IN BRIEF

£1 MILLION ENGINEERING PRIZE

The Queen Elizabeth Prize for Engineering is a new global award which celebrates outstanding advances in engineering that have created significant benefit to humanity. The Prize was launched on 17 November 2011 in London, with the leaders of all three main political parties present to lend their support.

The £1million biennial Prize will be awarded in the name of Her Majesty The Queen to an individual or team of up to three people, of any nationality, directly responsible for advancing the application of engineering knowledge.

Lord Browne of Madingley, who chairs the charitable trust formed to deliver the Prize, said: "I know that a lot of effort has been directed at redressing perceptions of engineering. This new Prize aims to turbocharge that effort by illuminating, on an international scale, the sheer excitement of engineering.

"The Prize will recognise and celebrate the best engineers in the world today. The search for the Prize will provide an unparalleled opportunity to demonstrate how engineers and engineering are making a real difference to humanity."

The Prime Minister, The Rt Hon David Cameron MP, launched the Queen Elizabeth Prize for Engineering in London on 17 November 2011

The Prize is the result of a growing realisation in the worlds of business, engineering and policy of the need for a pioneering initiative based in the UK to focus attention on engineering worldwide.

A number of major companies have donated to an endowment fund, which is being managed by an independent charitable trust, the Queen Elizabeth Prize for Engineering Foundation. The Royal Academy of Engineering will deliver the Prize on behalf of the trust.

An international judging panel of experts is being assembled to take responsibility for assessing nominations. The names of judges will be announced at the same time as the call for nominations, in February 2012. The first winner will be announced in December 2012 and the award ceremony will be held in Spring 2013. For more information: **www.raeng.org.uk/QEprize**

PYLONS OF THE FUTURE?

Danish firm Bystrup's T-Pylon has beaten 250 entries to win the pylon redesign competition sponsored by RIBA, the Department of Energy and Climate Change (DECC), and the National Grid. There is a need for more pylons to carry electricity to meet the UK's rising power demands – and to support the 20 new power stations that the DECC estimates will be necessary by 2020.

There are more than 88,000 pylons in the UK, and 22,000 of these carry the bulk of the National Grid's transmission network. Most of these pylons are built in the familiar steel-latticed tower structure, originally designed in the 1920s. The competition invited architects, engineers and designers to apply new materials and design techniques for future electricity carriers.

The T-Pylon is designed to be unobtrusive, and blend into a variety of landscapes. They can be produced in grey, white and rust-coloured finishes, and are available painted, hot dip galvanized to prevent rust, made of Corten (weathering steel) or stainless steel to resist corrosion and cope with a range of adverse environmental and climactic conditions.

The design drew praise from competition judges for its "simple and understated" single suspension arm carrying three conductors. Two diamond-shaped isolator frames hang from the outstretched top bar of the T-shape to support three rows of cables, and the frames are balanced to minimise the effects of the pylon's magnetic fields.

At 33 m, it is shorter and lighter than the original National Grid 50 m, 30-tonne pylons. Currently, Bystrup and the National Grid are working to develop the T-Pylon further, by using mathematical modelling, and prototype testing in extreme wind and icy conditions.

The National Grid is also interested in further developing two other competition finalists' designs: the 'Totem' design by New Town Studio and the 'Silhouette' by Ian Ritchie Architects , in collaboration with the firm of Jane Wernick FREng.

To view all the finalists go to **www.ribapylondesign.com**

The winner of the pylon competition was announced at the London Design Festival in October 2011. It was the unanimous choice of the judging panel © Peter Trimming

UNDERGROUND ENGINEERING SKILLS

The Tunnelling and Underground Construction Academy (TUCA) welcomed its first intake of students in October 2011. Located in Ilford, east London, it is the UK's first dedicated tunnelling and underground training academy.

Crossrail, in partnership with the Skills Funding Agency and with industry-wide sponsorship, developed the £13 million facility to meet the current and future needs of the underground construction industry.

Tunnel-boring machines like this one will be used on Crossrail. © Herrenknecht

Specialist tunnelling skills are in high demand for the Crossrail project, which will connect rail services through central London and the south east. Crossrail will run 118 km from Maidenhead and Heathrow in the west, through new twin-bore 21 km tunnels under central London to Shenfield and Abbey Wood in the east. It will bring an additional 1.5 million people within 45 minutes' commuting distance of London's key business districts. Crossrail services will begin from 2018.

The Academy will offer training to at least 3,500 people over the lifetime of the Crossrail project, and will become a long-term provider of underground construction skills for other major infrastructure projects.

TUCA is the only purpose- built facility in Europe specialising in soft-rock tunnelling. It is designed to replicate the tunnelling environment and enable training on key pieces of equipment. Set over two floors, facilities include a simulated tunnel-boring machine (TBM) environment supported by a TBM backup area, a loco and narrow gauge railway, a chamber for sprayed concrete operations, a large underground construction workshop and a centre for online safety testing.

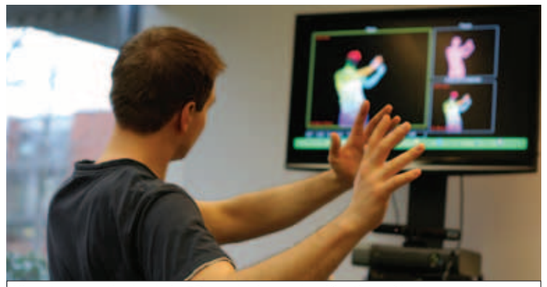
Students at TUCA include new entrants to the industry as well as existing workers aiming to upskill or formalise their knowledge through nationally accredited technical and safety training.

TUCA also acts as the London centre for the National Skills Academy for Railway Engineering (NSARE). For further information see **www.tuca.ac.uk**

SEARCH FOR EXCEPTIONAL INNOVATORS

The 2012 MacRobert Award is now inviting entries from companies of all sizes and disciplines. The award for innovation in engineering, worth £50,000 to the winners, has been presented annually since 1969 to engineering projects which have shown clear innovation, commercial success and benefit to society.

In 1972, the MacRobert Award was presented to EMI Limited, for the work of Godfrey Hounsfield on Computerised Transverse Axial Tomography – better known today as the CT Scanner. The judges could see the vast potential of the project at its inception just 14 months after the first scan of the brain had been made. It would be another seven years before Hounsfield received a Nobel Prize for his work in the field, by which time he had built a whole-body scanner. He was later knighted and elected as a Fellow to both The Royal Academy of Engineering and the Royal Society.



Kinect senses the body in 3D producing a classification of body parts via machine learning

The possibility of another revolution in medical engineering was one of the reasons why Microsoft Research won the 2011 MacRobert Award for advances in machine learning.

Kinect for Xbox 360 – which saw its Cambridge-based human motion capture software development team take a huge step forward in machine learning technology – soon became a household name. The world's fastest-selling consumer electronics device also has enormous potential for uses outside the gaming world. It is being adapted to help doctors manipulate medical images and before long, hospitals around the world could be using the Kinect technology to assist with delicate surgical procedures.

MacRobert Award finalists attend a gala dinner with industry leaders, politicians and the national media, at which the winner is announced. Full details can be found at **www.raeng.org.uk/prizes/macrobert** and entries close on 31 January 2012.

NEW CLYDESIDE MUSEUM

In June 2011, Glasgow's Riverside Museum opened to the public, replacing the city's former Museum of Transport. The new building was designed by architect Zaha Hadid, the Pritzker and Stirling prize winner known for her avant-garde structures based on organic forms. Her concept for the Riverside Museum combines the curves of the river Clyde in the building's shape with a spiky, zig-zagged roof recalling the tramsheds and shipyards that once stood there. Inside, instead of individual galleries, there is one central, open space, unsupported by columns, and painted pistachio green.

The lack of columnar support posed a challenge for the team at engineering firm Buro Happold, led by Rod Manson. Their solution to supporting the undulating peaks of the roof was to use a series of folded steel plates which, like pleated paper, becomes stiff and is able to hold its shape when folded. Buro Happold's geometry modelling group tested potential designs to maximise the stiffness of the roof at the 'transition zones', or folds, and the firm devised a set of mild steel I-beam sections, running transverse to the plates, to prevent the structure from flattening due to gravity.

To maximise display space, there is a 'velodrome' track of bicycles suspended from the ceiling, and an impressive 'car wall'. Buro Happold's solution to building a wall strong enough to support the stress loads of the cars on display was to use large cantilevered steel elements, secured back to the core walls. The project team also ensured that humidity, light and temperature are controlled by clever use of glazing and sensitive monitoring systems to protect all of the museum's objects and displays. For more information about the Riverside Museum, go to: **http://tinyurl.com/3mwf8jo**

The Riverside Museum has triple-thickness glass that helps stabilise the environment within the building and conserve heat. The glazing is heavy-filtered and contains solar-gain which helps the building's heating and cooling systems maintain a stable environment © Culture and Sport Glasgow (Museums)

PORTABLE POWER

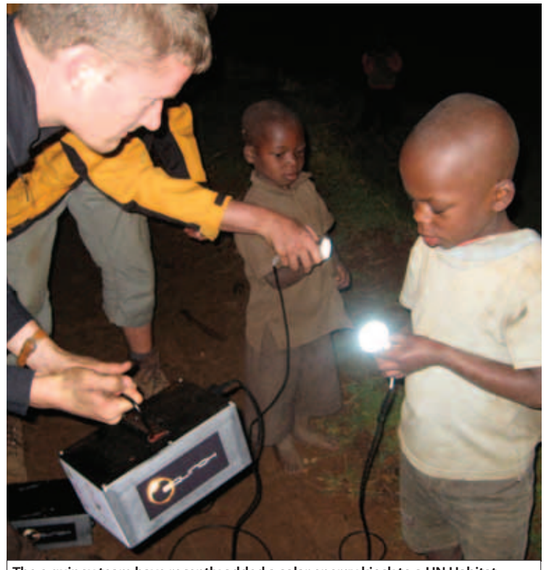
A UK project that brings portable, renewable electricity to rural communities has received an innovation award of $100,000 from the technology firm General Electric (GE). Called e.quinox, the not-for-profit project is the brainchild of students from the Department of Electrical and Electronic Engineering at Imperial College London. They have brought electricity to four villages in Rwanda and one in Tanzania using a central energy kiosk, which charges portable batteries from solar panels fixed to the roof.

Local people hire out the batteries to power their lights, radios and mobile phones. Money from hiring the batteries is channeled back into maintaining and developing the kiosk. The first solar kiosk, established in 2009 in the remote Minazi sector of Rwanda, has nine solar panels, with a peak power of 570W, and supplies electricity to 100 households.

Introducing electric power to small communities in developing countries has many benefits, but linking such communities to mains electricity is rarely financially or technically viable. The goal of e.quinox is to prove the concept of economically sustainable, off-grid electrification that can run in any environment so that entrepreneurs, governments and NGOs can use the blueprint to electrify rural communities everywhere.

Rwanda was chosen by e.quinox as the testbed because it is one of the least economically developed countries in the world with a struggling power infrastructure. Over 85% of Rwandans live in rural villages with limited access to grid electricity. However, being close to the equator, they benefit from sunshine all year long, with 5.15 Wh per square metre per day of solar energy.

Approximately 40% of Rwanda's electricity is generated by hydropower. The e.quinox team are working with villagers in the Nyaruguru district to set up a small turbine for charging villagers' batteries © e.quinox



The e.quinox team have recently added a solar energy kiosk to a UN Habitat community in the Bugesera district of Rwanda. Both the new and earlier projects were supplied with upgraded battery boxes and lamps. e.quinox provides boxes with both DC and AC outputs to satisfy different customers' needs © e.quinox

Having successfully demonstrated solar-powered kiosks, e.quinox is looking to experiment with other sources of renewable energy. Supported by the Rwandan Ministry of Infrastructure, the students are working with Dartmouth Humanitarian Engineering, a group of students from Dartmouth College in America, on a hydro-powered kiosk in the Nyaruguru district of Rwanda using the flow of the Rugaragara River.

The Rugaragara has an available power of 12.5 kW, of which around 1 kW will be used to provide batteries for 200 households. The project will involve constructing an intake to divert the 10 litre-per-second flow from the river to a channel, which will direct the water to a settling tank. A pressure pipe will then feed the water to a turbine to generate electricity for charging batteries in the nearby kiosk.

So far e.quinox has funded its activities mainly through awards. As well as winning the Ecomagination Award from GE in July 2011, it won a €10,000 grant from the energy company Total and $50,000 from J. P. Morgan as part of its Give-It-Away campaign, which allows students around the world to select a deserving cause to receive a charitable donation.

To learn more visit **www.e.quinox.org**

PROMOTING SCIENCE TEACHING

This year's Rolls-Royce Science Prize, rewarding excellence in science teaching, has been awarded jointly to two UK schools. This year's winning projects, announced in November 2011, showcased practical applications of materials science, construction engineering, and renewable energy. At Staunton-on-Wye Endowed Primary school, pupils researched the environmental and social impacts of various building materials, before applying this knowledge to design and construct a playhouse in the school grounds. Mulberry School for Girls conducted experiments in a hydroponic greenhouse, which will be powered by renewable energy, to learn about sustainable energy and food production.

Each of the winning schools was given £15,000 in prize money to advance science teaching, and students will spend a day with the Red Arrows display team. In addition to the winning schools, seven finalist schools were awarded £6,000 each to implement their projects during the academic year. Fifty further schools, which submitted entries of a very high standard, will be awarded £1,000 each. Since the awards were established in 2004, Rolls-Royce has awarded over £800,000 in prize money to 300 schools across the UK.

The prize is open to all UK schools and colleges with staff attending courses at one of the Science Learning Centres, a national network which delivers continuing professional development to teachers, lecturers, technicians and teaching assistants, so that they can offer engaging and innovative STEM education programmes.

Awards are presented to teams of adults, led by teachers, who can create inspiring and sustainable teaching proposals that address specific needs within their schools. To learn more about the prize, visit **www.RollsRoyce.com/scienceprize**

In their greenhouse, Mulberry School for Girls has installed large-capacity extraction fans, high-pressure sodium lamps, two hydroponics systems, and the capacity to control levels of carbon dioxide. The team plans to install a solar photovoltaic system sufficient to meet a significant proportion of the electricity demands of their two grow-rooms © Rolls-Royce

BIOMIMICRY WINS AWARD

The Dyson Foundation Trust's annual international student design competition, the James Dyson Award, has been won this year by 27 year-old Australian, Edward Linacre. Linacre won the £10,000 prize for his ingenious method of irrigating agricultural land using water vapour from the air, an application of great importance to Australia where years of drought have resulted in failed crops, bushfires, and growing rates of suicide amongst farmers.

Edward Linacre is using his prize money to further test and develop the design and engineering of the Airdrop system © Dyson Foundation Trust

The graduate of Swinburne University of Technology in Melbourne took inspiration from various sources including the observation that scarab beetles gather water from the brief early morning mists that pass over the sands of the Namib Desert, one of the hottest, driest regions on earth. The scarabs tilt their bodies to expose their wing cases to the cooling winds that rapidly disperse the fog. Water droplets collect on the wing cases on raised bumps that are coated in a hydrophilic substance. When the droplets reach a certain size, they slide down the bumps to be channeled into the beetle's mouth.

Edward Linacre's Airdrop irrigation concept uses a wind turbine to pull air underground through a network of coiled pipes that rapidly cool the air to the temperature of the soil so the water vapour condenses. The water is stored in an underground tank and pumped using solar power to the roots of crops through drip irrigation hosing. The turbine operates freely in high wind but can switch to the solar-powered battery in low wind.

The Airdrop can harvest 11.5 ml of water for every cubic metre of air. A small prototype that Edward set up in his mother's garden created a litre of water a day.