The group’s expertise is diverse and spans various fields including the following research areas:

- Electrical energy and power plant diagnostics
- Energy in the built environment
- Energy supply for remote communities
- Renewable energies
- Harnessing energy effectively

The Energy and Power Systems Research Group is led by Dr Stas Burek, who has over 25 years’ experience of research, consultancy and teaching in a wide range of energy technologies. Dr Burek’s research interests include energy resource assessment, renewable energy, heat transfer in energy systems, and energy use in buildings.

In recent years, the production of renewable energy in Scotland has become a key issue in technical, economic, and political terms, though much of its potential remains untapped. The group’s expertise is regularly called on in energy policy consultations. At Glasgow Caledonian University, experts are involved in research, consultancy and teaching in energy technologies, including energy from renewable resources such as sunlight, wind, water and heat. The team have worked with business and public sector partners on projects including feasibility studies for renewable energy, CHP (Combined Heat and Power) and other technologies, renewable resource assessment, and practical monitoring, data collection and analysis.
Key areas of research include energy use in buildings, energy performance monitoring, energy asset management and renewable energy. Testing facilities including a unique Environmental Chamber put Glasgow Caledonian University at the forefront of UK research into the performance of building materials and diagnostic methods of testing material failure.

The Energy and Power Systems Research Group have significant experience in working with company partners on Knowledge Transfer Partnerships (KTPs). Knowledge Transfer Partnerships is Europe’s leading programme helping business to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base. Current partnerships include those with Highland Colour Coaters Ltd. Supervised by Professor Mahmoud El-Sharif, the company is working to reveal knowledge about the phenomenon known as “gassing” and hence optimise production yield, quality and scope in powder coating on galvanized steel.

MAHLE Engine Systems UK is also collaborating with Glasgow Caledonian University on a KTP project looking at testing and process monitoring tools, techniques and procedures for the assessment of bimetallic strip bond integrity and monitoring of critical process parameters.

The Energy and Power Systems Research Group oversees several PhD studentships. GCU secured funding from the Energy Technology Partnership (ETP) and Optical Antenna Solutions Ltd for a PhD studentship to investigate low energy consumption illumination sources based on beam shaping optics. In their effort to reduce electricity bills and to fulfil their commitment to reducing CO2 emissions, councils across the UK have proposed to replace energy inefficient luminaries, with energy efficient solutions based on LEDs. The project aims to explore the use of novel non-imaging optics in combination with LEDs.

PhD Studentships have also spanned projects analysing the use of modern materials and design techniques to mass produce low cost solar water heaters; micro wind turbine prototypes; and heat transfer in solar chimneys using Particle Image Velocimetry (PIV) with Laser Induced Fluorescence, a method of flow visualisation of air and water.

Building Integrated Photovoltaic (BIPV) solar concentrator systems not only generate electricity, but also allow the transformation of ambient light and the use of cogenerated heat for various functions. GCU has developed a novel optical concentrator capable of providing gain on two planes. Such a concentrator can be used in a non-tracking wall mounted BIPV system. The concentrator provides higher optical gains than alternative optical elements, thereby reducing the amount of PV cell (and silicon) required. Additionally, carefully selected FOVs (Field-of-Views) contribute to capture solar radiation throughout the day and all year round, removing the requirement for electromechanical tracking.

The Energy and Power Systems Research Group’s expertise also includes electrical energy. Professor Chengke Zhou’s research interests include advanced signal processing for both transient pulse extraction from strong background noise and PD data analysis and diagnostics in PD-based condition monitoring. He has undertaken many pieces of funded research, working closely beside industry to identify further scientific and technological advances to meet the challenges faced by the power industry.

At Glasgow Caledonian University, we work with industry and public sector partners to ensure our expertise responds to the need for real-world innovation. GCU’s strategic business development and knowledge transfer teams work with academic experts in our Schools and Research Institutes to support businesses with a problem-solving approach.

Contact us to find out more about building a brighter future with GCU at www.gcu.ac.uk/business.