Project Call for 2022 ERBE Cohort

MaREI Supervisor	Prof Jamie Goggins
Institution	NUI Galway
Co-Supervisor & Institution (if known – please note this is not a requirement at application stage):	Dr Paul Moran (National University of Ireland, Galway), Dr Asit Kumar Mishra (National University of Ireland, Galway), Dr Syed Muslim Jameel (National University of Ireland, Galway), AN Other with expertise in electrical & electronics engineering (from UCL or Loughborough University)
PhD Proposal Title:	Development of cost-effective IOT sensors for evaluating the performance of smart, energy efficient buildings
Alignment with ERBE Themes: (200 words max – please specify if the project aligns with 1 or more of the ERBE Themes)	The proposed project aligns with the Technology and system performance theme but will also will address aspects of the flexibility and resilience, and comfort, health and well-being themes: The objective of the project is to develop cost-effective IOT sensors for evaluating the performance of smart, energy efficient buildings. The project will seek to innovate on the current market ready technology for physically monitoring the energy performance and indoor air quality of buildings. The proposed IOT sensors will be capable of verifying building solutions that provide energy efficient, comfortable and healthy buildings for people to live and work in. Furthermore, the proposed sensors will help de-risk building solutions for building stakeholders which will help increase market confidence in homeowners and financial institutions to invest in green sustainable buildings.

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PhD Proposal Abstract: (500 words max)	To reach our energy and carbon reduction goals, new buildings and those undergoing retrofit are being designed to reduce their energy demand to a cost-optimal level. However, research has shown many of these 'energy efficient' buildings do not meet their expected energy demand and indoor air quality levels. Many factors, such as thermal fabric performance, faulty equipment and user behaviour, have been identified as contributing factors. The measurement and verification of buildings can help to reduce the risk of buildings not performing to their expected standards. Measurement and verification can employ the use of physical monitoring for monitoring various parameters impacting a buildings energy consumption. However, the use of physical monitoring as part of any measurement and verification plan for stakeholders in the building sector (building owners, property managers, local authorities, building designers, etc.) comes with a number of obstacles including equipment cost, loss of data, loss of power, data verification, permission from building occupants, remotely accessing data, access to local networks, range of local networks etc. The objective of this PhD is to develop a suite of cost-effective, market ready wireless IOT sensors and their associated algorithms for use as part of a measurement and verification plan for monitoring the energy performance and indoor air quality of buildings. The sensors will allow the capture of real time data and information capable of being integrated into various construction practices (Structural Health Monitoring, Building Information Models, Digital Twins etc.) The proposed IOT sensors will be capable of verifying building solutions that provide comfortable and healthy buildings for people to live and work in. Furthermore, the proposed sensors will help de-risk building solutions for building stakeholders which will help increase market confidence in homeowners and financial institutions to invest in green sustainable buildings.

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PhD Proposal Summary for inclusion in Student Call Document: (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)	To reach our energy and carbon reduction goals, new buildings and those undergoing retrofit are being designed to reduce their energy demand to a cost-optimal level. However, research has shown many of these 'energy efficient' buildings do not meet their expected energy demand and indoor air quality levels. The measurement and verification of buildings can help to reduce the performance gap for buildings. Measurement and verification can employ the use of physical monitoring for monitoring various parameters impacting a buildings energy consumption. However, the use of physical monitoring as part of any measurement and verification plan for stakeholders in the building sector comes with a number of obstacles including equipment cost, loss of data, loss of power, remotely accessing data, access to local networks, range of local networks, etc. The objective of this PhD is to develop a suite of cost-effective, market ready wireless IOT sensors that can be used as part of a measurement and verification plan for monitoring the energy performance and indoor air quality of buildings. The sensors will allow the capture of real time data and information capable of being integrated into various construction practices (Structural Health Monitoring, Building Information Models, Digital Twins etc.) Prof. Jamie Goggins is a chartered engineer with more than 20 years of experience. He is an Established Professor in NUI Galway, Director of Research & Innovation in the School of Engineering and Principal Investigator and member of the Executive Management team of the SFI MaREI Centre. He leads a multi-disciplinary team, which includes civil engineers, mechanical engineers, energy system engineers, architects and social scientists. His core technical expertise is in developing sustainable and resilient structures for buildings and energy infrastructure. He has been principal investigator on over 50 research projects (total project value >€85M).