

# QS Wow News Top Article Award for Solar Research Institute (SRI) & Faculty of Electrical Engineering, UiTM and Malaysia Department of Public Works (JKR) Embarked on Energy Efficiency Technology Research

## Introduction

The Faculty of Electrical Engineering (FEE) and Solar Research Institute (SRI), Universiti Teknologi MARA (UiTM), Shah Alam, Selangor, Malaysia had pursued a research collaboration with Malaysia Department of Public Works or *Jabatan Kerja Raya* (JKR), Malaysia on energy efficiency technology for large-scale buildings. Through a Memorandum of Agreement (MoA), the collaborative research team lead by Assoc. Prof. Dr Muhammad Murtadha Othman a Director of Solar Research Institute (SRI), had embarked on a four-year research journey comprising two innovative research projects, which were conducted between 2012 to 2020.

The first research project was funded by the Malaysia Electricity Supply Industries Trust Account (MESITA) under the Ministry of Energy, Green Technology and Water (KeTTHA). The main objectives were to enhance the energy efficiency of buildings and create awareness among consumers on the importance of saving energy. The research utilised artificial intelligence (AI) technology in determining the optimal location and size of capacitors for energy saving as well as voltage reduction. An energy saving module prototype was installed at a selected large-scale building and showed a reduction in electrical energy consumption as well as enhanced the energy efficiency. It won a national-level JKR Innovation Award in 2011 and the research was documented in a published book entitled '*Kecekapan Tenaga: Kajian dan Penyelidikan di Bangunan Sultan Abdul Aziz Shah Berkonsepan Artificial Intelligence*'. The research project also received certification from the International Performance Measurement and Verification Protocol (IPMVP), which confirmed its energy saving potentials. In addition, the invention had been registered with the Intellectual Property Corporation of Malaysia (MyIPO)

Following the success of the first research project, an improvement on the design and function was done with a financial support from the Centre of Excellence for Engineering and Technology (CREaTE) under JKR. Through AI, the project investigated a new approach involving the implementation of optimal placement and sizing of capacitors and voltage regulators (OPSCVR) technology for energy efficiency improvement covering the overall electrical system of a large-scale building. With the novel solution, energy efficiency problems such as overheating of electrical conductors, malfunction of electrical equipment, and increasing electrical bill can be avoided. This was done by addressing issues that can be detrimental to the safety of buildings namely power losses, excessive incoming power, total harmonic distortion (THD) and violation of lagging power factor (p.f.) limit. It was proven in the early stage of simulation studies that the enhanced Volt-Var optimization technique improved the energy efficiency by 14%-24% in several large-scale buildings. Several findings have been successfully published in a Sustainability journal with the Web of Science (WOS) impact factor of 2.576 and the published manuscript title is "Significant Implication of Optimal Capacitor Placement and Sizing for a Sustainable Electrical Operation in a Building". In addition, the research project entitled 'Enhanced Volt-Var Optimization via Artificial Intelligence (AI) for Energy Efficiency Improvement in a Large-Scale Building' won Gold Award during the International Automation and Control Enhancing Innovation Competition (ACEiC) 2019 in October 2019 at Universiti Tenaga Nasional (UNITEN), Malaysia. An article of the winning was submitted to QS WOWNEWS. It was recently selected as the winner of QS WOWNEWS Awards under the category of 'Top Articles', which was announced during QS APPLE 2020.

The research project has great commercialization potentials and contributes towards the advancement in electrical engineering technology particularly in energy efficiency. The use of AI technology provides an added value for the invention as well as in line with Malaysia policy on Industrial Revolution 4 (IR4.0). It is a low-cost investment with short duration for the return of investment (ROI) and cost-effective due to low service and maintenance cost. It is also a safe, reliable and energy efficiency electrical system operation that not only provides energy saving by 20% but most importantly providing benefits to the society and the environment.

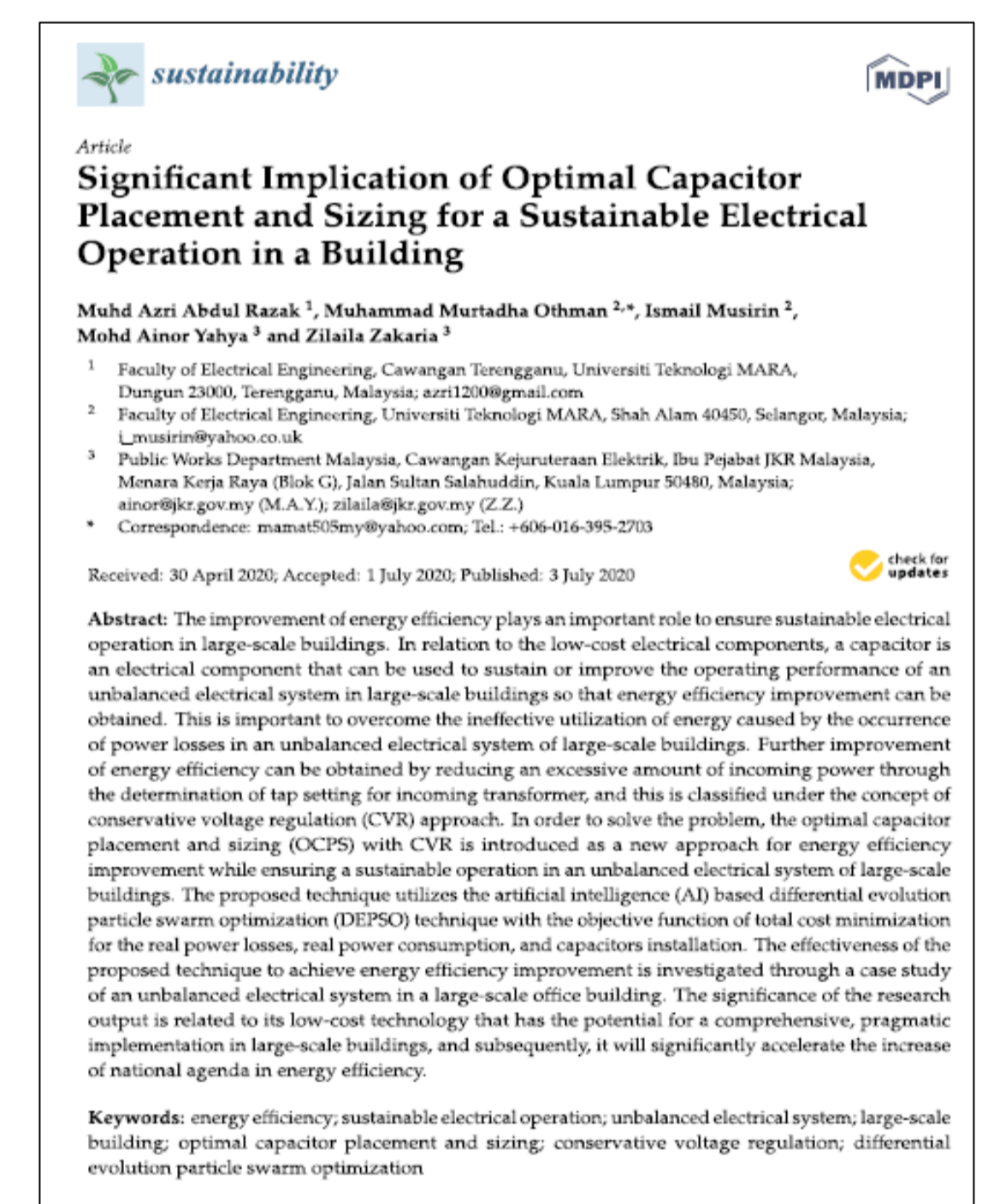
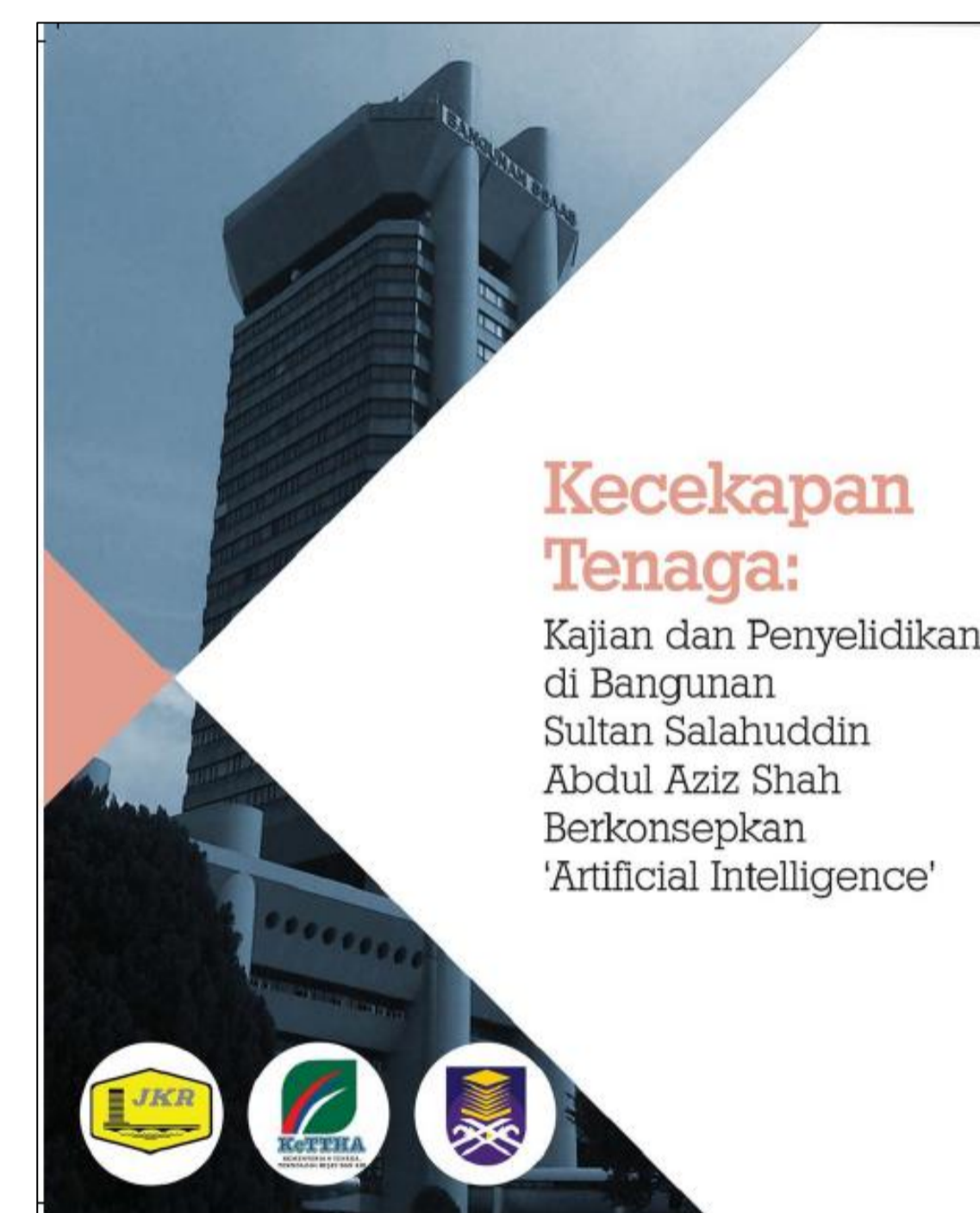
## Research Member

Research Members of FEE & SRI, UiTM - JKR Research Projects	
Faculty of Electrical Engineering (FEE) & Solar Research Institute (SRI), UiTM	Malaysia Department of Public Works (JKR)
<b>Research Project 1</b>	
<ol style="list-style-type: none"> <li>1. Assoc. Prof. Dr. Muhammad Murtadha bin Othman (Acting Project Director, UiTM)</li> <li>2. Prof. Ir. Dr. Ismail bin Musirin (Head of Research)</li> <li>3. Muhd Azri bin Abdul Razak</li> <li>4. Mohd Ainor bin Yahya</li> </ol>	<ol style="list-style-type: none"> <li>1. Dato' Ir. Haji Mohd Fazli bin Osman (Project Director)</li> <li>2. Ir. Mat Nasir bin Kari (Acting Project Director, JKR)</li> <li>3. Ir. Zilaila binti Zakaria (Head of Project)</li> <li>4. Ir. Baihaki bin Azraee</li> <li>5. Mohd Zaini bin Abu Hassan</li> <li>6. Abdul Muhaimin bin Mahmud</li> <li>7. Siti Habsah binti Mohd Dzin</li> <li>8. Nor Azilah binti Jahaya</li> <li>9. Mohd Hisham bin Salleh</li> <li>10. Wan Shazly bin Wan Ismail</li> <li>11. Shahrani bin Jafar</li> </ol>
<b>Research Project 2</b>	
<ol style="list-style-type: none"> <li>1. Assoc. Prof. Dr. Muhammad Murtadha bin Othman (Acting Project Director, UiTM)</li> <li>2. Ts. Mohd Fuad Abdul Latip (Head of Research)</li> <li>3. Muhd Azri bin Abdul Razak</li> </ol>	<ol style="list-style-type: none"> <li>1. Dato' Ir. Haji Shuib bin Tabri (Project Director)</li> <li>2. Ir. Mat Nasir bin Kari (Acting Project Director, JKR)</li> <li>3. Ir. Zilaila binti Zakaria (Head of Project)</li> <li>4. Ir. Baihaki bin Azraee</li> <li>5. Ir. Mohd Ainor bin Yahya</li> </ol>



## Publication

1. Book entitled '*Kecekapan Tenaga: Kajian dan Penyelidikan di Bangunan Sultan Abdul Aziz Shah Berkonsepan Artificial Intelligence*'.
2. M. A. A. Razak, M. M. Othman, I. Musirin, M. A. Yahya, and Z. Zakaria, "Significant implication of optimal capacitor placement and sizing for a sustainable electrical operation in a building," *Sustainability*, vol. 12, no.13, pp. 1-38, 2020



## Achievement



Receiving Gold Award during the International Automation and Control Enhancing Innovation Competition (ACEiC) 2019.



GOLD AWARD at ACEiC 2019

**Special Award**

QS WOWNEWS AWARD for TOP ARTICLE



Assoc. Prof. Dr. Muhammad Murtadha bin Othman (Director of Solar Research Institute (SRI), UiTM) with QS WOWNEWS Award for 'Top Article' category for the article 'UiTM's Electrical Engineering Research on 'Enhanced Volt-Var Optimization via Artificial Intelligence' wins Gold Award at the 2019 ACEiC'

Certificate of Top Articles Awarded to Universiti Teknologi MARA

For the article: UiTM's Electrical Engineering research on Enhanced Volt-Var Optimization via Artificial Intelligence wins Gold Award at the 2019 ACEiC

Ben Senter  
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QS Quantwell Systems