THE INDUSTRY INTERVIEW

Energy Management at the National Institute of Biological Standards and Control

In this regular feature, we focus on how organisations across different industries approach energy management. In this issue, we are exploring the world of biological research and medicines through one of its global leaders: The National Institute of Biological Standards and Control (NIBSC). Jude Hughes is the Environment and Energy Manager at NIBSC who has led the Institute's efforts to reduce its impact on the environment, securing impressive results to date, with savings of over £2.3 million from a range of initiatives. Jude has received a number of industry awards for her work, including Energy Manager of the Year in 2016.

NIBSC is a global leader in the characterisation, standardisation and control of biological medicines. We play a major role in assuring the quality of these medicines worldwide through the provision of biological reference materials, by testing products and by carrying out research. Our scientists provide advice on a routine basis to the UK Government and in response to emergencies such as the recent Ebola pandemic.

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NIBSC is a highly specialised research Institute, so inevitably it is an energy intensive organisation. The site was built in the early 1980s and its infrastructure and plant rooms reflected the standards of that time; the insulation was poor, and the equipment was old and not energy efficient.

Electricity is the largest energy cost on the site. Our extensive laboratory environments require constant lighting, conditioned air, freezers, scientific equipment and bespoke machines backed up by a large number of plant rooms. My first priority was getting the electricity meters to turn more slowly. We achieved this by setting up replacement programs for lighting and air handling units (AHUs) – this was one way of tackling the challenge of the older equipment – and by pushing through behaviour change initiatives. We followed up these early wins with a whole array of energy-saving projects that had real impact on our energy use; as part of this, we replaced the large gas boilers and the onsite electricity transformers.

What does energy management mean at NIBSC?

Due to the nature and scale of our scientific research work, we were from the start conscious of our responsibilities to reduce our energy consumption and our carbon emissions.

I introduced a raft of no cost and low cost energy initiatives. These early wins were key in demonstrating to the senior management team and scientific staff the actual savings that could be achieved on our site. The results gave credibility and confidence on which I could build.

This was important for future capital investment. At that time there were a large number of stakeholders competing for business and this presented challenges for environmental initiatives. Having a clear energy management strategy enabled us to identify and then develop sustainable projects which could facilitate optimum delivery of the science and yield the added benefit of reducing our energy bills

and carbon footprint. A win-win scenario. We were able to realise significant reductions, cutting our onsite electricity consumption by 16%. This yielded a saving of over £1.7 million on our site energy costs.

How does NIBSC deal with energy management?

Establishing the carbon footprint for the site was vital. This provided us with a baseline from which to measure the impact of our energy-saving projects. We used the DEFRA methodology for environmental reporting, with UK Government conversion factors, to model the carbon emissions and meet mandatory annual reporting requirements. The large majority of our carbon emissions are directly attributable to electric and gas usage. We made it a priority to reduce the carbon footprint whilst continuing to provide high-quality working conditions for our scientists and support staff. So far, we have managed to reduce the impact of our carbon footprint by 36%.

We developed robust business cases for a series of large-scale capital projects aimed at reducing costs and carbon still further. The PRINCE2 methodology, which involves "selling" business cases to senior management and key stakeholders, has given us an effective, precise structure to work with. All the projects are evaluated on criteria including savings in energy, carbon and overall payback.

Our priority was to improve the site infrastructure through replacement of older plant. We developed a major project to replace our three 25-year-old boilers with more energy-efficient versions. This project cost £1.3 million. We were particularly keen to introduce additional energy-saving technologies alongside standard features; these included an economiser, quality lagging, heat recovery systems, variable speed fans and pumps. There is a nine-year payback, so we are realising the rewards of this project year on year. This has helped to contribute to an overall saving of 20% on our gas consumption.

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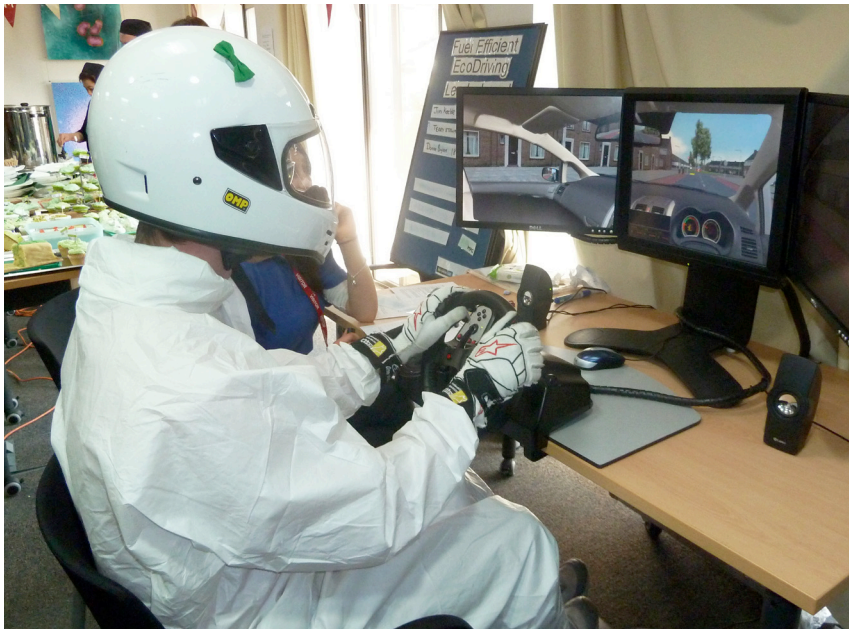
At any one time we have numerous refurbishment projects under way to update our laboratory facilities. We have developed an 'energy-saving package' which ensures we pack in efficiency features without compromising on the quality and output of the science. In the early design stages, we identify key features such as lighting, controls and daylight-enhancing sun tubes. We look at heating requirements, zoning and controls. We address the all-important insulation improvements through double glazing, and wall and roof insulation. Through these practical measures, we can factor energy efficiency into our strategic investment and embed it as a consistent site-wide strategy.

What areas of every day business at NIBSC are most challenging in terms of energy management?

NIBSC predominately consists of scientific laboratories. These contain all the equipment necessary for the complex research carried out within them on cancer, polio, influenza and many more areas of medicine. On the site we also have containment laboratories for microbiology work, where isolation from the surrounding environment is paramount in order to prevent infection or release of pathogenic organisms. This critical containment is achieved by supporting plant and equipment. For instance, the HVAC systems (heating, ventilation and air conditioning) are crucial to the provision of high quality conditioned air, controlled temperatures and the removal of moisture and airborne bacteria.

In such environments, it is important to have a sensitive approach to energy management and our work alongside the scientists: it is essential to maintain a balance between saving energy and providing a safe laboratory environment. To assess the energy demands here, I invested in a robust automatic monitoring and targeting system (aM&T) to complement the site's wide-ranging Building Management System (BMS). We installed layers of sub meters to help us make these changes; I use these to review and check anomalies in energy usage.



I can give you an example of how this works in practice. I worked with the site's BMS Manager to review the historic programming of AHUs in laboratory areas. In just one plant room, savings of over £5k were achieved instantly by updating the timing and zoning measures of the equipment. The next thing we did was to duplicate this across all the plant rooms. It is so important to revisit parameters, such as those controls set via a BMS, and to adapt to changes in room use.

What part does staff behaviour change at NIBSC play in terms of energy management?

I have always felt that behaviour change is a worthy "project" in its own right. We should absolutely be using it to complement the results achieved through capital investment. The way this is done, getting the tone right, is critical to its success. The job of our scientific staff is to undertake complex research, so our energy management needs to fit in and not be burdensome.

It is invaluable to be able to demonstrate to staff what can actually be achieved in practice. I developed site-wide switch-off initiatives, first working with smaller groups of staff and building up to the entire Institute. After repeated practice we were achieving a solid 10% saving in energy. These savings have continued to grow, and we have transferred these campaigns into a switch-off strategy for the site over the Christmas week, with endorsement from the senior management team.

> "I LOVE THE CHALLENGE OF MAKING ENERGY MANAGEMENT GOOD FUN AS WELL AS INFORMATIVE."

I love the challenge of making energy management good fun as well as informative. For me, the job is all about generating innovative, original ideas. We have run a lot of initiatives, including an eco-bike to power laboratory equipment, eco-driving with a Top Gear-style leader's board, and a staff Pledge Wall. In the lead-up to Christmas one year, I held a competition: "The Twelve Days of Switch-Off"; people wrote their own words to the traditional Christmas carol announcing what they would turn off over Christmas. I had a choir, the site's Director and the Institute staff all singing along!

I believe in leading by example. I hope that I have embedded sustainable development in the Institute, through culture change and by developing a 'green' community ethos. I work with staff to ensure they take individual responsibility for their energy usage. And at night I wander the corridors to check on their progress!

Can you describe an energy management project that reflects the organisation's principles and corporate responsibility when it comes to energy management and environment?

The Institute took its first steps into renewable technology in a significant project in terms of scale and environmental impact: the NIBSC Solar PV Project. I have to say that this particular project hit the UK solar industry at a turbulent time. Several Government consultations had commenced that went on to have a far-reaching impact on the solar industry. As a result of these various uncertainties, I adapted the initial project proposal and sought further funding to increase the investment opportunity due to the changing market. I also recognised that the roof space at NIBSC represents 'an asset', so I sought to change the panel specification to higher output panels of 300kW to maximise the opportunity presented by the roof space.

The project had a number of complexities. Due to the importance of continuous electrical supply to the site and the specialist nature of the scientific work carried out there, power supply and its security was crucial. It was essential that the project provided both grid resilience and full integration with site-wide emergency back-up generators. This added a layer of difficulty to the project, and we had to develop a robust strategy to handle this and give confidence both to the individuals managing the power supply and to the scientific staff that the project would not disrupt working practices.

The Solar PV Project involved the installation of a 442kW array across seven south-facing rooftops; a total of 1,490 solar panels were installed. The estimated output was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profiled, using project specifics and local weather conditions, to model projections across a typical year. A total saving of £2.5 million was estimated from three main sources – off-setting grid electricity, Feed In Tariff payments (FITs) and carbon tax abatement – across the twenty-year project lifecycle. Payback was set at seven years with an estimated 8% reduction in the annual electricity requirements.

Our key stakeholders have responded exceptionally well to this first step into renewable energy; and so have NIBSC staff, which is very pleasing. We have enhanced the Institute's reputation for corporate responsibility; the project has not only generated a lot of energy but also significant interest.

What is in the pipeline for the future?

There has been so much happening at NIBSC that has had a positive impact on reducing our energy usage, so much good work. I am keen to continue this. Following on from the implementation of the Solar PV Project this coming year, we are going to undertake a feasibility study which will help us to assess the further benefits of renewable technologies, such as large-scale energy generation and energy storage options. It will be fascinating to see how they measure up for our site.

Renewables hold great potential for us. If it all follows through, we shall be able to produce our own, cleaner, power and become less reliant on the mains grid. Right now, we are looking at other areas of the site where we can install solar technologies such as solar-style carports and integrated vehicle charging points. The environmental benefit is appealing; I hope that these potential projects will carry the necessary savings and payback for us to implement them.

NIBSC has made itself a leader in the environmental field by getting on and making changes, by actively following through on ideas and initiatives. We hope to continually invest in energy-efficient technologies which will equip us to drive innovation and future-proof our operations and site facilities for the vital scientific work that we do here.

Author's profile:
Professionally speaking Jude grew up on landfill sites, working as an Environmental Manager for landfill and waste-to-energy sites. At the Carbon Trust, she managed a £35 million program for businesses to invest in energy-efficiency. She then became the first Energy Manager at NIBSC, a perfect place to channel her energy! Jude's achievements were recognised in top industry awards in 2016; Energy Manager of the Year (Energy Institute); Government Energy Manager of the Year and Government Energy Project.