

A. Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology.

A1. Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology and other relevant developments.

I teach 4 M-level (level 7) modules as part of the Energy and Sustainability MSc. The nature of these subjects requires me to continually update the module content with changes in the energy sector related to policy, resources etc. I read journals, professional magazines and follow energy related news in addition to attending national and international conferences and seminars. The modules I teach are as follows:

CENV6090 Energy Resources and Engineering
CENV6145 Climatic Design of Buildings and Cities
CENV6147 Climate Change, Energy and Settlements
CENV6148 Energy Performance Assessment of Buildings

I act as a paper reviewer for numerous journals including: Energy Policy, Renewable Energy, Energy and Buildings, IET Renewable Power Generation, ICE Energy, ICE Engineering Sustainability and Building Research and Information. I am currently an Associate Editor of the IET Renewable Power Generation journal. I was the lead researcher on the £1.8m EPSRC project IDCOP Innovation in the Design, Control and Operation of Buildings for People which included extensive reviews of façade technologies and their markets. Some of my published work relates to assessment of new and emerging technologies:

[REDACTED] (2011) Pole-mounted horizontal axis micro-wind turbines: UK field trial findings and market size assessment. Energy Policy (doi:10.1016/j.enpol.2011.04.012).

[REDACTED] (2011) Evaluation of domestic Energy Performance Certificates in use. Building Services Engineering Research and Technology, 32, (4), 361-376. (doi:10.1177/0143624411404486).

[REDACTED] (2010) Implications of the UK field trial of building mounted horizontal axis micro-wind turbines. Energy Policy, 38, (10), 6130-6144. (doi:10.1016/j.enpol.2010.05.070).

[REDACTED] (2009) Combined heat and power: street-level domestic microgrids. Proceedings of the ICE: Energy, 162, (3), 131-141. (doi:10.1680/ener.2009.162.3.131).

A2. Engage in the creative and innovative development of engineering technology and continuous improvement systems.

I am the co-holder of European and US patents for the design of a two part photovoltaic (PV) roof tile (see patents EP 1190456 A2 and EP1190456 B1). This product was commercialised and became part of Marley Roofing's (Eternit group) product portfolio. The product was exhibited at InterBuild and Eco-Build.

[REDACTED] (2007) Photovoltaics: added value of architectural integration. Proceedings of ICE: Energy, 160, (2), 59-69. (doi:10.1680/ener.2007.160.2.59).

[REDACTED] (1997) Photovoltaic roof tiles: Design and integration in buildings. In, Conference on Sustainable Buildings, Oxford, GB, 05 - 06 Feb 1997.

My work in building integrated photovoltaics (BiPV) stems from undertaking the installation of the first fully integrated façade on the South Coast of the UK. This site at Southampton University became a test bed for analysis of the impact of mismatch and shading on BiPV systems.

[REDACTED] (2006) PV array <5 kWp + single inverter = grid connected PV system: Are multiple inverter alternatives economic? Solar Energy, 80, (9), 1179-1188. (doi:10.1016/j.solener.2005.09.010).

[REDACTED] (2004) Modelled and measured performance of inverters operating at various power ratings: Impact on energy yield. In, Proceedings of the 8th World Renewable Energy Congress (WREC VIII), Denver, USA, 29 Aug - 03 Sep 2004. Elsevier Science.

[REDACTED] (2004) Inverter operating voltage selection for optimum energy yield: Do predictions match reality? In, Proceedings of the 19th European Solar Energy Conference and Exhibition, Paris, France, 07 - 11 Jun 2004.

[REDACTED] (2002) Post installation optimisation of a building integrated PV system at Southampton University. In, 29th IEEE Photovoltaic Specialist Conference. 29th IEEE PV Specialist Conference, IEEE, 1504-1507.

[REDACTED] (2001) An assessment of the building integrated photovoltaic facade and its operational mismatch losses at Southampton University. In, Proceedings of UK-ISES REMIC conference. REMIC Conference Proceedings, Solar Energy Society Publications, 111-118.

[REDACTED] (2000) Southampton University solar campus project PV facade of building 2: installation trials and tribulations. In, Proceedings of 16th European. Photovoltaic Solar Energy Conference and Exhibition, 1914-1917.

I acted as the PV consultant for the design of a photovoltaic atrium integrated within the design of the new student services building at UoS. Funding of £200K was obtained from the Energy Saving Trust for this demonstration of BiPV. The atrium has formed the basis of several key papers highlighting the added value that BiPV brings to atria solutions – acting as weatherproof barrier, solar control and daylighting.

[REDACTED] (2009) Quantifying the added value of BiPV as a shading solution in atria. Solar Energy, 83, (2), 220-231. (doi:10.1016/j.solener.2008.07.016).

[REDACTED] (2008) Potential of emerging glazing technologies for highly glazed buildings in hot arid climates. Energy and Buildings, 40, (5), 720-731. (doi:10.1016/j.enbuild.2007.05.006).

[REDACTED] (2004) Photovoltaic atrium on a new administration and student services building - University of Southampton. In, Proceedings of the 19th European Solar Energy Conference and Exhibition, Paris, France, 07 - 11 Jun 2004.

I have been embedded with the design teams of several large

B. Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.

B1. Identify potential projects and opportunities.

I am responsible for recruitment of postgraduate MSc students to the energymasters programme within the University. I oversee the web presence (www.energymasters.soton.ac.uk) and contribute to the Twitter feed (@EnergymastersS). I take personal responsibility for maintaining contact with applicants to whom we make offers to over the course of the application year. In terms of research grant opportunities, I am active in grant submissions to EPSRC, ESRC, Royal Society, Technology Strategy Board and the Ministry of Sciences and Technology in China in addition to work funded directly by industry. The current value of grants of which I am either a Co-I or PI is >£11 million.

B2. Conduct appropriate research, and undertake design and development of engineering solutions.

I lead the energy system design aspect of the EPSRC-DFID Replication of Rural Electrification project. I designed the 12kWp diesel-PV-battery hybrid micro-grid which was installed in Kitonyoni, Kenya, in September 2012 providing power to 3000 people. The entire system is based around shipping containers which when delivered to site act as the plant room and office for the community energy co-operative. I designed the micro-grid, metering, data-monitoring and lightning protection elements of this scheme. See www.energyfordevelopment.net

I have developed numerous testing rigs for photovoltaic cell assessment and photovoltaic connector fretting (accelerated lifetime testing).

[REDACTED] (2009) Hydrogen and Argon as p and n type doping gas mixtures: impact on the efficiency and stability of sputtered amorphous silicon solar cells. In, 24th European Photovoltaic Solar Energy Conference and Exhibition, Hamburg, Germany, 21 - 25 Sep 2009.

[REDACTED] (2008) A comparative study of low hydrogenated amorphous silicon with commercially available thin film silicon solar cells. In, 23rd European Photovoltaic Solar Energy Conference and Exhibition, Valencia, Spain, 01 - 05 Sep 2008.

[REDACTED] (2004) Predicting photovoltaic connector lifetime. In, Proceedings of 3rd World Conference on Photovoltaic Energy Conversion. 3rd World Conference on Photovoltaic Energy Conversion (WPEC3), 12-16 May 2003, Osaka, Japan, Piscataway, United States, Institute of Electrical and Electronics Engineers, 2833-2836. (doi:10.1109/WCPEC.2003.1305175).

[REDACTED] (2002) Photovoltaic connector behaviour under accelerated fretting testing regimes. In, Proceedings of the Forty-Seventh IEEE Holm Conference on Electrical Contacts, 2001. Forty-Seventh IEEE Holm Conference on Electrical Contacts USA, Institute of Electrical and Electronics Engineers, 203-208. (doi:10.1109/HOLM.2001.953212).

I have also developed a test roof at Southampton University to enable field assessment of PV roof tiles and the analysis protocol for the national micro-wind trial for the Energy Saving Trust.

[REDACTED] (2002) Alternative approaches to achieving PV connector reliability: A comparative study of accelerated lifetime testing. In, Proceedings PV in Europe - PV Technology to Energy Solutions Conference and Exhibition, Rome, Italy, 07 - 11 Oct 2002. , 621-624.

[REDACTED] (2001) Accelerated lifetime testing of photovoltaic connectors: implications to built environment applications. In, Proceedings of the 17th European Solar Energy Conference held in Munich, Germany, 22-26 October 2001 [3-volume book set and CD-ROM]. Seventeenth European Solar Energy Conference Munich, Germany; Florence, Italy, WIP-Munich and ETA-Florence, 630-633.

[REDACTED] (2000) Electrical connector contact resistance behaviour within a PV shingle roof. In, Conference Record of the Twenty-Eighth IEEE Photovoltaic Specialists Conference, 2000. Twenty-Eighth IEEE Photovoltaic Specialists Conference USA, Institute of Electrical and Electronics Engineers, 1521-1524. (doi:10.1109/PVSC.2000.916184).

I am the co-author of a weather file morphing tool for building simulation weather files (epw and TMY2 format). This has been released as a free download UK (*CCWeatherGen*) and Worldwide tool (*CCWorldWeatherGen*), see www.energy.soton.ac.uk. These tools have been widely used by consultants and academics and have been cited by the EU, UKCIP and CIBSE (TM48: 2009, section 3.5 Choice of downscaling method).

[REDACTED] (2012) Manual for CCWorldWeatherGen climate change world weather file generator. Southampton, Sustainable Research Energy Group, University of Southampton, 9pp.

[REDACTED] (2009) Manual for CCWeatherGen climate change weather file generator. Southampton, Sustainable Research Energy Group, University of Southampton, 12pp.

[REDACTED] (2013) Transforming existing weather data for worldwide locations to enable energy and building performance simulation under future climates. *Renewable Energy*, 55, 514-524. (doi:10.1016/j.renene.2012.12.049).

[REDACTED] (2009) Development of climate change adapted weather files for building performance simulation: implications for southeast asia. In, World Renewable Energy Congress 2009 - Asia, Bangkok, Thailand, 19 - 22 May 2009, 1338-1343.

[REDACTED] (2008) Climate change future proofing of buildings—Generation and assessment of building simulation weather files. *Energy and Buildings*, 40, (12), 2148-2168. (doi:10.1016/j.enbuild.2008.06.005).

I am also a co-author of studies looking into thermal comfort in the classroom and the applicability of existing comfort standards to this setting.

[REDACTED] (2013) Thermal comfort in naturally ventilated primary school classrooms. [in special issue: Adaptive Comfort in an Unpredictable World] *Building Research & Information*, 41, (3), 301-316. (doi:10.1080/09613218.2013.773493).

[REDACTED] (2012) Naturally ventilated classrooms: an assessment of existing comfort models for predicting the thermal sensation and preference of primary school children. *Energy and Buildings* (doi:10.1016/j.enbuild.2012.06.022).

I have been linked with the design teams of several large UoS construction projects supporting the M&E engineers in relation to façade selection and overheating in naturally ventilated buildings. I have sat on various appointment panels for M&E consultants to UoS projects. On behalf of the Isle of Wight council I developed scenarios to deliver a zero carbon electricity network for the island by 2020 which now forms the basis of their low carbon agenda.

B3. Implement design solutions, and evaluate their effectiveness.

I installed and commissioned the Kitonyoni micro-grid system in Kenya. This system is being monitored (technical and social impact) for a further two years to assess its benefit. Other examples of evaluation include the UK micro-wind trial where I was appointed by the EST to evaluate the performance of micro-wind turbines (both building and pole mounted). This work fed into new policy standards in the UK and assessed micro-wind tools provided by the Carbon Trust and EST. The PV roof tile of which I am a co-inventor has undergone long term assessment at Southampton in terms of connector electrical reliability and thermal response using a test roof. Critical evaluation of BiPV systems, with which I have been involved in, has been widely published. I was a member of the team that developed the world's first PV refrigerated solar trailer for Sainsburys and undertook the data analysis and reporting of this study.

C. Provide technical and commercial leadership.

C1. Plan for effective project implementation.

I lead the technical aspect of the £2.8m energyfordevelopment project in rural Kenya and was responsible for the system design, installation, commissioning, data monitoring and handover. I liaised directly with our UK subcontractors responsible for the inverter control / switchgear and lightning consultants to develop the required systems and signed these components off to go to build. I was the lead field engineer ensuring project quality and delivery.

The CBES project is a 4 year control-treatment group study which provides free insulation upgrades to 200 middle income households living in two locations near Southampton. The tender process for the sub-contract for the insulation work (£75K) was led by myself with the support of University procurement. I negotiate with our data-monitoring supplier and manage the overall engineering budget for this project (>£500K). I led the national micro-wind trial for the Energy Saving Trust reporting to key stakeholders including Scottish Government, B&Q, Carbon Trust and British Gas. I also liaised with the data collection contractors (Energy Monitoring Company and BSRIA) to ensure timely delivery of appropriate quality data for analysis.

C2. Plan, budget, organise, direct and control tasks, people and resources.

I lead the insulation implementation aspect of the CBES project controlling budget and resources to deliver this aspect of the program. As PGT director I ensure that staffing resources are in place to meet teaching needs and make recommendations for new appointments to enhance the programmes I oversee. As PI of the EST micro-wind data contract (£65K) I led the team that delivered analysis and reporting to tight timescales. I led the £125K PV field trial at New Lane, Havant, Portsmouth where I designed the PV and monitoring systems. I managed this contract and liaised with the BRE assessor to ensure a smooth reporting process (both technical and financial). As Programme Director, I am responsible for the teaching budget for PGT Energy within the Faculty. I led the PMI2 project in Malaysia with responsibility for technical, non-technical and budgetary reporting.

C3. Lead teams and develop staff to meet changing technical and managerial needs.

As programme director for PGT Energy, I oversee a number of academics who deliver the taught and supervision elements of these programmes. I manage research fellows and assistants across the large grant programmes of which I am a co-investigator. I prepare job specifications for research fellows and sit on the interview panel for research and academic staff appointments. I am currently supervising 6 PhD students and have 4 PhD completions. I am responsible for Quality Assurance (QA) for PGT Energy and ensuring the smooth running of the programmes. In the event of a failure in QA I am responsible for resolving the issue to the satisfaction of the student and University – examples of which include appeals, plagiarism issues, timeliness of feedback from staff, health issues, finance etc. I represent the Faculty on the University's Energy Core Group with responsibility for University's direction in the energy field.

C4. Bring about continuous improvement through quality management.

I oversee QA for PGT Energy and write the annual LTERAP report (Learning and Teaching Enhancement Review and Action Plan) associated with PGT Energy. I run the staff: student liaison committee where students can raise issues with the MSc programmes and the Energy Subject Panel within the faculty. I chair both the informal and formal exam boards. I act as a reviewer for various journals and provide guidance to authors on paper revision and resubmission ensuring that the quality standards of the journals are maintained. I am the internal examiner of several PhD students providing guidance and recommendation for improvement. I undertake revision of the specification of modules which I teach on an annual basis for QA. This is informed by evaluation of Module Evaluation Questionnaire (MEQ) responses provided by students of these modules. To address modules which have low MEQ scores which fall within my PGT Energy remit, I consult

D. Demonstrate effective interpersonal skills.

D1. Communicate in with others at all levels.

I teach 4 MSc modules delivering content to students for whom English is often a second language. I have helped to run workshops in China (Shanghai and Guangzhou) looking at the future carbon performance of cities funded by EPSRC. In 2009, I acted as a technical expert for various DECC 'Big Energy Shift' public focus group consultation events. I ran a CPD event for MASHRAE on the impact of future climate on air-conditioning in Malaysia (Kuala-Lumpur funded by the British Council through their PMI2 Prime Minister's Initiative, 2009).

I have presented at numerous national and international conferences and events. I chaired the low architecture session at WREC XI in Abu Dhabi. I was an invited speaker at the CIBSE 'The future of weather data' CPD event (Balham, 2008). I have given a similar CPD talk for Gifford (now Ramboll) to their Southampton Office on future weather data.

I was invited to give the 'annual talk to industrialists' hosted by the French Embassy in London in 2007 on micro-generation, see the [Unlocking the Power House Report, www.energy.soton.ac.uk/publications/unlocking_the_power_house_report.pdf](http://www.energy.soton.ac.uk/publications/unlocking_the_power_house_report.pdf)

I gave a talk to the Liberal Party Conference in 2000 on micro-generation with a particular focus on photovoltaics. I have co-hosted numerous international delegations to the University, examples include David Cameron, MP, Greg Barker, MP, HRH Duke of York and the G8 group of scientists. I led the launch event for the ICE Why Waste Heat report attended by UK press at the IMechE in 2009. I have given numerous TV, radio and newspaper interviews discussing micro-wind turbines, incineration, heat recovery and micro-generation.

D2. Present and discuss proposals.

As a co-investigator of several large grants I discuss proposals with co-investigators and funders. I have sat on various expert discussion panels to participate in 'question time' style forums. I deliver lectures and workshops as part of my day to day lectureship duties.

I prepare bid submissions for funding either as Co-I or PI to various agencies including EPSRC, ESRC, Royal Society, EU, British Council and Technology Strategy Board. I am a panel reviewer for the Australian Academy of Sciences and the Latvian Academy of Sciences where I review grant applications related to renewables and micro-generation.

D3. Demonstrate personal and social skills.

In my role as Programme Director I have to build working relationships with academics across research groups to deliver coherent MSc courses. This requires strong interpersonal skills to achieve 'buy in' from staff. I act as personal tutor to all MSc students on the Energy and Sustainability MSc courses and write academic references for students as required. I have helped run workshops in China and a large CPD event in Kuala-Lumpur for MASHRAE (2009). I have also represented the UK on its national stand at the World Future Energy Summit in Abu Dhabi (2008) and Southampton University at exhibits at EcoBuild (London, 2009) and Copenmind (Copenhagen, 2008). As a lead academic of the technical side of the ESRC Energy and Communities project I regularly present to the public on project's progress and resolve problems that may have arisen.

with lecturers to establish change / training to bring about improvement. I also lead the accreditation submission for the energy MScs when their 5 year assessment by the Joint Board of Moderators is undertaken.

E. Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.

E1. Comply with relevant codes of conduct.

The CIBSE Code of Conduct reflects the academic principles under which I undertake my teaching, research and public engagement responsibilities at the University of Southampton. The MSc course Energy and Sustainability, Energy and Buildings pathway includes a module CENV6148 Energy Performance Assessment of Buildings. This module covers energy compliance of buildings in both a (i) England and Wales and (ii) European context. The course content must therefore be continually revised to keep pace with policy / legislation changes.

In terms of maintaining accreditation for the MSc programmes I must act to ensure that the quality of courses is maintained and accreditation criteria are met / worked towards. I am a co-author of a new CIBSE TM guide on 'Non-Domestic Building Refurbishment' which has completed review and is currently in production (contact Nicholas Peake, Head of Knowledge, CIBSE).

E2. Manage and apply safe systems of work.

I am an area safety officer within the Faculty responsible for the Energy Laboratory. I have previously been a H&S officer for the School of Civil Engineering & Environment responsible for investigating accidents / near-miss events. In this role I undertook formal investigations and reported to the University safety officer of findings and proposals for safety measure improvement. I am responsible for students under my supervision (Undergraduate / MSc / PhD) and oversee risk assessment and ethics approvals where required.

E3. Undertake engineering activities in a way that contributes to sustainable development.

My area of specialism is sustainable energy, see www.energy.soton.ac.uk. I have been active in the promotion of building integrated PV for many years, having been involved with cladding, atria and roof tile developments (see papers section A2). I was part of the team involved with the world's first solar refrigerated trailer for Sainsburys.

[REDACTED] (2002) Economics of solar powered refrigeration transport applications. In, Conference Record of the Twenty-Ninth IEEE Photovoltaic Specialist Conference 2002. 29th IEEE Photovoltaic Specialist Conference, IEEE, 1561-1564.

[REDACTED] (2000) Successful trials update for the application of solar refrigeration in food transport. In, 16th European Solar Energy Conference and Exhibition, Glasgow, GB.

I am a co-I of the EPSRC-DFID replication for rural electrification project which is delivering sustainable electricity provision to sub-Saharan east Africa, see www.energyfordevelopment.net. I am a co-I of the 5 year liveable cities project which is looking at infrastructure change and wellbeing to achieve 80% carbon reduction living in UK cities by 2050. Sustainable development is a core theme of the Energy and Sustainability MSc programmes which I oversee.

E4. Carry out continuing professional development necessary to maintain and enhance competence in own area of practice.

I have undertaken year 1 of the PCAP (Postgraduate Certificate of Academic Practice) scheme and undertaken the initial training sessions for the PREP Framework (Professional Recognition of Educator Practice Framework). I have recently attended training with the JBM this year in preparation for the Civil Engineering accreditation later this year. I attend conferences and workshops related to my field of expertise to keep up to date with latest developments and read journal articles. I act as a mentor to newly recruited lecturers providing guidance on the teaching aspect of academic practice.