

BUSINESS ENGAGEMENT CASE STUDY

NATIONAL GRID

Working in partnership to support National Grid in transforming the electricity transmission system for a greener, more sustainable future.

In 2003 the University of Manchester established a strategic alliance with National Grid, the owner and operator of the high-voltage electricity transmission network in England and Wales. The partnership aims to strengthen National Grid's research capabilities and develop real commercial solutions at a time of great change for the electrical network. Increased investment in wind farms and other renewable energy sources along with higher demand for electricity mean National Grid has to transform the way it operates to successfully deliver the future UK energy strategy.

Today the two organisations work collaboratively on a range of mutually beneficial activities:

FACILITIES

The University is home to the National Grid Power Systems Research Centre, which includes the largest and best-equipped high voltage laboratory in the UK. As well as a 2MV impulse generator, 800kV AC set and 600kV DC test set, the Centre also features laboratories equipped with protection and control systems, a material characterisation/processing laboratory and environmental chambers. It also supports teaching and training on the University undergraduate and postgraduate courses in power systems.

RESEARCH

Collaborative projects across the University include innovative research into overhead line designs to minimise visual impact; environmental improvements to power system equipment; high voltage, direct current (HVDC) networks; work on systems operation as smart grid technologies begin to penetrate the system; and improvements to modern protection and control systems to reduce the risk of failures. We also have research expertise in transformer design, high voltage DC systems, flexible energy network investment and wide area network monitoring.

INNOVATION AND COMMERCIALISATION

National Grid and the University of Manchester - via its agent for IP commercialisation, UMIP - are committed to commercialising the results of their research to improve delivery of electricity to customers. The two organisations are partners (along with Scottish and Southern Energy Power

Distribution, UMIP, and the UMIP Premier Fund) in the £1 million Co-Managed Energy Innovation Fund, created to identify and develop novel research and technologies that can be used by the transmission and distribution industry. See *overleaf for an example of a University spin-out company, funded by National Grid, which is developing and marketing new transmission technologies.*

EDUCATION

The University provides professional education to enhance the development and skills of National Grid employees. These bespoke training courses, delivered by academics and National Grid staff, ensure that National Grid's scientists and engineers understand and can manage any new technology that is implemented, and have the skills and knowledge they need to work on current and future power systems. The University and National Grid are also partners in the Power Academy Scholarship Programme, which aims to produce the next generation of world-class electrical power engineers and scientists.

OUTREACH

National Grid's support has enabled the University to work with local schools to raise awareness and inspire children to pursue careers in science and engineering. Staff regularly hold events for schoolchildren within the University's High Voltage Laboratory, exposing them to our unique facilities and the brand and work of National Grid in the UK, and demonstrating the range of careers available within the power industry.

WHAT DOES NATIONAL GRID GET FROM THE PARTNERSHIP?

- * ACCESS TO A DIVERSE RANGE OF ACADEMIC EXPERTISE
- * USE OF SPECIALIST RESEARCH FACILITIES
- * PROFESSIONAL DEVELOPMENT OF EMPLOYEES
- * DIRECT OPPORTUNITIES TO EMPLOY GRADUATES
- * LEVERAGE OF R&D INVESTMENT
- * DEDICATED EXPERTISE TO TURN RESEARCH INTO COMMERCIAL PRODUCTS.

WHAT DO WE GET FROM THE PARTNERSHIP?

- * GREATER UNDERSTANDING OF REAL BUSINESS NEEDS AND ENERGY SUPPLY CHALLENGES WHICH INFORM TEACHING AND RESEARCH
- * CONTINUED INVESTMENT IN RESEARCH, FACILITIES AND EQUIPMENT
- * REPUTATIONAL BENEFIT OF WORKING WITH AN ESTABLISHED LEADER IN ENERGY NETWORKS
- * DEVELOPMENT OF STRONG RESEARCH LINKS AND INCREASED ACCESS TO FUNDING
- * EMPLOYMENT AND INTERNSHIP OPPORTUNITIES FOR OUR STUDENTS
- * RAPID TRANSFER OF NEW TECHNOLOGIES TO END USERS.

The relationship is mutually beneficial, and although we work in a formal way to tackle challenges, we are colleagues as opposed to employer and researcher.

IAN COTTON,
PROFESSOR OF HIGH VOLTAGE TECHNOLOGY,
SCHOOL OF ELECTRONIC AND ELECTRICAL AND ENGINEERING

ARAGO TECHNOLOGY LTD

THE BACKGROUND

The way we consume energy is in a state of rapid change. Recent increases in renewable energy generation and greater use of consumer electrical goods mean that National Grid and other global transmission companies are facing a predicted 50% rise in electrical energy flowing through the electricity system by 2050. The UK Low Carbon Transition Plan has highlighted an immediate requirement to increase the UK transmission capacity but, due to planning restrictions, it is not always possible to build new pylons or increase the height of existing ones.

In 2008, the University began research with National Grid into ways it could address this problem. This research led to the development of a patented technology and the creation of a spin-out company, Arago Technology Ltd, whose first product offers a potential solution.

THE CHALLENGE

To develop a cost-effective new approach to power line insulation which allows existing transmission tower (pylon) voltages to be increased without any change to the tower's overall visual profile or height, or dramatically reduces the tower height of new builds.

THE SOLUTION

Combining the University's high voltage engineering expertise with the structural materials experience of external partner EPL Composite Solutions Ltd, Arago has developed an electrically insulating composite cross-arm for transmission towers. The new cross-arm, made using fibre-reinforced composite materials, can be retrofitted to existing towers or incorporated into new builds.

Insulated cross-arms, manufactured and sold by Arago, have been installed on pylons in some of the most stark and remote areas of the UK to test their resistance to extreme weather, and are also being tested for an eventual use with 400,000 volt systems at a coastal site in Scotland. Arago expects to be able offer it as a commercial product in 2013.

Arago Technology Ltd was presented with the Power & Energy Award and Highly Commended in the Emerging Technologies Category at the 2012 IET Innovation Awards.

THE IMPACT

ON NATIONAL GRID:

The ability to upgrade the existing transmission tower network to withstand the predicted increase in electricity flow, rather than investing in costly new builds; leading the way in the first major improvement in line configuration for decades.

ON THE UNIVERSITY:

Delivering tangible impact through research and making a genuine difference to power systems within the UK and globally; improving teaching through greater knowledge of industrial challenges; strengthening the strategic relationship between the University and National Grid, and paving the way for more funded research opportunities in this area.

ON SOCIETY:

Arago's groundbreaking technology will deliver new and renewable energy and help to safeguard future supply. As major investors in the research, National Grid will receive a significant discount on the new product, helping to keep costs down for energy customers.

