

Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all.



Universiti Malaya's Commitment to Affordable and Clean Energy

Universiti Malaya (UM) has consistently proven its dedication to fulfilling Sustainable Development Goal 7 (SDG 7), focusing on the provision of affordable, reliable, sustainable, and modern energy. In 2023, the university's efforts to promote clean energy took on even greater importance as global energy demands increased. UM's proactive stance aligns with its UM Transformation Plan 2030 and UM Master Plan 2050, both of which prioritise sustainability and carbon-neutrality across campus operations. The university's approach is not limited to mere infrastructural upgrades. Instead, it is underpinned by a holistic energy strategy that combines technological innovation, energy monitoring, renewable energy adoption, and collaborative partnerships. These comprehensive efforts ensure that the university is not only reducing its carbon footprint but also setting a global example for sustainable campus management. In line with SDG 7 and its overarching commitment to fostering clean and affordable energy solutions, Universiti Malaya (UM) has adopted a progressive Divestment Policy that aims to reduce its financial ties to carbon-intensive energy industries, particularly coal and oil. This policy is outlined in the <u>UM Sustainability</u> <u>Policy 2021-2030</u> and represents a significant step towards aligning the university's investment practices with its sustainability goals.

The policy, detailed on page 17 of the Sustainability Policy document, emphasises the university's decision to divest from industries that contribute heavily to greenhouse gas emissions. This includes investments in fossil fuel sectors such as coal and oil, which are known to be major drivers of climate change. By adopting this divestment strategy, UM is demonstrating its commitment to shifting away from reliance on non-renewable, carbon-intensive energy sources and moving toward a more sustainable, low-carbon future. UM's divestment policy not only underscores its dedication to carbon reduction but also reflects its broader vision of promoting renewable energy and sustainable practices across all sectors of society. The decision to divest from fossil fuels is part of a comprehensive effort to ensure that the university's financial and operational strategies are in line with global efforts to mitigate the impacts of climate change.

This approach is also designed to encourage other institutions, both within Malaysia and internationally, to adopt similar practices, ultimately contributing to the global transition towards clean energy.

Furthermore, this policy is closely tied to UM's broader sustainability framework, which seeks to integrate environmental, social, and governance (ESG) criteria into its financial decision-making processes. By divesting from industries that are at odds with its sustainability mission, UM is leading by example, showcasing how academic institutions can play a pivotal role in the fight against climate change by using their investments as a lever for positive environmental impact.

This divestment policy aligns perfectly with SDG 7, which promotes the universal access to affordable, reliable, sustainable, and modern energy. By reducing its support for fossil fuel industries and encouraging investment in renewable energy solutions, UM is actively contributing to the achievement of a more sustainable energy landscape, not only on campus but also within the broader community. This initiative strengthens the university's commitment to the global effort to limit global warming and protect the environment for future generations.



Right: UM Sustainability Policy 2021- 2030

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Universiti Malaya's Renewable Energy Pledge

To realise its vision of becoming a carbonneutral campus, the Universiti Malaya (UM) is committed to transitioning its energy sources from fossil fuels to greener and more sustainable alternatives, with the goal of achieving 100% renewable energy through phased approaches (including solar, biomass, biodiesel, and wind). This transformation requires the full support of university management, faculty, and students, engaging through research, education, operations, public-private partnerships, industry collaborations, and green procurement led by the UM Bursar. As part of the UM Transformation Plan, one key focus is the adoption of Smart Campus initiatives, designed to foster a cleaner, greener, safer, more connected, and seamless campus experience. This pledge is supported by continuous advocacy and engagement programs with key stakeholders and partners, both internal and external.



<u>UM Master Plan 2050</u>: Key Principles and Focus Area

In UM Master Plan 2050, under Key Principle 9 - Ensuring Efficient Infrastructure and Facilities Management, underlines three focus areas: i) Efficient Energy and Water Consumption, ii) Efficient Waste Management, and iii) Sustainable Facilities Management.

In line with the focus areas, UM is working towards renewable energy solutions aim to generate electricity on campus. This oncampus electricity generation will offset a large percentage of the increasing electricity demand as the campus grows to house more laboratories, larger teaching and learning buildings, and other buildings. These buildings must also be energy and water efficient to be cost-effective and educate the campus community on resource efficiency.

In UM Transformation Plan 2021-2030, under Theme 6: Enhance Learning & Work Environment on sustainable campus transition to be a carbon neutral campus by 2030 (page 61: Our Measure of Success). Once again, UM pledges to renew its commitment to focus on transitioning from fossil fuel dependencies towards greener and sustainable alternatives in pursuing pathways towards 100% renewable energy in years to come by phases.



SUSTAINABLE CAMPUS

UM aims of becoming a carbon neutral campus by 2030. In realizing its vision to be a carbon neutral campus, UM pledges to renew its commitment to focus on transitioning from fossil fuel dependencies towards greener and sustainable alternatives in pursuing pathways towards 100% renewable energy (solar, biomass, biodiesel, wind, etc) in years to come by phases (refer to UM Eco-Campus Initiatives).

<u>UM Transformation Plan 2021-2030:</u> Chapter on Our Measures of Success

Building Energy Monitoring System (BEMS)

Building Energy Monitoring System (BEMS) is an innovative technology that allows buildings to analyse and control their energy use with precision. Data collected on a building's energy efficiency, BEMS managed to identify areas for energy savings, improve occupant comfort, and optimise overall building performance. BEMS initiative designed and developed by the UM Power Energy Dedicated Advanced Centre (UMPEDAC) in 2019 located in the UMPEDAC Renewable Energy Laboratory presents findings on energy consumption profile at Wisma R&D building, Universiti Malaya (UM). The BEMS is a graphical user interface featured with a monitoring data measurement of up to 90 electrical parameters within a one-minute interval time to calculates and measures other parameters such as building energy consumption in kiloWatt hour (kWh), weather data, building energy index (BEI), energy cost (RM/USD), carbon dioxide (CO2) footprint in tonne (t-CO2) unit, and energy consumption profile in watt (W).



Above (left): Building energy monitoring and management system (BEMS) (Source: UMPEDAC) **Above (right):** The real-time monitoring system for photovoltaic (PV) inverter (Source: UMPEDAC)



Above: BEMS at Wisma R&D, Universiti Malaya

Below: BEMS displays carbon emissions, while the bottom graphic aids in identifying energy wastage and enhancing energy efficiency



Impact of 2023 Initiatives on Energy Efficiency and Sustainability

UM's drive toward achieving carbon neutrality by 2050 has led to numerous projects aimed at reducing energy consumption across the campus. In 2023, the university took several bold steps to enhance the energy efficiency of key buildings by retrofitting them to meet modern efficiency standards. These retrofits were guided by the UM Master Plan 2050, ensuring a sustainable and resilient infrastructure for the future.

One of the key milestones achieved in 2023 was the expansion of the Building Energy Monitoring System (BEMS). Initially introduced in 2019, BEMS, managed by the UM Power Energy Dedicated Advanced Centre (UMPEDAC), enables the precise tracking of energy usage across campus buildings. In 2023, the system was extended to cover additional facilities, allowing UM to monitor energy consumption patterns in real-time. This extension has already led to the identification of energy wastage, enabling targeted corrective actions that have resulted in significant energy savings.

Additionally, the BEMS initiative has empowered UM to optimise energy use, improving both operational efficiency and environmental sustainability. This system aligns perfectly with the university's goal to become a global leader in energy-efficient campus operations.







Advancements in Renewable Energy Adoption

In 2023, UM further accelerated its adoption of renewable energy, with solar projects being a major focus. The Pusat Agrosains Pintar continues to serve as a flagship project, showcasing the potential of solar photovoltaic (PV) systems. The installation of these systems has had a direct impact on reducing UM's dependence on nonrenewable energy while contributing to global renewable energy goals.

UM has also been exploring additional renewable energy sources beyond solar, such as biomass energy, wind power, and energy from waste, positioning itself as a diverse contributor to Malaysia's clean energy mix. The university's exploration into these alternatives is part of its broader carbon-neutral strategy. By investing in renewable energy projects, UM is not only reducing carbon emissions but also contributing to national energy security and environmental sustainability.

Furthermore, these projects highlight the university's capacity to implement scalable renewable energy solutions that can be replicated in other institutions and communities. UM's ongoing investment in these projects underscores its role as a pioneer in clean energy and its commitment to advancing SDG 7.









Solar Savior

Harnessing the power of the sun for a brighter, cleaner future.



Above: Solar energy installations located at UM's main campus



Right: Poster for "Webinar Research Cluster Public Forum: Climate Change & Power Outages" (Source: Social Advancement and Happiness Cluster)

Community Engagement and Educational Outreach

UM's energy initiatives have reached beyond its campus, engaging the wider Malaysian community in clean energy practices. Through the UM Community Engagement Centre (UMCares), UM has worked closely with local schools and organisations to optimise electricity use and introduce energy-saving technologies. A key example is the Pengoptimuman Penggunaan Tenaga Elektrik Di Bangunan Sekolah program, which uses artificial intelligence to help local schools become more energy-efficient without compromising comfort. This program underscores UM's commitment to knowledge transfer and community empowerment.

By collaborating with industry and government agencies, UM has organised numerous workshops, seminars, and public forums on energy efficiency. These efforts not only educate participants about sustainable practices but also position UM as a driving force in Malaysia's clean energy landscape. UM's active participation in national and international energy initiatives enhances its ability to influence broader policy decisions and technological advancements in clean energy.

Alignment with Global Trends and Contribution to SDGs

UM's sustainability strategies are deeply aligned with global movements toward climate action and resource efficiency. The university's emphasis on renewable energy adoption, energy efficiency, and carbon emission reduction directly supports international climate agreements such as the Paris Agreement. UM's goal to achieve carbon neutrality by 2050 not only aligns with global climate goals but also ensures that the university is making meaningful contributions toward limiting global warming.

UM's ongoing commitment to sustainable consumption and resource efficiency, demonstrated through initiatives such as the Zero Waste Centre, also aligns with SDG 12. By fostering a sustainability culture both on and off campus, UM is setting a global benchmark for responsible consumption practices and driving the circular economy agenda.

Furthermore, UM's active participation in global sustainability conferences, such as the 6th International Conference on Clean Energy and Technology (CEAT 2023), ensures that it remains at the forefront of clean energy research and policy advocacy. This platform allows UM to share its progress, collaborate with global partners, and continue contributing to the achievement of the SDG.



Above: Poster for the "6th International Conference on Clean Energy and Technology" (Source: UM Event <u>https://umevent.um.edu.my/ceat2023</u>)



Above: Participants of the "6th International Conference on Clean Energy and Technology"

The Clean Energy and Technology Conference (CEAT) is a series of international conferences with a focus on the issues pertaining to the study, development, application and advocate of clean and renewable energy. Being the 6th of its series, CEAT2023 was held alongside the International Symposium on Electric Mobility (ISEM). The conference took place in Penang, Malaysia on 7th - 8th of June 2023. The conference aims to provide a niche platform for researchers, academics and industry practitioners to share their passions and exchange ideas related to the latest development in clean energy and technology, and electric mobility.

The conference is a success with a total of 110 national and international participants from universities, industries as well as government sector participating in this conference. Initiative partner for this event: Universiti Kebangsaan Malaysia (UKM), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Teknologi MARA (UiTM), Universiti Sains Malaysia (USM), Universiti Teknikal Malaysia Melaka (UTeM), Universiti Tenaga Nasional (UNITEN), Sunway University, Universitas Negeri Padang (UNP), Japan Advanced Institute of Science and Technology (JAIST), Kamla Nehru Mahavidyalaya, Nagpur, India, IKA Technology, Quantum Approach Sdn. Bhd., RGS Corporation Sdn. Bhd.

Symposium on Sustainable Future Energy and UM Sustainability Festival

In 2023, the Symposium on Sustainable Future Energy, held in conjunction with the UM Research Gallery and UM Sustainability Festival, provided a unique platform for researchers, industry leaders, and policymakers to engage in meaningful discussions on clean energy and sustainable technologies. The symposium aimed to highlight UM's cutting-edge research and its practical application in addressing global energy challenges. It also underscored UM's efforts to position itself as a key player in the clean energy transition, with a focus on developing innovative solutions to power Malaysia's future sustainably.

Key themes of the symposium included the exploration of new renewable energy technologies, such as solar PV systems, wind energy, and bioenergy. The event also provided a forum for discussing critical challenges such as energy storage, grid management, and energy accessibility for marginalised communities. By engaging a diverse audience from academia, industry, and government, the symposium solidified UM's role as a leader in sustainable energy.

The symposium was further enhanced by its integration into the UM Sustainability Festival, a broader event that promoted environmental consciousness through workshops, exhibitions, and community activities. These events collectively emphasised the importance of multi-stakeholder collaboration in addressing the complex energy challenges of today's world.



Above: Poster for the Symposium on Sustainable Future Energy (Source: UM Research Gallery)

Professional Accreditation Program for Solar PV Design

The Professional Accreditation Program for Solar PV Design, conducted at UM's UMPEDAC in 2023, marked a significant advancement in the university's role in capacity building for Malaysia's renewable energy sector. Running from September to December, the program was specifically tailored to educators from Politeknik and Kolej Komuniti, equipping them with essential skills in solar energy system design.

Participants were trained in the design and implementation of both grid-connected and off-grid solar PV systems, covering topics such as solar radiation measurement, energy storage technologies, and the installation of photovoltaic modules. This program serves as an important initiative in increasing the number of skilled professionals capable of leading the charge toward a solar-powered future in Malaysia.

The program's impact extended beyond the immediate technical skills gained by participants. By fostering a deeper understanding of renewable energy technologies, UM is helping to shape the next generation of educators who will inspire and teach students the importance of clean energy solutions. This knowledge transfer plays a critical role in Malaysia's sustainable energy transformation and directly contributes to SDG 7 and SDG 8 by developing a skilled, green workforce for the future.



Above and below: Hands-on training at UMPEDAC during the Professional Accreditation Program for Solar PV Design, demonstrating the participants engaging in solar system installation exercises



ISO Accreditation for Electroluminescence Testing Laboratory

UM's Electroluminescence Testing Laboratory (ETL), housed within UMPEDAC, continued its key role in supporting Malaysia's solar energy sector through its provision of ISO-accredited testing services. In 2023, the lab underwent a successful extension of scope (EOS) assessment, reaffirming its compliance with ISO/IEC 17025:2017. This internationally recognised accreditation ensures that UM remains a trusted entity for the testing of solar photovoltaic (PV) modules.

The ETL provides critical services for ensuring that solar PV modules meet the highest international standards for performance and safety. By conducting tests that detect defects such as cracks, microcracks, and hotspots in PV cells, the laboratory helps improve the reliability of Malaysia's solar energy systems. This service is indispensable for both solar energy providers and manufacturers, who rely on accurate and reliable testing to meet performance standards.

UM's leadership in solar PV testing strengthens Malaysia's position as a growing leader in renewable energy technology and innovation. The ETL supports SDG 7 by ensuring that solar energy systems in Malaysia are optimised for performance, thereby increasing the adoption of clean energy solutions.









PV Solar Energy Inverter Testing Laboratory (ISO17025 Accredited)

Established in 2014, UM's PV Solar Energy Inverter Testing Laboratory (PVL) has played a pivotal role in advancing the quality assurance of photovoltaic inverters used in Malaysia's solar power systems. The lab's ISO 17025 accreditation ensures that it meets international standards for testing inverters, and it has since become a critical part of the nation's solar energy infrastructure.

In 2023, the PVL expanded its capacity to conduct a wide range of tests, including power factor, current harmonics, voltage frequency, and anti-islanding tests. These tests ensure that solar inverters perform to the highest standards and comply with international protocols such as IEC 61727 and IEC 62116. The lab's services are crucial for ensuring that large-scale solar farms and small residential PV systems alike are able to operate efficiently and integrate seamlessly into the national grid.

By maintaining the highest testing standards, the PVL supports the continued growth of Malaysia's solar energy sector. This work aligns with SDG 7 by enabling the deployment of reliable solar energy systems, which in turn contributes to Malaysia's transition to clean energy. UM's leadership in solar inverter testing positions the university as a key player in ensuring that Malaysia's solar energy projects adhere to global best practices. PV Solar Energy Inverter Testing Laboratory (PVL), UMPEDAC, Universiti Malaya has been established in 2014 and received ISO 17025 accreditation since 19 July 2017. Its main objective is to provide testing services for grid-connected photovoltaic (PV) inverters that cover both indoor and outdoor tests. The indoor test is meant for string PV inverters that range up to 10 kW output power rating, whereas outdoor test is meant for large-scale solar farm equipped with high power PV inverters with a range more than 10 kW.

This testing is important to ensure that the inverter being used complies with international standards such as IEC 61727, IEC 62116 and IEC 61000-3 and works seamlessly with the national grid system. The test scope covers the inverter performance tests such as power factor, current harmonics, voltage, frequency, flicker and anti-islanding tests. The test equipment available includes PV simulator, gridsimulator, power analyser, oscilloscope, programmable load etc.

Since its establishment, the lab has performed numerous grid-connected PV inverter testing services throughout the country where it is one of the competent parties recognised by Sustainable Energy and Development Authority (SEDA) Malaysia to provide these services.



Rural Electrification in Sarawak

UM Power Energy Dedicated Advanced Centre (UMPEDAC) has been actively involved in rural electrification projects, particularly in Sarawak. The community in Kampung Sungai Merah, Sebuyau, Sarawak has been electrified using solar home system in 2017. The project was conducted in collaboration with Kyoto University. The electrification involved 7 households which had previously relied on the diesel generators that are not only polluting but also expensive. After the electrification, the villagers were given training on the operation, maintenance, assembly, electrical safety, troubleshooting and repair of their solar home system. This is important to prevent neglect of the gifted solar home systems when a single component failed, and they could not obtain assistance from outside their village.



Above: Kampung Sungai Merah in Sarawak Below: Installation of Solar Home System



In 2023, the batteries of those solar home system had reached their end of life. UMPEDAC in collaboration with Kyoto University, Japan then replaced those degraded batteries in February 2023.

In summary, this project does not only offer community service to the marginalised and underprivileged, but the project also supports climate action for a greener world.



Above: Battery replacement and refurbishing the solar home system

The Table Talkies with PETRONAS and TNB: Advancing Clean and Affordable Energy Solutions

The Table Talkies with PETRONAS and TNB was an influential event held on 26 October 2023, at Universiti Malaya, focused on the topic of clean and affordable energy solutions. The event featured two prominent speakers from Malaysia's leading energy corporations - Ts. Mohd Hazriq Hakimi, Manager at TNB Renewables, and Amirudin Kassim, Manager at Energy Transition Solution-CCUS for PETRONAS. The primary objective of the event was to provide engineering students and professionals with insights into the practical aspects of the energy transition, emphasising the shift towards renewable energy sources, carbon capture technologies, and sustainable energy policies.

The discussions covered a wide range of topics relevant to SDG 7: Affordable and Clean Energy, with a particular focus on Indicator 7.2 (increasing the share of renewable energy in the global energy mix) and Indicator 7.3 (doubling the global rate of improvement in energy efficiency). Both speakers delved into the challenges and opportunities in the clean energy sector, highlighting the strategic approaches employed by TNB and PETRONAS to drive sustainable development.

Ts. Mohd Hazriq Hakimi shared insights on TNB's role in the renewable energy landscape, detailing how the company is investing in solar, wind, and hydropower projects to diversify Malaysia's energy portfolio. He emphasised the significance of technological advancements and policy support in promoting renewable energy deployment and outlined the company's plans to achieve carbon neutrality in the coming years.

On the other hand, Amirudin Kassim provided a comprehensive overview of PETRONAS's initiatives in energy transition, particularly focusing on carbon capture and storage (CCS) technologies. He discussed how CCS plays a pivotal role in reducing carbon emissions, especially in industries that are difficult to decarbonise. By capturing and storing CO2 emissions from power plants and industrial facilities, PETRONAS aims to significantly reduce the carbon footprint of its operations, contributing to SDG 7.2 by promoting cleaner energy production. Furthermore, the speaker outlined PETRONAS's strategies for integrating renewable energy sources into its energy mix and the company's efforts in supporting Malaysia's overall goal of achieving a sustainable energy future.

The event also featured an interactive Q&A session, where participants engaged with the speakers on a range of topics, from the technical aspects of renewable energy technologies to the policy frameworks needed to support energy transition. Students expressed interest in how they could contribute to the clean energy sector and explored career opportunities within PETRONAS and TNB. This engagement was crucial in bridging the gap between academic knowledge and industry practices, providing students with a clearer understanding of how their skills and expertise can be applied to real-world energy challenges. The event also addressed SDG 7.3 by discussing strategies for improving energy efficiency across various sectors, including industrial processes, transportation, and residential energy use.

Furthermore, The Table Talkies provided a platform for discussing the role of partnerships in advancing clean energy solutions. Both speakers emphasised the importance of collaboration between government, industry, and academia in driving innovation and developing sustainable energy technologies. By fostering dialogue and knowledge exchange, the event underscored the need for multi-stakeholder partnerships in achieving SDG 7. The discussions on energy policies, technological innovation, and sustainable business models provided participants with a holistic understanding of the energy landscape and the critical role of clean energy in ensuring sustainable economic development.

The impact of the event extended beyond the technical discussions, as it inspired participants to consider their role in supporting clean energy initiatives. By showcasing how companies like PETRONAS and TNB are at the forefront of energy transition, the event motivated students to pursue careers in the energy sector and become active contributors to Malaysia's sustainable energy future. It highlighted the significance of developing practical skills, staying informed about industry trends, and advocating for policies that support renewable energy and energy efficiency.



Above (left): Poster for "The Table Talkies: Clean & Affordable Energy" (Source: <u>IMechE UM Student Chapter</u>)

Above (right): Session with Tenaga Nasional Berhad (TNB) on "Energising Sustainable World"

Firming Relationship with Malaysian Green Technology and Climate Change Corporation (MGTC) via Solar Energy Know-how Initiative

In line with its commitment to Sustainable Development Goal 7 (Affordable and Clean Energy), Universiti Malaya has continued to foster strong partnerships in the field of green technology and renewable energy. A key activity in 2023 that reinforced this commitment was the Firming Relationship with Malaysian Green Technology and Climate Change Corporation (MGTC) via **Solar Energy Know-how** initiative. This collaboration builds on a longstanding partnership with Pusat Tenaga Malaysia (PTM), now known as MGTC, which has been instrumental in advancing renewable energy solutions in Malaysia.

The collaboration between Universiti Malaya and MGTC began in 2005, centered around the successful development of a local grid-connected photovoltaic (PV) inverter. This partnership was part of the **Malaysia Building Integrated Photovoltaic (MBIPV) Technology Application**, which aimed to promote the use of solar energy in building design. Over the years, this collaboration has not only advanced solar energy technology but also contributed significantly to national green policies.

HICoE UMPEDAC (the Higher Institution Centre of Excellence under the UM Power Energy Dedicated Advanced Centre) played a crucial role in this progress, leading key projects such as the Langkawi Low Carbon Mobility Blueprint and the development of Malaysia's Electric Vehicles (EV) Roadmap. The university's expertise has also supported the Training Needs, Capacity Building, and Standards Development for the Electric Vehicles Value Chain in Malaysia, further contributing to the nation's clean energy goals.

Right: The Memorandum of Agreement between Universiti Malaya (UM) and Malaysian Green Technology and Climate Change Corporation (MGTC) On 4 October 2023, this long-standing collaboration was strengthened through the organisation of two significant programs aimed at enhancing technical capacity in solar energy: Training on Solar PV for Beginners and Solar PV System Design and Operation. These programs, jointly organised by Universiti Malaya and MGTC, were designed to provide participants with essential knowledge and practical skills in solar photovoltaic (PV) technology, promoting the adoption of renewable energy across various sectors in Malaysia.

The event, held at Universiti Malaya, was attended by prominent figures, including Ts. Shamsul Bahar Mohd Nor, the Group CEO of MGTC, and Mr. Rahimi Muhammad, the Chairman of MGTC. Representing Universiti Malaya, Professor Ir. Dr. Shaliza Ibrahim, the Deputy Vice Chancellor of Research & Innovation, emphasised the importance of academia-industry collaboration in driving clean energy initiatives. Professor Ir. Dr. Nasrudin Abd Rahim, the Executive Director of HICoE UMPEDAC, along with Professor Ts. Dr. Jeyraj Selvaraj (Deputy Director of UMPEDAC) and Assoc. Prof. Ir. Dr. Yap Hwa Jen, the Director of UMConsult, were also present, reinforcing UM's leadership in clean energy research and training.



This event was significant in positioning Universiti Malaya as a leader in promoting affordable and clean energy solutions. The training programs offered by UM and MGTC were not only aimed at industry professionals but also catered to individuals seeking to enter the field of solar energy. The "Training on Solar PV for Beginners" was designed as an introductory course, offering participants foundational knowledge of solar photovoltaic systems, including their components, design, and basic operations. This program was particularly relevant for those new to solar energy, providing them with the skills required to work in this rapidly growing industry.

The second program, "Solar PV System Design and Operation," offered more advanced technical training, focusing on the intricacies of solar PV system design, installation, and operational management. This program provided participants with hands-on experience, enabling them to understand the complexities of designing efficient solar energy systems that can be integrated into the national grid or used in stand-alone applications. Both programs were seen as essential steps in advancing Malaysia's renewable energy capacity and ensuring that the nation has a skilled workforce capable of driving its transition to clean energy.



The event also marked a key moment in policy development, with HICoE UMPEDAC playing a pivotal role in shaping national energy policies in partnership with MGTC. Over the years, the collaboration between UM and MGTC has resulted in contributions to major green technology policies, including the Langkawi Low Carbon Mobility **Blueprint**, which aims to reduce carbon emissions and promote sustainable transportation in the Langkawi region. Additionally, the development of the **Electric** Vehicles Roadmap has been a significant achievement, setting the stage for the widespread adoption of electric vehicles in Malaysia.

Universiti Malaya's collaboration with MGTC, through technical cooperation and training programs, is a testament to the university's commitment to achieving SDG 7. By offering practical training in solar PV technology, UM is actively contributing to the development of clean energy infrastructure in Malaysia, ensuring that both individuals and industries are equipped with the knowledge and skills to adopt sustainable energy solutions. The strengthening of this partnership with MGTC reflects the university's ongoing efforts to drive innovation in green technology, ultimately contributing to the national agenda of reducing carbon emissions and transitioning to a low-carbon economy.

In conclusion, the Firming Relationship with Malaysian Green Technology and Climate Change Corporation via Solar Energy Knowhow event is a clear demonstration of Universiti Malaya's leadership in renewable energy and its role in fostering sustainable industrial practices. Through its collaborations with key industry partners like MGTC, the university continues to be a driving force in Malaysia's pursuit of clean, affordable energy for all, firmly aligning its activities with the goals of SDG 7.

UM and Hong Kong Renewable Energy Company - EPRO Advance Technology Launch the World First Silicon-Fueled Hydrogen Genset

On 13 December 2023, Universiti Malaya (UM) and Hong Kong's EPRO Advance Technology introduced the world's first silicon-fueled hydrogen genset - a pioneering alternative to heavily polluting diesel gensets commonly used for construction sites, backup power in commercial buildings, chemical industries, and data centers. This innovative genset generates ultrapure hydrogen on demand and off-grid, allowing direct use in fuel cells to produce electricity. Unlike traditional fuel cells, which require substantial on-site hydrogen storage at high pressures or cryogenic temperatures (posing safety risks), the silicon-fueled genset produces hydrogen only as needed, minimising on-site storage and enhancing safety.

At the launch, UM Vice-Chancellor Professor Dato' Seri Ir. Dr. Nor Azuan Abu Osman expressed his honor in presiding over this inaugural event, viewing it as a milestone in UM's partnerships with leading innovators and a meaningful step toward uniting academic research and practical industry applications. Associate Professor Dr. Wey Yang Teoh from Universiti Malaya's Faculty of Engineering highlights that a key advantage of the siliconfueled hydrogen genset is the unique properties of silicon. The proprietary nanoporous silicon used is safe, requires no special handling, and can be manufactured in areas abundant in renewable energy whether at Bakun Dam in Sarawak, North Sea wind farms, or Xi'an's desert solar farms.

As an energy carrier, silicon is easily transported across regions or continents. Upon arrival, it can be converted into hydrogen and then electricity through the genset, enabling the safe, practical redistribution of renewable hydrogen worldwide and addressing a major challenge in the global hydrogen economy.

Additionally, the silicate byproduct from hydrogen production can be repurposed into high-performance green concrete, meeting high demand. The launch of this technology marks a significant step forward for Malaysia and the global hydrogen economy.



Below (left): The silicone-fueled hydrogen genset

Below (right): EPRO Hydrogen Genset launching and signing ceremony

Energy Usage Per Square Meter of Floor Space in UM

Universiti Malaya (UM) closely monitors its total energy usage per square meter of floor space across all university-owned and controlled facilities. This tracking helps UM understand and manage the energy consumed by individuals, events, and organizational activities on campus. The data indicates a gradual reduction in energy use per unit of floor space over the observed periods, reflecting UM's commitment to energy efficiency and sustainable resource management in its operations.

The chart illustrates the total energy used per square meter of floor space in University of Malaya (UM) buildings from 2019 to 2023. The energy usage remained stable at 0.26 GJ per square meter in 2019 and 2020, decreased to 0.21 GJ per square meter in 2021 and 2022, and returned to 0.25 GJ per square meter in 2023. This metric captures all energy consumed by individuals, events, and activities within university-owned or controlled spaces. UM's monitoring of energy usage per floor space reflects its commitment to energy management and efficiency across its facilities, aiming to optimize resource consumption within its campus operations.



Above: Chart for University Total Energy Used Per M2 Floor Space (Source: UM Estates Department)

UM's provision of assistance to low carbon innovation start-ups



UM Deep Tech (UMDT) Accelerator Programme's Domain Technology

The Universiti Malaya Deep Tech (UMDT) Accelerator Programme, run by the UM Centre of Innovation and Enterprise (UMCIE), is a targeted initiative to support low-carbon innovation startups by assisting in their journey from lab-based research to market readiness. This structured, 6-month programme is designed to bridge the crucial funding gap between proof-of-concept (PoC) and market, helping deep tech startups progress with validated prototypes that meet market needs.

UMDT is a comprehensive accelerator that offers intensive mentorship, 24 weekend training sessions, and hands-on market validation guided by industry experts. It is organised into three distinct stages:

Stage 1: Customer-Problem Fit Identifying the target audience and validating that a genuine need exists.

Stage 2: Solution-Prototyping Fit Developing and refining prototypes that address the identified customer problem.

Stage 3: Problem-Solution Fit Ensuring the solution fully addresses market demands and has strong potential for commercial success. The ultimate aim is to foster a supportive entrepreneurial ecosystem at Universiti Malaya by helping deep tech startups establish a strong foundation for market entry. In addition to mentorship and training, the programme provides financial support through grants to enable startups to develop viable, market-ready prototypes.

RESPONSIBILITY AND KEY PERFORMANCE INDICATOR (KPI)



Above: UM Deep Tech (UMDT): Responsibility & KPI

To participate, each startup team must include at least one UM researcher or academician as the founder, with co-founders potentially being students, entrepreneurs, or business professionals. Eligible applicants include UM researchers, PhD candidates, or Post-Docs, and preference is given to projects with a minimum Technology Readiness Level (TRL) of 4, alongside labbased PoCs, prototypes, or intellectual property. This initiative aims to empower researchers and innovators to bring impactful, sustainable solutions to life, enhancing both the startup ecosystem and real-world applications in low-carbon innovation. Furthermore, with dedicated mentoring and support from UM faculty members, a team of Universiti Malaya (UM) students from the Faculty of Engineering's Department of Mechanical Engineering and Department of Electrical Engineering formed the "Smart Blue Green Roof" group and achieved remarkable success in the Honeywell STEM for Sustainability Competition. They not only placed in the Top 5 but also won the "Green Energy" category, securing a prize of RM3,800.00. The team, comprising four Mechanical Engineering and two Electrical Engineering students, developed an innovative green rooftop design aimed at reducing flood risks and generating sustainable energy for commercial applications.

Additionally, under the guidance of the Universiti Malaya Entrepreneurship Secretariat, the "<u>Green Tiles"</u> team, comprising UM students, achieved notable success at the Intervarsity Youth Startup Competition & Summit 2023. The team secured the position of 3rd Runner-Up in the Green Innovations category.



Above: The "Smart Blue Green Roof" group
Below: The "Green Tiles" group

