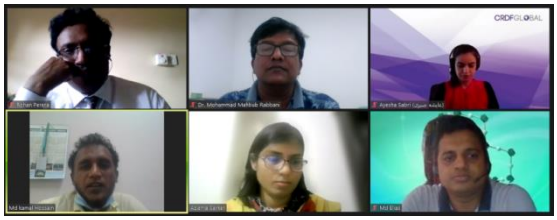
Afterwards, a short interactive discussion session was held where the speakers answered the queries of the participants. Following that, Prof. Dr. Md. Abdul Mannan (Director, Faculty of Engineering, AIUB) thanked the speaker and presented a token of appreciation to the speaker.



AIUB received grant from CRDF Global for Chemical Security Management

Secured Chemical depository is a prime concern all over the world. Dual use of hazardous chemicals is a major threat to any society and government. If unauthorized persons get in touch of any hazardous chemicals, they can misuse them to do harm for the mankind. Chemical security experts take care of these issues to secure chemicals in industry and academy. Recently, Dr. Mohammad Mahbub Rabbani (Associate Professor, Department of Chemistry and Deputy Director, Dr. Anwarul Abedin Institute of Innovation) and Dr. Farzana Khalil (Assistant Professor, Department of Chemistry) participated and successfully completed a two-day long training titled "Chemical Security Inventory Management Systems (CSIMS) Training for Academia and Chemical Industry". The training was conducted by the United States based research funding and development organization, CRDF Global under its Chemical Security Program (CSP). In addition to training program, CRDF Global provides funds and other necessary technical support to ensure chemical security in physical infrastructures (laboratories and factories). As a part of the training program, the foreign funding agency CRDF Global has also provided grants for Center for Nanotechnology Research (CNR) and Chemistry Labs at AIUB with essential equipment and software to strengthen the inventory management systems of the aforementioned Labs.





Faculty of Engineering Organized an Industrial Tour to Rampura 230/132KV Substation

On 18th May,2022, Faculty of Engineering Organized an Industrial Tour to the Rampura 230/ 132 KV Substation, located in Jahurul Islam Project, Aftab Nagar, Dhaka, Rampura, Dhaka. A group of 50 enthusiastic students of AIUB along with 4 faculty members- Mr. Mohammad Khurshed Alam (Assistant Professor, Faculty of Engineering, AIUB), Ms. Susmita Ghosh (Assistant Professor, Faculty of Engineering, AIUB), Mr. S. M. Imrat Rahman (Assistant Professor, Faculty of Engineering, AIUB) and Mr. Mehedi Azad Shawon (Assistant Professor, Faculty of Engineering, AIUB) visited the substation in two groups. The students were taken to the 132 KV and 230 KV substation. The students were guided by the senior engineers of the PGCB. The engineers provided the students first-hand knowledge of the transmission, distribution, protection, and switchgear systems used in the production of electric power. The students were brought to the control room, where a number of PLCs were being used to monitor the entire system of stepping-down the 230KV to 132KV. Afterwards, the senior engineers of PGCB answered various questions asked by the students. The students expressed their heartfelt gratitude towards the authority of the Power Grid Company of Bangladesh (PGCB) for their tremendous support and cooperation. The tour ended with a group photo with all the authorities and engineers, respected faculties and the participants. It was a great learning experience and successful tour for the engineering students.

Dr. Anwarul Abedin Lecture Series "Sustainable Technologies and Renewable Energy"

As a part of the "Dr. Anwarul Abedin Lecture Series", a regular development initiative of the American International University-Bangladesh (AIUB), a research talk titled "Sustainable Technologies and Renewable Energy" was held at Multipurpose Hall, AIUB from 03:00 PM- 05:00 PM on May 11, 2022. The Center for Nanotechnology Research (CNR), AIUB organized this event and invited prominent researcher Dr. Abdul Halim (Chief Technology Officer, Process Research Ortech Inc., Canada) and Dr. Md. Shahiduzzaman Sohel (Assistant Professor, Kanazawa University, Japan) as distinguished speaker. Dr. Carmen Z. Lamagna (Vice Chancellor, American International University-Bangladesh) commenced the lecture series acknowledging the twenty first century as the era of fourth industrial revolution where nanotechnology plays a significant role with other contributing innovations. Dr. Md. Shahiduzzaman Sohel (Assistant Professor, Kanazawa University, Japan) began his presentation on "High-Performance Perovskite Solar Cells and Experience Sharing on Publication in High Impact Journals". He then went on to cover the relevance of renewable energy generation, performance of various types of solar cells, the use of nanotechnology to renewable energy, and the mechanism of Perovskite Solar Cells in his lecture. He also discussed his experiences and techniques for publishing scientific articles in high-impact journals with the audience, emphasising the importance of local and worldwide research cooperation as well as doing unique research in well-equipped labs.

Later, Dr. Abdul Halim (Chief Technology Officer, Process Research Ortech Inc., Canada) delivered a lecture on "Sustainable Technologies to Produce Battery-grade Lithium Hydroxide from Primary and Secondary Resources" as part of the lecture series, which included industry-academy knowledge and experience sharing. He went on to discuss the mechanism of lithium-ion batteries, prevalent lithium-ion battery technologies, main and secondary lithium hydroxide resources, and the key components utilised in lithium-ion batteries. He also outlined how Bangladesh may become a potential option for primary and secondary lithium hydroxide resources in the near future. Afterwards, a short Q&A session was held where the speakers answered the queries of the participants. Dr. S. Mosaddeq Ahmed (Professor & Head, Department of Chemistry, AIUB) chaired the session and Dr. Mohammad Mahbub Rabbani (Associate Professor, Department of Chemistry, and In-Charge of CNR) moderated the lecture series. The seminar was graced by the presence of Dr. A.B.M. Siddique Hossain (Professor & Dean, Faculty of Engineering, AIUB), Dr. Md. Abdur Rahman (Professor & Associate Dean, Faculty of Engineering, AIUB), Dr. Humayra Ferdous (Associate Professor,& Head-in-Charge, Department of Physics, AIUB), Dr. Md. Kamrul Hassan (Associate Professor, Faculty of Engineering, AIUB), Mr. Md. Saniat Rahman Zishan (Associate Professor & Head, Department of Computer Engineering , AIUB), Mr. Kawshik Shikder (Assistant Professor, Faculty of Engineering, AIUB), Dr. Farzana Khalil (Assistant Professor, Department of Chemistry, AIUB), Dr. Md. Tariqul Islam (Senior Assistant Professor, Department of Chemistry, AIUB), Dr. Effat Jahan (Assistant Professor, Faculty of Engineering, AIUB), Dr. Md. Rifat Hazari (Assistant Professor, Faculty of Engineering, AIUB), Mr. Abul Hasnat (Assistant Professor, Faculty of Engineering, AIUB), Mr. Md. Rabiul Islam (Lecturer, Faculty of Engineering, AIUB). Students and faculty members from other universities were present among the participants.

Faculty Research and Publication

Thermo-fluid Physiognomies of a Photovoltaic Thermal Collector: A Comparative Study with Different Flow Channel Materials

Author: DR. AFROZA NAHAR et al.

Brief Description:

In recent years, a good number of research works have been conducted to elucidate the different aspects of photovoltaic thermal (PV/T) technology. However, in order to take a technology to its maturity level, it is important to explore its internal physics and identify the factors that control system performance. With this view, in the present research, thermal and heat transfer characterization, and pressure drop phenomena inside a parallel-plate PV/T collector have been examined numerically to portray the thermo-fluid physiognomy of the system. A three-dimensional mathematical model of the PV/T system has been developed, and the model is used to build a computer simulation of the system in COMSOL Multiphysics® software. Hence, the simulation model has been validated by outdoor experimental results and was found to be in good agreement. Thus, the simulation program is employed to produce temperature distribution and heat flow plots throughout the flow channel, wherein results have been evaluated for two different channel materials, e.g., aluminum and copper. Results show that heat flowrate through both aluminum and copper channels is virtually the same. On the other hand, pressure drop, thereby pumping power required to maintain flow, is greater for an aluminum channel. The developed heat transfer simulation model can be extended for other PV modules with diverse designs and materials of the heat exchanger.

Source: https://asmedigitalcollection.asme.org/solarenergyengineering/article-abstract/145/1/011001/1141271/Thermo-Fluid-Physiognomies-of-a-Photovoltaic?redirectedFrom=fulltext

Numerical Simulation for Nanofluid Flow in a Wall Driven Cavity with Solid Hindrance: Impact of Thermal Conductivity Ratio and Heat Generation

Author: AYESHA SIDDIQUA et al.

Brief Description:

The current work performs the heatline revelation for combined convection of nanofluid within an enclosure with two moving walls at several thermal conductivity ratios plus heat generation parameter. A solid obstacle that produces uniform heat q per unit area is positioned at the middle of the domain. Sliding lids are assigned to the opposite side walls. Two cases: (I) vertical lids are moving in the same directions and (II) horizontal lids are moving in the opposite directions are analyzed. The computational fluid throughout the enclosed space is water-alumina nanofluid. The Finite Element Method of Galerkin's weighted residual technique is used to solve the

governing nonlinear partial differential equations. Numerical estimations are conducted for a wide range of solid fluid thermal conductivity ratio ($0.2 \leq K \leq 50$) and heat generation parameter ($1 \leq Q \leq 4$) for both cases. Outcomes are obtained as streamlines, isothermal lines, heat lines, heat transfer rate and average heat flow. The results show that the heat flux magnitude is higher for case II than case I but the rate of heat transfer stays nearly same for both cases which increase for the increment of Q and decrement of K. Finally, correlations have been established between the heat function with parameters K and Q. There exist strong correlations between the variables which measured from the R-squared values.

Source:
https://www.ingentaconnect.com/content/asp/jon/2022/00000011/00000002/art00009;jsessionid=ca1sf7sajp22.x-ic-live-03

Islanded mode microgrid automation by using droop control method for stranded zone in Bangladesh

Author: ABU HENA MD. SHATIL et al.

Brief Description:

Distributed generation (DG) is a critical component of the emerging microgrid concept, which enables sustainable energy integration within a distribution network. Inverters are critical components of DG unit operation since they connect energy sources to the grid utility. By combining inverters with feasible control mechanisms, the interface may be enhanced successfully. These controllers are critical in microgrids since they help to increase the system's performance, stability, resilience, and dependability. In Bangladesh, areas like Saint Martin, Hatia are remotely located where this type of microgrid automation can be implemented. The microgrid can be operated in grid-connected and island mode. Different control strategies like droop control, master-slave control, circular chain control, average current sharing control can be used to perform grid in island mode. In this study, a hierarchical droop control methodology has been used. In a conventional droop control system load-dependent on the frequency and voltage regulation become poor. In this research, it has been observed that the hierarchical droop control network shows stable power-sharing with improved voltage and frequency regulation. Extensive simulations have been carried out to validate the proposed control strategy's effectiveness in terms of rapid transient response and stabilization of voltage, frequency, and power equitability among the micro sources in the islanded microgrid.

Source: https://seu.edu.bd/seujeee/downloads/vol_02_issue_01_Jan_2022/SEUJEEE-Vol02Issue01-4.pdf

MICROGRID DESIGN AND SIMULATION

Author: ABU HENA MD. SHATIL et al.

Brief Description:

In this cutting-edge period, power is a basic need for all things and it applies to the electrical framework. Just as this circumstance the developing pace of the populace is expanding step by step. This kind of case made protection from offering total assistance in every single distant region and area in Bangladesh, particularly on the Island of St. Martin's. This paper shows a hybrid system to complete this service. MATLAB Simulink is used to perform the simulation. This system is divided into two loads and they are fixed load and dump load. For as usual load, Diesel Generator is perfect at the same time Battery Energy Storage System (BESS) can provide this complete service when diesel generator or diesel Genset is disabled. This problem has a permanent solution which is a model Microgrid Equivalent model. This model is also applicable to using a battery and it can remove a high amount of fuel consumption. The final result shows that the diesel little by little tasks the complete amount of load; the maximum frequency deviation which is decreased from 5 Hz to 2 Hz, the frequency restores from 2-2.5s. This microgrid system is the most advantageous and unrestricted for the proposed area.

Source: https://seu.edu.bd/seujeee/downloads/vol_02_issue_01_Jan_2022/SEUJEEE-Vol02Issue01-2.pdf

Operational Cost Minimization of Electrical Distribution Network during Switching for Sustainable Operation

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

Continuous increases in electrical energy demand and the deregulation of power systems have forced utility companies to provide high-quality and reliable services to maintain a sustainable operation and reduce electricity price. One way to continue providing the required services while simultaneously reducing operational costs is through minimizing power losses and voltage deviation in the distribution network. For this purpose, Network Reconfiguration (NR) is commonly adopted by employing the switching operation to enhance overall system performance. In the past, work proposed by researchers to attain switching sequence operation was based on hamming distance approach. This approach caused the search space to grow with the increase in total Hamming distance between the initial and the final configuration. Therefore, a method is proposed in this paper utilizing a Mixed Integer Second Order Cone Programming (MISOCP) to attain optimal NR to address this issue. The Hamming dataset approach is opted to reduce search space by considering only radial configuration solutions to achieve an optimal switching sequence. In addition, a detailed economic analysis has been performed to determine the saving after the implementation of the proposed switching sequence. The effectiveness of

the proposed technique is validated through simulations on IEEE 33-bus distribution network and a practical 71-bus network in Malaysia. The result shows that the proposed method determined the optimal network configuration by minimizing the power losses for the 33 bus and 71-bus system by 34.14% and 25.5% from their initial configuration, respectively to maintain sustainable operation.

Source: https://www.mdpi.com/2071-1050/14/7/4196

A Review on Global Emissions by E-Products Based Waste: Technical Management for Reduced Effects and Achieving Sustainable Development Goals

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

In the 21st century, a great amount of electrical and electronic waste (e-waste) has accumulated, and the unregulated nature of its disposal and recycling represents a particular hazard in a global context. For the purposes of e-waste management, there must be more emphasis on the scientific processes for recycling, reusing and remanufacturing precious materials. Resource management is related to energy management; therefore, the harvesting of costly materials from e-waste is important for both energy management and sustainable development. At present, a lack of scientific recycling of a significant amount of e-waste is a source of environmental pollution and health hazards that are having a detrimental effect on sustainable development goals. It is necessary to find a process for recovering valuable materials from e-waste with the minimum possible environmental impact. At present, it is essential to modify the process of electrical and electronic products (e-products) becoming e-waste, and the subsequent process of e-waste recycling, in order to lessen the impact in terms of pollution. E-waste scientific recycling initiatives can reduce the environmental impact of the process, which in turn can support a shift from the current linear flow of costly materials to a more sustainable circular flow. Furthermore, internal consumption loss, emissions, and heating loss from e-products are the main factors contributing to the loss of energy efficiency in the process, which in turn contributes to environmental pollution. Promoting green innovation in the manufacturing process of e-products, as well as their reuse, can reduce the environmental impact of e-waste in near future. Both of these pathways are imperative for a less polluted, low-toxic environment and sustainable development. However, the sustainable development initiative of the United Nation Environmental Programme (UNEP) policy framework is the ultimate goal. This is expected to support the management of environmental pollution, maintaining it at an acceptable level, while also preventing hazardous risks to human health. Hence, this review examines the prospects for achievable environmental sustainability through technological developments.

Source: https://www.mdpi.com/2071-1050/14/7/4036

Direct Power Control Based on Point of Common Coupling Voltage Modulation for Grid-Tied AC Microgrid PV Inverter

Author: DR. SHAMEEM AHMAD et al.

Brief Description: In this paper, a direct power control (DPC) approach is proposed for grid-tied AC MG's photovoltaic (PV) voltage source inverter (VSI) to regulate directly active and reactive powers by modulating microgrid's (MG) point of common coupling (PCC) voltage. The proposed PCC voltage modulated (PVM) theory-based DPC method (PVMT-DPC) is composed of nonlinear PVM, nonlinear damping, conventional feedforward, and feedback PI controllers. For grid synchronization rather than employing phase-locked-loop (PLL) technology, in this study, direct power calculation of the PCC voltage and current is adopted. Subsequently, at PCC, the computed real and reactive powers are compared with reference powers in order to generate the VSI's control signals using sinusoidal pulse width modulation (SPWM). Because of the absence of the PLL and DPC method adoption, the suggested controller has a faster convergence rate compared to traditional VSI power controllers. Additionally, it displays nearly zero steady-state power oscillations, which assures that MG's power quality is improved significantly. To validate the proposed PVMT-DPC method's performance real-time simulations are conducted via a real-time digital simulator (RTDS) for a variety of cases. The results demonstrate that PV VSI using the suggested PVMT-DPC approach can track the reference power quicker (0.055 s) along with very low steady-state power oscillations, and lower total harmonic distortion (THD) of 1.697% at VSI output current.

Source: https://ieeexplore.ieee.org/document/9916258

A Novel Approach for Secure Hybrid Islanding Detection Considering the Dynamic Behavior of Power and Load in Electrical Distribution Networks

Author: DR. SHAMEEM AHMAD et al.

Brief Description: In the arena of modern electrical power distribution systems, distributed generators (DGs) are emerging as a manifestation of electric power personalization. Even though DGs have various advantages, unintentional islanding phenomena caused by DGs during abnormal grid operations can damage equipment connected to the grid. Therefore, islanding detection mechanisms are essential for DGs in grid-connected mode to disconnect the DG from the grid in case of grid abnormalities by obeying to specific grid codes. In this regard, a novel approach to develop a secure hybrid islanding detection method (IDM) is presented in this paper. The proposed hybrid IDM is developed by combining two passive IDMs known as rate of change of active power and rate of change of reactive power with an active IDM called load connecting strategy. An 11 kV Malaysian distribution system integrated with three types of DGs, namely synchronous generator, photovoltaic, and biomass, has been chosen as a testbed for the verification of the proposed hybrid IDM. Seven different case studies have been conducted in the PSCAD/EMTDC platform to validate the performance of the proposed IDM for islanding and non-islanding events. The simulation results confirm that the proposed IDM can detect islanding within 0.09 s, which is within 2 s complying with IEEE and IEC standards. Further, a comparative study based on the detection time and non-detection zone has been carried out, which has confirmed that the proposed IDM demonstrates better performance compared to the previously developed hybrid IDMs.

Source: https://www.mdpi.com/2071-1050/14/19/12821

Forecasting Photovoltaic Power Generation with a Stacking Ensemble Model

Author: DR. SHAMEEM AHMAD et al.

Brief Description: Nowadays, photovoltaics (PV) has gained popularity among other renewable energy sources because of its excellent features. However, the instability of the system's output has become a critical problem due to the high PV penetration into the existing distribution system. Hence, it is essential to have an accurate PV power output forecast to integrate more PV systems into the grid and to facilitate energy management further. In this regard, this paper proposes a stacked ensemble algorithm (Stack-ETR) to forecast PV output power one day ahead, utilizing three machine learning (ML) algorithms, namely, random forest regressor (RFR), extreme gradient boosting (XGBoost), and adaptive boosting (AdaBoost), as base models. In addition, an extra trees regressor (ETR) was used as a meta learner to integrate the predictions from the base models to improve the accuracy of the PV power output forecast. The proposed model was validated on three practical PV systems utilizing four years of meteorological data to provide a comprehensive evaluation. The performance of the proposed model was compared with other ensemble models, where RMSE and MAE are considered the performance metrics. The proposed Stack-ETR model surpassed the other models and reduced the RMSE by 24.49%, 40.2%, and 27.95% and MAE by 28.88%, 47.2%, and 40.88% compared to the base model ETR for thin-film (TF), monocrystalline (MC), and polycrystalline (PC) PV systems, respectively.

Source: https://www.mdpi.com/2071-1050/14/17/11083

Genetic Algorithm-Optimized Adaptive Network Fuzzy Inference System-Based VSG Controller for Sustainable Operation of Distribution System

Author: DR. SHAMEEM AHMAD et al.

Brief Description: To achieve a more sustainable supply of electricity and reduce dependency on fuels, the application of renewable energy sources-based distribution systems (DS) is stimulating. However, the intermittent nature of renewable sources reduces the overall inertia of the power system, which in turn seriously affects the frequency stability of the power system. A virtual synchronous generator can provide inertial response support to a DS. However, existing active power controllers of VSG are not optimized to react to the variation of frequency changes in the power system. Hence this paper introduces a new controller by incorporating GA-ANFIS in the active power controller to improve the performance of the VSG. The advantage of the proposed ANFIS-based controller is its ability to optimize the membership function in order to provide a better range and accuracy for the VSG responses. Rate of change of frequency (ROCOF) and change in frequency are used as the inputs of the proposed controller to control the values of two swing equation parameters, inertia constant (J) and damping constant (D). Two objective functions are used to optimize the membership function in the ANFIS. Transient simulation is carried out in PSCAD/EMTDC to validate the performance of the controller. For all the scenarios, VSG with GA-ANFIS (VOFIS) managed to maintain the DS frequency within the safe operating limit. A comparison between three other controllers proved that the proposed VSG controller is better than the other controller, with a transient response of 22% faster compared to the other controllers.

Source: https://www.mdpi.com/2071-1050/14/17/10798

Hybrid islanding detection technique for distribution network considering the dynamic behavior of power and load

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

Nowadays, distributed generation (DG) has become an indispensable part for meeting the growing power demand in electrical power generation and distribution. However, one of the drawbacks of DG is unintentional islanding phenomena, which has become a safety issue for both human and equipment connected to the system. To prevent this hazardous condition, according to IEEE 1547 standards, this islanding condition must be detected within 2 s. This paper proposed an approach to develop a hybrid islanding detection method (IDM) to prevent the damages caused by this islanding condition. The proposed hybrid IDM is a combination of three different IDMs, two passive and one active; that is, rate of change of active power (ROCOAP) and rate of change of reactive power (ROCORP) are passive IDMs where load connecting strategy (LCS) is active. To differentiate islanding conditions with similar occurrences, different case studies are taken into account with photovoltaic (PV) and synchronous generator (SG) working as distributed generators on PSCAD/EMTDC platform. The simulation results confirm that proposed IDM is more favorable compared to other IDMs due to simplicity and fast islanding detection time when its performance is tested on the 11-kV Malaysian distribution system for various cases.

Source: https://onlinelibrary.wiley.com/doi/abs/10.1002/cta.3181

Design and Analysis of a Virtual Synchronous Generator Control Scheme to Augment FRT Capability of PMSG-Based Wind Turbine

Author: DR. MD. RIFAT HAZARI et al.

Brief Description:

Massive integration of inverter dominated renewable energy systems (RESs), i.e., wind turbines (WTs), reduces the reliance on conventional alternator-based power stations. The system inertia and damping aspects of the power system were significantly decreased by this extensive integration of inverter-based WT system, which impacts on the fault ride-through (FRT) competence and thus precipitates the frequency instability. Modern grid code instructed to operate the WT system similar like conventional power plants. However, most of the conventional inverter controller failed to fulfil the requirement. To compensate for the issues, an advanced control method of a VSG for variable speed wind turbines with a permanent magnet synchronous generator (VSWT-PMSG) is proposed by this work. The proposed control scheme mimics the behavior of a conventional alternator and includes an active-power frequency control scheme with a governor model accompanied by an automatic voltage regulator (AVR) model, along with a current feedback loop system which enhance the system inertia and consider damping aspects of the system during serious fault conditions, i.e., three line to ground (3LG) fault. The suggested VSG-based inverter controller's functionality has been verified using the simulation model.

Source: https://www.astesj.com/v07/i06/p26/

Efficiency Enhancement of an Ultra-Thin Eco-Friendly All-Inorganic CsGeI3 Perovskite Photovoltaic Cell using SCAPS-1D

Author: NOWSHIN ALAM et al.

Brief Description:

sGeI3 perovskite is an eco-friendly alternative to organic-inorganic hybrid perovskites for photovoltaic (PV) cell design. This work has optimized an ultra-thin (1.86 µm) lead-free all-inorganic novel n-i-p PV cell structure using the SCAPS-1D simulator. Comparative analyses of cell performance data of the current optimized structure with experimental and simulated data obtained from the literature have been carried out. To investigate the impacts of variables on the performance of the device, several parameters such as absorber defect density, absorber thickness, the doping concentration of hole transport layer (HTL), electron transport layer (ETL) and absorber, the thickness of HTL, ETL, and capture cross-section areas at ETL-absorber, HTL-absorber interfaces are examined carefully. The fundamental structure has a power conversion efficiency (PCE) of 17.12%. Optimization of the structure results in an outstanding PCE of 26.28% with short circuit current density (Jsc), open-circuit voltage (Voc), and fill factor (FF) of 24.245 mA cm–2, 1.242 V, and 87.28%, respectively. The simulation results of this work may be useful in fabricating an eco-friendly, cost-effective, and highly efficient all-inorganic perovskite PV cell.

Source: https://link.springer.com/article/10.3103/S0003701X22010194

Optimization of a high-performance lead-free cesium-based inorganic perovskite solar cell through numerical approach

Author: NOWSHIN ALAM et al.

Brief Description:

In this work, an ultra-thin (0.815 µm) lead-free all-inorganic novel PV cell structure consisting of solid-state layers with the configuration SnO2/ZnOS/CsGeI3/CZTSe/Au has been optimized using SCAPS-1D simulator. ZnOS electron transport layer (ETL) has been deployed and various hole transport layer (HTL) material candidates have been considered to find the most suitable one in order to get the maximum possible power conversion efficiency (PCE). The simulation begins with the optimization of the thickness of the ZnOS buffer layer, followed by an analysis of HTL and ETL doping concentrations, thickness and bandgap optimization of absorber layer. The maximum permissible defect density at the ZnOS/CsGeI3 interface and the bulk defect density of the absorber layer (CsGeI3) are also investigated. It is also found that when the temperature rises, short circuit current density (Jsc) rises by 1.43 mA/K and open-circuit voltage (Voc) degrades by 2 mV/K. The optimized structure results in a PCE of 26.893% with Jsc, Voc, and fill factor (FF) of 28.172 mA cm−2, 1.0834 V, and 88.107% respectively. The cell performance parameters outperform those found in the recent literature. The simulated results of the proposed configuration are expected to be a helpful reference for the future implementation of a cost-effective and efficient all-inorganic perovskite PV cell.

Source: https://www.cell.com/heliyon/fulltext/S2405-8440(22)03007-9

Technical Comparison of Modern HVAC and HVDC Transmission System Along with Cost Analysis

Author: DR. MOHAMMAD TAWHIDUL ALAM et al.

Brief Description:

This research aims to provide comprehensive information on current state-of-the-art technology in the field of high voltage transmission lines. Also, this study compares the performance of present high voltage AC/DC power systems and classifies potential future opportunities. It presents a contextually updated cost analysis for researchers' working on modern HVAC and HVDC transmission systems. Besides this paper explained the most important aspects of the modern features of transmission systems. It also describes the modern technology, conductors, and accessories equipment for the transmission system, which greatly reduces the loss of power transmission. This paper further describes the cost breakdown of HVAC and HVDC overhead and underground transmission lines, cost estimation, explanation of comparative HVAC and HVDC transmission costs, and price variation. As the variation between the HVAC and HVDC transmission lines increases, a certain amount of voltage drops and losses occurs which is explained in detail.

Source: http://matjournals.co.in/index.php/JCIE/article/view/988

Design and Analysis of a Rooftop Hybrid Solar PV System using Homer Pro and MATLAB Simulink

Author: DR. MUHIBUL HAQUE BHUYAN et al.

Brief Description:

In this research work, the primary target was to design a hybrid solar PV system through numerical modeling here. Here a hybrid system was proposed with a load capacity of around 1 kW. MATLAB Simulink was used to design and simulate the proposed scheme. Aspects, like the availability of physical space, electrical system scale, and on-site electrical system experts mark the areas attractive sites for rooftop solar PV implementation. Moreover, rooftop hybrid solar viability is contingent upon numerous capricious factors and the success in one site may not be reproducible at another site due to some exterior aspects, like national policy, native natural gas resources, energy fares, and availability of solar irradiance. As such, this research also investigated the feasibility of diverse kinds of rooftop systems for solar power generation and distribution in residential households, which can operate in parallel with the on-grid or in an island mode to deliver a tailored state of high reliability and flexibility to grid instabilities. This cutting-edge, integrated distribution system addressed the necessity of applying them in the sites without electric supply and/or transportation limitations in inaccessible places, and to protect the loads at a critical juncture and parsimoniously thoughtful growth.

Source: http://seu.edu.bd/seujeee/downloads/vol_02_issue_01_Jan_2022/SEUJEEE-Vol02Issue01-5.pdf

A Comparative Study on various Recent Single-Phase Single-Switch Non-Isolated AC-DC SEPIC Configurations

Author: DR. MUHIBUL HAQUE BHUYAN et al.

Brief Description:

In this comparative analysis-based research paper, five recent power electronic circuits of single-phase, non-isolated AC-to-DC SEPIC configurations are considered, such as, switched capacitor, modified, high-efficiency, input switched, and improved performance based SEPIC circuits. The open-loop performance analyses were made among these five recent converter circuits. Before that, a good number of articles on power electronic converter circuits are studied and key performance parameters, for example, voltage gain, efficiency, power factor of the supply current signal, Total Harmonic Distortion, and the number of parts were identified. Then these are analyzed based on the variation of load resistance and duty cycles. The performance evaluation points out that the high-efficiency SEPIC circuit provides an impressive efficiency of over 99% within a wide range of load resistances or duty cycles. In terms of power factor, the modified SEPIC circuit demonstrates better results of over 0.98. The switched capacitor SEPIC circuit can provide the lowest THD among the five topologies.

Source: http://seu.edu.bd/seujeee/downloads/vol_02_issue_01_Jan_2022/SEUJEEE-Vol02Issue01-1.pdf

A Long-Term Wind Speed Projection Based on Machine Learning Regression Techniques in the Perspective of Bangladesh

Author: DR. MUHIBUL HAQUE BHUYAN et al.

Brief Description:

Wind speed projection is a research hotspot in wind energy conversion systems because it aids to optimize the operating costs as well as boost the reliability of power generation from wind. Wind power output depends on wind speed that depends on different parameters. Non-linearity among these parameters makes machine learning methods a preferable approach. In our work, we have used eight parameters and fifteen different machine learning regression methods to predict the hourly wind speed of five different sites of Bangladesh. The results obtained from these methods are very compelling as it has a low Mean Absolute Error (MAE) and Root Mean Square Error (RMSE). So, this sort of investigation can be effective for future wind energy-related ventures and research in Bangladesh.

Source: http://www.seu.edu.bd/seujeee/downloads/vol_02_issue_02_Jul_2022/SEUJEEE-Vol02Issue02-1.pdf

Designing and Manufacturing a Single-Phase Transformer and Analyzing its Performance

Author: DR. MUHIBUL HAQUE BHUYAN et al.

Brief Description:

Aims: This work aims to design a single-phase transformer for analyzing its performance based on some requirements.

Study Design: At first, requirements are set, then the design was completed using AutoCAD, after that the designed machine was simulated in MATLAB Simulink, manufactured in real-time in the laboratory, tested experimentally, and then the equivalent circuit parameters were computed from the experimental data.

Place and Duration of Study: The design, manufacturing, simulation, and performance testing were conducted in the electrical machine 1 laboratory of American International University-Bangladesh (AIUB). It took around four months to complete the whole task.

Methodology: This work is a bit expensive and complicated process for students without any funds. So, a group was formed with eight students. The tasks were to design, simulate, implement, and test a single-phase transformer that would step down 220 V (ac) to 110 V (ac) having a 440 VA capacity, and core loss should not exceed 5 W.

Results: MATLAB Simulink was used to simulate the designed transformer to get the primary and secondary winding voltage and current wave shapes that were confirmed by the experimental results. Open and short circuit tests indicate that loss is only between 5 W and 8 W respectively. The total design cost is only BDTK1, 270.

Conclusion: The results satisfied the design and performance parameter requirements and the designed transformer worked very well. The design cost was also kept minimum.

Source:
https://journaljenrr.com/index.php/JENRR/article/view/246/489?fbclid=IwAR0pEeLIkVKpi4uAMIJdoSjuExB8-wGyARiXTZSVr6GdHpSANbcUjWZHEUM

Dual Z-scheme heterojunction g-C3N4/Ag3PO4/AgBr photocatalyst with enhanced visible-light photocatalytic activity

Author: DR. JAHIDA BINTE ISLAM et al.

Brief Description:

Recently, there has been a significant interest in developing high-performance photocatalysts for removing organic pollutants from water environment. Herein, a ternary graphitic C3N4 (g-C3N4)/Ag3PO4/AgBr composite photocatalyst is synthesized using an in-situ precipitation-anion-exchange process and characterized by several spectroscopic and microscopic techniques. During

the photocatalytic reaction, X-ray photoelectron spectroscopy clearly illustrated the formation of metallic Ag on the g-C3N4/Ag3PO4/AgBr composite surface. The ternary composite photocatalyst demonstrated an increased photoactivity under visible light (>420 nm), achieving a complete decolorization of methyl orange (MO) in 5 min. The ternary g-C3N4/Ag3PO4/AgBr hybrid was also applied to the 2-chlorophenol degradation under visible light, further confirming its excellent photocatalytic activity. In addition, quenching experiments revealed that holes (h+) and O2•– were the major attack species in the decolorization of MO. The enhanced photoactivity of g-C3N4/Ag3PO4/AgBr results from the efficient transfer/separation of photoinduced charges with the dual Z-scheme pathway and the charge recombination sites on the formed Ag particles.

Source:
https://www.sciencedirect.com/science/article/abs/pii/S0272884222013517?via%3Dihub

Performance Analysis of a Direct Absorption Solar Collector using Different Nanofluids: Effect of Physical Parameters

Author: DR. AFROZA NAHAR et al.

Brief Description:

Nanofluids have been used in direct absorption solar collectors (DASC) to enhance their performance, wherein contribution of entropy generation plays a decisive role. Among other factors, entropy generation is influenced including physical structure of the system and operation conditions. In this article, heat transfer and efficiency of a nanofluid based DASC considering the entropy generation has been performed for various physical alterations and operating conditions. Working nanofluids are chosen to Cu-water nanofluid, Al2O3- waternanofluid, TiO2-waternanofluid and water is chosen as base fluid. Solar irradiation value for the current analysis is considered 225W/m2 from the annual average solar irradiance range (215 W/m² in the north-west to 235 W/m² in the south-west per day) in Bangladesh according to UNDP report. Governing equations consisting of Navier–Stokes and energy equations are solved by Penalty finite element method with Galerkins weighted residual approach. Impact of parameters nanoparticle concentration and thickness of flow on isotherms, average output temperature, the average Nusselt number, collector efficiency, average entropy generation and Bejan number are discussed for all considered fluids. Results reveal that DASC system exhibits efficacy in heat transfer using 2% Cu nanoparticles under 225W/m2 irradiance, 0.015 kg/s mass flow rate and 0.015 m flow thickness. The outcomes will be supportive in designing DASC to attain improved heat transfer performance considering entropy generation.

Source: https://ganitjournal.bdmathsociety.org/wp-content/uploads/2022/07/Article-03-18-33.pdf

Optimizing IoT Based Parallel Server in a Low Power Operational Environment

Author: METHILA FARZANA WOISHE et al.

Brief Description:

Despite, the fact, Internet of Things (IoT) has indeed proven an effective technology in transportation, agriculture, healthcare, industrial automation, and emergency response to natural and man-made disasters, IoT inherits limitations from power of the devices in the IoT infrastructure. Such limitations, demands the need to have optimization research. The aim of this study is to develop a parallel server architecture in an IoT-based service in a low-power environment. The need for parallel computing is necessary for IoT-enabled devices and system architecture. The server-oriented IoT-based cloud architecture study needs immense capability and efficiency to produce satisfactory throughput. Although the efficiency is relatively acquired by the services, the demand for security is also a matter of concern in the modern platform of IoT-supported services. The concurrent process of the encryption system, data processing and computation in the service transactions, and effective, reliable management of the servers working simultaneously in an energy-efficient network service architecture is the aimed product of this study. The focus is to provide the data and task level parallelism to ensure lesser transaction delay in the system.

Source:https://www.academia.edu/78153279/Optimizing_IoT_Based_Parallel_Server_In_A_Low_Power_Operational_Environment

Design of an IoT based power monitoring system model for a grid connected solar PV

Author: DR. MD. HASAN IMAM et al.

Brief Description:

The new age of electricity generation is renewable energy. There is no other room, but to use renewable resources in energy generation to make the planet healthier, safer, and sustainable for the future. There are many different forms of renewable resources, but solar power is by far the most convenient. By utilizing solar panels, solar energy can be converted into electricity. Nowadays, solar panels are extensively utilized for the efficiency, availability, and simplicity of power production. This paper mainly represents the simulation of the compact design of a grid-tied solar system for energy production & internet of things (IoT)-based power monitoring using Matlab/Simulink. The main three sections of this design are; a fully optimized grid-tied model, IoT-based power measuring system, and optimized battery-based storage system. The model is also capable of working under load-shedding conditions. When irradiance is 1000, the integrated system can produce 2056W from the solar panels and it gradually decreases when the irradiance is less than 1000. Detail's structure and modelling of this system were discussed in this paper. The results found are promising which could be implemented in real life.

Source: https://www.researchgate.net/profile/Md-Nuhin/publication/362619804_Design_of_an_IoT_based_power_monitoring_system_model_for_a_grid_connected_solar_PV/links/63240856873eca0c008ed005/Design-of-an-IoT-based-power-monitoring-system-model-for-a-grid-connected-solar-PV.pdf

Modeling and analysis of cost-effective energy management for integrated microgrids

Author: ABU SHUFIAN et al.

Brief Description:

A microgrid concept is an innovative approach for integrating hybrid and renewable energy sources into the utility grid. The uncertainties because of the intermittent nature of renewable energy resources, the load, and market price are significant challenges. In the traditional heuristic method, data is forecast but not known perfectly. Improving energy storage systems and energy management systems (EMS) development using optimization-based methods is a possible solution to improve the performance of microgrid operations. The EMS is an essential part of the distributed energy resources in the microgrid system, especially when power generation, transmission, distribution, utilization, and variable pricing are involved. This optimization process developed in this paper uses forecasted costs and loading conditions to store or sell the energy from an integrated grid battery system. Two approaches are introduced in this research work: the heuristic method using state flow (chart flow) and the optimization method based on linear programming (LP), which minimizes operation costs (savings of around 19% cost) subject to operational constraints. The LP optimization saves roughly 3.44–5.01% of excess grid energy. Several plausible outcomes of this research study simplify the comprehensive, integrated microgrid simulation for EMS optimization algorithm validation. The suggested integrated microgrid management system might be a testbed for smart grid technology research.

Source: https://www.sciencedirect.com/science/article/pii/S2666790822001136?via%3Dihub

Optimized Performance and Economic Assessment for Hybrid Island Microgrid System Considering Uncertainties

Author: ABU SHUFIAN et al.

Brief Description:

Distributed energy resources (DER) based microgrid system integration over conventional grids at remote or isolated locations has many potential benefits in minimizing the effects of global warming. However, this emerging microgrid technology brings challenges such as high capital costs, stable performance, uncertainties, operation, maintenance, and management issues. This research introduces an island microgrid system with a correlation of PV/wind/biomass/electrolyzer/hydrogen storage/fuel cell/diesel generator. The suggested hybrid system is assessed based on the different natural uncertainties of the DER, considering the availability of wind speed, solar irradiation, and biomass fuels. Optimized electricity production and possible economic interpretation of the microgrid system are revealed. Day-ahead forecast generation and load demand dispatch analysis related to various uncertainties are estimated and calculated by the net load demand forecasting approach. With the help of optimal power dispatch scheduling, the day-ahead generation and load demand uncertainties are effectively handled. A few plausible case studies bespeak the suitability of the suggested island microgrid system in different environmental situations where the national grid is unavailable. The real-time simulation of the proposed model amplifies the feasibility of generation synchronization with load demand.

Source: https://link.springer.com/article/10.1007/s40866-022-00156-9

COVID-19 and Sustainable Development Goals: Bangladesh Perspective

Author: MD. MORTUZA AHMMED et al.

Brief Description:

The objective of this study is to evaluate the state of the Sustainable Development Goals (SDGs) in Bangladesh before the arrival of COVID-19 along with its apparent impact on the accomplishment of SDGs in the future. Data from several national and international sources have been utilised to serve the analytical purpose of the study. Obliteration of the commendable accomplishments regarding some of the SDGs so far and resetting of the goals in terms of precedence are going to be the main consequences of COVID-19 concerning SDGs in Bangladesh which would impede attaining SDGs. However, constrictions in the production of industries along with a massive drop in fossil fuel usage through vehicles would give some respite to nature leading to notable progress regarding SDG 13, SDG 14 and SDG 15. But it would never recompense significantly for the overall effect resulting from COVID-19.

Source: https://www.inderscience.com/info/inarticle.php?artid=125098

Energy Solution by Hybrid Energy System at Bhasan Char

Author: KAZI FIROZ AHMED et al.

Brief Description:

Due to its environmental friendliness and availability of resources, renewable energy sources are being adopted by numerous nations around the world for electrification. In this study, a hybrid islanded microgrid system is proposed for the electrification of Bhansan Char, the location of the Rohingyas' most recent relocation. The hydrogen fuel cell (HFC), wind, solar power, and biogas generation are all included in the model design. The system maximizes the conversion of renewable energy into electricity. Experimental testing has proven that the modeled hybrid energy system efficiently produces electric energy for a remote site under various environmental conditions, such as for a cloudy sky. A feasibility analysis for the electrification of the island is conducted using the preliminary load structure of Bhansan Char. The technical study is carried out by building the project in Matlab for the best case from HOMER, while the economic analysis is carried out using the HOMER program. It is intended to supply the 26 MWh daily electricity requirement and 4.2 MW peak load. Based on the system's Net Present Cost (NPC) and Cost of Electricity (COE), the optimum system configurations were selected. The results demonstrate that a hybrid solar/wind/fuel cell/biomass system is more effective in an isolated place like Bhansan Char, where connecting to the national grid is a significant barrier, in terms of power consumption and efficiency. The project is extremely efficient and effective over the long term despite its high starting cost.

WIND AND DUAL AXIS SOLAR AUTOMATED IRRIGATION SYSTEM

Author: KAZI FIROZ AHMED et al.

Brief Description:

Electrical power is the most crucial issue in the modern world. A hybrid system is a combination of different but complementary energy generation systems based on renewable or mixed energies. This paper describes a hybrid power system that uses wind energy and renewable power sources (solar and wind) is designed. A hybrid system is a combination of different but complementary renewable energy generation systems or mixed energies. This paper describes a hybrid power system that uses wind energy and renewable power sources (solar and wind) is designed. . This system is controlled by an Arduino Pro Mini controller. All of this power is stored in a battery. In this project, we try to make a hybrid power generation system. This system also measures the soil condition and watering (irrigation) automatically with a soil moisture sensor and a pump motor The analysis demonstrates the optimal solution as well as the costs of system construction. The outcomes presented validate the efficacy of the proposed method, which could be regarded as a handy tool in the design and analysis of a hybrid power generation system. Agriculture, along with its supporting industries, is a significant source of income for many people. This sector employs approximately 70% of the rural population and has been plagued by issues for example, energy, and water management. We should develop technology to help farmers, as more than 20% of Indian farmers are affected by drought. The most significant has been the use of renewable resources. issue confronting this industry. There are several prototypes for the agricultural sector on the market, and their price and component count should be low. We describe a revolutionary agricultural system with a Solar Plate with Dual Axis Sun Tracking and an autonomous irrigation system in this study.

Source: Source: https://dspace.aiub.edu/jspui/handle/123456789/857

A safe and long cycle life aqueous hybrid (Na+/Zn2+) ion battery.

Author: DR. S. MOSADDEQ AHMED et al.

Brief Description: In the present study, we report on a carbon-coated Na3V2(PO4)3 (NVP/C) nanoflake cathode prepared by pyro-synthesis for use in rechargeable Na+/Zn2+-ion hybrid aqueous batteries with high rate performance. An X-ray diffraction study confirmed the formation of pure NASICON Na3V2(PO4)3 with rhombohedral structure. As observed from electron microscopy studies, the NVP/C sample shows flake-like morphology. Raman spectroscopy and CHN analysis confirmed the presence of carbon. The electrolyte containing 2 M sodium acetate and 1 M zinc acetate was used for assembling rechargeable hybrid aqueous battery. When tested in the rechargeable hybrid aqueous batteries (ReHABs) system, the NVP/C showed good cyclability over 1000 cycles (about 72% of the initial capacity was retained at 32C) and demonstrated high rate capability of 66 mAh g-1. In-situ synchrotron X-ray diffraction and ex-situ X-ray absorption near edge structure (XANES) were carried out for studying structural transformation and oxidation change studies of the electrode during cycling, respectively, which confirmed the two phase reaction of the NVP/C electrode in the cell. The carbon-wrapping enhances the electrochemical performance NVP particles significantly. This report will open window for the application of Na3V2(PO4)3@C in rechargeable aqueous Na-Zn hybrid battery.

Source: www.advancedmaterialscongress.org/conclave-bangladesh

An Environment Friendly Combined Method of Axial Hydro Floating and Kinetic River Turbine

Author: KAZI FIROZ AHMED et al.

Brief Description:

Converting from conventional energy production methods to renewable and other green energy worldwide is now holding a strong position in power generation. Escalation of burning fossil fuels has already augmented the greenhouse gasses, mutilated the ozone layer, and deteriorated our descendants' existence in our very own planet. The use of renewable natural resources such as solar energy, wind energy, hydro energy on full scale instead of fossil fuels, coal, and atomic energy will be commendable. Many of the riverine countries are blessed with spontaneous water flow along with strong streams from rivers throughout the year. The continuous flow of water generates a stream, which can be used for rotating turbines, and will help to produce green energy. Two types of hydro turbines can be implemented together for achieving maximum energy production. One of the turbines is a floating axial hydro turbine, which will be implemented on the shallow water surface and, another turbine is a kinetic river turbine, which will be situated on the river bed. The use of two separate energy, kinetic and potential energy, from the stream as well as the turbine blade, will make this operation viable. Depth of water will play a prominent role in finally fulfilling the gaining of maximum electric power production from the system. A brief discussion on water speed variation reliance on water depth will be helpful.

Source: https://icmmpeduet.com/

Design and Comparison of Floating Solar Panel for Chalan Beel

Author: ABU HENA MD. SHATIL et al.

Brief Description:

Floating solar panels become a recent trend in solar energy harvesting systems. Countries like Bangladesh where land is scarce and densely populated could conduct feasibility tests about these floating panels. There are many rivers, canals, beel around Bangladesh which could be a perfect place for such kind of experiment. This paper investigates the possibility to set up floating solar panels in Chalan Beel, Natore, Rajshahi. Throughout the experimental setup, it is also observed the comparison between the ground-mounted panel and floating panel based on electrical parameters like output power along with costing. After the analysis, it is found that the energy conversion cost in the floating panel set up is 0.57 cents/kWh, which is acceptable comparably with other countries.

Real Time Power Management for AC Microgrid Prioritizing Renewable Energy Sources, Battery Storage and Critical Load

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

In this paper, real-time power management systems (PMSs) are proposed for both grid-connected and islanded operations of AC microgrid (MG) by considering the maximum utilization of renewable energy sources and storage systems prioritization of critical loads together. The advantage of the proposed PMSs is instead of focusing on a market-based optimization problem, it is emphasized on the instantaneous supply-demand balance for enhancing MG stability and providing better power quality. Real-time simulation on a real-time digital simulator is carried out to prove the effectiveness of the proposed MG PMSs. The results show that through the implementation of the proposed PMS, maximum use of renewable energy sources and energy storage systems are ensured by maintaining a proper balance between supply-demand.

Prediction of Solar Photovoltaic Energy Output Based on Thin-Film Technology Utilizing Various Machine Learning Techniques

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

This paper presents solar photovoltaic (PV) energy prediction based on thin-film technology utilizing various machine learning (ML) models. Several ML models like Support Vector Machine (SVM), Extra Tree Regression (ETR), Decision Tree Regression (DTR), K-Nearest Neighbour (kNN) and Feed-Forward Neural Network (FFNN) were utilized to evaluate each model's performance according to performance metrics. The primary input parameters such as time, solar radiation, wind speed, ambient and PV module temperatures, and the actual power generated by the thin-film PV panel based on the 2018 data set were considered for predicting solar PV output power. The ETR is proposed to predict the PV power output in this work and compared with other ML models. The results showed that ETRs outperformed the different ML algorithms, whereas DTR performed the poorest. The ETR model had the best performance, with Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) values of 59.17 and 39.07, respectively. On the other hand, the DTR model performed poorly, with an RMSE of 81.83 and an MAE of 52.9, respectively.

Forecast of Solar Photovoltaic Power Output Based on Polycrystalline Panel-based Employing Various Ensemble Machine Learning Methods

Author: DR. SHAMEEM AHMAD et al.

Brief Description:

This paper presents solar photovoltaic (PV) energy prediction based on Polycrystalline technology utilizing various ensemble machine learning (ML) models. Several ML models like Extra Tree Regressor (ETR), Decision Tree Regression (DTR), Random Forest Regressor (RFR), Adaptive Boosting (AdaBoost), and Gradient Boosting Regressor (GBR) were utilized to forecast PV power output and the performance of all models is evaluated according to performance metrics. The selected ensemble models are based on bagging and boosting approaches. The primary input parameters such as solar radiation, wind speed, time, and the actual power generated by the Polycrystalline PV panel based on the 2019 data set were considered for forecasting solar PV output power. The results showed that AdaBoost outperformed the other ensemble ML algorithms, whereas DTR performed the poorest. The AdaBoost model had the best performance, with Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) values of 15.36and 25.05, respectively. On the other hand, the DTR model performed poorly, with an RMSE of 35.72 and an MAE of 23.47, respectively.

Advanced Solar Powered Multipurpose Agricultural Robot

Author: SUJAN HOWLADER et al.

Brief Description:

Agriculture is contemplated as one of the foremost principal economic exercises in Bangladesh. Its contribution to GDP is a lot and it is the third most benefaction sector to Bangladesh's GDP. Though its subscription is decreasing for many years. It comes to12.6% in 2020 from 17% in 2010. This project bargains with the exchange and advancement of low power, low cost, and less man work robots within the agronomic approach. Agrarian automata are broadly utilized at the tunnelling, seeding, collecting stage, and developing. This robot is built to diminish the farmer's exertion. This project's main goal is to increase the agriculture production rate and to help the farmers. The planned Mechanical autonomy procedures are proficient for accomplishing the assignments such as seed sowing, water sprinkling, pesticide spraying, and digging the land. This system can spread seeds in 4 rackets at a single moment. A 4–7volt motor has been used in this system. This robot's efficiency is 80% that needs a 500mA-1A current and 50rpm Motor Torque. The robot has the capacity to lift approximately 12 litters of water. This system will enlarge the fabrication rate as well as will reduce the time that is given in the production procedure. As the entire system will consume its required electrical energy from solar panels so it will be cost-effective and will contribute to the counties economy.

Source: http://www.incet.org/

Performance Analysis of a DFIG Based Wind Turbine with BESS System for Voltage and Frequency Stability during Grid Fault

Author: MEHEDI AZAD SHAWON et al.

Brief Description:

The ease of Doubly-Fed Induction Generator (DFIG) based wind turbines is largely deployed due to their variable speed feature and hence influencing system dynamics. However, owing to grid faults, the output power fluctuation in the DFIG wind turbine system brings a major concern to power system stability. In this paper, the grid voltage and frequency stability of the wind power system investigates different cases such as DFIG and the approach of a Battery Energy Storage System (BESS). Designing of a wind turbine model including Rotor Side Controller (RSC) and Grid Side Controller (GSC) and connected to the grid. An equivalent BESS is introduced in the power system model and connected to the grid through a three-phase inverter. The BESS system is designed to stabilize the frequency at a constant value with controlled active power also; voltage is controlled by reactive power. To design the wind turbine only active power is considered in this specific work. Therefore, the system performance has improved after including BESS. The performance analysis is observed by simulation work through “PSCAD/EMTDC” professional software, which is the most realistic and well-organized software, especially for power system analysis.

Design and Implementation an IoT Based Smart Traffic System Using Renewable Energy Sources

Author: DR. MD. KABIRUZZAMAN et al.

Brief Description:

Congestion in the streets is a big issue in many countries. Traffic congestion has been caused by signal failure, poor law enforcement, and inefficient traffic management. One of the biggest issues in many countries is that the existing infrastructure cannot be expanded further, leaving only better traffic management as an option. Overcrowding has a negative economic impact, on the environment, and on the general quality of life. As a result, it is past time to address the traffic congestion issue efficiently. For traffic control, visual data analysis, IR sensors, inductive loop detection, remote monitoring, and other methods are available. The problem of traffic congestion has had a significant impact on the country’s transportation system. This creates a slew of issues, particularly when there are emergency situations at traffic signal junctions, which are always congested. To address these issues, a traffic light controller system was created using renewable energy. When the system received a radio frequency (RF) transmission signal from an emergency vehicle, the speaker was triggered, and the traffic police were notified. The road was thereafter cleared by the traffic police. This technique will decrease accidents that occur frequently at traffic light crossings since other vehicles must congregate in order for an

emergency vehicle to be given a unique route. This system was designed to run when it received a radio frequency (RF) transmission signal from an emergency vehicle, then the speaker was activated, also notifying the traffic police by the server. We include many features of a smart traffic system, such as voice announcement for ambulances with radio frequency, renewable energy source, extra power supply for residential areas, overspeed protection system, automatic street lights only for night time, pressure sensor traffic manual system, accident tracking and sending SMS with the accident location, local server, and global application/IoT base. Traffic congestion will be decreased as a result of the use of this innovative technology. Bottlenecks will be spotted early, allowing for early preventative steps to be performed, saving the driver time and money.

Estimation of Hydrogen Demand for a sustainable Energy mix in Bangladesh replacing the traditional fuels by 2040

Author: DR. GOUR CHAND MAZUMDER et al.

Brief Description:

Due to the environmental deterioration, fossil fuels are no longer preferable energy sources. Among other alternatives, hydrogen is a potential candidate to replace fossil fuels. Some countries have already developed the hydrogen economy and policy to achieve the sustainable energy mix. Many East Asian countries are to deploy the policy within 2040. Bangladesh has already started the research for the use of hydrogen in various applications. The demand projection of hydrogen and a policy is required for the development of a sustainable energy sector in Bangladesh. In this paper, performed analysis shows the potential of hydrogen demand by Bangladesh in 2030. The analysis is based on the methods and criteria adopted by several international agencies, research institutes and laboratories. There are three scenarios, each having a specific percentage of different fuel mix. These three scenarios are modified and set for Bangladesh. For scenario1, Bangladesh would require about 2.98 MTOE of hydrogen in 2041, whereas for scenario 2 and 3 the amount would be 6.05 and 9.12 MTOE. The Power sector would consume about 70% whereas industries and transport would consume 23% and 6%, namely. Technology transfer and locally developed low cost systems may facilitate more accessible and low-cost production of hydrogen in Bangladesh because of the penetration of Renewable energy sources and technologies. Technology transfer would be challenging for Bangladesh. As neighbouring countries have already completed, and about to start making hydrogen policy, Bangladesh should commence on it. This research would contribute to the hydrogen economy and policy in Bangladesh.

Source: https://www.bapa.org.bd/bapa-ben-annual-conference-2022/

Temperature and Power Analysis of the Thermoelectric Generator in Hybrid Electric Vehicles

Author: CHOWDHURY AKRAM HOSSAIN et al.

Brief Description:

In the modern days, the technological advancement of the Hybrid Electric Vehicles (HEVs) is the most dynamic as the global warming issues has been taken as a prime concern all over the world. For updating this field vehemently, the use of Regenerative Braking System (RBS) is one of the most prominent and effective approaches till now. In this manuscript, the comparative study is shown taking the proposed model of the Thermoelectric Generator (TEG) along with the other existing technology of RBS. Also, the analysis of temperature and the electrical power output obtained from the TEG is portrayed with the description of the used model. Following the principles of RBS, this design will be one of the key sources of expanding the driving range of the HEVs lowering the net cost of recharging for the users.

Temperature and Current Density Analysis of Thermoelectric Generator for Regenerative Breaking of the Hybrid Electric Vehicle

Author: CHOWDHURY AKRAM HOSSAIN et al.

Brief Description:

The advancement in the area of Hybrid Electric Vehicles (HEVs) is one of the most dynamic in the modern world with the concern of global warming issues. The incorporation of a Regenerative Braking System (RBS) into this technology is also a primary element in keeping this field up to date fiercely. It is shown in this article that the suggested Thermo-Electric Generator (TEG) model can be compared to other current RBS technologies using the comparative research method described above. Aside from that, a representation of the model is provided together with the results of the temperature and current density study performed using the TEG. The suggested design was simulated using the Ansys mechanical model and the Ansys 2021 Workbench software, which was used to generate a test simulation of the concept. This device captures the wasted heat of the vehicle energy from the brake pad of the wheels and turns it into useful electrical energy. In accordance with the principles of RBS, this design will be one of the most important sources of extending the driving range of HEVs while simultaneously reducing the net cost of recharging for the end-user.

Renewable Energy of Bangladesh for Carbon-free Clean Energy Transition (C2ET)

Author: ABU SHUFIAN et al.

Brief Description:

At the beginning of the 21st -century global warming is one of the alarming issues that causes the imbalance of living beings' relations on Earth due to the increase of CO 2 and greenhouse gas on burning fossil fuels for electricity generation. With the effect of modernization and industrialization, Bangladesh and many countries worldwide generate power very rapidly from fossil fuels. Due to overuse, the world's fossil reserves will soon be depleted. Considering the above problems, Bangladesh needs to depend entirely on renewable energy (RE) to meet the growing electricity demand. The proposed C2ET strategy will pave the way for a bright future of green energy in Bangladesh, taking into account the various sources of recent power generation and the immense potential of RE. The model will make the entire country's energy system affordable and user-friendly by controlling it through an intelligent energy management system (EMS). The suggested strategy will formulate the future RE mix by thoroughly analyzing Bangladesh's ecological-environmental-economic systems. Following the outline, Bangladesh will meet its electricity demand from about 85% RE and 15% nuclear power by 2050. The power generated from RE will be used in any emergency condition as it will be stored on a short, medium, and long-time basis. There will be no need to generate electricity from fossils. Old and running fossil power plants will be gradually shut down. So, being a developed country, the carbon emissions tax on Bangladesh will no longer be effective. The suggested C2ET would be a ground-breaking and timely solution to preserve the world ecologically pleasant while also keeping up with the rising globalization system without jeopardizing the Earth's equilibrium.

Source: https://icaeee2022.com/

Modeling & Economical Analysis of Hybrid Solar-Wind-Biomass-H2-based Optimal Islanding Microgrid in Bangladesh

Author: ABU SHUFIAN et al.

Brief Description:

Renewable energy systems are being developed to take the place of fossil-fuel-based energy systems in order to minimize the effects of global warming. Microgrid-based renewable energy generation has gained popularity on islands and in remote places worldwide. This paper proposes an optimal islanding microgrid system considering hybrid solar-wind-biomass-H2 storage components. The system consists of a mini solar hub, an onshore wind zone, and an anaerobic digester biogas plant with hydrogen energy storage. The suggested hybrid system is assessed based on its different intermittent natures, examining the alternation, uncertainty, and correlation of average daily solar, wind, and biogas output. Economic analysis and optimum control aspects are evaluated, with the ideal and practical operation configurations. Various plausible case studies demonstrate the usefulness of the proposed microgrid model. The real-time simulation demonstrates that the suggested hybrid system can effectively generate electricity for an isolated site in different environmental situations where the national grid is unavailable.

Smart Cable Fault Location Diagnosis System

Author: ABU SHUFIAN et al.

Brief Description:

Repairing underground cable lines might be challenging due to a lack of a proper system for tracking the precise location of cable faults. Repairing wires of a defective cable becomes extremely difficult in the case of an underground fault because there is no way to locate the exact location of the fault. A microcontroller is used in this research study to investigate underground cable fault distance locators. It employs a straightforward interpretation of Ohm's law; the voltage drop might change depending on the length of the fault in the cable since the current varies. A group of resistors is used to represent the cable's length in kilometers. A DC voltage is put into one end of the cable, and the defect was identified using an analog to voltage converter when the voltage changed. The LCD displays the location of the defect as it interacts with the microcontroller that does the necessary calculations. Overhead cables were developed in recent years, but they are now laid as underground cables, which is superior to the earlier technique because the underground cables are not impacted by inclement weather like storms, snow, heavy rain, or pollution.

Source: http://www.r10htc2022.org/

Automatic Protection of Electrical and Gas Transmission System on Earthquake

Author: ABU SHUFIAN et al.

Brief Description:

A medium-sized or large earthquake can damage gas pipelines, electricity poles, and electrical components. Because there is a constant supply of gas and an active electricity supply, an active running system might result in gas explosions and electrical mishaps. This proposed model aims to create a device that can detect an earthquake of a particular Richter magnitude, trip electrical components, and automatically cut gas flow from the gas line by activating the solenoid valve during the earthquake. The safety system will automatically activate when the gadget senses that the ground is shaking at a 3.5 Richter scale. A microcontroller totally operates this system with the help of a relay and a solenoid valve. Implementation of the whole system was done successfully.

Source: https://ieeexplore.ieee.org/xpl/conhome/9864330/proceeding

Research and Development on Embedded System Design to Attain Sustainable Development Goals

Author: DR. MUHIBUL HAQUE BHUYAN et al.

Brief Description: In 2000, world leaders adopted the Millennium Development Goals (MDGs) to eliminate certain critical problems from this earth. Then in 2015, The United Nations adopted the well-known 17 Agenda of the Sustainable Development Goals (SDG) to realize a sustainable world by 2030. It was recognized that poverty and other problematic issues in this world must be resolved jointly by initiating a group of action plans to obtain sustainable developments through signs of progress in the areas of poverty, health, energy, education, gender inequality, economic growth, environment and climate changes, social issues, collection, and preservation of natural resources, etc. The 17 SDGs comprise 169 sub-targets, all of which must be achieved within 2030 through an integrated approach and cooperation. To achieve these goals, engineering research, innovations, development, and commercialization of the designed products can assist us in the respective areas. In this talk, I shall emphasize the recent research and innovations in embedded system design to achieve the SDGs. These ventures will help both societal and economic repayments in the world for sustainable growth. In this talk, I shall also focus on the seven areas of the SDGs where embedded system design has an important role to execute. These are mainly related to good health and well-being, quality education, clean water and sanitation, affordable and clean energy, sustainable cities and communities, life below water, and life on land. In fine, we may conclude that the advancement of embedded system design surely helps electrical and electronic engineers to design and develop complex engineering problems' solutions to achieve the mentioned specific SDGs, and hence to realize a sustainable world for humanity.

Source: https://dspace.aiub.edu/jspui/handle/123456789/845

A low-power wireless sensor network for a smart irrigation system powered by solar energy

Author: DR. AFROZA NAHAR et al.

Brief Description: The research work provides an intelligent renewable power irrigation system for protracted and continuous power supply. In Bangladesh, irrigation is one of the most powerful sources, however it is difficult for a single person to monitor continually and on a regular basis. To make this irrigation easier, our system includes certain modifications to the standard irrigation system. A solar panel, a lithium battery, an architectural model, and a system circuit make up the proposed system. The lithium current battery charging control is characterized by hardware rather than software, increasing the system's dependability and stability. It likes to use solar energy whenever there is enough sunlight, when there is ample sunshine, it prefers to use sun's radiation, while the rechargeable battery acts as a backup in case of conditions such as overcast, rain, and night. To completely use solar energy, the system includes a maximum power point tracking (MPPT) controller., and it provides an extraordinarily long life for the lithium battery using an optimal charging approach that reduces the frequency of the battery charge-discharge cycle. This system may be implemented using low-power technology, as a result, it's suitable for Internet of Things wireless sensor nodes deployed outside (IOT).

Source: https://www.researchgate.net/publication/362654033_A_Low-Power_Wireless_Sensor_Network_for_a_Smart_Irrigation_System_Powered_by_Solar_Energy

Smart IoT System for Automatic Detection and Protection from Indoor Hazards: An Experimental Study

Author: ABU SHUFIAN et al.

Brief Description:

Electrical short circuits and gas leakages are responsible for most of the fire occurrences. Considering this problem, Internet of Things (IoT)-based smart sensors and relays have been proposed in this paper. Besides, an automated indoor safety mechanism has been introduced which consisted of various sensors, built up with Arduino with the monitoring mechanism of ThingSpeak via IoT. The purpose of this proposed model is to save living creatures and goods from fire incidents. Additionally, a comprehensive device has been built to avert this situation by disconnecting the power source promptly and hence, save lives and property within a short time period. The main feature of this model is – (i) the monitoring device can operate from a remote area, and (ii) it collects real-life data and for the purpose of storage, the collected data would be send to the cloud. However, collected data can be analyzed from various locations using smart devices e.g., smart phones, laptops, computers, and hence, real-time decisions can be taken as well as execute. This experimental study ensures power safety as a result of fire or gas hazards and an IoT-based data monitoring system has been built which would continuously monitor the leakage of flammable gases e.g., Liquefied petroleum gas (LPG), Carbon dioxide (CO 2), Ammonia (NH 3) from the surroundings. The proposed system has been planned for online monitoring of indoor safety measurement, and the parameters can give important as well as helpful information about the atmospheric record and security issues of that place. The application of the developed model has been widely used in various settings, including - (i) residence, (ii) industries, (iii) gas stations, (iv) automobiles, (v) power plants, (vi) research centers, (vii) commercial areas (e.g., shopping malls), and (viii) hospitals.

Source: https://ieeexplore.ieee.org/document/9929677

Fabrication of Carbon Nanotubes (CNTs) by Chemical Vapour Deposition Technique

Author: DR. MD. EHASANUL HAQUE et al.

Source: https://www.aiub.edu/international-symposium-on-nanotechnology-2022-isn2022

Fabrication of Carbon Nanotubes on Si/SiO2/Co Substrate by Chemical Vapor Deposition Technique

Author: DR. MD. EHASANUL HAQUE et al.

Source: https://scientificfederation.org/webinar/2dmatertials-graphene/