Sustainable Energy Systems for Future Human Space Missions (SEnSe)

The European Astronaut Centre (EAC) is part of the European Space Agency (ESA) and is actively developing its research capabilities and working towards developing a test bed facility for technologies that are important for future manned space missions. These include technologies relating to water processing, waste management, automation, robotics and systems architecture. A primary focus is energy generation and energy storage for the lunar environment.

Lunar missions involving humans require essential resources to sustain life. This includes ~5 kg/day/person of metabolic consumables (oxygen, food and drinking water) and ~20 kg/day/person of clean water. A four-year mission to Mars would then require 28 tons of water for each person! Hence, technologies that can recycle food and human waste back into consumables would be indispensable. Energy is paramount to drive the processes that deliver these essential resources, and the longer the missions are, the more difficult it becomes to maintain energy supply.

A manned space mission involving the creation of a lunar base is currently under consideration. Development of accurate models are required to simulate the generation, storage and use of energy on the base, before such a project can be undertaken. A sustainable space/craft/base framework has the versatility to include both traditional – photovoltaic (PV) and thermoelectric generators (TEGs) – and disruptive energy-generation technologies, such as fuel cells (FCs). For PV and TEGs, testing under extreme conditions is needed, as well as estimation of the impact of these conditions on the effectiveness of solar harvesting. Water purification for human consumption will require a power-hungry technology where PV is key.

Heriot–Watt (Drs Nick Bennett and John Andresen are working with the EAC to investigate recycling of organic residues and used water within a Microbial Fuel Cell (MFC) within 24-48 hours where reusable water and CO2 for food crops is produced. This will include novel experimental testing of device performance at HWU, by replication of harsh lunar conditions. In particular will be performance/degradation testing of PV and Thermoelectric Generators as a function of exposure to lunar temperature cycles.

More information: N.Bennett@hw.ac.uk
The pan-university Energy Academy, research excellence ranges from solar energy and energy-focused materials through to energy economics, use, policy and logistics.

KTP Innovation Showcase

Technology & Innovation Centre, 99 George Street, Glasgow 28th May, 2015 4:30 – 8:00 pm

In 2015 the KTP programme celebrates its 40th anniversary and the Innovation Showcase will provide a unique opportunity for the KTP community in Scotland to come together and celebrate. At the Showcase we will be welcoming attendees from the diverse range of businesses and organisations that KTP has helped over the years as well as all our key stakeholders from the academic and public sectors.

The event will begin at 4:30pm with a networking reception where delegates will be able to view posters designed by the Showcase will include contributions from the business and academic communities as well as past and present KTP associates. The event will also see the premiere of a new KTP Scotland video which highlights the impact the programme is having all over Scotland.

Register: http://www.eventbrite.co.uk/e/ktp-innovation-showcase-tickets-16479981067

Work with Heriot-Watt for Free!!
Company-Led Engineering Design Projects

We are keen to work with you on a company-led engineering design project that can provide our Engineering students with relevant work experience as part of their degree studies to improve their experience and chances of employment upon graduation. NO COST Taking part in this initiative has no cost to your company and bright innovative engineers will work with you to make a real difference to your organisation

Project Term Extended: The students will work with your company for 24, not 12-weeks!! Term 1 should be dedicated on design and Term 2 on manufacturing challenges

What you get: Tap into a ready-made pool of enthusiastic students, keen to roll up their sleeves, develop their skills and make a contribution to your business.

Deadline for submission of project proposals: 15th August;
Decisions on proposals and notification to companies: 1st September;
Launch of the projects with allocated student teams: mid-September

More information: i.mcewan@hw.ac.uk or ask on the Heriot-Watt stand at All Energy 2015 or download the flyer at: https://www.dropbox.com/s/j4xsj5qi7m57iv3/HWU_Company-led-EngineeringDesign_projects-flyer%20282%29.pdf?dl=0

Offshore Oil and Gas Environmental Monitoring in Colombia

Professor Hamish Mair (School of Life Sciences) chaired a workshop in Bogota, Colombia on 23rd April at the invitation of the Colombian Ministry of the Environment and ACP (Asociación Colombiana de Petróleo). Over 60 participants were involved representing the oil companies with current offshore exploration interests (Ecopetrol, Shell, Repsol, Petrobras, Anadarko), consultancy and service companies, and the main government ministries and agencies. The aim of the workshop was to develop Terms of Reference for the environmental licensing of seismic and exploratory well-drilling activities offshore.

An overview of the history and current situation of environmental licensing in the North Sea was given as a basis for looking at best practice for similar developments offshore in Colombia. Professor Mair and colleagues had previously been involved in three other workshops in Colombia related to offshore environmental sampling and monitoring for hydrocarbon activities at the request of Ecopetrol and the government’s ANH (Agencia Nacional de Hidrocarburos). Colombia has an important, long-established onshore oil and gas production sector but it has only recently started investigating its offshore hydrocarbon resource potential (Caribbean and Pacific coastal waters).

Professor Mair also visited the British Embassy in Bogota to update officials in the UK-Colombia Trade mission within the Embassy since they are interested in promoting potential for UK companies to become more involved in the offshore developments. In addition to the technical workshop topics, there is scope for joint collaboration in other energy sectors such as renewable technologies of solar, wind and geothermal. The UK-Colombian government scheme of the Newton-Caldas Funding programme is being investigated for research collaboration potential in the energy sector as well as in various aspects of Colombia’s water and agricultural resources.

If you are interested in building relationships with Colombia in offshore developments or in renewable energy, particularly through the Newton Fund, please send a note to j.m.mair@hw.ac.uk For more information on the Newton Fund, visit: https://www.gov.uk/government/publications/newton-fund-building-science-and-innovation-capacity-in-developing-countries/newton-fund-building-science-and-innovation-capacity-in-developing-countries
Heriot-Watt at All Energy

Find Heriot-Watt in the Highlands and Islands and Orkney Pavilion ORK10

Wednesday 6th May
Community Energy - Seminar Theatre Exhibition Floor EX4

12:40 Harnessing Community Energies – ORIGIN Andrew Peacock, Heriot Watt

Thursday 7th May 2015
Grid 3 Technology - Conference Room 3

15:30-17:00
Chair: David Corne, Professor of Computer Science, The Energy Academy, Heriot-Watt University

- Knowing the FACTS – Dr Fahd Hashiesh, Technology Manager, ABB Ltd
- Accelerating renewable connections – Euan Norris, Project Manager, SP Energy Networks
- A solution to save the developer community time and cost with connection at 33kV and 132kV – John Rimell, Principal Business Consultant, British Power International
- VISOR – increasing stability and capacity on the transmission network – Priyanka Mohapatra, Senior Project Manager, Scottish Power Energy Networks
- Impact of electrolysers on the distribution network – Steven Adams, Project Manager, Scottish and Southern Energy Power Distribution
- My Electric Avenue: trialling demand control with electric vehicles (EV) - James Cross, Consultant, EA Technology
- Q&A and discussion

Poster Presentations
Poster Site 1, close to the Offshore Wind Theatre (EX1)
- The valuation of energy storage on UK’s Power Market
  Laila El Ghandour, Heriot Watt University

EU Energy Focus Bulletin

“The EU Energy Focus service is a free, Government-funded service to support European funding for energy-related projects.”
More information: Tel 0845 6000 430
Web: www.euenergyfocus.co.uk

Highlights

Fuel Cell and Hydrogen Call for Proposals. Launch of 2015 Call for Proposals will be published on the FCH JU website http://www.fch.europa.eu/ when they are available.

Webinar on 2015 Call for Proposals – 10th June 2015
Register: http://fch2juwebinar2015.eventbrite.com/

2015 Horizon 2020 Energy Calls for Proposals – deadlines in May and June 2015
The 2015 Call for Proposals for Low Carbon Energy, Smart Grids and Smart Cities closes on Tuesday 5th May. After this, there is then only one remaining 2015 Horizon 2020 Energy deadline, on Thursday 4th June. This remaining deadline covers research, demonstration and market uptake projects for buildings, heating and cooling, industry and products and finance for sustainable energy. The Call budget is 82M€.

Download at: http://www.dropbox.com/s/0nawlljll1nrt94m/EU%20Energy%20Focus%20Bulletin%20April%202015.pdf?dl=0
Small farm-scale biogas from food waste in cold climates; an opportunity for micro-biological energy storage

In the warm areas of the developing world small scale anaerobic digestion (AD) systems are growing in popularity. For example in India today it is estimated that over 12 million plants are in operation. They can simultaneously help in dealing with waste, while providing a renewable decentralised source of gas for cooking, gas lighting, heating or generating electricity, as well as producing fertiliser as a by-product. However, in cooler western climates, effective smaller scale AD units are not available, while larger units are well out of the budget range of most farmers; there is however a considerable amount of waste available.

A hybrid-biogas technology has potential to be an important part of the solution to these challenges: combining waste streams and heat storage with microbial processes to generate a gas in a cost efficient way, which can stored provide energy on demand. Yet in rural areas, where organic waste is in plentiful supply, biogas technology in the UK remains under deployed as a result of technological challenges. For example due to UK temperatures being far below the optimal for biogas production, well established commercial small scale tropical systems do not function well. The result is longer digestion periods, which results in much greater digester volumes required, resulting in higher capital costs.

For instance, the new food waste regulations exempt up to 18% of the Scottish population and a significant number of rural businesses from food waste collections. They collectively generate somewhere in the region of 200,000tpea food waste at different parts of the food chain, and this could potentially yield 240GWh equivalent in biogas as well as digestate for organic/sustainable local food production. Admixing of farm wastes is also possible in rural areas.

On the other hand, there are global challenges around energy supply and waste management. For example, on Scottish Island communities there are grid capacity issues, where there are in some cases restrictions or long lead times with adding generation capacity to the national grid. There are also issues of energy poverty in rural communities, who often are forced to pay higher costs for their heating, for example due to lack of connectivity to the national gas network.

Furthermore, energy autarky has been presented as a framework for implementing sustainable regional development. This is the situation in which the energy services for supplying local consumption, local production and export are provided by local/regional energy resources. One key challenge to effectively moving forward with this vision is improving temporary energy storage.

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Drs Joel Chaney, Edward Owens and John Andresen are modelling the effectiveness of different hybrid strategies to maintain the temperature of a biogas plant and thereby lower the cost of operation. These strategies might include different insulation, taking advantage of wind to generate heat and produce agitation through mechanical energy; the integration of solar heating and the use of phase change materials in order to maintain a constant optimum temperature for the bacteria; as well as waste-heat harvesting from other available sources, for example extracting and using heat from composting or from waste water.

They will also look at the possibility of using such a hybrid-biogas system as a means to temporarily store, while making use of, excess renewable energy generation in the form of heat. There is then the possibility to extract a portion of this at a later time without upsetting the stability of the microbial system, and there is the added possibility of then using the biogas generated to meet energy demand, when this cannot be met by other renewable sources.

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