



# THE EMA MAGAZINE

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## ROADMAP TO NET ZERO

### NO WASTE FROM WASTE

by Ethan O'Brien

### CAREER INTERVIEW

with Gillian Brown

### ENERGY AND BIOMIMICRY

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We share the most significant results from our research, the changing role of energy, and the actions businesses should take to prepare for a more commercially and environmentally sustainable future.

If you have any questions about our research or if you would like help starting your journey please contact us: [centricabusinesssolutions@centrica.com](mailto:centricabusinesssolutions@centrica.com) or visit: [www.centricabusinesssolutions.com](http://www.centricabusinesssolutions.com)

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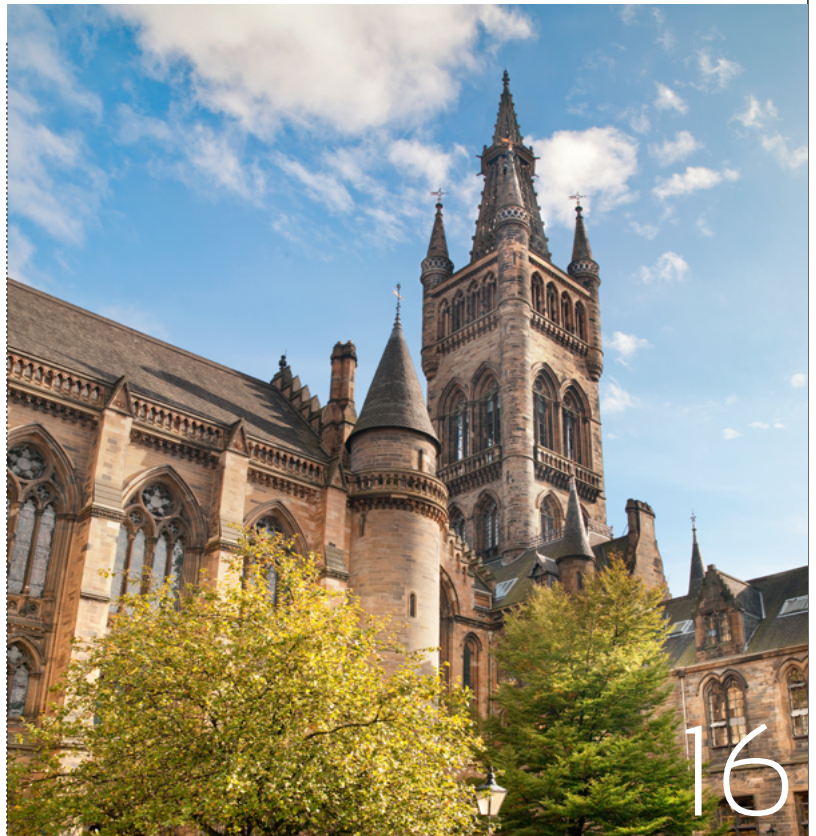
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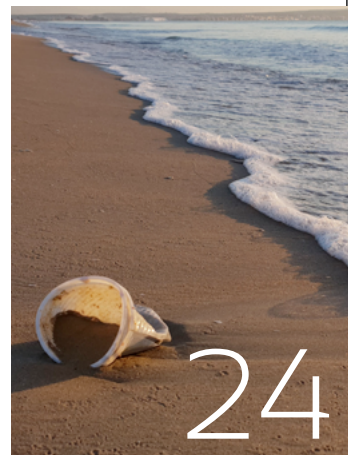
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## THE EMA MAGAZINE

# Dear Reader,

Welcome to our latest magazine, with useful news and articles, for your delight and delectation.

The main issue at the moment, amongst myriad others in this veil of tears we call energy management, is SECR; the first stage is rapidly coming up, and from what we have observed and heard, very little has been done by companies to prepare for this. We hope that they are not aiming to go for the same last minute panic that plagued ESOS. Especially, as failure to provide a fully worked up SECR report in your annual accounts to Companies House means your accountant cannot sign off on them, and how many accountants will sign off on something that has not been audited?

We have an interesting article on IT issues with 'dead data' on servers - how much energy is used to store data that is redundant, out of date or just plain irrelevant and how many old emails do you have archived that no longer have any meaning? – Or when was the last time you defragged your server, to get rid of old programmes and apps?

The article on barriers to energy efficiency will ring bells with experienced Energy Managers and serves as things to look out for to new and upcoming Managers. We hope that you find this magazine useful, and a good starting point for information.

Enjoy!



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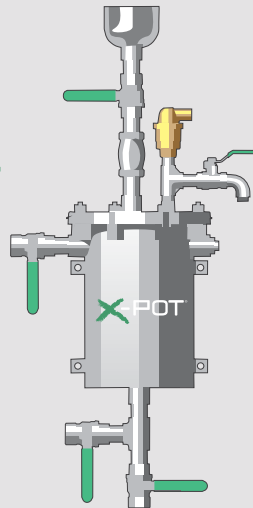
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# Roadmap to Net Zero

**The Climate Change Committee (CCC) recently published Net Zero, which sets out a science-based roadmap to carbon neutrality for the UK by 2050. The scale of this task is not insignificant but unlike many previous reports, the imminent threat of irreversible climate change means that organisations are starting to question how they can reach Net Zero.**

The EMA is working on a ten-point plan that can be used to create a roadmap to Net Zero and be presented to Boards. The plan will cover the steps that will need to be taken by organisations and when they need to be achieved. The EMA has been working on the Simplified Energy and Carbon Reporting (SECR) regime over the last three years and created a methodology built around SECR that could also be used to create a company plan to achieve Net Zero. The software that incorporates all elements of the methodology has been developed and can be used by companies even if they do not fall within the scope of SECR.

In theory, simply following the EMA methodology should result over time in meeting a high percentage of the Net Zero targets. However, as all energy managers know, there are a lot of moving parts and a

number of trade offs that will need to be made to get the lowest carbon footprint possible. An inconvenient truth is that some of the solutions set out in the CCC report are based on technologies that do not exist at scale, at present, and will need to be incorporated when available. Whilst this is a thirty-year journey, the major savings will need to be implemented in the short term. The plan drawn up below excludes offsets but does include the purchase of green energy with caveats.

The elements of the plan are based on the EMA SECR methodology:

“ **CLEARLY ALLOCATING SPECIFIC INDIVIDUALS OR JOB TITLES WITH SPECIFIC ACTIONS OR OWNING PARTS OF THE IMPLEMENTATION STRATEGY IS VITAL.** ”

## 1. Company policy

Any targets set by the Board will need to be undertaken at every level within the company; therefore, developing or integrating a company wide policy on all elements of carbon emission reductions will need to be incorporated into all working practices. This will take time and cannot be solved by a detailed policy being signed off by the Board immediately which has no

implementation strategy. A policy that is great on paper but ignored in practice will have no carbon benefit.

## 2. Strategy

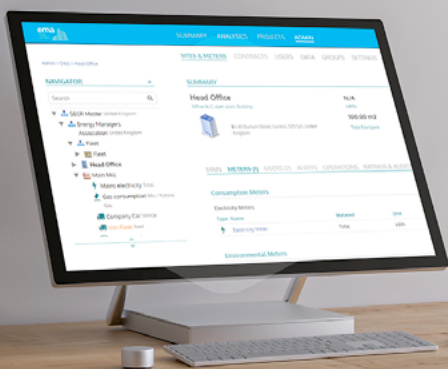
Once a policy has been agreed, strategy documents will need to be formulated to set out how and when actions are to be taken. These need to be based on specific actions and will therefore need to look at how the agreed strategy can be implemented and, crucially, over what time scale.

## 3. Responsibility

One of the major problems in this sector is that often responsibility in energy management is fragmented in company structures. Clearly allocating specific individuals or job titles with specific actions or owning parts of the implementation strategy is vital. There is an argument that jobs should be allocated as part of the company strategy; however, energy management is a fragmented profession and to embed it within organisational procedures, there needs to be a positive engagement by companies.

## 4. Accurate data collection

This is the primary tool of energy management. Creating a baseline of energy used by the organisation will require accurate meter data.



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A large proportion of companies have incomplete meter data sets, and so improving meter data through moving to AMR across the organisation would be one of the first actions prioritised. Analysis of this data, normalised for seasonality and degree days, will guide any strategy being formulated.

## 5. Finance

Financing energy efficiency measures is often difficult when competing against other financial priorities. If the targets are to be met, ring fence energy funds for energy efficiency measures, whether in Capex or Opex spend, will be needed. Communicating the financial investment needed to meet a longer-term plan will mean year on year provision for energy efficiency measures will need to be written into future budgets.

One off measures, with a maximum of twelve month paybacks, will simply not deliver more complex projects or any hope of meeting carbon reduction plans.

## 6. Transport

The move to electric vehicles (EVs), as set out in the Government's paper 'Road to Zero', envisages a third of the UK's fleet (excluding trucks) being electric in ten years. Migrating your fleet to low carbon or zero carbon, at point of use, will be far more complex than just purchasing vehicles. Charge points, electricity capacity and charging times management will all have an impact on the electricity use of your sites. Focusing on EVs should not be the only strategy when it comes to transport. Greater carbon savings may be based on actions such as replacing older vehicles with more efficient models, driver training, telematics that will monitor and report on company or drivers use of the vehicles.

All measures will need to be taken at the same time but understanding the carbon cost of the fleet has not been seen as an energy manager's role in the past. However, this will

change, especially if the organisation falls within the scope of SECR, which requires companies to convert fuel data into kWhs. This could help companies to match energy used in transport against other assets; however, some companies may be surprised to realise that fleets or grey fleets are a large part of their overall energy usage.

## 7. Behaviour change

Behaviour change can be one of the most cost-effective areas of energy management; however, it is hard to clearly measure success and is also notoriously hard to do well. For these reasons, it has often been neglected. Building and implementing a

“ THIS COULD HELP COMPANIES TO MATCH ENERGY USED IN TRANSPORT AGAINST OTHER ASSETS. HOWEVER, SOME COMPANIES MAY BE SURPRISED TO REALISE THAT FLEETS OR GREY FLEETS ARE A LARGE PART OF THEIR OVERALL ENERGY USAGE. ”

behaviour change programme may need outside support, as many energy managers do not think they have the skill sets needed. However, for a long-term success, programmes will need to be integrated and embedded into all areas of the company with the training being a continuous process.

## 8. Procurement

The purchasing of green energy is an important first step in helping to finance the move to low carbon electricity. However, the electrons supplied to an organisation is grid mix and until the grid is 100% renewable all the time, there will be a carbon cost. Renewable gas for the majority of companies is unavailable.

Therefore, any plan put before the Board with purchased renewables should be carefully explained, as to the proportion of the energy used that can reasonably be claimed as renewable and the proportion that is

fossil fuel based.

The purchase of offsets is problematical as this is a form of cheating. Offsets should be used as a last resort once all the above measures have been taken as in reality it is passing any reductions to a third party.

## 9. Supply chain

Most organisations have a complex supply chain from products or raw materials supplied through to IT such as cloud-based activities. In the past, this has been a scope three reporting activity, which needs to be undertaken by the largest companies. However, many organisations are starting to question the carbon used in their supply chain and how they can work with their suppliers to reduce carbon cost.

## 10. Publishing plans and progress

If companies report under SECR, they will need to report their energy, carbon usage and energy

efficiency measures. However, as Climate Change concerns increase, there will be more pressure from Boards, shareholders and financial institutions to clearly state the companies' plans on reducing energy usage. It will not be long before financial bodies will start requiring this information as part of their due diligence work and, therefore, work in this area could conceivably determine organisations management of risk and affect their credit rating.

The energy management profession has been based over the last couple of decades around cost control. The Government has passed legislation setting out a Net Zero target, thus the future of energy management will be entwined with that goal.

We have asked energy management professionals to give us their views on the current barriers to energy efficiency.

**In your opinion, what are the three most common barriers to energy efficiency and how can you overcome these?**

**Mark Taylor, Senior Energy**



**Management Consultant at SMS plc**

On the face of it, energy efficiency is a straightforward task, an organisation or individual needs to ensure that their equipment/processes/buildings are:

- running at the right times;
- controlled to suit the requirements;
- insulated if related to heat transfer;
- replaced if outdated (inefficient).

As a sector, we have a great opportunity to make a demonstrable impact in the current climate.

The UK has stated its net zero ambitions, and individual organisations and councils are following suit, declaring a Climate Emergency and aiming for Carbon neutrality by 2030<sup>1,2</sup>.

So, the drivers are there and the task is straightforward. Job done? Not quite...

**1. Making an efficiency proposal understandable**

An energy efficiency business case is competing for investment funding against a range of other investments (IT upgrades, marketing and sales initiatives, new business development). These other

investments and their benefits will be more easily understood and are more akin to business as usual activities.

Combined within an energy efficiency business case will be references to energy uncertainties:

- The Negawatt, or the amount of energy not used due to the implementation of an energy conservation project, often modelled using a regression formula;
- The future unit rate of energy;
- The future (rising) cost of pass through charges (relating to energy supply infrastructure and government policy);
- Practical implementation and operational and maintenance risks.

It is the role of those proposing an energy efficient investment to give sufficient comfort to the decision maker to allow them to invest. As a breed, energy professionals will revert to technical jargon and physics

“ THERE MAY BE OUTSIDE INFLUENCES LEADING TO A PROGRAMME NOT ACHIEVING ITS FULL POTENTIAL, BY INDIVIDUALS INTERACTING WITH A NEW SYSTEM IN AN UNEXPECTED WAY. ”

to explain complex concepts. This is to be avoided at all costs when proposing an investment to a decision maker.

One way to give comfort and avoid the pitfalls of complex concepts and jargon is by running a representative pilot program to demonstrate the value, or starting with a less complicated technology that is easily understood (lighting upgrade). Trust in the ability of energy efficiency to deliver can be gained from previous project success.

**2. Condition of existing infrastructure**

All energy efficiency projects are dependent on the quality of the surrounding infrastructure; for example, the existing wiring for a lighting upgrade or condition of the central heating ventilation and air conditioning (HVAC) plant for control upgrades.

In most circumstances where poor infrastructure could affect an efficiency project, the state of the system affects the quality of service and cost of service to the host organisation. For example, high reactive maintenance costs for a boiler house in poor state of repair.

The maintenance function within an organisation may not have complete or accurate information about individual assets (an asset register that has partial or out of date information). The maintenance activity on an estate may be largely reactive, with a lower proportion of activity being planned, and predictive maintenance a future aspiration.

Opportunities for investment in the remediation of poor infrastructure can be easily identified and included within a program, increasing the value of the project by assigning a value to the lost service provision and higher service costs.

**3. Interference, outside of programme control**

There may be outside influences leading to a programme not achieving its full potential, by individuals interacting with a new system in an unexpected way.

An example of Jevons paradox is heating consumption going up after insulating a home due to the building being able to retain heat better. In a similar way, the maintenance function of an estate needs to be considered when

<sup>1</sup> <https://climateemergency.uk/blog/list-of-councils/>

<sup>2</sup> <http://www.bristol.ac.uk/biology/news/2019/university-of-bristol-declares-a-climate-emergency.html>



implementing a change. The function will often be a mix of internal maintenance teams undertaking the less technical aspects of estate maintenance whilst managing the more complex activities, subcontracting these to third parties. In this situation it can be difficult to ensure that a maintenance party does not override the changes made to the system due to the quantity and size of organisations involved in maintaining equipment.

The ability to track changes made to a system is possible; for example, sending out automated alerts that identify when a system is outside of set parameters within a controls project. This level of supervision can be valuable for an estate management team as it can also include the ability to read and report system fault codes, enabling a change to a predictive maintenance regime with quantifiable benefits.

The key to avoiding barriers is being able to demonstrate the value of the mitigation across the business.

### Andy Clarke, Energy Manager at The Energy Check



#### 1. Lack of motivation

Because of apathy and the cheap cost of energy, people haven't been motivated to take measures to reduce their consumption. The attitude to energy efficiency is changing as people see the linkage between wasting energy, climate change and the loss of resources in the future. Increasing press coverage

of the issues and the opportunities has created a desire to improve energy usage efficiency; however, it has also left many false assumptions in the public mind.

#### 2. Lack of knowledge

And there is the rub, there is a lack of knowledge about how energy is generated and used and misunderstanding of how it can be used more efficiently. That, plus doubts about the accuracy of claimed savings from equipment manufacturers and installers, has created uncertainty in the minds of decision makers (that isn't helped by the plethora of what I call "one-club golfers", who claim that their specific solution is the answer for all energy issues). Individually, experienced and qualified professionals can deal directly with those concerns but the barriers within organisations can prevent them ever actually getting access to the right people.

We can deal with the problem of energy ignorance more generally: organisations like ESTA and the Carbon Trust are running campaigns to improve business consumer knowledge, and organisations like



EMA, Energy Institute and UKAEE provide training to improve the knowledge base of professionals.

Many of us have articles published aiming to improve understanding, we're holding meetings where experts can discuss the issues and opportunities and we're generally open to giving advice about the correct technology for any application.

Some of us try to be "technology & manufacturer" agnostic in that we identify opportunities to make savings for customers and then choose the best equipment/methods to cost-effectively deliver a project to reduce costs, improve efficiency and reduce emissions with the minimum of disruption to the customer's business. By avoiding ties to suppliers, manufacturers and even technologies, we are able to identify the best solution for the client, even when that doesn't provide the best profit for us!

Another obstructing issue is the client who demonstrates the adage that "a little learning is a dangerous thing" and has been informed about (or used) particular equipment and believes that it is the best under all circumstances – it probably isn't! For example, LED lighting is a great advance but there is little point in using it to replace properly installed Mercury, Sodium or even T5 fluorescents which may use less energy! Persuading this customer can be a real issue and some will "get the sale" by giving him what he wants, not what he needs!

**3. Lack of funding**

Getting finance for projects can be difficult but not impossible if there is a good business case. The first issue can be internal to the client and relate to the issues described above. If the Finance Director doesn't understand the nature of a project,

“GETTING FINANCE FOR PROJECTS CAN BE DIFFICULT BUT NOT IMPOSSIBLE IF THERE IS A GOOD BUSINESS CASE.”

he won't support it and he may choose to support projects he does understand. What he won't appreciate is that energy used can't be retrieved (and its cost sunk) and damage to the planet is cumulative (Carbon Dioxide released now may still be in the atmosphere in the 22nd Century!).

So, the first task is to educate the decision makers.

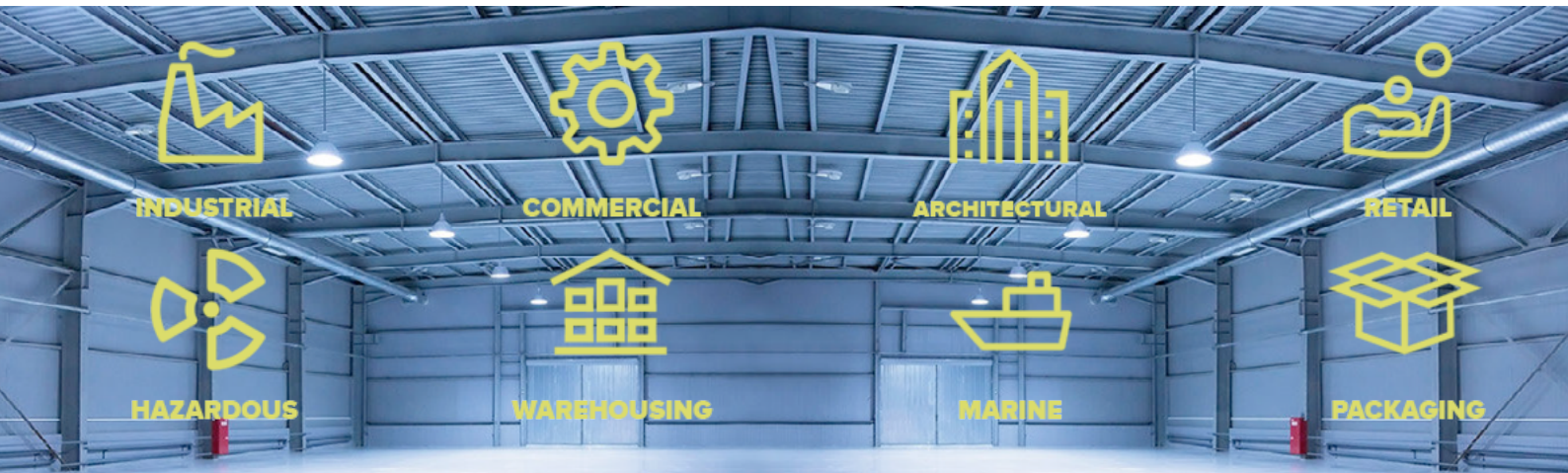
External funding is reasonably easy to obtain for well-engineered projects and currently interest rates are very affordable.

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24<sup>TH</sup> Energy Management Strategy

NOVEMBER

5<sup>TH</sup> Battery Storage for Business  
6<sup>TH</sup> Water Management  
6<sup>TH</sup> Understanding and Delivering Behavioural Change Programme  
12<sup>TH</sup> Lighting – Basic Understanding  
13<sup>TH</sup> Energy Auditing Techniques  
13<sup>TH</sup> Turning Data into Energy Savings  
19<sup>TH</sup> On-site Electricity Generation  
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# Zombies Are On the Rise

**The problem many Energy Managers face is making energy savings interesting, and one of the least understood and most tedious areas is IT. However, the wastage through energy hungry inefficient management of your data and IT infrastructure could account for a significant portion of your carbon emissions.**

**Much of your data is stored but is never going to be used again, dead but not buried. Here are the facts and, unlike the amusing zombie plagues of fiction, zombie servers and data are serious contributors to our carbon emissions and have an effect on the health of our planet.**

According to Whatis.com, "a zombie server is a physical server that is running but has no external communications or visibility and contributes no computing resources; essentially, it consumes electricity but serves no useful purpose."

In 2015, Jon Taylor of the Anthesis Group and Jonathan Koomey from Stanford University published a paper revealing that out of a sample of five data centres, 30 percent of enterprise servers were comatose, performing no useful computing over a six-month period. The results of a 2017 study by the same authors using a sample of ten data centres found that 25 percent of servers were zombies. In other words, there has been very little change.

In 2017, the Guardian newspaper published a forecast that information and communications technology (ICT) is

likely to be 3.5% of global emissions by 2020, surpassing both aviation and shipping. Greenpeace estimate that data centres consume 2 percent of the World's electricity. Energy consumption from ICT in general, and data centres in particular, is a big problem that is rarely covered in the media.

To date, in the studies, Taylor and Koomey have focussed on servers that are performing no useful work, but this may be missing the elephant in the room: zombie data. Zombie data is data that you don't access, but that still exists somewhere, waiting to be jumpstarted back to life. It is likely that we are all guilty of having files on our computers or emails in our inboxes that have not been removed or deleted.

Scanning my own mailbox, I can see emails going back to 2000, many of which I will never need again. These emails are a replica of the emails stored on servers based in a data centre and whilst the hard disk in my laptop computer won't consume more energy the more data is stored on it, the email server it communicates with will have banks of thousands of hard disks that are either rotational or solid state, all online, consuming power just in case I wanted to retrieve an email with a 2-1 pizza offer from 2011.

In my case, my emails reside on Microsoft's Office 365 servers. Earlier this year, Microsoft reported that they now have 180 million Office 365 users, all with a mailbox on their servers. Most will have redundant, zombie data consuming power and adding to carbon dioxide emissions just by existing on disk infrastructure. I should point out that Microsoft,

“ A ZOMBIE SERVER IS A PHYSICAL SERVER THAT IS RUNNING BUT HAS NO EXTERNAL COMMUNICATIONS OR VISIBILITY AND CONTRIBUTES NO COMPUTING RESOURCES; ESSENTIALLY, IT CONSUMES ELECTRICITY BUT SERVES NO USEFUL PURPOSE. ”

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*I found the course extremely useful, and it greatly simplifies the process of analysing critical plant and equipment, so that we can increase the effectiveness and hopefully reduce energy use.*

**Facilities Manager, Huntingdonshire District Council**

*Perfect for teams and job roles that need to start engaging on energy change programmes. Helpful to those that need reminding how best to interact with teams and getting the best out of them.*

**Energy communications and Compliance Manager, Marks and Spencer**

### Green IT Policy Tips:

1. Many organisations will use, or be considering using, “Cloud” based services. In terms of carbon footprint, not all Cloud Service Providers are equal. For some providers there are also large discrepancies between their datacentres. In 2017, Greenpeace produced a Click Green report covering the main providers. It is now 2 years old and elements may be outdated, but it can be used to ask potential suppliers what the primary source of electricity for a specific datacentre is.
2. Audit your IT estate, particularly servers onsite and in the Cloud, and check if they all need to be live. In many organisations, servers are left running just in case someone might require access. It is often possible to power off or snapshot (type of backup) a server so that it can be restored quickly if required.
3. When purchasing computer hardware don't always choose the fastest possible device. Look at the power consumption and choose a device that will do the job for the smallest power budget.
4. There is a trend to have larger or multiple monitors. In most cases, a larger screen means greater power consumption so ensure you only purchase what is required rather than the largest possible screen.
5. Modern PCs and laptops will sleep (transition to a low power mode) after a period of inactivity. Many organisations disable these setting. If possible, make use of sleep mode so that computers power down when you are not at your desk.

the organisation behind Office 365, buys a significant proportion of electricity used in its data centres from green energy sources and purchases renewable energy certificates to reduce carbon emissions.

This has led to Microsoft as a whole, and therefore Office 365, being 100 percent carbon neutral since 2014. This is not the same as saying that Microsoft servers are not causing new carbon emissions. They are merely offset.

When you start to look at corporate data as a whole, the situation appears even worse. My own investigation found that organisations have millions of files such as documents, spreadsheets and images, but more than 80 percent of these have not been accessed in the past two years.

I'm sure we are all guilty of keeping files just in case they are needed at some point in the future, particularly anything that might be considered contractual. But

keeping these on “live” infrastructure is unlikely to be the best place to store them.

Early in my career, I worked for local government, and there was a filing cabinet in my office. When these were full (which didn't take long, as back then most emails

received were printed by personal assistants so that they could be filed away!), the emails were sorted and either shredded or taken away to a vast underground store where they were archived. Back in the mid-1990s this process didn't feel efficient but compared to today's practices, it was. At least, archived items didn't continue to consume carbon and accelerate the onset of global warming.



A recent report by International Data Corporation predicts that the collective sum of the world's data will grow from 33 zettabytes (ZB) in 2018 to a 175ZB by 2025. A zettabyte is a trillion gigabytes. Research by enterprise software provider Templafy found that between 2014 and 2018 the average

office worker received 90 emails a day and sent 40. To put this into context, if a company has 1,000 office workers, they will send 40,000 emails per day and based on an assumption of 250 working days a year, this results in a mind-blowing 10 million emails a year.

Today, there are few options for electronic filing that don't have a long-term carbon impact but with the right level of public support and action to reduce what we keep, this could change. In terms of technology, magnetic tape storage has existed since the early 1950s and the technology is still being developed.

For in-house IT systems, adding a tape archive to servers is straightforward. Today, most of us are looking towards the Cloud for long-term storage options. Amazon Web Services offers long-term storage in the form of its "Glacier" storage products; however, it isn't clear from the product description if data is stored on disk or tape and if these solutions actually take data offline so that it can be stored without the need for continuous electricity consumption.

It would appear that the Cloud computing industry is missing a trick by not offering long-term storage that is guaranteed not to consume electricity once an archive has been created and would only do so again should the zombie data needed to be revived.

### Top 3 tips for reducing Zombie data:

- Kick off with your personal email and online storage accounts, such as Dropbox, Google Drive and One Drive, and clear out the data that you no longer require. This also applies to photos taken on smartphones that are backed-up using online storage such as iCloud. Remember that data is not often permanently deleted until it is removed from Deleted Items or the Trash folder.
- Identify the person/department within your organisation that is responsible for data retention and work with them to formulate a plan to delete data that is no longer required.
- Start examining offline storage options for data that needs to be retained on a long-term basis such as contractual information.

### Author's profile:

Widely recognised as a leading expert in data centre automation, low carbon IT, backup and disaster recovery, Simon Ponsford has held senior positions in some of the World's leading technology companies. He speaks regularly on data centre technologies, data security, data regulation and energy efficient computing at industry conferences and leading academic institutions.

# ESOS Compliance – Get It Right

With the Phase 2 ESOS compliance deadline in just over 4 months, a summary of the most challenging areas identified during the Phase 1 could prove useful and direct your focus.

The EMA offers an opportunity for your company to comply internally and train one of your staff member to undertake your ESOS compliance, or to appoint one of the EMA Registered Lead Assessors.

For more information contact [enquiries@theema.org.uk](mailto:enquiries@theema.org.uk) or 0203 176 2834.



**ESOS Phase 2 Compliance Deadline:  
5th December 2019**

# Career in Energy Management

**The Energy Managers Association aims to encourage and enable more professionals to enter the world of energy management and environmental roles. Being an energy manager may not seem like the most obvious career for many, and the EMA has taken on a challenge of changing the perception of energy management by raising the sector's profile and sharing its members' – leading energy managers – insights into their career progress and achievements. In this issue, we have asked Gillian Brown, the Energy Manager at University of Glasgow, about her career in energy management.**



## What made you choose energy management as a career?

I have always had an interest in the environment, and I didn't see myself working in an office all the time so when I left school, I picked a degree which was in something I was interested in rather than a specific career path. Geography was a good choice as it strengthened my interest in people and the planet, and how the two interact. It also allowed for a good mix between indoor and outdoor working. I was lucky enough

to research water management in Saharan countries during my final year at University, which really sparked my interest in resource scarcity.

From this, my first real job was dealing with water management for a company with a huge property portfolio. It just so happened that the water and energy management functions were part of the same team, so when I started to get involved with energy savings at the same time as water ones, I became much more aware of how much influence energy had on the workings of a company, and the importance to ensure the consumption of energy was as low as possible. At the time, this career path offered me a good mix of instant results from energy reductions, and yet still fed my overarching interest in the impact these reductions were having on a global scale.

## What does your role at the University of Glasgow entail?

My role within the University is a varied one. It is broken into three main areas. First, legislation and compliance. I manage all energy and carbon legislation and compliance reporting for the University. This includes things like EUETS, CRC and EPCs. The second part is the technical on-site project work. This can vary from BMS system management, LED lighting upgrades to boiler replacements. The third part is around promotion and Smart Campus development. For this part, I look at how to best integrate smart energy systems and equipment into both our new and old properties. A key aspect of this is the importance of ensuring the promotion of what is achieved goes out to the wider

“ENERGY MANAGEMENT NEVER STANDS STILL, THERE IS ALWAYS SOMETHING NEW AND INTERESTING TO KEEP YOU ON YOUR TOES.”

organisation, so I create reports and press releases for the internal organisation as well as, on occasion, external media outlets.

## What is the most exciting part of your job?

By far the variety and challenge keep the energy manager's job exciting. I have always been a person who loves a challenge and to think through a problem, and this position provides that. Energy management never stands still, there is always something new and interesting to keep you on your toes. Specifically, within the energy management role at the University, the most exciting part has to be the technical project side. The building portfolio means that no expectedly simple project is ever that. Building age/type, experiments and people all play a very large part in how projects develop. It's a very interesting part of the job.

## What is your biggest achievement to date?

My biggest achievement to date is the energy refurbishment of a busy hospital campus. The project involved a full LED installation of an entire ward block (including high dependency wards), a full boiler exchange, the installation of a 2MW biomass boiler and CHP engine, as well as other smaller projects such as burlap trolley warm-up time reductions. There were a number of difficulties to overcome with



the projects due to patient care and welfare during the works, the building age leading to asbestos issues, as well as ensuring the works did not disrupt the function of the hospital. There were significant savings achieved, as well as financial returns, through the RHI. Overall, the project was a fantastic success.

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### **What was the most exciting project that you worked on and why?**

I would have to say that the University developments into 'smart campus' are by far the most exciting and interesting part of energy management I have worked on. By integrating different pieces of equipment into one platform, it allows us to be more intelligent about how we run our buildings, both existing and new. The exciting part about this for the University is that, as well as trying to bring the smart campus concept into our new building projects, it means implementing what we can into buildings that were constructed 150 years ago.

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### **What is the most frustrating part of your job?**

A lack of time is by far the most frustrating part of the role. There is a huge workload and it's so varied that it is difficult to do the exciting and new project trials simply due to competing priorities. There is a new wave of exciting technology hitting the market, but like a lot of new technologies these have to be

“ **YOU DON'T HAVE TO BE AN ENGINEER OR A DATA ANALYST OR A LEGAL EXPERT SPECIFICALLY. YOU JUST HAVE TO BE CONFIDENT ENOUGH TO BE ABLE TO ASK FOR ASSISTANCE WHEN THINGS GET MORE TECHNICAL THAN YOUR LEVEL OF EXPERTISE.** ”

tried and tested to ensure they are the right fit for the University. This is unfortunately the bit of the job which isn't time resourced particularly well as we all tend to fall into the trap of compliance and reporting.

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### **What is the best approach to attract women into energy management sector?**

The best approach to enticing more women into the sector is to promote the idea that energy management can be whatever you want it to be. There is a huge scope within the sector so finding something which suits your needs and situation is easy to do. Whether you like technical

engineering, on-site roles or more legislative and reporting based desk roles, Energy Management has something which will suit everyone.

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### **What advice would you give to someone looking to become an energy manager?**

Energy Management used to have a reputation that it was a role for engineers who were looking to slow down into retirement. This is no longer the case. You don't have to be an engineer or a data analyst or a legal expert specifically. You just have to be confident enough to be able to ask





for assistance when things get more technical than your level of expertise. You have to be the type of person who likes to take on new challenges as energy management is full of new ideas, solutions, legislation, equipment and stakeholders, and these change all the time.

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**What is the most absurd statement that you have heard in your job?**

Myths and legends follow energy management and have done for many years. I have had people tell me that they didn't think we paid for water as it was covered in other bills. I've had people say that when they look directly at light fittings, they are too bright and people who think turning a thermostat up to the maximum temperature heats the room faster.

But by far the most challenging statement was from an older gentleman who headed up an engineering team where I started in energy management. He told me "we don't do things like that here, hen" referring to energy saving and management. It was definitely a

surprise being so young and new into the job, but I think it was a good wakeup call, which showed me that to make the energy management function worthwhile, people had to not only understand what it meant but had to buy into the idea. A valuable lesson which stays with me to this day.

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**What are your long-term motivations?**

Long term motivations for me are based around a development of the sector. I am focused on driving energy consumption down, whether this be in this organisation through a technical role or perhaps in a lecturing capacity, whereby I teach younger generations the value of what the energy management field is all about.



# The EMA Energy Management Awards

Giving Prominence and Inspiring Professionals

ENTRIES WILL OPEN IN JUNE 2019



## 9 AWARDS' CATEGORIES – 3 FOCUS GROUPS



Public Sector Energy Manager of the Year  
Private Sector Energy Manager of the Year

Junior Energy Management Professional of the Year

Public Sector Energy Management Team of the Year  
Private Sector Energy Management Team of the Year



Energy Management Project of the Year  
Energy Management Consultancy Partnership of the Year



Energy Product of the Year  
Innovative Energy Product of the Year

## NOMINEES



Candidates will be scored on their achievements and initiatives in promoting energy efficiency, and overall savings and energy reduction achieved for their organisations. **It's a great way of celebrating your individual or team achievements!**



Energy and Engineering projects and partnerships will be scored on successful implementation of projects or delivery of services. **Whether your project's focus is on optimising, upgrading, replacing or behaviour change for your organisation or in a partnership with a consultancy service provider, we would like to hear from you!**



Products will be required to demonstrate evidence of benefits and outcomes and will be scored on their innovation, and ability to achieve energy efficiency savings and carbon reduction. **Whether you are a technology manufacturer or supplier, or an end user with a product that you would like to recommend, you could qualify for this category!**

## ENTRIES

Entries are free of charge and can be submitted on the EMA website from 1 June until 25 October 2019.

## WINNERS & HIGHLY COMMENDED

The winners and highly commended in each category will be announced on Wednesday 27th November 2019 in London, and will be entitled to the benefits and opportunities:



- The use of the EMA Energy Management Awards 2019 logo;
- Have their category profiles published in The EMA Magazine and EMA website;
- Highlight their achievements with published case studies and/or articles (The EMA Magazine and website).

**Submit your entries at [www.theema.org.uk](http://www.theema.org.uk)**

# SECR: Time to Start Now!

## What is SECR?

Streamlined Energy & Carbon Reporting, introduced in April of 2019, applies to all quoted and large unquoted businesses and limited liability partnerships in the UK. Businesses in scope of SECR will have to include the SECR report in their annual director's report submission to Companies House. Companies such as LLPs, which do not have to submit an annual directors report to Companies House will have to lodge a separate SECR report.

If your business is quoted, or has more than 250 employees, £36 million in annual turnover or £18 million on the balance sheet, then you may be in scope.

## If your organisation is in scope, start now!

- Meet with your Finance team.
  - Find out about existing obligations for reporting and ask for space in the company's Annual Report.
- Identify and document on reporting boundaries
  - Identify parts of the business that must be included.
- Start collecting data
  - Identify who holds required data and start collecting regularly.
- Decide how you are going to store and report data
  - Energy management system via e.g. Excel, database, energy monitoring platforms.

## Frequently asked questions

### What do I have to report?

Companies in-scope must report on their top-line energy and carbon figures reported in kilowatt hours (kWh) and carbon dioxide equivalent (CO<sub>2</sub>e) respectively. Companies must also report at least one carbon intensity metric along with a narrative on energy efficiency and the methodology that they have used to produce the report.

### When do I have to report?

The information must be disclosed in your company's annual report at the end of the reporting year. Therefore, the SECR period aligns with your company's existing reporting.

### What is an energy efficiency principal measure?

To cut through the ambiguity of the narrative requirement, the EMA has produced a methodology to simplify the reporting process and add structure and guidance to reporting on energy efficiency actions, in addition to clearly defining principal measures.

### What methodologies can I use to report?

The global standard methodology for accounting and reporting on greenhouse gas emissions is the GHG Protocol. Building on the global standard, the EMA has

“ **BUSINESSES IN SCOPE OF SECR WILL HAVE TO INCLUDE THE SECR REPORT IN THEIR ANNUAL DIRECTOR'S REPORT SUBMISSION TO COMPANIES HOUSE.** ”

created a SECR-specific methodology for reporting energy and carbon data, industry-appropriate intensity metrics, and best-practice energy efficiency narrative.

## The EMA offers guidance through:

### • *The SECR Compliance Course*

The EMA is holding the SECR Compliance Course monthly in London. The course is appropriate for anyone tasked with undertaking SECR within organisations, or consultants seeking to upskill to expand the offering of their services to clients.

The course can also be delivered in-house for organisations seeking to up-skill teams.

The course will help you to understand:

- Basic concepts contained within SECR
- Scope of the regulation
- Data collection methods for energy, gas and transport
- Creation and use of intensity metrics
- Stated methodology used
- Definition and scope of energy efficiency principal measures
- Compilation of the report for auditors, Board of Directors, and Companies House

The next course will take place on Wednesday 21 August in London.

### • *The SECR Evaluation Tool (SECRet)*

SECRet allows companies to capture data, perform detailed analysis, and access industry best-practice to ensure simplified compliance year-on-year.

Automatic GHG conversion factor updates, data quality alerts, and creation of intensity ratios simplify your organisation's energy data.

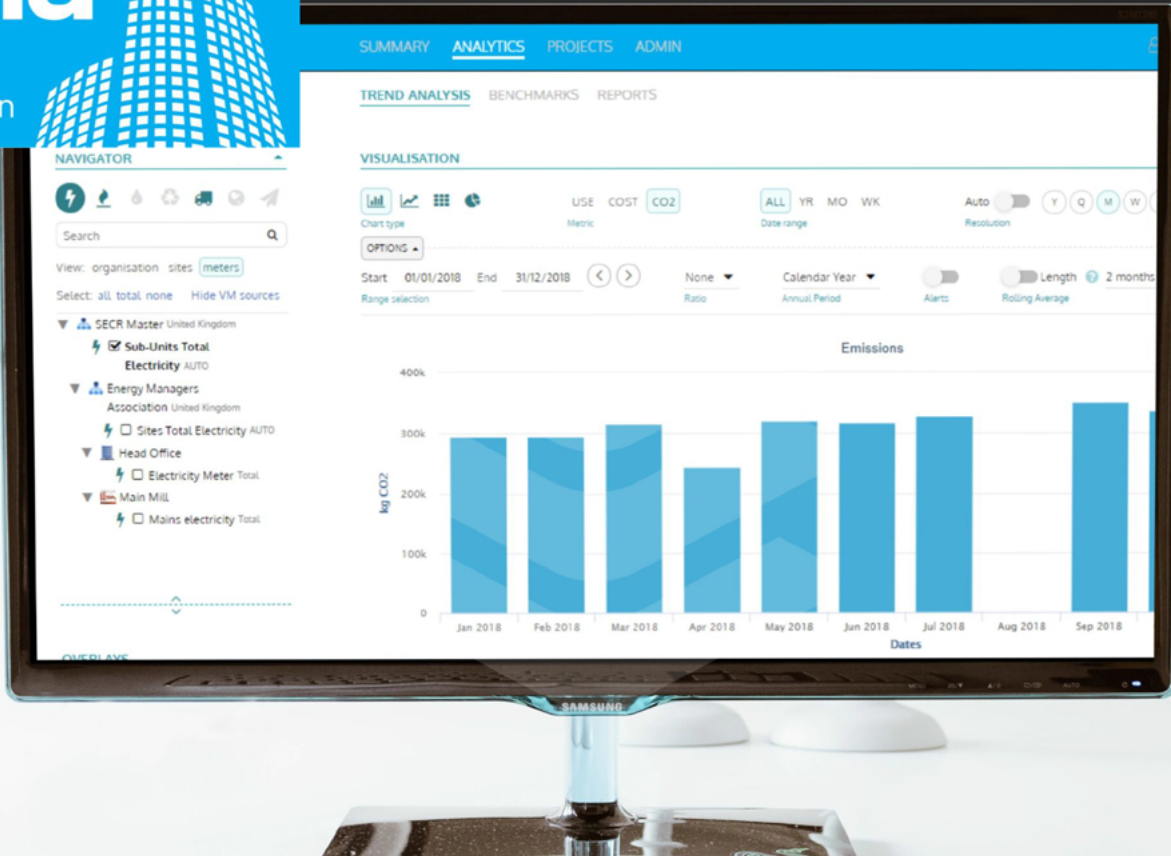
SECRet allows companies to manage energy data and leverage information for continuous energy efficiency and carbon reduction improvement.

### • *Get in Touch*

For any questions regarding SECR Compliance for your organisation, or any of the EMA SECR offerings, please contact Alex Ross, SECR Project Development Manager at alex.ross@theema.org.uk.

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# SECR COMPLIANCE



## Data Collection

Easily capture your organisation's data and create carbon & intensity metrics.



## Analysis & Visualisation

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## Compliant Reporting

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Simplify SECR reporting with energy & carbon data, energy efficiency narrative, EMA Methodology and 3rd party verification. Get access to our SECR Compliance and continuous energy improvement tool.

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# No waste from waste!

**Transitioning to a circular economy or, in simple terms, maintaining the highest value and quality of materials and resources for as long as possible is an essential part of tackling plastic pollution and climate change. It is an alternative to the traditional linear economy, which fails to fully utilise the potential in many materials. The rhetoric on circular economy and climate emergency is a far cry from the reality of today. Take London, it produces millions of tonnes of waste each year that is still landfilled or exported abroad. Across the UK, some 27 million tonnes of municipal waste and 47 million tonnes of waste from businesses are produced every year<sup>1</sup>. That is the scale of the challenge ahead.**

After a decade of retreat from waste management policy, there are strong signs that the UK Government is now alive to both the urgent need for better resource use, and to the exciting opportunities it brings for jobs, innovation, growth and sustainable lifestyles.

Defra's recently published Waste and Resources Strategy wants to address key challenges such as ensuring that packaging producers pay the full costs of increasing recycling through extended producer responsibility, something that is commonplace across Europe; ensuring the delivery of both the quantity and quality of recycling infrastructure Britain needs; and taxing virgin plastics to stimulate innovation in packaging design.

Design is key as the materials packaging is made from and how it is constructed play a fundamental part in how much of it can be recycled. Moreover, recycling is only possible where there is a use for the recycled materials that is technically and economically viable, so stronger end markets for secondary materials is also essential to future recycling efforts.

## Clutching at straws

Government headlines about banning plastics straws and declaring war on single use plastics fail to place into context the enormity of the task ahead. Though well-meaning, this is virtue signalling – demonising plastics is easy, fixing our waste of resources and tackling climate change is much harder. It also fails to level up honestly with the shift that is required by members of the public, who need a form of radical encouragement to 'do their bit'.

Recent research<sup>2</sup> conducted by IPSOS Mori, a polling firm, highlights that though a majority of British people are concerned about plastics, most respondents say they are reluctant to help solve the problem if it will cost them money: 47% of the public think forcing councils to spend more on recycling would help, but only 14% would pay more council tax to achieve it; and 45% think naming and shaming the retailers responsible would be effective, yet only 18% would stop using those retailers.

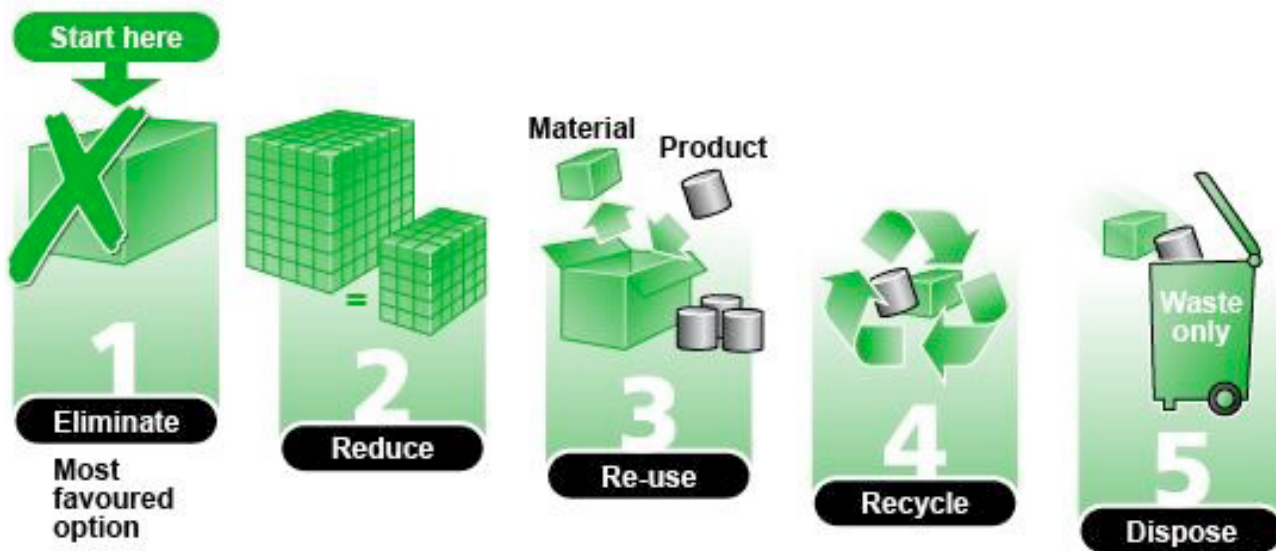
Government and industry can help with providing clearer information to consumers on what to do once they have finished with packaging and products, but concern by consumers needs to be backed by willingness to act, and taxation policy should be used to "nudge" consumers in the right direction.

Consumer engagement is going to be key if we are to address sustainability issues more generally, not only in terms of unnecessary packaging and food waste, but wider in terms of decisions about commuting to work, choices about holiday destinations and our penchant for fast fashion. Solutions to these issues need to go far beyond simply saying no to the straw which is little more than piecemeal analysis of one small lens of the overall issue.

## The nexus of waste and energy management

Waste and energy management are not directly linked. One is possible without the other. But in the bigger picture, the two are closely related. Whether it's tackling plastic waste or cutting carbon emissions, protecting the planet is everyone's business. Energy and sustainability managers are well positioned to be positive change makers on both fronts. Below are some practical steps to aid planning and development of a robust organisational waste management strategy.

- Understand the legal implications of the waste produced in your organisation by identifying the specific legislation that affects your business. Select waste carriers carefully and make sure Duty of Care responsibilities (for the waste you produce, store, transport and dispose of) are met for all waste streams.
- Quantify and identify waste generation and understand waste composition. Where does it arise and how much does it cost to dispose? There is an optimum method of material management for each waste type, so use the waste hierarchy to identify what currently happens to the waste as it arises. Undertake walk around audits and look at your bills.
- If planning a new project, there is an opportunity to set waste reduction and recycling KPIs/targets early on for waste generation, and waste diverted from landfill.
- Depending on the make-up of your business, you cannot necessarily control the volume or types of waste produced; therefore, no single waste management option alone suitably covers all of the waste streams and quantities that are generated. Identify different possible disposal options where



Picture courtesy of BBC – GCSE Bitesize: Reducing waste

you cannot reduce or recycle. Waste minimisation is the best strategy of all, but there will always be waste, which cannot be recycled for technical or economic reasons, so the decision then is to treat this resource in the most appropriate way e.g. energy recovery instead of landfill.

- Innovate and think outside the box: the true cost of waste is not just the cost of taking it away – it's often buried in processes and practices within a business that create waste in the first place. Through re-designing processes and adopting better behaviours, the volume of waste companies generate can dramatically fall. This naturally leads to a reduction in disposal costs and, more importantly significant operational costs savings.

Waste management is a particularly iconic, visible and tangible example of the impact businesses and people have on the planet. Failure to adequately tackle it in an organisation damages wider ambition and results in sustainability claims being rather tenuous. On the upside, businesses that can explain the positive impacts from their waste management activities stand to gain reputationally and commercially, as conscious investors, employees and consumers are putting increasing pressure on big-name companies to make large-scale changes across their supply chains. Climate change, something all energy managers are motivated to do something about, can only be tackled if all angles are covered, and this includes improving how we deal with our waste. It is no doubt something our children and grandchildren's generation will judge us by.

#### Authors' profile

Ethan O'Brien is an Energy Management Consultant at JRP Solutions. During his previous role at Cory Riverside Energy, his contribution to the waste management sector was recognised when he was declared winner of a LetsRecycle '35 Under 35' Award in 2018. He is a University of Edinburgh Business School graduate.

<sup>1</sup> National Infrastructure Commission. Congestion, capacity, carbon and air pollution. [https://www.nic.org.uk/wp-content/uploads/Congestion-Capacity-Carbon\\_-\\_Priorities-for-national-infrastructure.pdf](https://www.nic.org.uk/wp-content/uploads/Congestion-Capacity-Carbon_-_Priorities-for-national-infrastructure.pdf)

<sup>2</sup> <https://www.ipsos.com/ipsos-mori/en-uk/public-concern-about-plastic-and-packaging-waste-not-backed-willingness-act>

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**Practical Guide for  
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# WASTE MANAGEMENT



reuse reduce

**“Putting Energy  
Management at  
the Heart of  
British  
Business”**



**Global waste generation has increased in line with population growth, directly impacting the environment we live in and our health and well-being. In response, governments are introducing strategies for sustainable waste practices to replace current disposal methods as waste management advances from being a local concern to a global challenge.**

As a direct result of both consumption and lifestyle choice, economically developed countries are producing more waste than ever before - the UK alone produces around 200 million tonnes of waste in total every year. This is compounded by the increasingly synthetic nature of waste which is resulting in global pollution and health issues.

Waste is everywhere but by modifying the way we think about the types of products and materials we buy, how they are used, and the way in which they are disposed of, the amount of waste produced can be dramatically reduced. Waste management can be tackled through reduction, reuse and recycling; however, it means that some old habits will need to be transformed.

### Circular economy

The United Nations' 2030 agenda for sustainable development includes 17 goals for tackling the most pressing social and environmental challenges. One of which (Goal 12) was to "Ensure sustainable consumption and production patterns". However, achieving this is not as simple as it might seem.

Our general economic structure is fairly straightforward: we take raw materials out of the ground and turn them into products and materials that have a finite useful life. We then put them back into the ground as landfill. This is known as an open-loop system – where the output has no influence or effect on the input. It is a straight line, or linear model:

This is wasteful in terms of both natural resources and expenditure. It is also a model that is not good for the environment. An alternative economic structure is a closed-loop



system – also known as a feedback system – which is a system that has one or more paths or feedback loops (hence its name) between its output and its input.

In the closed-loop system, products or materials become reused or remanufactured in some way to form a proportion of the input to new products or materials, rather than simply end up in landfill.

This closed loop system is commonly referred to as a circular economy (due to the circular shape of the feedback loop): a restorative or regenerative economy in which products are designed and utilised with reuse and recycling in mind.

There can be significant environmental benefits of adopting a circular model as it can build economic and social capital based on three principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

For example, utilising some of the waste material to make new products – such as aluminium cans – significantly reduces the quantity of raw materials required. Design alterations will reduce waste material quantity as the product is designed to be reused or recycled. In addition, by-products and excess materials which might have previously been sent to landfill can be considered for utilisation or manufacturing in other production streams.



To fully transfer an economic structure from an open-loop linear – make-use-discard – model in favour of a closed-loop circular – make-use-make – model will take a radical overhaul of all patterns of production and consumption

supported by training & communication and government-led incentives.

### Defining waste

Waste can sometimes be difficult to define, but is typically anything that you discard, intend to discard or are required to discard. This does, however, cover more than just products and materials you have decided to dispose of: materials being recovered - for example sent for recycling or being prepared for reuse are also considered waste.

Domestic waste is waste generated by households. Business waste (trade, commercial or industrial waste) is any material disposed of by any organisation, whether for profit or not and whether public or private. This article refers only to business waste.

Examples of waste materials include:

- used packaging,
- discarded food,
- discarded electrical equipment.

Most, if not all, organisations create waste (either directly or as a by-product of some other process) and most types of organisational waste are classed as controlled waste<sup>1</sup>. Controlled waste is waste that is subject to legislative control in either its handling or its disposal and this article refers only to the management of controlled waste.

The UK has developed National Waste Strategies which outline how it intends to deal with the increasing

amount of waste produced each year and meet various European recycling targets - England, Wales, Scotland and Northern Ireland have each developed their own separate waste strategies. Each strategy contains information on how the country will deal with all sorts of waste including

packaging, electronics, batteries and end of life vehicles.

To support these strategies each country will need to increase recycling rates which means a requirement to:

- Collect even more materials in recycling bins;
- Educate as many people as we can about recycling;
- Find new ways of turning recycled materials into useful items.

### Principles of waste management

Organisations face increasingly tough legal obligations with regard to their waste and so the adoption of effective and robust waste practices makes it easier to comply with existing regulations, whilst enabling better preparation for any changes to, or additional, legislation that might occur.

There can be substantial penalties if an organisation fails to manage its environmental liabilities which could include reputational damage, loss of income, organisational disruption, prosecution or fines. Environmental responsibility and protection are becoming more prevalent amongst employees, customers and investors alike. Credence is put on being able to demonstrate an organisation is environmentally responsible and failing to take appropriate action could affect organisational reputation and profitability.

The whole-life cost of waste is not only the cost of those materials

Effective waste management can benefit the environment as well as the organisation, for example:

- A reduction in waste to landfill means less methane, a greenhouse gas that contributes to global warming;
- Energy recovered from waste means less requirement for the use of fossil fuels.

Reducing organisational waste makes good business sense and it helps to protect the environment. The costs associated with sending waste to landfill are increasing as are the restrictions on what you can actually send. Therefore, recycling can bring cost reductions to a waste contract.

### Waste management hierarchy

An organisation should choose the best waste management option for each type of waste it produces. When choosing a waste option, you should follow the waste management hierarchy. The waste hierarchy is both a guide to sustainable waste management and a legal requirement, as set out within the Waste (England and Wales) Regulations 2011.

The waste hierarchy outlines the stages of waste management from the preferred option to the least preferred option as shown below (a RAG status – red, amber or green – has been used to colour code which options are preferred and which are least preferred – red, as you might suspect, being least preferred).



discarded but also incorporates:

- the use of raw materials & energy;
- disposal of by-products;
- waste treatment;
- labour costs & transport.

According to the Chartered Institute of Procurement & Supply, the actual cost of waste for UK companies is typically 4–5% of turnover and in some cases can be as high as 10%.

The waste hierarchy can help you to identify the best option for each waste type:

- **Reduce** – the most effective option is to minimise the waste you produce in the first place, such as requesting less packaging on the products you buy thus less residual waste to deal with from

“ ACCORDING TO THE CHARTERED INSTITUTE OF PROCUREMENT & SUPPLY, THE ACTUAL COST OF WASTE FOR UK COMPANIES IS TYPICALLY 4-5% OF TURNOVER AND IN SOME CASES CAN BE AS HIGH AS 10%. ”

the product itself.

- **Reuse** – products and materials that can be reused within your own organisation or by another organisation. An example of this would include the reuse of your ‘old’ computers and phones by local schools or start-up businesses. For example, just because it is of no use to you any more does not mean it cannot be of some use to someone else.
- **Recycle** – products and materials that can be reprocessed into products and materials for either their original purposes or some other purpose, so benefit is still gained from them. Aluminium cans, paper, glass and wood waste are good examples of materials that can be recycled into other

products.

- **Recover energy** – waste used to generate energy or produce biofuel. This tends to involve the burning of waste and recovering energy in the form of heat but can also be such things as anaerobic digestion where food is composted on an industrial scale to generate biogas which can be used to

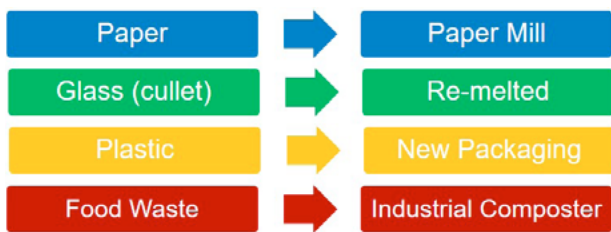
generate electricity and heat.

- **Dispose** – the least sustainable option is to either bury waste at a landfill site or burn it without recovering any energy. Neither of these will lead to any benefit from the waste.

## Reducing waste

In February 2011, the Waste (England and Wales) Regulations introduced the legal requirement for organisations to apply the waste hierarchy when dealing with waste. Organisations must therefore take reasonable steps to reduce waste production at source. Where waste is produced the onus is on the organisation to manage it in the most environmentally friendly way – in line with the waste hierarchy – that is economically viable.

Zero waste to landfill is about diverting waste from landfill and using the products and materials for other purposes, for example:



Waste reduction at source is always the best option from an environmental and economic perspective. Whilst a number of benefits can be achieved through reuse and recovery, such reprocessing activities also use energy, so the priority should be to reduce waste in the first place. There are a number of ideas that can be considered for source reduction, including:

- Potential easy wins – small changes can sometimes produce significant results – for example, printing and photocopying both double-sided and in black & white, switching off lights and electrical equipment when not in use and using rechargeable batteries where possible.
- Procure with whole life perspective in mind. Evaluate make versus

buy options, review buying in bulk to reduce packaging. Always consider a product or materials in terms of sustainability, durability, lifespan and end of life potential – sometimes all that is required is a discussion with the manufacturer.

- Undertake process reviews – ensuring that products and materials are used efficiently and effectively is not only good business sense, it can also help to keep waste to a minimum.
- Product design – minimise materials and packaging in a product and minimise the steps taken to create products and materials. This is similar to, and will most likely form part of, the process review function.

## Reusing waste

The reuse of an organisation's waste within the organisation itself can reduce costs and benefit the environment as there is no need to buy new raw materials, pay to dispose of the waste or send the waste to landfill. Organisational waste may also be used by a different organisation – becoming a valuable commodity which can generate a new income stream.

The reuse of products and materials will vary but can include:

- Use of waste paper as notepaper;
- Use of durable dishes, glasses and cutlery rather than paper or plastic alternatives;
- Donation of used products and materials to schools and charities.

## Recycling

After reduction and reuse, recycling is the next best waste management option, albeit slightly less beneficial to the environment than reuse: some energy and resources will be required to reprocess the products and materials before they can be used again. However, recycling is still very important as it reduces the amount of

waste sent to landfill, whilst reducing the requirement for new raw materials. Recycling is the operation by which waste products and materials are used to make new products and materials – either for their original purpose or a new one. For example, waste glass bottles can be used to make new glass bottles. Old tyres can be used to make new tyres or to make other rubber products such as playground surfaces. Recycling also includes the reprocessing of organic material.

It is useful to look at the whole life cost of a product or material. Although there may be some cost associated with recycling, it may be much less than sending waste for energy recovery or disposal. Separating and segregating the waste that can be recycled from the other waste streams will help maximise the quality and volume of each recyclable waste stream, such as:

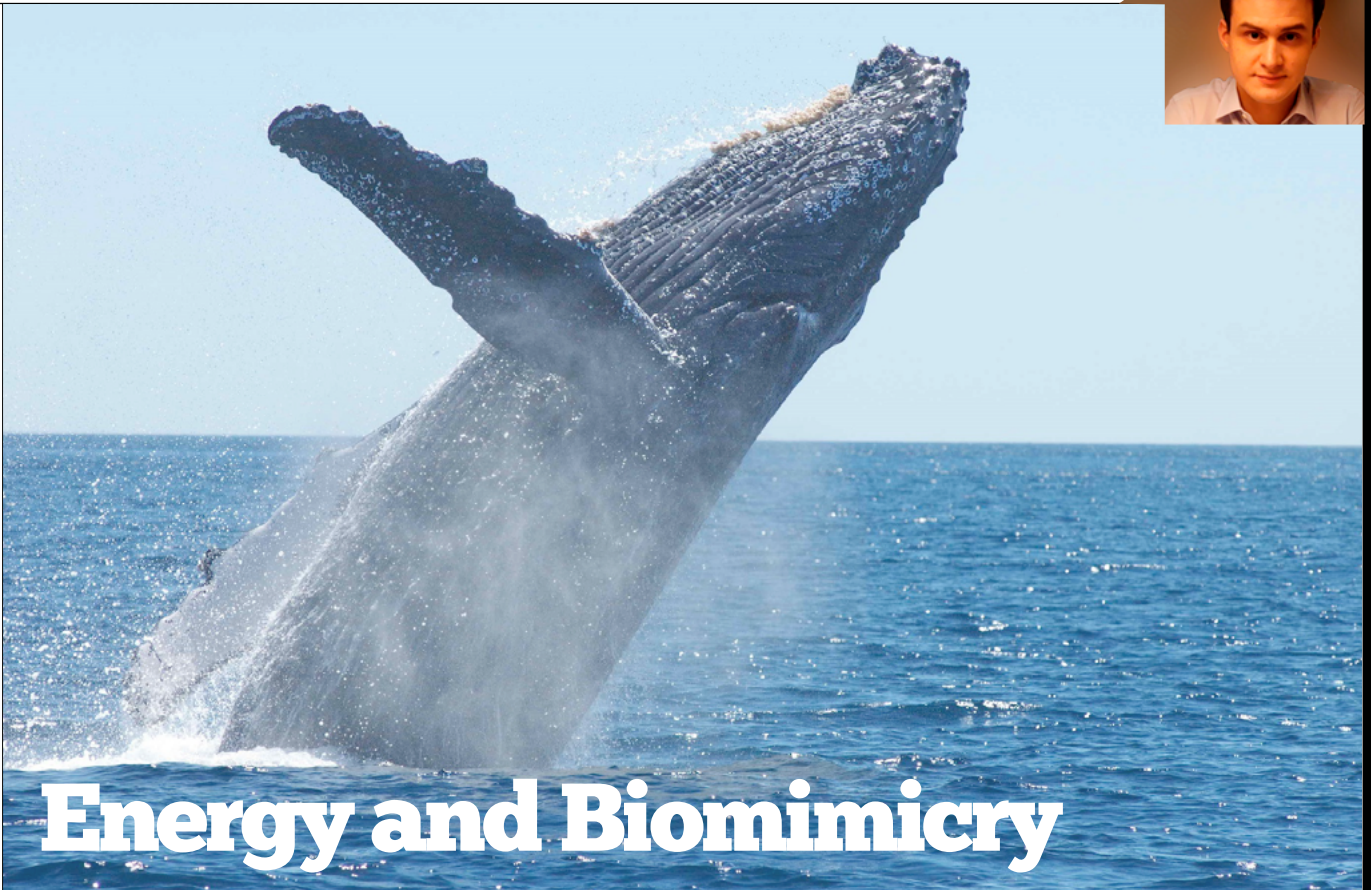
Glass	Metals	Plastic
Paper & cardboard	Timber	Food waste

## Disposal

Where a waste product or material is discarded with no recovery – i.e. the waste is not providing any form of use, productivity or being a resource input or output to any other operation. The best known example of disposal is landfill, which comes at a cost. The Landfill Tax was introduced in 1996 and has steadily risen each year as an incentive to encourage recycling. The landfill tax standard rate is fast approaching £90 per tonne as compared to the inert rate of just under £3 per tonne.

**The full version of the EMA Waste Management Guide for energy management professionals will be available on the EMA website in the near future. It will include sections on the type of waste, waste management rules, permits, auditing, procurement, strategy and planning.**

<sup>1</sup>It should be noted that, although certain wastes are classified as 'non-controlled', this does not necessarily mean that there is no legislation governing their handling, storage, transport and disposal.



# Energy and Biomimicry

**Nature has been around for 3.8 billion years. In that time, it has developed a myriad of time-tested solutions to complex problems; and this is the principle that biomimicry leverages on. Biomimicry seeks innovative solutions to human challenges by emulating elements, systems and processes found in nature.**

Biomimicry is shaping engineering in a wide range of ways. For instance, the Shinkansen (bullet train) 'silently slices' through the atmosphere, thanks to its streamlined forefront which results in high speed and low drag. This innovative design is based on the beak of the kingfisher, through which the bird is able to penetrate water as smoothly as possible in order to catch its prey. This design allows the Shinkansen to travel 10% faster with a corresponding 15% reduction in energy consumption.

Furthermore, planes are fitted with winglets (curved ends) that maximise lift and reduce drag, thus saving up to 3% on fuel consumption. This design is borrowed from birds called swifts, whose feathers in the wing tips are curved, and are well-known for travelling

distances of up to 6,000 km in just one go at speeds of up to 110 km/h.

Considering that energy usage and consumption will become even more vital in the coming decades (the International Energy Agency (IEA) forecasts a 35% increase in energy consumption from 2012 to 2035), engineers and scientists alike are increasingly looking to nature to solve the most intricate challenges.

How does biomimicry contribute to energy efficiency? Can biomimicry enhance more sustainable and cost-effective designs and processes? This article aims to answer these and other pertinent questions.

“ **BIOMIMICRY SEEKS INNOVATIVE SOLUTIONS TO HUMAN CHALLENGES BY EMULATING ELEMENTS, SYSTEMS AND PROCESSES FOUND IN NATURE.** ”

## Energy design and biomimicry

### 1. Industrial fans, wind turbines and humpback whales

Synonymous to a submarine moving gracefully under water, Humpback Whales (*Megaptera novaeangliae*) are able to turn at sharp angles, even at low speeds.



This outstanding dexterity is mainly due to its 'flippers', which have irregular bumps (tubercles) across their edges.

Wind tunnel trials of model whale fins with and without tubercles have shown that the addition of tubercles enhance lift by 8% and reduce drag by 32%, while allowing for a 40% increase in the angle of attack.

This design is being applied in energy efficient fans and on wind turbine blades with serrated edges. After extensive field-testing, fans with tubercle blades are found to be 20% more efficient and allow for 25% more air circulation than standard fans. These fans are now being commercialised at industrial levels. Research is also currently exploring how wind turbines can benefit from these findings.

## 2. LED lightbulbs and fireflies

LED bulbs play a fundamental role in clean energy. Two processes contribute to the overall efficiency

of LEDs: quantum efficiency (the production of light) and light extraction efficiency (the process of getting light to the LED). Whereas the improvement of the former efficiency is limited, the latter can be improved.

The fact that current LED technologies have a light extraction efficiency of only around 50% has led to significant research on the improvement of this efficiency. Interestingly, this research has led scientists to the firefly.

Similar to the LED structure, the firefly's (Photuris) lantern features a luminous layer, a nanostructured cuticle and a dorsal layer that allows the propagation of bioluminescent light. This dorsal layer holds the

secret to the successful light emission in fireflies. The design of the dorsal layer comprises asymmetrical micro pyramid structures, synonymous to stacked roof tiles, thus allowing more light to escape and minimising reflection.

“ **SCIENTISTS AND INVENTORS ALIKE ARE INCREASINGLY LOOKING AT NATURE IN SOLVING FUTURE ENERGY CHALLENGES.** ”

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could be employed in the large-scale manufacturing of LEDs. This would involve cutting the sapphire crystals in the LEDs at a titled angle, thereby minimising reflection and improving light extraction efficiency.

**The future of energy and biomimicry**

Apart from the aforementioned examples, several other technologies have been inspired by nature such as injection needles (inspired by the mosquito's proboscis), swimsuits (inspired by sharkskin), swarm technology and bio-inspired robotic legs amongst several others. Scientists and inventors alike are increasingly looking at nature in solving future energy challenges, especially in the design of wind turbines, solar cells and hydropower.



By mimicking these asymmetrical structures, South Korean researchers found that the light extraction efficiency of LEDs could be improved by up to 90%. Once a patent is obtained for this technology, it

Fern leaves are being studied in the development of effective models, which can be used to capture and utilise solar energy. Research teams from Australia's



RMIT University are using fern leaf structures to develop mechanisms, which can boost current energy storage capacities by as much as 3,000%.

Additionally, a Tunisian start-up is currently utilising the principles of biophysics as exhibited by the humming bird in the blade design of wind turbines for small off-grid wind power stations. Furthermore, a renewable energy company has created a prototype hydro-power and wave power plant, that mimics the motion of seaweeds and other underwater plants during the motion of waves.

Several think tanks have mooted the proposition of having a 'green' energy future. Since nature by default is 'green', biomimicry may be the solution to achieving this ambitious goal.

### Authors' profile

Gabriel Hurtado González, Energy Gabriel Hurtado Gonzalez, Energy Solutions Manager at Mitie, and Sasaenia Paul Oluwabunmi, Operations Officer at the OPEC Fund for International Development, are specialists in International Energy Solutions & Strategies. Their portfolio includes multiple publications in Austria, Canada, India, China, Egypt, South Africa, New Zealand, UK and the United States. They have extensive experience in business development, project management and energy systems engineering.

<sup>1</sup> <https://asknature.org/strategy/flippers-provide-lift-reduce-drag/>

<sup>2</sup> Stephen W. Dewar, Philip Watts and Frank Fish (United States/Canada), Finalists for the European Inventor Award 2018. European Patent Office, 2018.

<sup>3</sup> Innovative and Energy Efficient Ventilation Products. Envira-North Systems Ltd.

<sup>4</sup> <https://www.futurity.org/light-bulbs-leds-fireflies-1988062/>

<sup>5</sup> <http://www.newelectronics.co.uk/electronics-news/firefly-inspired-surfaces-improve-efficiency-of-led-lightbulbs/210282/>

<sup>6</sup> <https://www.zmescience.com/research/firefly-inspired-led-improved-efficiency-432423/>

<sup>7</sup> Biologically inspired LED lens from cuticular nanostructures of firefly lantern. Jae-Jun Kim, Youngseop Lee, Ha Gon Kim, Ki-Ju Choi, Hee-Seok Kweon, Seongchong Park, and Ki-Hun Jeong. Proceedings of the National Academy of Sciences of the United States of America.

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# EMEX

The Energy Management Exhibition

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# The Importance of Sharing Your Knowledge

**It's easy to think that no one will be interested in listening to what you have to say as you are not doing anything new or extraordinary. But remember this – nobody is doing the same thing as you and the experience you share can be an invaluable source of knowledge and inspiration for those who have embarked on a similar journey.**

Sharing knowledge and inspiration is vital in our fast changing industry. It can foster vision in others and strengthen professional ties. When you share with others, it helps deepen your own knowledge and engrains what you know. New conversations and opportunities can arise just from that gesture, offering even more opportunities to grow.

There is also an urgency to be more open about our work and quickly realise that the whole profession can benefit from our collective expertise – we mustn't become silos of knowledge ourselves. Nor do we want our knowledge and experience, our stories and ideas to lie dormant. They have the power to inspire those around us to create their own processes to energy efficiency and sustainable operations.

Despite what you may think, there will be many people who want to hear what you have to say. The easiest oral presentation to start with is an experience report. No one can (although some may try to) argue with an experience report. It is your story. It is what you did. It happened to you.

Also, consider some of the following and don't be afraid to mash them together.

- Latest successful project.
- Tools you use.
- Techniques you implement in your work.
- What are other people in the industry talking about?
- What challenges do you have at work?
- How did you get to where you are now – tell the story of your journey?
- What have you learned recently?
- What process or methodology do you work in and is it good for you right now?
- What are you most frustrated about in the industry?
- What do the experts discount? And are they right?
- What failed and how did you learn from this?

“THE ONLY SOURCE OF KNOWLEDGE IS EXPERIENCE.”

Albert Einstein

EMEX is a free-to-attend annual event taking place at ExCeL London on 27–28 November 2019 and providing a highly structured and appropriate forum for all practitioners to promote, share and discuss various issues and developments on how to improve energy efficiency and reduce carbon emissions.

Under the governance of the Energy Managers Association and its board members, 5 areas of expertise have been defined and will be hosted across 5 dedicated theatres as follow:

## 1. Best Practice, Career and Training

- Experiences
- Upskilling-Reskilling
- Qualifications
- Case Studies

## 2. Sustainability and Climate Change

- Strategies
- Visions
- Reporting
- Transformational Change
- Adaptation

## 3. Built Environment, Technology and Innovation

- Smart Tech
- Clean Power
- Big Data
- Futuroscope

## 4. Strategy, Regulation and Compliance

- SECR
- ESOS
- Taxation
- Standards
- Policy

## 5. Demand-Side Response & Flexibility

We'd like to invite you to submit your proposal on all topics related to these areas by completing the online submission form no later than Friday 26<sup>th</sup> July 2019 at [emexlondon.com/call-for-speakers](http://emexlondon.com/call-for-speakers)

# Are Your Heat Meters Giving You the Correct RHI Payback? Water quality makes a big difference!

The Department of Energy and Climate Change mandated a report into why BIOMASS Heating Systems were underperforming.



Incorrect heat measurement could lead to under payment and hence loss of revenue for Renewable Heat Incentive (RHI) participants.

**Scope of the report**

This report covers the work carried out by AECOM and BSRIA, together with input from DECC and Ofgem, setting out:

- Actions that could be taken to reduce the occurrence of these errors.

**Water quality**

Maintaining good water quality is important for all components of a heating system. Where water quality is poor, accelerated wear and corrosion are likely to lead to increased maintenance and reduced component life

**Dirt**

Indications are that dirt or other deposits can cause very large measurement errors of over 10%. Other contaminants that could form deposits or alter water properties include Magnetite, a product of corrosion and therefore an indication of poor water quality.

**System design and good practice**

- Install a side stream filter within the heating circuit.
- Install a de-aerator and ensure that the system can be vented at all high points.
- Ensure the system water has been appropriately chemically treated.

All the quoted material above has been taken directly from the DECC report.



Biofilm removed on an X-POT filter. Biofilm is a greater thermal insulator vs magnetite and scale.



X-POT magnet grate capturing magnetite combined with biofilm.

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