## Project Call for 2022 ERBE Cohort

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| MaREI Supervisor | Prof. Jamie Goggins |
| Institution | NUI Galway |
| Co-Supervisor & Institution (if known – please note this is not a requirement at the application stage): | Dr. Syed Muslim Jameel (NUI Galway), Co-supervisor from UCL or Loughborough University |
| PhD Proposal Title: | Decarbonization and Energy Conservation for Different Generation Modalities in Smart Building |
| Alignment with ERBE Themes: (200 words max – please specify if the project aligns with one or more of the ERBE Themes) | The topic aligns with Technology and system performance ERBE themes. This research investigates the optimized energy conversation process for smart buildings) getting energy sources for different generative modalities). Mainly, this research focuses on developing the automated energy conservation tool, which allows knowing the best time and load for various energy sources (green or carbon-based) and suggests utilizing the minimum carbon-based energy in the building, which is directly linked with the demand reduction and decarbonization aspect of this call. |

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| **PhD Proposal Abstract:** (500 words max) | In the era of digitization, conventional living and industrial standards need to be improved towards smart solutions. At the same time, decarbonization and energy conservation is the utmost important aspect for a sustainable environment and economic stability and growth. Energy audit quantifies and identifies the area where the energy is being used in a significant amount, which is an essential energy conservation tool. The energy audit is done manually as a most common practice, which is not feasible for smart cities infrastructure, such as smart buildings. In smart buildings, energy arrives with varieties of generative modalities, including carbon-based or sustainable/ green energy. The manual and static energy audit tools do not qualify to observe the variations of optimized energy usage. Therefore, it requires an advanced automatic control process tool, which could pre-inform the optimized energy conversation (time and loads) and minimize carbon-based energy in smart buildings. For that reason, predictive monitoring using machine learning will be helpful.<br>In this research, the novel model for predictive monitoring model will be formulated to provide the energy conservation guidelines and recommendations, and data adaption will be utilized to enhance the current machine learning technique. The primary concern of this research is to optimize energy use overall and minimize fuel-based energy consumption. Therefore, this research focuses on using the IoT-based collected data from the smart building and utilizing that to identify the energy conservation patterns concerning time and different deployed loads. IoT collected parameters will be integrated into the formulation to obtain the best energy consumption time for each load. Since the electrical load pattern changes rapidly with respect to time, weather, processes, and activities, a pattern identification process will be done for each generative modality. The suggested model will help in decision-making for energy conservation and decarbonization by minimum utilization of fuel-based energy (reduce carbon dioxide emissions through low carbon power sources). |

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| **PhD Proposal Summary for inclusion in Student Call Document:**<br>(300 words max – please note the student will be indicating their order of preference for all submitted proposals; please ensure this summary includes a project overview & introduction to the supervisor & institution) | Smart buildings are designed by amalgamating optimized structures, systems, and technology. Over time, each of the components inside a building has been developed and improved, allowing modern-day building owners to select lighting, security, heating, ventilation, and air conditioning systems. At the same time, the energy can be used either from the fuel-based sources of green energy. However, the primary concern is to optimize the energy use overall and minimize fuel-based energy consumption. Therefore, this research focuses on using the IoT-based collected data from the smart building and utilizing that to identify the energy conservation patterns with respect to time and different deployed loads.<br><br>Prof. Dr. Jamie Goggins is a Chartered Engineer and Professor in Engineering in NUI Galway. He is also the Director of Research and Innovation in the School of Engineering at NUI Galway. He has more than 20 years of experience in consultancy, construction, and research. He is a Co-PI and member of the Executive Management Committee of the MaREI Centre, which is a national centre with over 200 researchers working across six academic institutions collaborating with over 45 industry partners and whose research focus is on addressing the global challenges of blue growth, climate action, and the energy transition. He leads a multi-disciplinary team, including civil engineers, mechanical engineers, energy system engineers, architects, and social scientists. He has a strong history of collaborating with industry and international research institutes on many research projects. Prof. Dr. Goggins is the author or co-author of more than 150 internationally peer-reviewed articles, with an H-index of 27. He has been the principal investigator on over 50 research projects in the past ten years (total project value €73M), and has won greater than 20 awards. The National University of Ireland, Galway (NUIG), Ireland, is a globally recognized research-led university renowned for research and innovation's quality and impact. NUIG encourages creative thinking and cross-disciplinary collaborations. NUIG possesses sufficient e-infrastructure, services, and expertise to work on world-level research. For example, NUIG has a national supercomputer as a fundamental component to support research and innovation among the other computational facilities. Such a facility is more than enough to deal with high computational processing. Also, other facilities, such as Big Data Sandbox, provide a shared Hadoop platform for modern statistical analysis. |



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