CONFERENCE REPORT

Powered by Advanced Manufacturing Ireland

ENERGY SYMPOSIUM 2016

The Role, Future, Challenges and Best Practices of Energy in the Manufacturing in Ireland

www.energysymposium.ie

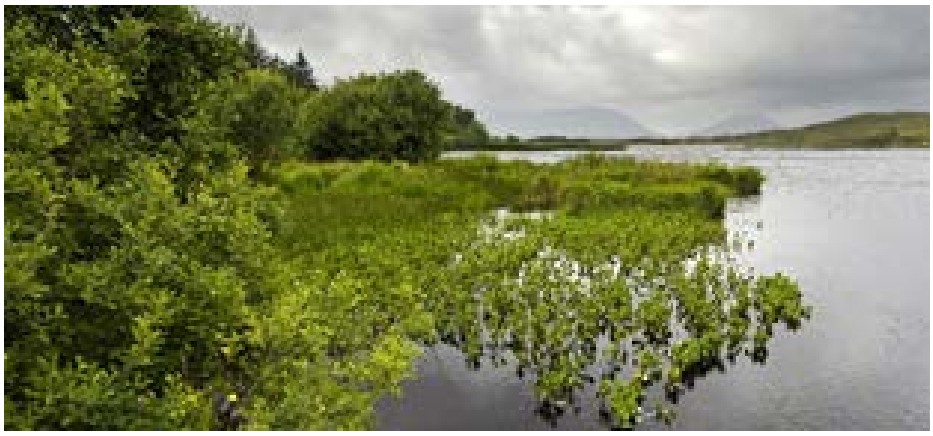
Cong Village

In association with CONG REGATION

Contents

CONG ENERGY SYMPOSIUM

A very successful energy symposium was held in Cong on 14/10/16. A very beautiful setting in a quiet quaint rural village on the West coast of Ireland in Mayo. It started on the Thursday night with a real jolt created by Norman Crowley of CEO of Carbon Crowley. He presented data from leading climatologists, scientists, economists showing exactly the impact the emissions, such as Carbon, are having on the Climate but not just Climate but on the very way that we live. In Ireland and Northern Europe we have not seen the full impact yet, except through the mass migration of people from Africa on biblical proportions. If you would like to see Normans Slide deck, please see **www.energysymposium.ie** or contact us on **events@imr.ie**



This thought provoking talk set the scene for one of the most unusual, but powerful conferences I have had the pleasure of being associated with, in years. Every delegate, in order to attend the event, had to make a submission 'on-line' – a White Paper or a blog (for the more techie nerds). Every delegate had a chance to present their topic at the event around the theme of COP21 – Irelands response to Climate Change. The delegates in groups of 10 met in the local coffee houses around the Village of Cong, where Tea and Coffee were provided continuously. At every session, lasting an hour each, 3 delegates were invited to present their thoughts from their submission which was followed by intense discussion and debate. During the course of the day, the delegates moved around the coffee houses, networked and met an amazing amount of people. Business was openly happening and more particularly business, that was having impact on driving efficiencies in industry, targeting improvements in areas, such as, Carbon footprint.

Norman Crowley, CEO Crowley Carbon

Policy paper proposals were discussed for which a paper will be written and submitted to government for consideration. Research ideas were generated which will be presented to Irish Manufacturing research board and to Academia for consideration.

Below is a snap shot of the kinds of items and topics that came up.

Enjoy the read and many thanks to those delegates for taking the time for submission, attending and sharing your thoughts and for caring about the future of our planet. I would particularly like to thank our sponsors i2e2, ICMR, Lumcloon Energy and Crowley Carbon

Barry Kennedy

CEO – Advanced Manufacturing Ireland

A triage of companies changing the face of manufacturing

GENERAL COMMENTARY (SYNOPSIS OF FINDINGS)

This document contains the entire texts presented by each of the participants as well as their own synopsis and key takeaway points.

The following commentary has been gleaned from notes taken on the day, reportage from the forum chairpersons and information from the feedback survey.

Several key elements crystallised from the group discussions including;

- COP 21
- Leadership
- Carbon rating
- Education
- Compliance
- Data (Energy)
- Energy Storage

Group photo

Commentary, ideas and group discussion points came from a wide range of participants and covered a broad range of topics. These seven headings however covered much of the feedback and input we got from the process. Some of the key commentary is outlined below.

COP21

There was a general concern within the working groups, that people were unclear and unsure what COP 21 is, both as individuals and companies. There was no clear understanding of the connection between COP 21 and any active policy documents at Government level. There did not appear to be any real commitment made in the recent budget – has COP 21 already been de-prioritised at local and national level?

"No connection from politicians shaking hands in Paris to local effect and individuals & businesses".

"No votes in climate action (not politically popular)"

This concern is elevated considering that the attendees at the conference would define themselves as being 'active' or 'interested stakeholders or parties in all things related to energy and climate change'.

Majella Kelleher, SEAI, Charing a Huddle in Cong

LEADERSHIP:

The general consensus was that there was a lack of critical leadership nationally in a critical phase in our response to the climate change challenge. Questions were being asked around who should take the leadership role to climate change action at a national level. There were concerns raised at the lack of an overarching strategy in relation to this topic (for example the Agricultural mandate to grow output in that sector, would appear to be at odds with the COP 21 targets). Business leaders are concerned with environmental challenges, but find it difficult to link outputs and targets within their strategic frameworks. Political leaders will want to set the agenda, but political realities can in some cases be counterintuitive. The education system (outlined above) does not appear to have a clear mandate to prioritise this information in curriculum at any level (outside TY project status). The result is a disjointed approach to one of the most critical challenges facing mankind. This is in contrast to an approach undertaken by the Swiss government, where a strategic document to 2050 has been unveiled.

Participants were concerned that the problem can appear 'too big' or 'not my problem' and that practical steps to correct our behaviours are not apparent and in any case up to the government. Practical steps in terms we need to tackle the information gap, the attitude we have on the island nationally and bring us to a realisation that this is time critical, impacts us all and must be resolved. We need to make this the social and economic norm going forward.

We need to set up a national program designed to resolve these counter intuitive situations. How do we protect crucial agricultural output whilst delivering the necessary carbon reductions to meet the climate challenge?

A review was suggested of the current energy producing incumbents with respect to some of the alternative energy programs that they are operating, to see if there would be an overarching or better way of achieving carbon footprint requirements (e.g. biomass sites, energy imports etc.). Dynamic pricing models (and metering) need to be investigated in relation to incentives for consumer use (have a smart meter that told the consumer they were using renewable). Responsibility for carbon emissions also lies with not just industry or agriculture but also domestic users and transport (for example a suggestion was made to convert Dublin Bus to Hydrogen fuel cells).

Barry Kennedy, Advanced Manufacturing Ireland

Several other suggestions were made in this space:

- Nationally we should target the creation of jobs that promote clean energy.
- Tax credit structure to support individual responsibility.
- Financial assistance for SMEs to help with the transition
- More support for companies developing energy products.
- Enforced energy efficiency design (e.g. IS399 and Xceed Programs)

CARBON:

We should consider the introduction of a trademark brand on products that facilitates the consumer making an ethical decision on their purchase (similar to the Fairtrade brand) with respect to Carbon and Climate Change I.e. buying products with a lower carbon content.

This would require an international agreement on the carbon standards.
A variant of this was discussed which was the idea of a "company energy labelling scheme" – companies doing energy audits and having a 'badge' to identify their energy rating similar to the Building Energy Rating
A lot of focus is on Energy but another real issue is Carbon trapped in the atmosphere. We need to remove Carbon and urgently lower the temperature of the planet.

Donal Og Cusack chairing a Huddle in Cong

EDUCATION:

Education was highlighted as a key important area especially if we are to change attitudes and behaviours as was quoted by one of the participants;

"Need a cultural shift and have it as normal behaviour for people eg 'drink drive campaign'… Junior level kids do pester but as we mature into work place we lose it".
At second level Sustainability / Climate Action should be more formally built into the curriculum rather than have it as a nice optional extra for Transition Year students or at project level.
At third level need to integrate climate change, (understanding of it and the practical decision making associated with it), with the required technical training – this will be very important in delivering next generation of engineers and scientists (as well as accountants).
Also, building this into Continued Professional Development programmes across the full range of disciplines is also important.

Andrew Lynch, IMR

COMPLIANCE

There was a robust series of discussions in the areas of standards, limits and compliance. Questions were raised, with respect to the regulatory authorities (with manufacturing companies and local communities) on whether there was any real incentive or disinincentive or enforcement legislation to lead and/or push citizens to do the right thing with respect to the climate change disaster that's facing the world.

DATA & ENERGY:

There was an acknowledgement that existing data sets are generally not being well utilised in either the public or the private sector. Discussion was had, with respect to the need to have analytics at a higher / community level for level loading on the grid. There is a need to have mandatory energy data visualisation in the home and on factory floor and this should be mandated. If you don't measure it you won't improve.
A good discussion was had, in relation to the observation that driving efficiency is good for driving profit on the bottom line. Most companies in responding to tender applications are now being asked to respond in terms of their energy efficiency policies and activities. A suggestion was made that there should be a new energy efficiency metric for manufacturing operators on factory floors, and have this linked to bonuses. It was also suggested that CEOs should have their bonus system linked to carbon footprint targets.
It was acknowledged that there is a challenge to presenting energy data linked to production costs but this is necessary to drive accountability to the point of use. However, it was noted that it will be incumbent on actors that this energy metric be correlated to quality for there to be significant buy in from manufacturing floors.

ENERGY STORAGE:

Several interesting discussions were held on the whole area of energy storage. It was generally agreed that energy storage was a necessary requirement and may in fact have a bigger impact than consumption reduction, due to the percentage of energy that is being wasted.

REFLECTIONS ON ENERGY SYMPOSIUM 2016

Over 98% of respondents rated the event either 'very good' or 'excellent' and suggested we look to hold this event again next year. A date for your diary **19th& 20th October 2017** for a new and improved version of the Energy Symposium.
The overwhelming response to the Energy Symposium has been

Thursday Night Presentation

extremely positive and some exciting suggestions have been made to further enhance the experience for next year.
For next year's event, we are looking for and inviting corporate sponsors. If this is something you' be interested in taking part in, please get in touch.
We will also be providing the Department of Communications, Climate Action and Environment with a copy of output from the Symposium as well as engaging with them on national policy options going forward. An important element of this process is to provide the policy makers with a coherent view point from industry (& related) partners on how we need to move forward as a country, rather than a series of unrelated vested interest groups.

SOME QUOTES FOR PARTICIPANTS:

Owen Wilson (Electricity Association of Ireland)
Has the potential to become a significant forum for shaping the debate on energy and related policies

Paul Walsh (J&J)
"Great networking opportunity, with similar minded peers in a very relaxed but focused setting"

Brendan Heneghan (Irish Wind Energy Association)
This was an excellent event in a beautiful location

Tadgh Hickey (Arup Consulting Engineers)
Informal format facilitated genuine discussions on energy related issues with free sharing of knowledge to the benefit of all.

Donall O'Brien (EM3)
The Energy Symposium focused my mind on what the big picture is for energy professionals, and that we have an unprecedented opportunity to impact CO2 emissions way beyond these shores. We must make the most of this opportunity and lead the way.

Sean Dowd (Boston Scientific)
An excellent way to meet and talk to people. Great interaction between the groups. It is more effective that just attending a conference and listen to presenters.

Pete Dice (Bonesteel Design)
The best 6 hours spent during the last 6 months, eye opening sessions in a great setting....

Peter Duffy (Enercomm)
This Symposium encapsulated a new approach, continuous interaction throughout the day and fresh thinking around the whole area of energy policy

Frank Murray (Piercom)
The format was so innovative and resulted in some focussed outcomes and recommendations

Matt Cotterell (CIT)
Event attracted a diverse range of contributors and the format encouraged their active participation

Kevin O'Regan (Malone O'Regan Environmental)
A well organised and very informative event that provided excellent networking opportunities.

Frank Burke (Schwungrad Energie)
It was very interactive and brought together diverse perspectives very well.

Paul Price (An Taisce, Climate Change Committee)
Real understanding of future energy requires collaborative and challenging discussion in the context of climate reality; this event makes those discussions possible.

Sean Dowd, chairs a huddle

Catherine Adley (UL)
Togetherness in knocking knees animated discussion around the table, generation ideas and real-time networking.

Sean McLoone (QUB)
The novel structure and environment made for an excellent networking event with free-flowing discussion and exchange of ideas on energy in manufacturing.

Dermot Freeman (Dermot Freeman & Assoc)
Excellent ideas that will now need to be turned into actions.

Paul Butler (Enterprise Ireland)
Developing and investing in low carbon and climate resilient technologies can make Ireland a front runner economy in our continued efforts to limit the adverse effects of Climate Change. IMR have successfully brought industry and societal leaders together to share and continue this journey.

David Guthoerl (BBraun)
A great opportunity to discuss important industry topics in a relaxed atmosphere

Seamus Conlon (Abbotts)
Energy CONGclave - Not a Quiet Man at the IMR CONG-ress

Liam Tolton (Second Sight Technical)
An excellent opportunity for energy networking, discussion and learning! A day well spent! "

Sharon McManus (European Defence Agency)
Learning through informal networking

Orla Nic Suibhne (UCD)
Best networking event so far this year!

Theresa O'Donohoe (Foundation for Sustainable Economics)
The energy symposium was an engaging event giving value to the contribution everybody had to make in our collective response to climate change.

Mark Daly (Smartcharge)
I found the symposium very useful, it definitely expanded my knowledge and forced me to move outside my comfort zone in considering the possibilities of cleaner energy technologies and policies.

Alan Healy (Exergyn)
The event - unusually - was a conversation rather than a broadcast; a chance to meet with a variety of fellow professionals and share our experiences

Vicky Brown (Cool Planet Experience)
Exceptional conference, the diversity of the backgrounds enhanced the experience, the intimacy of the setting enabled real conversations to happen, and unlike other conferences - phones and wifi were off and not missed'.

James Kennedy (Mazars)
Fantastic insight into alternative views with the core objective to enhance both the renewable energy infrastructure and energy awareness within society.

Energy Usage Reduction in a BioPharmarmaceutical Manufacturing Facility

Submission:

Guy McDonnell

Climate Change Position Statement.

As a science-based health care company, Pfizer has long recognized the risks posed by global climate change, such as more severe weather events and potential adverse impacts on human health, and has, as a precautionary step, taken significant voluntary action to reduce its own greenhouse gas (GHG) emissions.

From 2000 to 2007, we reduced our GHG emissions by 20 percent. From 2007 to 2012, we reduced them an additional 35 percent. Our current goal is to reduce our GHG emissions another 20 percent by 2020 (from our 2012 baseline). These reductions will keep us on track to achieve the 60 to 80% reduction by 2050 (from 2000) that scientists indicate is needed on a worldwide basis to stabilize global temperatures.

Pfizer has, and will continue to undertake energy efficiency and clean and renewable energy projects that not only reduce GHG emissions, but reduce costs as well. Recognizing that we have a significant and wide reaching supply chain, we are also committed to working with our supply chain partners to help them achieve GHG reductions.

It is Pfizer's policy to:

- Continue our efforts to voluntarily reduce our GHG emissions.
- Partner with our suppliers to assist them in reducing their GHG emissions.
- Work with policymakers to encourage reduction of GHG emissions both voluntarily and through support of balanced regulatory frameworks.
- Engage with stakeholders to explore markets for environmentally preferable products.

Pfizer will continue to take voluntary steps to reduce GHG emissions and optimize other aspects of environmental performance. While voluntary measures often offer the greatest opportunity for companies to design innovative solutions that work best for their particular situation, product range and investment timelines; tackling climate change will require action from all parties in all sectors.

Therefore, Pfizer supports governmental policy frameworks that promote implementation of low carbon and renewable energy projects, reduce GHG emissions, and meet the following criteria:

- Supports climate and energy research and promotes an economic environment conducive to technological innovation.
- Removes barriers to energy efficiency and renewableenergy projects, including replacing higher carbon fuels with lower carbon fuels, and streamlines processes for approving such projects.
- Offers incentives for energy efficiency enhancementand renewable energy implementation.
- Provides a flexible, market-based approach to reducing GHG emissions that

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- Offers incentives for energy efficiency enhancementand renewable energy implementation.
- Provides a flexible, market-based approach to reducing GHG emissions that promotes energy price predictability, enabling businesses to strategically plan for long term energy alternatives
- Establishes emissions reduction targets guided by the best available science and available technologies and which appropriately credits companies that haveachieved verifiable voluntary emissions reductions.

Converting Low Grade Waste Heat to Power

Submission:

We've developed an engine that runs on hot water (c.85–120°C) – the Exergyn Drive™. Technically, it's a solid-state reciprocating engine that converts low-grade waste heat ("LGWH") to power, and we believe it's the first new class of heat engine to be developed since the diesel engine in the 1890s.

The amount of energy lost globally each year in the form of wasted hot water is enormous – equivalent to twice the output of Saudi Arabia (oil + gas) – much of it coming from industrial engines. We estimate the specific target market for our product to be worth a minimum of €286 billion, and if our product were 100% deployed it could reduce global carbon emissions by 1.2%.

Having produced and tested earlier prototypes (for which we've received third-party verification that "grid-quality" electricity was produced on a landfill site), we're currently testing a 3.5kW prototype in our lab; and our next-generation 8-10kW prototype will commence industrial trials in early 2017.

Our product involves the assembly of technologies that have been around for over a century (hydraulics, electrics, pistons, valves). The only 'exotic' element is nitinol, which has been in use for c.60 years. Nitinol (a blend of nickel and titanium) is an unusual alloy; it's one of the only substances in the universe to contract when heated. And it does so very powerfully.

Our technology works by heating/cooling nitinol cores with alternate hot/cool water – to move a piston up and down.

Our aim is to be the first commercial solution to the LGWH problem, offering a 2-3-year payback to customers. At 4.5c kWh, we expect the Exergyn Drive™ to have one of the lowest average Levelised Costs Of Electricity ("LCOE") of any power generation technology.

The only realistic competitor technology is the Organic Rankine Cycle (ORC), which has been around since the 1960s. But ORCs are not competitive at small-scale and low temperatures (<150°C), and have sold relatively little.

Markets like biogas are attractive to Exergyn because their gensets operate 24/7, make no use of their waste heat and often receive high Feed-in-Tariffs ("FiTs"). Cargo shipping is also attractive –the easy availability of cold water provides a large "delta- T" compared to the hot water coming from the engine.

Geothermal is experiencing significant growth because the output is reliable and constant (unlike solar and wind). Here, there are two "holy grails": (1) cheaper drilling costs, and (ii) generating electricity from lower temperature water. Our technology could solve issue (ii). Being able to generate electricity from 100°C water rather than requiring 190°C, say, means that geothermal operators could dig far less deeply to access the hot water1, and they could also revisit abandoned geothermal wells where the temperatures have depleted to less than 140°C.

There is also the potential to bring electrification to underdeveloped regions such

Alan Healy

Synopsis:

Exergyn has developed an engine that runs on hot water – the Exergyn Drive™ – which could resolve the low-grade waste heat ('LGWH') problem for the first time.

Waste heat is an enormous problem in power generation, industrial processes and transport. We estimate that the amount of LGWH lost each year is equivalent to twice the annual energy output of Saudi Arabia, Our total addressable market is estimated to be worth €290 billion, and if our initial product were 100% deployed across this market it could reduce global emission by over 1% – equivalent to the UK's total carbon emissions in 2014.

Takeaways:

- Although we at Exergyn have developed a revolutionary technology that could reduce global carbon emissions by over 1%, it does not make sense for us to try to sell our units in Ireland at present because potential cus tomers have little incentive to con

as Africa where a simple, inexpensive, renewable solution could be fashioned using Exergyn Drives™ and black pipes (to heat water via the sun).

Since incorporation in early 2012, we've put a major focus on IP protection and believe we've captured the key enabling innovations behind our technology, thus preventing future competitors from copying our solution.

Commercialisation of the Exergyn Drive™ is planned for Q4 2018. We have 20 employees, and to date we've raised over €3.2m in equity and won a Horizon2020 SME grant worth €2.5m.

1 Drilling costs increase exponentially the deeper down you go.

vert their waste heat when com pared with other jurisdictions. We therefore need to export jobs and know-how to make our business a success.

- While the proportion of renew ables is increasing in Ireland, there is not enough joint-up thinking, or real leadership.
- Semi-state bodies such as the ESB are driving policy and infrastruc ture build – but they are incentiv ised to sell more power. So there is a lack of leadership for the com mon good.
- Changes are happening too quick ly for the regulator to keep up; there is a sense that the regulator does not understand all the changes.

About Alan Healy:

Alan Healy has been CEO with Exergyn for over 4 years, during which time he has raised over €3.3m in equity and spearheaded the winning of a Horizon2020 SME grant worth €2.5m. Previously, Alan has advised start-ups & established companies on strategy and project roll-out (e.g. RTE, Capita plc), worked with numerous companies in relation to complex negotiations (e.g. Opennet Telecom, NCB Stockbrokers), self-published a successful kids' novel, developed 2 patents, and worked with Goldman Sachs (London) and in private equity.

Contacting Alan Healy:

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Ireland's Low Carbon Future

Submission:

1. Low Carbon Future

By 2020, 40% of Ireland's electricity production will be zero carbon. By 2025 the majority of our electricity generation will be renewable. By 2050 the Irish electricity system will be net carbon neutral. If this is the plan, we should start the joined up thinking right now. It's not rocket science to figure out how to decarbonise the economy without overburdening energy consumers, but we need to box clever when it comes to market interference. There are inherent advantages of greater adoption of renewable energy in terms of energy security and price stability, but getting our timing right is key to keeping electricity costs competitive both in the short and longer horizons.

2. The Plan

The vast majority of renewable electricity will come from intermittent sources, so the new flexibility in the system will come from managing consumption patterns to soak up energy during renewable production peaks and reduce needs at other times. This flexibility is commonly known as storage. Today it's made available from a mix of pumps, refrigeration and standby gensets by specialists like Ireland's Endeco who monetise this flexibility for industrial and commercial customers. In future we will see more dedicated storage units such as Tesla batteries to reduce peak demand also. Flexibility and storage will become increasingly available in both heat and transport sectors. To wean ourselves off fossil fuels and achieve mandatory emissions targets, we will inevitably adopt more zero emission vehicles and zero emission heating systems. Public health will also benefit from reduced pollutants.

3. Inflection Point

The pivot point on Electric Vehicle sales will occur when the range anxiety is no longer an issue for motorists. Electric motors are inherently more efficient than the internal combustion engine. As soon as an equivalent range is available at the same price from the main vehicle manufacturers, the lower running costs will drive sales. Plug in hybrids are a transition-phase solution, with the engine becoming obsolete as the battery range stretches and costs reduce with scaling and technology improvements. V2G will become common where the onboard battery is providing online storage for the home, work & grid.

Similarly the economics of the super-efficient heat pumps from Glen Dimplex and others continue to improve and will eventually displace fossil fuelled boilers and take advantage of excess wind energy on the grid to soak up low cost surplus electricity to further reduce heating costs.

4. Future is Sunny

As a Nobel laureate once explained, "solar energy is nuclear energy at a safe distance". Nobel musings aside, solar PV economics are already on a trajectory which indicates that every rooftop will in due course have an array for harvesting free energy from the

John McKiernan

About John Mckiernan:

John McKiernan is Head of External Collaboration at ESB. John is responsible for identifying new ways to collaborate with new partners to unlock new revenue streams. John's key objective is early adoption of emerging technologies & innovative business models to gain first mover & sustainable competitive advantage. John was previously Partner at Greencoat Capital – the adviser to ESB's €200m Cleantech Investment Fund. John is a power sector investment specialist with over 20 years of international development experience including 8 years in Tokyo. John is currently Chairman of the Sustainability Skillnet & member of Ibec's Innovation, Science and Technology Policy Committee.

sun …even in Ireland. Given the passive and benign nature of solar panels and the unused real estate on top of our homes and workplaces, it's a "no brainer" to forecast the arrival of roof top panels across Ireland with or without subsidies.

ESB & Kingspan already have a "Funded Solar" solution for business owners who want the benefits of solar energy on their roof space without the performance risk or investment capital. Why roof top? Well because electrical energy is twice as valuable at the point of consumption (under your roof!) than in a remote field somewhere. It's "tricky" to put a wind turbine on your roof, but solar PV is perfect & modular. The largest arrays are composed of large numbers of the same panels. So you can benefit from the mass production of panels even if you're just putting a modest array on your roof. The continued reduction in the price of solar modules is clear. We know the Chinese are already selling them cheaper than we can buy them in Europe due to antidumping levies. These levies will fall away in due course and the efficacy of the technology will continue to improve. Germany has installed over 40,000 MW of solar pv capacity over the past decade to pump prime the world market and drive huge future cost reductions for other countries. It's their "gift to the world" according to one German power utility.

5. Future Proof

Access to low cost, low carbon electricity is key to Ireland's future economic competitiveness. ESB is collaborating both nationally and internationally to develop new customer solutions to take full advantage of the changing generation mix and emerging technology solutions. We are focused on innovations in energy efficiency, energy management and low carbon generation. ESB Innovation launched "Smart Energy Services" this year to partner with larger energy consumers to reduce energy costs and exposure to volatile international oil prices.

ESB is changing from a commodity provider to a tailored service provider to better address individual client energy requirements. We are collaborating with manufacturing industry leaders in Ireland and technology providers to pilot emerging solutions that will future proof our customers energy strategy for a win-win outcome.

Please come and talk to us about how we might assist you to achieve your energy goals!

Do the work – and with a bold vision

Ed Collins

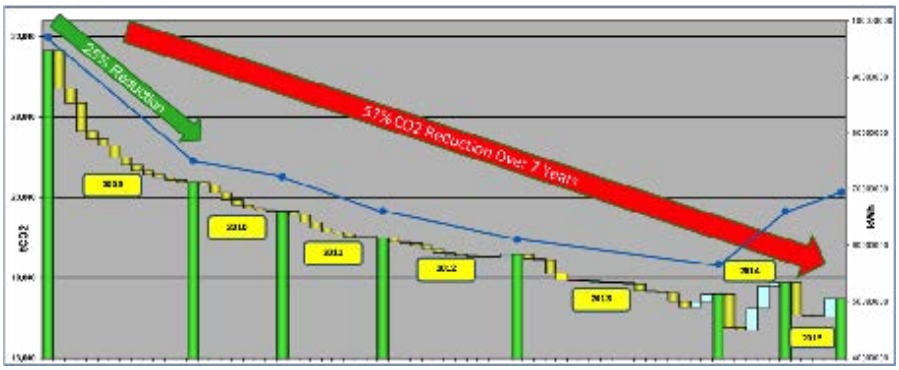
Energy and Water reduction makes good business sense as it reduces costs while at the same time contributing to a more sustainable business model and ensuring that CO2 emissions from industrial activities are minimised. A successful programme needs to be adequately resourced and supported by senior management and will adopt a variety of different strategies. It's important that new facilities and equipment being installed are as energy efficient as possible and an Energy Efficient Design methodology is used for all projects. The adoption of international standards, such as the ISO 50001 Energy Management Standard and the European Water Stewardship, are key to the development of sustainable programmes which will introduce a continuous improvement process. The on-going involvement of all key stakeholders such as employees, contractors and suppliers should also be a key object. Finally, adoption of expensive renewable technologies and the replacement of utilities generation equipment should only be done when wastage of energy or water has been minimised.

GSK has the following ambitious goals for Carbon, Water and Waste reduction by 2020:

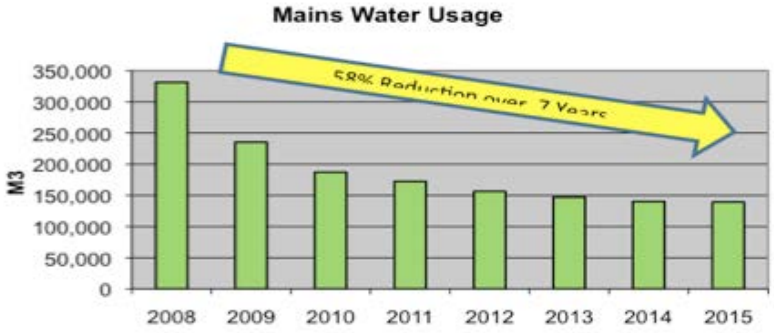
- •25% reduction in overall carbon footprint
- 20% reduction in Water Impact (value-chain)
- Zero operational waste to landfill
- 90% of paper packaging from responsible sources

Each manufacturing site is expected to contribute towards the company's goals by taking a proactive approach to Energy and Water reduction. Programme Managers have to be appointed, resources obtained and projects planned.

Since 2009, GSK Cork has delivered a sustained Energy and Water reduction programme which can be seen from the charts below.



GSK Cork Energy CO2 Reduction 2008-2015



GSK Cork Water Reduction 2008-2015

The sustained Energy and Water reduction over a 7 year period can be attributed to the following factors:

- Support of Site Leadership Team
- Dedicated resources working on programme
- Joined up thinking and good inter-team communication and cooperation
- Use of Operational Excellence Tools
- Energy Mapping data used to prioritise projects
- Good Use of Monitoring & Targeting System
- Innovative and challenging approach
- Top Down-Bottom Up approach
- Performance Management and Tiered Metrics
- Devolving responsibility and accountability to key users
- Implementation of ISO 50001 Energy Management System
- Development of networks within and without GSK

An innovative and challenging approach needs to be taken so that the programme continuously evolves. At GSK Cork we have adopted a range of strategies including:

- "Top Down" Energy and Water Reduction Projects
- "Bottom Up" Tiered Metrics
- Leak Detection and Thermo-graphic Surveys
- Water Usage Mapping
- Use of Distributed Control System to automate switch off of equipment
- Introduction of Energy Management Standard e.g. ISO 50001
- Introduction of Renewable Technologies

An Energy Efficient Design approach should be used for all new projects and this was successfully done at GSK Cork for a new Consumer Health Care Plant in 2012/2013. As this was going to be a high volume plant, a significant energy user, and was to be the first major project since the site achieved

certification to ISO 50001, we wanted to ensure that the project would consider energy efficiency in the design as required by the standard.

It's also very important to ensure that all stakeholders such as employees, contractors and suppliers are actively involved in the programme and a variety of methods need to be used to do this, such as energy awareness campaigns, training on energy and water reduction programmes and reward and recognition.

The external network we have developed over the last number of years includes CIT and UCC for student placement and final year projects. We have also worked as an industrial partner for CIT Masters students and will soon be an industrial partner for a PhD on Water Management. We are a member of SEAI LIEN, a board member of i2e2 and a company member of the Skillnet Lean Water & Energy Steering Group. As part of the Cork Lower Harbour Energy Group (CLHEG) we worked with other Pharmaceutical and Health Care companies on the planning submission and installation of three 3 MW wind turbines in the Cork lower harbour area, one of which is installed at GSK .

In summary, the sustained success of the Energy and Water Reduction Programmes at GSK Cork cannot be attributed to a single factor but has been due to the synergy of a variety of strategies, methodologies, technologies and standards. The latest methodology we have adopted is an SEAI Energy Management Maturity Assessment for which we are one of the pilot companies. It can be seen from the sustained success of our programmes that with senior management support, sufficient resources and the development of an effective network that there are significant returns to be gained for the business and the environment.

Ireland's Energy Challenge

Submission:

The challenge posed by Climate Change is summed up in the Fifth Assessment Report provided by the Intergovernmental Panel on Climate Change IPCC**(1)** "Warming of the climate system is unequivocal and it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century". Evidence is emerging in Ireland of the impacts of climate change. Storms and floods which previously would have been considered "1 in 100 year" events are now occurring more frequently.

Addressing this challenge requires collective action and for this reason the topic of Energy Action should be considered at the Energy Symposium 2016.

On a positive note, action has already begun: At the Paris Climate Conference in December 2015, Ireland, along with 194 other countries, adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to limit global warming to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

Engineers Ireland highlighted the issue of Energy in our recent 'State of Ireland'(2) Report. The report has placed a special emphasis on climate action, recognising that both policy and behavioral change are needed to protect our planet for future generations. The report acknowledges that Ireland's energy infrastructure is fundamental to economic competitiveness. It puts forward the position that prudent choices and targeted investments in our energy system have the potential to boost growth, create jobs, improve equality of opportunity, and achieve balanced development.

Electricity Supply Sector: The transition to zero carbon in our electricity supply is underway, kick-started by the 2007 Energy White Paper(3). We are now above 25% with a real prospect of achieving the 40% (4) target by 2020. This progress was largely driven by collective action and investment by the electricity industry.

Progress must be maintained. In a decade or so it is likely that coal and peat-fired generation will cease, taking two very large carbon emitters out of the equation. So where will new generation sources come from? Costs of wind and solar power are coming down, and the technical challenges associated with lack of system inertia are being addressed. In the longer term there will be a need for a debate on the future for nuclear power.

Electricity supply represents only about 20% of the carbon emissions from the energy sector. Of greater importance at this stage are the heating and transport sectors – representing 21% and 26% of non-ETS GHG emissions respectively. Given their scale and the absence of any significant progress in recent years, it is essential that these sections

Caroline Spillane

ENGINEERS IRELAND

About Caroline Spillane:

Caroline Spillane is Director General of Engineers Ireland. Prior to undertaking this role Caroline was the Chief Executive Officer of the Medical Council of Ireland. Caroline has held senior roles in organisations including Assistant National Director with the HSE, and Chief Executive of the CPA.

Caroline is an economics graduate of University College Cork, and also holds an MA from the Dublin Institute of Technology.

are prioritised. So what are the prospects?

Heating Sector: We must increase energy efficiency. At the enterprise level, there are great examples of companies that are advancing on energy efficiency and carbon reduction. Engineers Ireland, in our 'State of Ireland' report, highlights one such company – Astellas Ireland Ltd. who have achieved a 92% reduction in carbon emissions through the installation of a biomass boiler, a wind turbine, and a solar water heating system – and critically in the process they have reduced overall manufacturing costs and increased its competitiveness. This success story needs to be replicated throughout the country.

Transport Sector: When it comes to heavy vehicles, using CNG offers a real opportunity to reduce emissions from diesel-fuelled trucks and buses. Importantly, the introduction of CNG to the heavy vehicles fleet is a gateway for the future introduction of renewable gas into the transport sector. Renewable gas in the form of biomethane is an upgraded form of biogas, and is produced through the anaerobic digestion of organic matter. It is now 10 years since the first hybrid bus appeared in London and the UK now has over 1400 hybrid busses on the road. Ireland has yet to see one. As a first step Engineers Ireland would like to see the government supply the €1 million in funding, previously refused, to allow Dublin Bus to trial three busses next year. This

should then be followed by a roll out gradually replacing all state agency car, van and bus fleets to electric, compressed natural gas (CNG) and hybrid modes respectively and thereby a helping to address emissions. Accelerate the purchase of Electric Vehicles (EVs) by Irish consumers through soft incentives such as the use of bus corridors, revisiting the registration tax and exploring other financial incentives will be essential if we are to move the Irish car owners from fossil fuel to clean energy technology.

When accessing the aforementioned dynamics of the energy transitions that must take place in the electricity supply, heating and transport sectors, are they occurring fast enough? and can they be accelerated? What actions can those involved in manufacturing undertake to support Energy Action?

Concluding remarks

As highlighted in the 'State of Ireland' Report- Ireland's energy efficiency performance is inadequate and a significant change in how we consider and measure energy efficiency is required to ensure that it becomes part of long-term infrastructure planning in the future. The engineering profession is uniquely positioned to be able to foresee and understand the future impact of climate change and energy policy. As thought leaders in this area we must inform opinion and lead by our actions to ensure that how we generate, use and conserve energy becomes part of the fabric our societal thinking.

Energy transition is going to take time. Enablers to this change are

1. availability of the enabling technology;
2. a burning platform to change;
3. clear consumer benefits;

4. clear policy direction and implementation.

References:

1 *Fifth Assessment Report provided by the IPCC, the Intergovernmental Panel on Climate Change, in 2014*

2 *State of Ireland 2016 A review of infrastructure in Ireland Engineers Ireland 2016*

3 *2007 Energy White Paper Delivering a Sustainable Energy Future for Ireland.*

4 *The setting of a target for renewables, initially 33% but subsequently increased to 40% of total electricity supply*

The Changing Energy Landscape for Irish Industry

Submission:

The Irish energy landscape is changing due to both legislative and technological advances. This in turn brings new opportunities for Irish businesses, of all sizes, to reduce their operating costs through the use of new and highly accessible technologies.

The past decade on the island of Ireland has been a period of consistent change and has thrown up many challenges for businesses operating across all sectors of the economy. With the cranes reappearing on the skyline of our major cities, most economists have a positive outlook for the future of business in Ireland. This is supported by research in the areas of public trust in our key institutions (2016 Edelman Trust Barometer shows improving public trust across business, media, government and NGOs) and consumer sentiment (ERSI CSI index is back near 2005 levels). However, we will always face international competition from our neighbours looking to emulate our ability to attract foreign direct investment to our shores and for the industrial sector in particular, energy costs make up a significant proportion of operating costs.

The retail energy market in Ireland for SMEs and Industrial customers remains highly competitive and this is helped by a sustained period of lower wholesale gas prices, which has resulted in reduced prices for customers. The irony of this situation is that the market price of energy is not promoting energy efficiency to consumers as much as it would in a higher price environment. However, energy policy costs such as the PSO levy continue to put upward pressure on energy bills despite the low cost of wholesale gas. This trend of increasing non-energy costs looks set to continue, driven by the challenging renewable electricity and energy efficiency targets set out under EU legislation.

ISEM is another major change that the Irish energy industry is currently managing. The evolving power generation mix in Ireland and the need to align our electricity market with the rest of the EU means that through the ISEM initiative we are currently navigating through a fundamental redesign of the wholesale electricity market. For energy companies like Bord Gáis Energy this will require an investment in systems and an increase in complexity that we must embrace in order to ensure we can procure electricity for our customers in a competitive way. The regulators are approaching the ISEM project with a view to amending how our market works and facilitating a mechanism that seeks to reward generation and generation services that provide most value to customers in a changing landscape. This market will need to contemplate greater penetration of renewable power, the proliferation of demand side generation and, of course, the impact of interconnector electricity flows, both imports and exports. For our customers this will drive additional revenue opportunities through the use of existing assets such as standby generators and combined heat and power units which can provide capacity to the electricity grid during supply and demand imbalances.

One factor that has remained constant throughout all of this change is the effectiveness of energy efficiency when it comes to reducing energy costs in a business and many of our customers are taking advantage of this opportunity. However, if energy efficiency or renewable energy technologies are to compete with core business investment opportunities, they must continue to deliver an attractive

David Meade

Bord Gáis Energy

About David Meade:

David is the Energy Services Manager for Bord Gáis Energy (BGE) and is responsible for delivering the company's Energy Efficiency Obligations along with growing BGE's energy services capabilities through the development of innovate energy solutions and propositions. With a background in mechanical & sustainability engineering, David has over 10 years experience in the UK and Irish energy markets working in various commercial roles in Centrica and Bord Gáis Energy. Prior to working with Bord Gáis Energy David led the commercial development of large scale Energy Performance Contracting and Distributed Energy solutions with Centrica in the UK.

return on the capital invested. This is not the only consideration for consumers – the value propositions that are developed by energy services providers need to be easily understood and innovative. This is particularly true when it comes to the SME sector which has significant constraints when it comes to decision making time and available cash flow. In terms of renewable energy, the future generation mix in Ireland, both at a utility scale and behind the meter is sure to include technologies such as solar PV and battery storage. The scale at which these technologies are adopted will depend on future government support and the level of innovation delivered by service providers.

While the energy market is going through significant change, so too is the way in which our customers engage with us as their energy supplier. Our customers require more information about how they use energy. They also require more control and instantaneous feedback on their consumption trends. This is being facilitated through the emergence of smarter metering & monitoring solutions and the Big Data insights that these technologies unlock. At Bord Gáis Energy we support our customers with energy efficiency in a number of ways. Through our Energy Efficiency Grant Funding scheme, which offers customers grant funding for energy efficiency projects, we help generate that illusive return on investment. Through our industry partnerships we ensure our customers have access to cutting edge technologies and disruptive value propositions. Take UrbanVolt for example. Through their 'Light as a Service' model, UrbanVolt offers LED lighting solutions to customers at no upfront capital cost and takes all of the technology risks away from the customer through a turnkey LED lighting installation and maintenance service – delivering an immediate benefit to the bottom line. Many of our customers are taking advantage of these opportunities and as technology evolves we are seeing more and more opportunities for financially viable energy efficiency projects.

On the global front we are also seeing welcome signs that the energy efficiency opportunity is becoming more relevant for businesses. Take for example the fact that in October 2016 Blackrock, the worlds largest private investment fund (€4.9 trillion under management), announced that "Investors can no longer ignore climate change. Some may question the science behind it, but all are faced with a swelling tide of climate-related regulations and technological disruption"

In order to become more relevant in todays' world, sustainability and energy efficiency must become more aligned with sound economic and business strategy. This will drive more investment, technological advances in energy efficiency and lower business energy costs which in turn will make Irish businesses more competitive.

Using Real-time energy visualization to drive sustainability.

Submission:

Paul Walsh

The majority of the companies I have worked with have a comprehensive metering (electrical and mechanical) system installed, often using calibrated instrumentation to collect the information, and sometimes the data is on a validated platform. The issue is that the data that is generated by this system is rarely analysed with a view to improving energy consumption. Even accessing the historical data is an arduous task, as it may reside on several different databases, and any analysis is always performed retrospectively, even several weeks or months later (when the bill arrives!!)

My lightbulb moment came from a presentation delivered by Kevin Geogehan (Intel) where he mentioned the importance of "making energy data visible". I realized that J&J Vision care Limerick was data rich but information poor so I developed a project to rectify that. My plan was to grab live data from two data sources (EFT and Schneider) and display it on a dashboard above the production line. This dashboard would automatically refresh the data being displayed every 2minutes. We developed a proof-of-concept for one production line in the plant – see Figure:1 below.

Figure:1 – Dashboard showing the live energy data above a production line

The Compressed Air, Nitrogen, DI water, and electricity energy data from this line is being captured and displayed in 15min intervals – this energy data is then divided by the number of lenses produced to give a 'kWh/lens' sustainability metric. The idea of dividing it by the number of lenses produced is so that production lines of varying volume can be compared.

The visualization of the data was designed to be "easy-to-read-in-a-1-second glance" format. So in conjunction with the Operations team we developed a gauge indicator that goes RED when target limits have been exceeded. If one of the energy indicators goes into the red zone the technicians on the line will see it within 15minutes of the issue occurring and have the ability to troubleshoot the action and fix the issue. The

corrective action will result in consumption reducing and the indicator returning to green zone.

paul-walsh-image-2

Fig.2 Data visualization screen

The objective was to focus energy efficiency from the end-user point (i.e. the production lines) as opposed to the utility side (e.g. compressors/boilers/etc) which is typically the focus for ECMs.

There are automatic reports being generated on a per shift basis, which totalizes the energy consumption (as opposed to the instantaneous value). This compares the total energy consumption for a 12hr shift to the target value, and then equates the energy consumption to a € cost value.

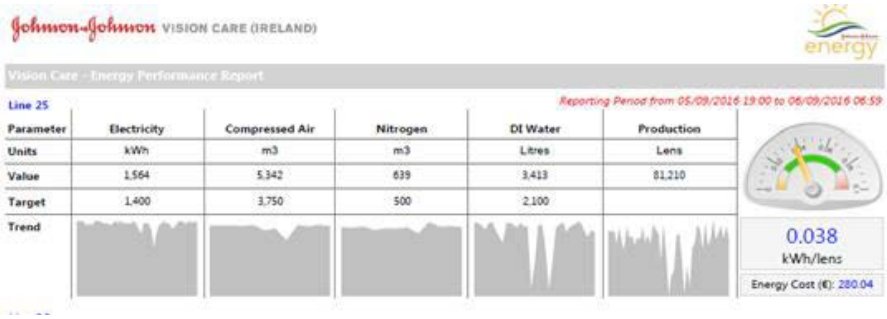


Fig.3 Daily shift report

In order to trend the consumption over time the daily data is aggregated up to a daily report, showing trends in consumption over time. This will establish baseline consumption so that when ECMs are implemented there will be a reduction evident over time. It also ensures that any savings made do not degrade over time.

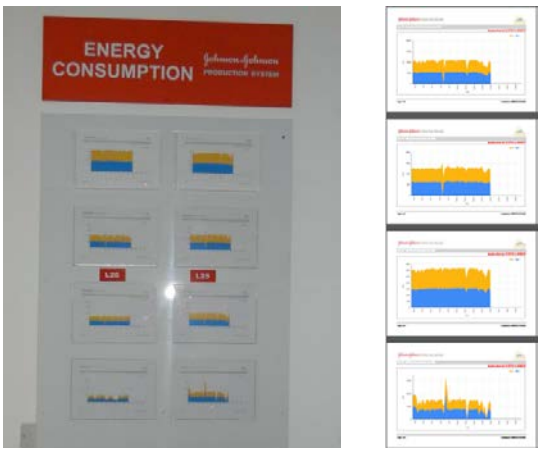


Figure:4 Trending Energy reports (which is displayed in the Ops meeting room, and reviewed weekly)

Key Outcomes:

The visualization of energy data in real time has enabled the operations team on the line to develop four separate ECMs around compressed air and nitrogen which will deliver a 10% reduction in consumption. The generation of compressed gases in J&J Vision care represents over 25% of the site electrical load. There are also two projects underway on reducing the DI water consumption of the line by 15%. This reduces water consumption but also electrical power as the water has to be heated.

Empowering people – the technicians on the line now have the ability to influence the energy consumption.

Planned:

- Link the energy performance of the line to the bonus payment. Incentivising the staff to become energy aware and instilling an energy awareness culture.
- Roll out to all production lines (Q1'17). Develop a league table to demonstrate the best production lines from an energy perspective.
- Roll out to other J&J sites (Q1'18)
- This pilot project has received grant funding from a J&J Sustainability council to expedite its roll out. This will speed up the deployment of implementing the sustainability metric into more sites.

Energy and CSR are Utterly Inseparable.

Submission:

Majella Kelleher

Two weeks in Marrakech in a few weeks' time… this might sound like an advert for a vacation – but it is actually the 22nd UN Conference of the Parties to the UNFCCC or COP 22, a year on from the Paris Accord. The agreement achieved in Paris got a mixed reception, some saying it didn't go far enough and others pointing to the fact that it was backed by nearly 200 nations. It's notable that the scale of international ratification already achieved for the Paris Accord took over eight years in the case of the Kyoto Protocol.

The global obligations now enshrined in the COP agreements demonstrates that the world at large is beginning to take this responsibility seriously. At a very minimum there is now a moral obligation on us, individually and as a nation, to be responsible global citizens.

This reflects an acceleration in the seriousness with which the climate change and sustainability agenda is being taken albeit delivery will not be simple. And so it is that one key question underpinning the discussions here in Ireland is can we balance the competing agendas of growth in agriculture with contraction in emissions allowances. This exemplifies the sort of challenges that the commitments made through the Paris Accord are facing at local and national levels. But let's face it, if it were easy it would have been happening a long time ago and would not need an international agreement to underpin action.

When you talk 'sustainability' most people will use some sub-set of terms such as – environmental protection, resource efficiency, water, pollution, community engagement, society… Within each of these pillars, whatever way you view them, energy is an intrinsic part and driving for energy efficiency can deliver some or all of the required improvements. It is an absolute fact that achievement of the required objectives delivers energy savings.

Take water conservation as an example – the energy component associated with extraction, treatment, pumping and disposal of water is massive. So when we take action on water, there are significant energy benefits. And if we are looking to achieve big savings in industry or in our local authorities then water is a great place to start.

Looking to community action – local communities have long been mobilised in the area of sustainability with tidy towns being a great visible example. What we in SEAI are now seeing is communities moving rapidly towards the less visible actions of energy efficiency as a way of delivering increased comfort, health benefits for citizens, as well as the obvious cost savings associated with warmer and more efficient homes.

Both of these examples demonstrate how intrinsic energy is to the sustainability agenda.

When it comes to business, sustainability has been in the business lexicon for some time now. Like all dimensions of what is sometimes put together as the Corporate Social Responsibility agenda sustainability practice ranges from deep to very shallow. And like CSR, doing it badly can do more harm than good – customers and investors know greenwash when they see it. On the other hand done well it can be

About Majella Kelleher:

Majella Kelleher is Head of Energy Demand Management with SEAI with responsibility for programmes in business and the public sector.
Majella is a graduate of University College Cork with a civil engineering degree and of Trinity College Dublin with an MBA, and more recently an MSc in Management (OB). Since joining SEAI she has filled a number of roles most recently as Head of Sustainable Energy Deployment where she had responsibility for a range of deployment schemes in the domestic sector. Prior to this she worked as a business consultant both in Ireland and abroad

transformative and this is the type of real action that is being demanded in the current business environment (and by society generally).

Many businesses are responding, realising how energy efficiency can reduce costs, increase competitiveness and, importantly, contribute to their sustainability. Some examples in recent years are Apple's investment announcements for Ireland specifically linking the importance of renewable energy availability. The Cork Lower Harbour Group, mostly represented at this forum, brought together hi-tech companies DePuy Synthes, GSK, Janssen Biologics and Novartis, investing between them over €20 million in sustainable energy in the recent past , including the development of wind energy generation for their own use. Similarly, a growing number of firms are looking to local biomass resources to meet their need for heat, Aurivo in Roscommon and Abbvie in Cork being two examples. And at the same time, major new business investments, including Diageo, Glanbia and Dairygold, have all put sustainability in to the core design.

There was a time when these kinds of actions and investments were rare, but now they are becoming the new norm. Would we call this kind of behaviour CSR? – I believe the answer is yes. There is no doubt that the best companies are thinking long term and are looking for opportunities – not only to meet the demands of their investors and customers for strong action in the CSR space but also to benefit in parallel from the financial savings that can be achieved and carving out competitive advantage.

Sustainability and CSR is no longer a fringe issue or optional extra, but a major strategic driver in business globally. A transformation in energy and resources is taking place. Last year, over £300 billion was invested in clean energy around the world. In Europe, investment in clean energy assets is now larger than in fossil fuel assets. Any business that is still viewing this agenda as some kind of side event will get left behind.

I believe that sustainability and CSR goals cannot be met without significant action on the sustainable energy front – and so I make the case that they are utterly inseparable – let's collectively leverage the opportunity that this new movement provides.

Take the Leadership Opportunity.

Submission:

Ken O'Mahony

EMC²

To measure is to manage' and at DELL-EMC's Centre of Excellence in Cork, we live and breathe that philosophy: We continually monitor our manufacturing and production practices and our costs in order to ensure we operate as efficiently and effectively as possible.

Our 'energy dashboard' has been an integral part of our best manufacturing practice at the Cork, Ovens site from the first beginnings. As our production volumes have increased – so have our costs decreased. The beginning of 2008 saw our operation using some 60 million kWh's in annualized electricity, which reduced to just under 37.5 million kWh's in Aug 2016.

Goals and aims lead the way: Our site energy reduction target for 2016 for example is 8.52% – equating to an electricity reduction target of 3% and a gas reduction target of 27% of our 2015 consumption figures.

In these matters no company is an island, which is why I welcome the opportunity of Ireland's upcoming energy event in Cong, Mayo, October 14th. Here is a gift of an opportunity to share what we know best for the good of the whole.

Many Irish businesses – in telecoms, IT, computing, med-tech and pharmaceuticals – lead the world in their field. Why not energy?

Since 2008 DELL-EMC Ireland, Cork Ovens, has succeeded in driving down our electricity utility costs by a factor of over 48%. Furthermore, our approach and strategy in our CoE in Cork is replicated by EMC colleagues throughout our offices worldwide.

In energy matters, we lead the way. There is no reason for your business to aim for anything less.

The Challenge of Implementing Energy Policy Driven by Climate Change

Submission:

Context

Historically energy policy was hinged on security of supply and lowest energy cost over the longer term. Leaving aside the use of nuclear energy fossil fuels such as oil, coal and gas were the pillar energy sources. Only when the oil crisis hit in 1970 did governements look to renewables as an alternative to soaring oil prices. This interest in and drive for renewable energy varied considerably until the turn of the century as different oil crises occurred and resultant oil prices rose and fell. All that was to change when the effects of climate change were better understood through the work of the IPCC (Inter-Governmental Panel on Climate Change). As a result climate change has now rightly been placed front and central to energy policy within the current three pillars of "security, sustainability and competitiveness"; this is clearly evident here with the Government's White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015-2030'. But global thinking has already moved on from this to a carbon-free economy. Globally we need put the issue of climate change and its impact on our planet fairly and squarely to bed, supported by the quantum of science and irrefutable evidence, and where the doubts and soundings of the nay-sayers are adequately addressed.

The Impossible has become Inevitable.

The impossible has become inevitable. A carbon-free, nuclear-free energy economy is our future. The world faces a series of interconnected crises – climate change caused by carbon-based energies like oil, coal and methane gas, a shrinking supply of fossil fuels and the long-term environmental damage from nuclear energy production. A paradigm shift is needed to achieve this, encompassing every aspect of living from buildings, transport, industry, food production, energy production and consumption. With energy policy headed in this new direction there is a need for increased emphasis on policy implementation strategies. Getting buy-in to and implementation of energy policy are the challenge. Should climate change and its attendant issues be included as a subject in all our schools where climate change, environment, sustainability and energy topics are embedded in our schools curricula? Should there be far greater emphasis on understanding and addressing the concerns of communities particularly in relation to energy projects and developments? Have we learned lessons from the handling of the Corrib gas coming ashore? There is a tendency to establish enquiries only when things have gone wrong – would it be more productive to hold enquiries when things have worked well so that we can learn from them and model future projects and strategies on them? Surely there are positive examples around we can learn from.

Relevance and Immediacy

Gaining acceptance or buy-in is related to relevance and immediacy; evidence of this is where communication and transport technologies have been embraced. Ten years ago we had hardly heard of WhatsApp, Skype, Twitter and Facebook. Even if we are opposed to something out of legitimate concerns but on closer consideration find that there are relevant and immediate benefits to us which outweigh those concerns then opposition may be replaced with active support. An example of this is the widespread opposition to mobile phone masts we saw several years ago; this all but disappeared when people saw the value and relevance in having mobile phones with

Peter Duffy

ENERCOMM INTERNATIONAL

About Peter Duffy:

Peter Duffy graduated in 1969 in engineering from UCD and joined ESB, working in power stations for the following 17 years. Afterwards he was training manager in ESB, and then moved to regulation for Power Generation where he was involved in the preparatory work ahead of deregulation of the electricity industry. In 1999 he left ESB and formed Enercomm International, working on consultancy assignments both in Ireland and overseas including Israel, Croatia, Russia, Serbia and Kosovo where he was energy strategy advisor to the new Government in Pristina. He was a member of the Grid DS3 Advisory Council until recently. He now concentrates on projects that are linked to system services, intermittent generation and climate change issues and climate change issues. He is a Director of several companies including Parsons Solomon Energy in China.

a good mobile telephone signal; the rapid penetration of mobile phone ownership considerably added to allaying people's fears. Where people have concerns regarding an issue, and where the benefits are of a more generic nature several years down the road then it can be hugely difficult for people to see past the immediate problem – opposition to the proposed second north-south transmission line and opposition to building wind turbines in some areas could be seen as falling under this heading; while there are legitimate concerns people who are opposing these projects will have difficulty seeing either relevance or immediacy in the benefits arising. Of course cost will always be a key factor in embracing or rejecting a new regime. But we must search for ways to bring the benefits more relevant and more immediate to people rather than the more generic benefits to the population in the years ahead.

Conclusion

The International Energy Agency has stated that the future of human prosperity depends on how successfully we tackle the two central energy challenges facing us namely a) securing the supply of reliable and affordable energy and b) effecting a rapid transformation to a low-carbon, efficient and environmentally benign system of energy supply. What is needed is nothing short of an energy revolution. Politians, industrialists, academics, utilities, service providers, innovators, technology developers and most importantly energy consumers globally all play a critical role in successfully meeting these challenges and ensuring our continue survival on this unique planet.

Importance of a strong energy ecosystem in winning new manufacturing FDI

Submission:

IDA Ireland has responsibility for attracting Foreign Direct Investment (FDI) into Ireland and promotes Ireland to MNC's globally through its network of overseas offices. Today there are over 1200 foreign companies based in Ireland utilising the skills of a talented Irish workforce for global business. Key activities carried out in Ireland include high value manufacturing, research and development and global business services.

Manufacturing is a high value, high skills component of the Irish economy and accounts for over 23% of our GDP which is above the EU average of 15%. The majority of manufacturing investment in Ireland is located outside of Dublin and is critical to the economic development of our regions. The Irish Government is committed to developing the energy sector and has recently published both a new White Paper on Energy (October 2015) and a report on developing Ireland as a hub for Energy Research (July 2016).

From an FDI point of view it is very important that Ireland continues to develop its energy capabilities and ecosystem:

- Multi- national manufacturing investment requires a reliable and competitive source of energy and increasingly low carbon energy.
- Investment in energy efficiency helps to maintain a competitive cost for manufacturing in Ireland.
- We need to continue to develop Ireland's capability in energy research as an attractor for new FDI investment and Ireland with its strengths in ICT and energy research is well placed to harness new technologies which improve energy efficiency and develops renewable technologies.
- Opportunities to win new investment in renewables such as wind, solar, wave and biomass.

Ireland is already recognised as a world class location for research by leading Multi-National companies. This success has been built by offering these companies an R&D ecosystem which is world-class, competitive and collaborative. Ireland is now also playing a prominent role in the global research agenda for renewable energy.

As part of its incentives to FDI companies, IDA offers grant support to companies engaging in energy research activities in Ireland. IDA also supports clients to undertake substantial investments in a wide range of proven energy efficiency and renewable energy technologies, where the result is a significant gain in overall cost competitiveness.

Brian Conroy

IDA Ireland

Synopsis:

Ireland has built a reputation as a location of choice for high value and highly regulated manufacturing capability. It forms a critical part of the Irish economy and is particularly important to the development of the regional economy. Winning future global investment in manufacturing is not guaranteed and the availability and development of a competitive and innovative energy ecosystem is vital to our future success.

Takeaways:

- Importance of manufacturing investment to Ireland
- Role of energy in winning manu facturing investment
- Opportunities from new energy technologies

Envisioning Ireland in 2050: Making decisions now for then?

Submission:

Where will I build my manufacturing facility, and what factors do I need to consider for the next 5 years and all the way to 2050 and beyond?

If, as of today, I wanted to build a modest manufacturing facility with a modest energy demand in Ireland, what factors would I take in to account for its location?

I would take into account the following factors, in no particular order of importance (you will have your own values)

- Space requirements and room for expansion
- Energy supply; its price, availability, reliability and familiarity
- Access to raw materials
- Communication links
- Access to labour force, the price of that labour force
- Access to specialist expertise: does my location add to their willingness to work with me?
- Access to services; water, wastewater, waste disposal
- How close do I need to be to customers, other manufacturers and other services?
- Availability of grants, support and local enterprise assistance
- Transportation links; road, rail, airports, ports for materials in and products out
- My own circumstances, where I live
- Environmental qualities
- Quality of life; schools, social services, leisure opportunities, housing, community

So where might I locate? In a rural or urban location? In a place like Cong?

2050: If I can assume that I will be at that location into 2020, 2040 and up to 2050 how might my ranking change?

I would expect to be in very different energy environment, depending on what I am making and how much more energy efficient I can become. I can expect to have moved away from fossil fuels as the prime source of energy. I may move to using 100% renewable energy sources, either from a third party electrical power provider or in house (biomass, wave, wind, solar) or any of a number of combinations.

I can also expect to have reformulated my processes and products to reduce their energy demand. I may do this a number of times. In reality I would hope to be making entirely new products.

I would hope to be free of energy constraints and manufacturing within my carbon budget.

What of my labour? How will they travel to my facility? How will I get my product moving? Given that transportation accounts for 19% of our current greenhouse gas emissions and residential another 11%, what will the transition from the fossil based economic model mean for them and affect me?

Marc Kierans

epaResearch
Climate - Water - Sustainability
Identifying pressures • Informing policy • Developing solutions

Synopsis:

Where will I build my manufacturing facility, and what factors do I need to consider for the next 5 years and all the way to 2050 and beyond?

Takeaways:

- Which factors are important now and how might they change as we move to 2050..
- REnergy consumption in heating our homes and transport are a significant proportion of energy consumption. They will become even bigger as we move to 2050.

About Marc Kierans, Research Manager:

Marc Kierans, originally a microbiologist has worked with the Environmental Protection Agency for over 10 years. In that time he has worked on Industrial Integrated Pollution Licencing, Air Monitoring, Emissions Trading for the Stationary and Aviation Sectors and is currently Managing the Climate Pillar of the research programme.

He has also worked the printing and packaging industry and in New Zealand as community pollution officer.

About the Environmental Protection Agency:

The Environmental Protection Agency is at the front line of environmental protection and policing. We ensure that Ireland's environment is protected, and we monitor changes in environmental trends to detect early warning signs of neglect or deterioration.

Overview of technologies at MTC for use in Energy sector

Submission:

The Manufacturing Technology Centre (MTC) is focusing on industrial upscaling of new processes enabling new product designs and functionalities as well as improving overall productivity in manufacturing and gaining further competitive advantage for our clients through higher resource efficiency. The setting up of MTC was supported by aerospace industry but technologies apply very much to the energy sector as well.

Resource efficiency in "Connected Factories of the Future"

Resource efficiency is a bit challenge for factories in the future. This relates to more efficient use of materials and resources and particularly energy use. Moving into connected factory environments using Digital Manufacturing / "Industrie 4.0" technologies will offer to manage particularly the overall use of energy in a much more efficient way. Using its own industrial scale environment MTC has demonstrated in projects run under the MTC Core Research Programme how an Energy monitoring SCADA system can work and the benefits that can be achieved. The demonstration included the comparison of process simulation data and actual energy consumption based on the example of a high power welding machine (RFW). It clearly showed how you can make effective predictions about energy consumption at the process simulation and planning stage.

Additive Manufacturing technology to support

- **Industrial implementation of hybrid manufacturing technology to support MRO in Power Generation**

MTC has a strong background in additive manufacturing and is hosting the National Centre for NetShape and Additive Manufacturing". Based on Hybrid manufacturing technology MTC has demonstrated the support for MRO in Power Generation on industrial scale. Hybrid manufacturing is understood as a combination of subtractive (drilling, milling etc.) and additive manufacturing (laser deposition etc.) technologies. Based on nationally funded projects (RECLAIM) MTC has developed in collaboration with a machine tool manufacturer and a large turbine manufacturer a first industrial scale application for the overhaul of turbine blades for the power generation sector. The first machine was shown on the EMO show in Hannover September 2013 and received there the show's "Innovation award" in the multi-function machine category.

- **AM technologies to benefit the energy sector**

Additive manufacturing (AM) technologies will certainly play an increasing role in the energy sector. MTC areas of activity include:

- Hybrid manufacturing for MRO in power generation; MTC leading the "OpenHybrid" project under "Factories of the Future" (H2020) which includes overhaul of large structures.
- Optimisation of SLM based manufacturing processes to increase productivity and reduce material and energy waste; MTC leading the "ENCOMPASS" project under "Factories of the Future" (H2020) which takes a holistic approach to the product and process design in AM; considering particularly post-processes already at the design stage and reduction of support structures leading to less waste (time, material, energy) in the building of components.

Harald Egner

mtc Manufacturing Technology Centre

About Harald Egner:

Professional experience

After graduating at the University of Stuttgart with a master's degree in mechanical engineering Harald joint Fraunhofer. His work at Fraunhofer in Stuttgart took him from the early stages of automation in the early 80s to design for automation and into product development. His focus in the 90s was very much on customer driven product development and relevant methodologies such as QFD. All through his professional career he was working very much on the application and implementation of technology, particularly for SME.

To gain new experience Harald moved with his family to the UK in 2002 with a focus to build new European business partnerships and networks with a particular focus on European Framework Programmes. From the time Harald came to the UK he was involved in the UK innovation infrastructure as a board member with Faradays and KTNs. Further on this included involvement in the "Hauser Review" and developments following on from there which led to the set-up of the Catapult infrastructure.

Current role

- Use of AM to build more efficient heat-exchangers by utilising new design options which are not available with conventional manufacturing technologies.
- High performance parts for wind energy; using hybrid manufacturing technology to add high value functionalities (e.g. surface properties) and features to "simple" base materials.
- MRO of parts in wind energy; particularly parts from the drive chain.
- Enhanced and specifically designed components manufactured by AM processes to significantly improve performance and efficiency of e.g. ""Rankine engines" and therefore enabling more commercial viable waste heat recovery.
- Specifically designed and AM manufactured parts to significantly enhance "superheated steam" systems for distributed and more efficient energy use; ongoing projects on national level.

T-ERA (Thermal Energy Research Accelerator)

At the forefront of energy transformation, the Energy Research Accelerator (ERA) will tackle some of the biggest energy challenges facing the UK. As part of the Midlands Innovation group of higher education institutions, ERA aims to foster research and develop new technologies to shape the UK's energy landscape over the next 40 years. It is a cross-disciplinary hub of technology research and energy talent which brings the region's combined research expertise together with the surrounding industrial base to deliver a step change in energy innovation.

The Thermal Energy Accelerator (T-ERA) is leading the development and integration of hot and cold energy technologies, delivering domestic and grid-scale applications and innovative solutions to heat homes and buildings.

T-ERA will deliver:

- Establish an Advanced Thermal Manufacturing Centre (ATMC): To develop enhanced research and design capacity in thermal energy technologies.
- A scaled up Dearman piston engine: Driven by liquid nitrogen to produce clean cold power for transport applications.
- Thermal energy storage research: To study the costs and performance of low-carbon heating technologies.
- Research into reducing thermal load in buildings: To develop low cost technologies that are easy to apply and retrofit.
- Research into Hydrogen from Biomass: To develop an alternative means of producing green hydrogen at higher efficiency than produced by current technology.

In this context the Manufacturing Technology Centre (MTC) is involved to help transform small and medium-sized UK manufacturing companies into some of the most efficient digital factories in the world, and leading players in the Fourth Industrial Revolution.

The MTC will bring in the use of principles like cyber physical production systems and intelligent technology that harness big data, to increase manufacturing productivity, where the UK lags behind many of its European neighbours including Germany.

Backed by £10m funding from the Thermal Energy Research Accelerator (T-ERA), the Manufacturing Technology Centre (MTC) together with the universities of Birmingham and Loughborough develops the 'Factory in a Box' concept that deploys custom-

After moving from Fraunhofer IPA in March 2013 the current role now is with the Manufacturing Technology Centre (MTC), a technology and innovation centre in the UK and part of the High Value Manufacturing Catapult (HVMC). As the EU & Research Partnerships Manager Harald is responsible for the creation of synergistic schemes between the MTC (TRL 4-7) and its research partners (TRL 1-3/4) as well as growing MTC engagement in European collaborative research programmes.

With his arrival at the MTC he brought along the ideas and developments of "Industrie 4.0" in Germany which have been adapted in the MTC. He also is an active member of various EC work groups in Digital Manufacturing and an strategic initiative to great a national stakeholder platform in the UK..

Main publications and/or achievements

- 1997: Winner of the "Fraunhofer Award" for project management and delivery of industrial project: Design and implementation of crack detection „pipeline pig" (total project value approx DM 4.5 Mio)"
- 1999 – 2001: Elected member of the Fraunhofer „Hauptkommis sion" (HK), Fraunhofer internal Advisory Board of the Fraunhofer President and directors
- 1998 – 2007: Deputy head of Fraunhofer TEG – structures and processes for strategic develop ment and for the qualification and orientation of employees, Certifica tion under DIN EN ISO 9001, Bal anced Scorecard, Personnel devel opment strategy etc

Experience with EC

- 2002 – 2008: Member of the High Level Expert Group at SME unit, DG Research, Brussels
- participation in Framework projects from FP 5 to FP 7, success ful in various H2020 projects
- coordinator role in FP7 and H2020 projects
- active member of various EC work groups in Digital Manufacturing

designed mini-factories into established manufacturing operations across the world. The mobile factories – which can be shipped in a container – will use next generation Industry 4.0 technology, such as smart sensors, super-fast broadband and big data to measure and control production processes remotely.

T-ERA and the MTC believe this will reduce the significant expense of setting up stand-alone production facilities, while also giving UK companies the opportunity to establish manufacturing footprints in new markets relatively quickly.

Get Value from Shared Practice

Submission:

From the start Boston Scientific Ireland has found great value in cross-sectoral value and learnings from all kinds of companies that share energy issues as common ground.

Our award-winning production sites throughout Ireland have a practice of energy efficiency at their core. In Ireland, Boston Scientific has, for example, been involved in path-finding work in value improvement processes (VIP); in a number of Combined Heat and Power (CHP) projects, in chilled water optimisation projects and in the areas of air handling and compressed air systems.

Boston Scientific Ireland was first on the grid to implement a pilot scale metering programme in its production facility with a measuring solution partly developed by academic partner, Trinity College Dublin (TCD).

The upcoming Cong Energy Summit, October 14, therefore makes complete sense to me in terms of the valuable networking and information opportunities alone.

There are multiple opportunities to embrace technology that improves energy efficiency – reducing cost and raising business competitiveness. I urge all business energy users in Ireland to lend their voices to the Cong summit and to take advantage of all the benefits on offer. See you there!

Sean Dowd

Boston Scientific

About Sean Dowd:

Sean joined Boston Scientific in1995 and worked his way up from a Project Engineer to Senior Facilities Manager. During that time he held various exciting and challenging roles within the Facilities Department.

He currently manages the strategic direction and agree the goals of the Facilities Department to ensure alignment with plant objectives. His main responsibility is to deliver on the annual budget & quarterly forecast including headcount, expense, capital, safety, and energy and quality targets. His team is responsible for the provision of all Facilities utilities and services to support Operations, PD, R&D and EMEA.

An important daily activity is to manage the energy portfolio and set energy objectives & targets for continuous improvement. They have achieved over 33% energy reduction across the plant in the last 10 years while production has more than doubled in output. They now generate 73% of the site power on site and use the heat from the exhaust to supply 100% of the plant heat and the remainder of the heat is used to cool the plant via an absorbent chiller. But they want to do more!.

Qualifications:

- Post Grade in Building Services – Brunel University, UK.
- Graduate Engineering Course in Building and Environment – St Patrick College, Dublin.
- Honours B.Eng. Industrial Engineering & Information Systems – NUIG, Galway.

Energy consumption in Metal and Polymer Additive Manufacturing- a comparison with traditional manufacturing methods and analysis of the longer term product benefits of adopting AM technologies.

Submission:

Additive Manufacturing (3D printing) has been promoted recently as the new phase of modern manufacturing. In many regards this is correct, but like any new technology it needs to be adopted not as a replacement for traditional processes or an enhancement of the old way- additive needs to be adopted with a fresh approach to component manufacture.

Traditional manufacturing methods have become very energy-lean in terms of energy utilization in the process, and AM processes such as DMLS and FDM are very energy-thirsty. That said, a holistic view should be adopted and a simple process comparison between traditional processes and AM technologies is a small minded approach. These processes are not comparable for a number of reasons. The supply chain for traditional manufacturing processes is far more energy dependent than with AM, where the supply chain starts at the machine, when the electronic model is sent for printing.

An example of this is where NASA sent a polymer printer to the International Space Station, and their Chief Engineer stated at a press conference that rather than scheduling a launch to deliver components to the ISS, they could just email it up! While it's likely that it was in some ways a publicity stunt (given the challenges of printing in zero gravity) it is without question a window into the future that AM is the technology of the next industrial revolution.

Industry in Ireland has become both excited and scared by the prospect of AM technologies being thrust into the "Factories of the future" and everyone is talking up the "Internet of things" and "Industry 4.0" but my experience has been that there is interest but no real deep knowledge of the technology in terms of 3D printing.

AM technology such as FDM, SLS, Polyjet, SLA in polymers is energy intensive in terms of the energy usage for the preparation of the material to be printed and the build conditions in the chambers of the machines in support of the process.

In the metal printing process, there are two main technologies and both are extremely energy dependent. The primary methods, DMLS (Direct Metal Laser Sintering) and EBM (Electron Beam Melting) both use lasers in a heated chamber and as such are extremely energy dependent, using either 400 watt or 200 watt lasers depending on the materials in addition to the heating requirements of both the build plate and the build chamber.

But we should look further than the cost of the process, and further into the long term benefits of this new technology, and it has been described as a disruptive technology- and we can't at this point predict how disruptive this will be.

On an energy usage level, while this technology is expensive to use, the product geometries that can be produced can reduce the extended energy usage over the

Jonathan Downey

SCHIVO
...engineering Partnerships

About Jonathan Downey:

Schivo, Strategic Projects Manager.

Jonathan is responsible for the management and implementation of projects which are of strategic importance to the Schivo group, including the implementation of new processes and introduction of new products.

He also manages the groups research and development activities and has led the development of the groups own product line.

Jonathan led the implementation of the group's additive manufacturing (3D printing) capabilities, in both metal and plastic, and the company continues to embed this technology into a normal production environment using traditional manufacturing methodologies to compliment the additive processes.

lifetime of a product. The prime example of this is an aircraft, where there have been some examples of non-structural components being redesigned with AM technology thinking, and the redesign results in a significant weight saving that can have significant cost savings over the lifetime of the aircraft.

It is impossible, when considering disruptive technologies, to examine what effect these will have on traditional industries. But one of those that I think needs to be considered is the medical world. AM offers opportunities for mass and local customization that will reduce the energy requirements of the supply chain and the immense cost within the supply of non-custom devices in the medical implements industry.

Let's not take a narrow minded view of what the effects of AM can be in terms of the cost of the process- but we should consider how these technologies can be used to make energy usage reduction more widespread.

Faster, Smarter, Lower Cost Energy Infrastructure

Submission:

Aiden Cawley

SIEMENS

The manner of delivering Energy infrastructure, in particular the electricity system, is currently being challenged in Ireland due to the speed of build of new Industries and the demand to connect new forms of power generation to the system. This scenario is being repeated in many EU countries however Ireland is one of the few systems that has the challenge of being an island system with a growing level of renewable penetration and a significant high load growth in its capital city where it is becoming imperative to consider faster, smarter and economical energy solutions to meet the new energy future

Under the Renewable Energy Directive (2009/28/EC), Irish overall renewables target is set at 16% of total final consumption to come from renewable energy in 2020. This target will be made up of contributions from renewable energy in electricity (RES-E), renewable energy in transport (RES-T) and renewable energy for heat and cooling (RES-H) with the RES-E contribution to gross electricity consumption at 40% by 2020. To incentivise investment in this area, a RE Feed-In-Tarriff (REFIT) has been in place which has resulted in the connection of a near 3,000MW of wind to the system and a queue of +5,000MW in a gated process. The existing REFIT expires in 2017 which places considerable pressure on Grid to facilitate a speedier connection to meet the incentive cutoff. An additional issue arises in that much of this new generation creates new problems for Grid operators where new approaches are now to be considered. This situation Is not particular to Ireland but it is now becoming more pronounced in Ireland than most locations globally

Growth in demand on the Grid has mostly come from around the Dublin area. Much of this is focused around the M50 area and is related to Datacentre growth. Datacentres tend to have a very quick expansion cycle compared to Pharma or Manufacturing, and indeed the rapid explosion in the need for increased data storage has planning for such organizations extremely challenging beyond 2-3 years. This in turn challenges Grid and the supply chain to respond to plan and deliver Grid capacity and access much quicker than the previous norm.

To address the need for speed of connecting, the need for certainty on exporting energy to the grid and the need for grid solutions to support the intermittent power generation mix the energy system must transition to embrace flexibility in Grid and Generation. This is a blend of standardization, modularization, and flexibility for a smarter energy system and Siemens has developed solutions that can assist in this transition.

Excellent examples of work to date is the use of our Gas insulated Switchgear for high voltage substations developed into a precast substation solution. HV substations are traditionally built as open switching yards with bricks and mortar buildings, however using the GIS approach reduces the footprint by a factor of 4 or more and facilitates building and pre-commissioning the complete station in sections off site and connecting these sections very rapidly onsite.

Smart Grid solutions are now very well understood and developed and are now being actively deployed by Grid operators worldwide. Much of these solutions address the instability issues created on the grid from Renewable deployment and can include Storage, Network operation in closed loop, Dynamic Network management, Demand response, etc all involving the deeper integration of Data, Communications, Consumer and Generator

Floating Conventional Power stations can be used to provide a backup inertia to a system that is transitioning. This can come in the form of PGaaS (PowerGeneration as a Service) where the floating barge can be connected to a strategic point to the grid, used for a number of years and once it has served its purpose, disconnected and sailed to its next location or home base for refurbishment. Siemens are currently building the first barge units for global customers and expecting to deploy the same in 2016/ 2017.

The Energy System is changing quickly because of a changing build rate of Industry, the demand of change in the generation mix and the convergence of ICT with energy. Ireland is one of the first European systems to be challenged to innovate and has the opportunity to lean on the expertise of the market and deliver on its promise of a greener and very resilient energy system.

Energy, who needs it?

Submission:

Paul Butler

Supply and demand, the first law of economics, prices go up when there is short supply and prices come down when there is plenty of it. On energy and its current low price, we find ourselves in a period of extraordinary confluence; United States domestic production has nearly doubled in the last several years, pushing out oil imports that need to find another home. Saudi, Nigerian and Algerian oil that once was sold in the United States is suddenly competing for Asian markets, and the producers are forced to drop prices. Canadian and Iraqi oil production and exports are rising year after year. Even the Russians, with all their economic woes, manage to keep pumping at record levels.

OPECs muted efforts to control the market, means production has reached an all-time high with most wells in the US currently unprofitable. Equally, low profit for the petro-states such as Brazil, Venezuela, Nigeria, Ecuador and Russia cause them to keep on pumping, as the consequence of dropping production could mean further economic hardship not to mention political hardship.

On the demand side, the economies of Europe and developing countries are weak and vehicles are becoming more energy-efficient. So demand for fuel is lagging, although there are signs that demand is growing in the United States and production is falling because of the drop in exploration investments.

Either way, we find ourselves in extraordinary times. Our 'so called' weak economies continue to be over financialized. Low oil prices and quantitative easing demonstrate a 'politicisation' marked by a need to grow markets leading to increased consumption.

Ultimately, this comes at a cost. In early September, over 600 academics, campaigners, activists and policy makers came together in Budapest at the Fifth International Degrowth Conference. At it, we heard that Europe is more dependent on importing resources than any other region in the world and that increasingly, our resource intensive lifestyles are leading towards greater social inequalities and environmental damage.

This increased consumption and short term gain has implications for future generations. The concept of Peak resources is not new to many. The Association for the study of Peak Oil (ASPO) for many years operated out of Ballydehob in West Cork. Their plotting of national based oil reserves showed up many anomalies based around over statements of reserves, a point later taken up by the International Energy Agency who have indicated us likely passing Peak Oil before 2020. Once we do so, supply will continue to drop and prices continue to increase. Our current rush to consume merely heralds this date forward.

Today, we find ourselves (as a nation) to be more affluent than at any point in history. We have ready access to information, food, healthcare, money and energy. Increasing energy prices or worse still, an interruption in the availability of energy such as that in the 1970's would have significant implications for all of us. Continued and increased investment in alternative energy sources needs to happen now, because, in answer to the question, we all need it.

ENTERPRISE IRELAND
where innovation means business

About Paul Butler:

Dr. Paul Butler is a Snr. Commercialisation Specialist, Manufacturing, Engineering and Energy Commercialisation, in Enterprise Ireland

The Cool Planet Experience

Submission:

Introduction:

The Cool Planet Experience is a unique collaboration between industry, academia and philanthropy who together are leading Ireland and beyond to ensure we have an engaged, educated and inspired public who understand why we are experiencing climate change, and what are the new, innovations and solutions that we all need to adopt as we transition to a climate free economy.

The Cool Planet Experience is located at Powerscourt Estate in Wicklow, whose gardens were voted number 3 in the world by National Geographic after Kew in the UK and Versailles in France. Located in a glacial valley, Powerscourt attracts over half a million visitors annually, two thirds from Ireland and a third from UK, USA, Europe and Asia.

It is being modelled on London's Science Museum and Belfast's W5, albeit on a smaller scale and with a climate focus.

Why do we need The Cool Planet Experience:

Public understanding on climate change is improving, but very slowly.

In Ireland 49% of respondents to a SEAI poll (2015) believe climate change is a 'serious problem' which appears to highlight the gap that exists in Irish society between the undisputed reality of climate change and public awareness and engagement on this grave global emergency.

It is this gap – coupled with a passion for preserving the Earth as we know it, that inspired the Cool Planet.

Who we are:

The Cool Planet Board are:

Norman Crowley (Chair); George Polk; Clyde Pereira; Frank McGovern; Anna Pringle & Sarah Slazenger

The Team are:

Vicky Brown (CEO); Philip Smyth (Head of Public Engagement); Sinead Crowley (Design & Content)

Audience:

The Cool Planet will target the half a million visitors that currently go to Powerscourt. We will focus on school children, those in 5th & 6th class at primary level and 1st, 2nd and transition year at secondary. There are 3,300 primary schools and 750 secondary schools nationally and we are developing state of the art science based education

Vicky Brown

CoolPlanet ENERGY SYSTEMS

About Vicky Brown:

Vicky Brown is CEO of the Cool Planet Experience.

Vicky has spent the last 20 years working in both the for and not for profit sectors looking at how small groups of people can effect real social change. Previously Vicky held a number of roles in the One Foundation, investing €85million into non-profits in Ireland and Vietnam, Barnardos and several advertising firms in NYC.

programme for these groups to engage schools before, during and after the exhibition. We will create an e-learning site whereby schools can engage at a deeper level with the content. This programme will be delivered in conjunction with the Green Schools Programme using the support of the NCCA (National Council for Curriculum & Assessment); CPD for teachers through the Education Centre's and the SEAI schools programme.

Our supporters:

Academia: UCC Marei Institute; UCD Earth Institute, TCD & Science Gallery, Icarus Centre at NUI Maynooth.

Industry: Crowley Carbon, Calor, Vodafone, NTR Foundation, Gaelectric

Sector: The Environmental Protection Agency, Sustainable Energy Authority Ireland

Not for profit: BirdWatch Ireland, Friends of the Earth

Media Partner: The Independent News & Media Group

The Exhibition:

Visitors will learn about climate change, what is is, why and how it is happening. They will work out their carbon footprint and learn about the implications of global warming on our seas and our environment, and why this warming is having such a negative effect on our planet. One of the highlights is an immersive experiential experience on extreme weather, from drought to the super storms such as those we experienced last year.

The Cool Planet Experience gives a glimpse into what the planet will look like in 50 years' time if we continue burning fossil fuels and clearing rainforests at the current rate. Visitors can play 'Race to 2050' where they have the chance to save the planet by going back in time and making decisions about our energy choices such as renewables, waste and pollution, water, transport & through this game interact with being part of the solution.

Visitors will understand the science of climate change, from what is carbon and green house gases, to carbon sinks and the impact to their health, disease, migration, to crops and food availability.

Finally, they will be brought from now to the future – to see what is possible, what

innovations are happening that may help us win this race to keep our planet below 2 degrees.

As they leave, visitors can make their 'pledge' to reduce the carbon footprint and will be given tips and suggestions on how to do this – linked to a media wall where all the pledges can be shared publically.

Above all – this will be interesting, engaging, unexpected and fun!

Energy Management Standards – An Irish Success Story – Part 1

Submission:

2004 After initially considering the introduction of a carbon tax the Government announces its intention to intensify action on the non-tax measures of the National Climate Change Strategy. In response to this, the Sustainable Energy Authority of Ireland (SEI as it was known then) announces a new sustainable energy initiative for industry. The intention of this programme is to promote an effective response to the competitiveness, security of supply and energy/environmental challenges facing industry.

Having looked at the experience of a number of countries where such measures were previously introduced, SEAI is particularly impressed with the Danish approach. Central to the implementation of their approach is the use of a Danish standard for energy management.

To provide the same structured framework for organisations to maximise the opportunities associated with effective energy management, the National Standards Authority of Ireland (NSAI) is requested to establish a task force with a mandate to develop an Irish energy management systems standard.

2005 NSAI task force complete its mandate with the publication of I.S. 393 "Energy Management Systems – Requirements with guidance for use".

2006 SEAI having established an Energy Agreements Programme for large industry energy users, member organizations begin implementing I.S. 393. With the critical supports provided by SEAI many members quickly realise significant savings.

2009 Having identified a need to establish a standard at European level to support industry efforts toward a more efficient energy use, CEN (Committee European Normalization) publishes EN 16001 "Energy Management Systems –Requirements with guidance for use". During its 3 year development cycle Ireland plays a key role in shaping the European standard. As the Irish standard is the only national standard published in one of the three official languages of CEN, 399 becomes the de facto working draft for EN 16001. The experience gleaned from the implementation of I.S.393 sees Ireland take a central role during all development stages where the Irish experience informs many debates in establishing system requirements and in identifying best practice.

2011 The International Standards Organization (ISO) having long seen the global relevance of having an energy management systems standard publishes ISO 50001 "Energy Management Systems –Requirements with guidance for use" thus making this standard the first globally recognised standard for energy management. Again having had a sound grounding in implementing both 393 and 16001 standards Ireland brings its considerable experience to the fore during the development of this International standard.

2014 Having established an internationally recognised experience in implementing energy management system standards an SEAI lead international working group produces ISO 50004 "Energy management systems- Guidance for the implementation, maintenance and improvement of an energy management system" .

Energy Management Standards – Building on Success – Part 2

Barry Smith

NSAI

Takeaways:

- Collaboration works
- Share successes/best practices
- Build on successes

About Barry Smith:

With NSAI since 1993, Barry first worked in certification services as an ISO 9001and ISO 14001auditor. Since moving to the standards division in 2004 he has had a number of responsibilities including the development of energy management standards and the national application documents for the implementation of the European standards for structural design (Eurocodes). Barry is currently Technical Secretary to the NSAI ICT Standards Consultative Committee.

About NSAI:

NSAI (National Standards Authority of Ireland) is Ireland's official standards body.

Operating under the National Standards Authority of Ireland Act (1996) NSAI is accountable to the Minister for

Jobs, Enterprise and Innovation.

Activities include ; operation of the Legal Metrology Service, National Metrology Laboratories, Standards and Certification services.

2014 NSAI publishes I.S.399 "Energy efficient design management – Requirements with guidance for use". Having previously published its own methodology on energy efficient design, SEAI proposed the development of this standard as an effective approach in building on the lessons learned through previous energy efficient design (EED) pilot studies and as a means to promote the integration of EED practices within organizations energy management systems.

Features of this standard include requirements for new projects including the establishment of key design organization roles (EED expert and EED owner) together with processes for design for energy performance (DfEP) and design for energy management (DfEM).

Since the standards publication a number of case studies have been produced which clearly demonstrate;

- Reduced baseline demand of all utilities,
- Energy knowledge harnessed for future investments,
- Maximum value from capital investment,
- Savings identified with little or no capital investment,
- Projects have achieved between 20 and 50% from design baseline.

2016 SEAI launches the EXEED Certified Program (Excellence in Energy Efficient Design).During 2015 NSAI collaborated with SEAI in the development of this new and innovative certification scheme. EXEED provides a framework for energy efficient design management for both new investments and upgrades to existing assets which aims to optimise energy performance and energy management capability. The EXEED process puts energy management firmly on the design agenda, integrating the energy management discipline at the earliest stages of design.

EXEED offers three distinctions of certification which include;

- EXEED Designed,
- EXEED Verified,
- EXEED Managed.

NSAI will be the first third party body to provide certification to the EXEED scheme.

Energy as a military capability and the need for innovation to develop this capability.

Submission:

Operational energy is defined by the US Armed Forces as "energy required for training, moving and sustaining military forces and weapons platforms for military operations". Energy has for centuries been a fundamental enabler of military operations. However, there is complexity to moving energy supplies to where they are needed most, especially in the last tactical mile of resupply due to poor lines of communication, risk from explosive devices and other ambush attacks.

These factors can impose huge costs, monetary and human, on a resupply operation. Therefore, 'energy efficiency' is critically important to armed forces if they wish to improve military capabilities, unit autonomy and operational resilience on the battlefield. But energy efficiency does not apply just to deployed operations. In keeping with the adage 'we train as we fight', it is imperative that military forces operate in an energy-efficient manner at home also in order to be able to transfer that skill to operations conducted in overseas theatres.

Developing capabilities takes time – a capability cannot be taken off a shelf – it requires years of research, development, doctrine, training and finally application. Developing an energy efficient force requires commitment. Therefore innovation, research & development is critical for military forces in order to ensure that they have the capability to carry out their functions in peace time and in war.

War is never as easy topic to discuss but it should be noted that as a result of military campaigns and conflicts many of the most innovative solutions were conceived and have now made the jump from a military technology to a civilian technology. These technologies are known as "dual-use" technologies and examples include GPS, drones, the internet, radar, microwave ovens, carbon fibre and nylon to name but a few.

Presently the EU is exploring the provision of a substantive defence research programme in the next multiannual financial framework. This means using the EU budget for defence research. The intention is to ensure that we retain Europe's ability to be a credible security provider that relies on state-of-the-art cutting-edge technologies. In terms of how this is relevant to energy, Europe is surrounded by an arc of instability from Russia to the Middle East to Northern Africa, both politically and from the point of view of energy, particularly in terms of security of energy supply, protection of critical energy infrastructure and for the cost competitiveness of EU industry. Energy security is a strategic issue for the EU today – including for defence. The EU imports more than half of all the energy it consumes and is particularly high for crude oil. Managing energy is a key aspect of our European Strategic Autonomy; we need to promote efficiency and diversification of fuel sources to increase security of supply.

Like all other sectors, the defence sector has a role to play in the decarbonisation of the economy. R&D for energy in defence is imperative in order to make good on Europe's COP21 commitment to cut harmful emissions by 40% by 2030. In the EU, the armed forces are the largest public consumer of energy and are also the largest public owner of free land and infrastructure.

Sharon McManus

EUROPEAN DEFENCE AGENCY

About Sharon McManus:

Sharon McManus is the European Defence Agency (EDA) Energy & Environment Project Officer with responsibility for the Energy & Environment Working Group and the European Commission's Consultation Forum for Sustainable Energy in the Defence & Security Sector on behalf of the 28 Member States (MS) Armed Forces.

Sharon has served as an Engineer Corps Officer of the Irish Defence Forces for 20 years and has worked in both combat and infrastructural engineering environments most notably as the Defence Forces Energy Manager with responsibility for control and monitoring of energy consumption throughout the land, sea and air domains of the Defence Forces. Between 2007 and 2012 the Irish Defence Forces reduced their total energy consumption by 17% without reducing operational output and were accredited to ISO 50001 International Energy Management Standard in 2012, the first Defence Forces in the World to achieve this standard and the first to be re-accredited in 2015.

Sharon has a BE Civil Engineering

The European Defence Agency provides a platform for Member States to focus on energy challenges, both operationally and domestically in a collaborative way and provides a unique opportunity for armed forces to develop energy efficiency, resilience and autonomy in cooperation with their national programmes.

For the defence sector energy is more than a commodity. It is as essential to mission accomplishment as food, water and ammunition. Military energy efficiency is key to sustaining operations at home and overseas, and advances in this field of military energy will benefit the wider national economic and environmental strategic objectives of each Member State and of Europe.

degree from NUIG and a MEngSc Sustainable Energy Master's degree from UCC. Sharon is also a Combat Engineer and has served on three overseas deployments with the Irish Defence Forces including; Liberia, 2005; Kosovo, 2006 and Chad, 2010. In her role as Energy Project Officer in the EDA, Sharon aims to build a common understanding of effective energy management practices throughout the EU armed forces, provide training to ensure that this knowledge is widely available to all MS, profile military energy use throughout the EU armed forces to define the scale and complexity of the energy challenge and though this, allow for data-informed decisions in the areas of research, procurement and design of technology and services for the military.

It is all about the data!

Submission:

Maria Archer

ERICSSON

There are many forms of energy and a key one is emergent energy for our data and new business opportunities. We are in an era where business is knowledge based and becoming more so. Emergent energy is created by our communities of interest and has the potential to deliver massive new markets and revenues. In order to harness this connected world, we have to engage with our communities, our inner connected markets and create our ecosystems.

For many corporates this is going be a difficult transition as it a fundamental business shift from a closed siloed controlled environment.

New forms of powerful conversations are taking place, new business opportunities are being formed and new revenue streams are being created.

Data is key, it is through making data sets and api's available that our new business services will be created. A risk insensitive approach is needed to create a collaborative business engagement model. By opening up our data into our communities and enabling our employees, partners and suppliers to co-create based on their needs and requirements.

There are many established successful models of co-creation. as an example google maps works through exchanging and receiving data, it is part of the sharing economy. Paypal is an example of a successful emergent strategy. Paypal was struggling and had tried the web unsuccessfully when ebay approached them to use Paypal.

This changed their strategy and business proposition and led to the success that paypal is today.

Open data is at the heart of the internet of things, building new conversations, energy efficiency and new services and products leading to new revenues, innovations and new markets. Solving problems and realizing new opportunities.

There are already a number of examples of the sharing of open data to create innovation that are successful in other markets.

Ericsson can support your business and has the technology that can enable you to take these new conversations!.

Free Air Cooling, Evaporative Cooling or Heat Pumps

Submission:

When cooling is required mechanical cooling may often be the first step to resolve the cooling need whether that be a DX system , water or air cooled chillers

The Irish climate has a maximum number of days to take advantage of free air cooling. There are many facility applications that take advantage of the mild climate. This is usually delivered by exhausting hot air with supplementary mechanical cooling. This has advantages with lower capital investment

Can the negative be turned to a positive and treat the cooling need as a heat resource. This can be achieved through use of heat pumps. This would be viable if there is a heat sink. In many case those heat sinks are not obvious but air handling units can be set up to use low temperature hot water. There may be a hot water requirement where a base-load can be met with this heating

Don't limit the analysis to within the premises and look to opportunities to share this heat resource.

Kevin Geoghegan

Takeaways:

- Look at cooling as a heat resource
- Analyse the best technology to deliver the cooling
- Look for synergies to match loads within and external to facility

Improving your bottom line by increasing your building's energy efficiency

Submission:

Commercial refrigeration is one of the largest consumers of electricity in today's world. The chief consumer of that electricity in those systems is the compressor. Well-known compressor technology can be enhanced with an off the shelf solar thermal collection system to create an advanced compressor system and bring double digit % energy savings. The "trick" lies in the use of the ideal gas law:

p * V = Rs * T

Solar Cool, which uses SunSource Energy technology, installs solar panels between Compressor and Condenser. Utilising the free available energy from the sun to heat the refrigerant & subsequently reducing the workload of the compressor(s). As free energy from the sun heats the refrigerant, it is provided with thermal energy, this in turn raises the internal energy (the sum of all microscopic kinetic and potential energy of the molecules).

The molecules then move with a higher value of kinetic energy, which simply implies each molecule moves with a higher velocity than before. The molecules collide with one another and rebound with an increased energy, moreover inter-molecular forces weaken and the molecules space out further. There is an increase in gaseous volume and therefore a naturally increased mass volume flow, resulting in an improved Delta T across the condenser and which lowers the power required to drive the system.

The hotter the sun shines, the more the solar panel takes over the heating of the gas and the more power is saved. The compressor acts mainly as a pump, providing the necessary cycle flow. Even in Ireland, the technology can be used to save 20% of the cost of cooling buildings. And depending on the sun level and type of system, the solar thermal systems reduce the energy consumption (on fixed speed staged, inverter and digital scroll systems) by as high as 60%.

That's not a typo.

This can be retrofitted onto rooftops without the need to expensive new compressors/ systems. Of course, it's also a heat pump, so you can run it backwards and create cheaper heating as well.

The technology Covers all sizes, from residential and small offices, to medium and large commercial applications, to commercial water chillers and refrigeration systems, ranging from 7kW to 900kW.
One Policy: mandatory solar power on buildings of a certain size, and tax incentives to do so.
COP21 Reaction: i fear it's too little and too late.

Peter Dice

BONESTEEL

Synopsis:

Using basic physics and off the shelf components being used today in smaller enterprises, we can use the sun's energy to lower your energy bills on cooling systems around your plant. This technology scales from small off-grid applications to a industrial complex.

Takeaways:

- Increase the energy efficiency of compressors by at least 20%.
- Recoup your initial investment in ~1 year, saving money YoY.
- Monitor the savings real time over the internet
- Make Ireland's factories greener than anyone thought possible.

About Peter Dice:

Highly creative and award winning Technical Leader with 20 years experience delivering cutting-edge computing solutions–most recently in the Internet of Things (IoT) space. Patent-holder with strong experience in key customer-facing roles, com-

bined with deep technical understanding of all aspects of computing, from the ground to the cloud: HW, SW, firmware, and IoT/Wearables. Well-earned 'disruptor' reputation for delivering new technologies that transform business. Skilled at identifying IoT solution synergies and opportunities, and partnering strategically to leverage business improvement via intelligent systems. Excellent interpersonal, team-building and customer engagement skills, enabling long term relationships with Intel's top customers worldwide and key partners in IoT, Transportation, Industrial and Consumer electronics. Strong presentation and influencing skills –both internally and with industry groups. Excellent leadership ability with experience in strategy, policy and influence (Energy, Health, City management and Education.) Extensive business acumen with detailed understanding of IOT standards, business processes and use of IoT business methodologies. Successfully managed large teams across global locations and relishes leading the charge on new innovation launches worldwide.

About Bonesteel Design:

Internet of Things consulting company focusing on industrial applications and educational advancements.

Steam Generators Versus Traditional Shell and Tube Steam Boiler (Efficiency and Safety Benefits)

Submission:

In to days industry, all company's strive to have the have the most efficient and reliable plant to maximize uptime in order to keep production costs down and maximize profit and future viability for the company and its shareholders. Although companies set high goals, it is not always the case that the required management systems or mechanisms are in place to continually improve process and attain the standards expected. Budgetary constraints, competing priorities act to de-rail the best intentions set forward. A risk based approach needs to be adopted to ensure that limited resources are focused on the correct plant operation and maintenance activities and that capital investment is made on the correct plant and equipment. Many companies focus on their plant uptime primarily with energy and environment as secondary requirements or perhaps have no energy management program. This said, typically if you have good energy management systems in place, this will lead to higher uptime and efficiencies and indeed the necessarily capital investment can be more readily justified so really the two priorities complement each other. There is a lack of competency in the market around energy management. There is a reluctance to embrace new, even proven technologies. Energy management consultants need to assist company's by understanding their individual needs, business and in particular preparing the business case, ROI and payback to get the project over the line. Internally, companies should all have a energy management program to a minimum standard and appropriate to the organization need. Opportunities to mandate this should be considered. For example, we have BER ratings for domestic housing and no ratings listed for larger commercial applications.

Awareness of Market Developments/ New Technologies and Opportunities.

In regard to the Title, Steam Generators versus Shell and Tube Boilers Steam Boilers, this relates to been aware of market developments and indeed embracing alternative technology which at times we appear slow or reluctant to do. (Many time justifiable so).

Here is a particular technology that has not been widely adopted to date yet has many significant benefits over its traditional competitor.

The following is a simple list of these:

- Technology developed in the 1940's
- The concept is simple – Simple works when it comes to reliability
- Available in capacities from 200Kg to 20,000 Kg/Hr.
- Up to 93% Efficiencies
- Additional Generators can be added on.
- Generator produces steam from cold with 5 minutes – Therefore -No need to keep a standby unit at temperature, no energy lost
- 30% less footprint
- 99.5% dry saturated steam at all loads available
- It is not possible to have a steam explosion in a steam generator
- Many installations justified on Safety improvements alone
- Minimal blow down loses

Fergus Regan

VEOLIA

Takeaways:

- All Companies should have an Energy Management program of a minimum standard and appro priate to the business concerned.
- This should be mandated by government and overseen by the appropriate department eg. SEAI
- Production / Commercial facilities should have an energy rating sys tem and process in place to incen tivize improvements

About Fergus Regan:

Having originally trained as a marine engineer, I have built up almost 30 years work experience in the utility and facility maintenance industry. My employers have included Intel, Pruftechnik, Carillion, Dalkia, Airmotive, BP and Irish Shipping. I am currently employed by Veolia Industries Global Services on the Bristol-Myers Squibb Contract. I have particular expertise in condition based maintenance systems, maintenance and asset management and strategy development.

- Minimal maintenance – 4 service visits / Annual 1 Day shut down for inspection

There are some disadvantages to the technology but on the balance these are far out weighed by the above.

Worth researching in my book.

- MSc In Maintenance And Asset Management.
- NCEA Dip Eng AEng MIEI
- Marine Engineer

About Veolia Industries Global Services:

Integrated services for greater efficiency.

In 2010 Veolia assumed sole responsibility for an array of technical and support services on behalf of the pharmaceutical giant BMS, at its sites throughout Europe.

Eleven sites in Europe and a wide range of services

The scope of services included in Veolia's contract with Bristol Myers Squibb is exceptionally broad: utilities and water cycle management, multitechnical maintenance, janitorial services, grounds management, laboratory support activities and an array of services for building occupants, including cleaning, reception and dining services. The contract encompasses 11 production, research and administrative sites: three in the UK; two in Ireland; two in Italy; and one each in Germany, Belgium, Spain and France.

By focusing on their core business, manufacturers can reduce their operating costs while simultaneously meeting their environmental goals."

A single source for integrated solutions

Veolia has demonstrated its ability to draw on its full range of expertise in utilities – the water cycle, hazardous and non-hazardous waste management, recycling of solvents and more – to produce a single, integrated solution.

Veolia's ISO 9001-certified Business Manual System, with its incorporation of ISO 14001 and OHSAS 18001 standards for managing environmental impact and safety-related risks, ensures that uniform, standardized procedures are in place at each of BMS's sites.

Moreover, Veolia has proposed a number of solutions to improve energy efficiency, reduce their water consumption and recover waste at BMS facilities.

Energy Savings in Data Centres

Submission:

Noel Lynch

EDPAC®

About Noel Lynch:

Data centre growth in Ireland has been driven partly by our location within Europe and to a considerable degree by our climate. Design criteria for data centres in Ireland ranges from -10oC in Winter to 28.9oC in Summer. The ASHRAE guidance on managing the data centre environment between 5.5oC and 15oC ensures that direct cooled data centres can be cooled using fresh air and an adiabatic type humidifier with PUE's approaching unity. In addition, modern servers are more resilient operating within wider temperature and humidity bands than the older 'legacy' systems. The major IT companies, such as Apple, Facebook, Amazon, Dell, Digital Realty and Google are establishing significant data centres here in Ireland.

Where does this leave all the older legacy data centres, telecom hubs, etc. ? While many of these were set up using older technology, there are many opportunities available to upgrade these systems and significantly reduce operating costs. Some low cost high return areas to review in seeking opportunities to reduce cost include:

A Determine the Real Load:

It is important to determine the real load within the data centre / hub. In a very recent enquiry for 6 x 100kW of cooling, it was suggested that the load be physically measured and it was found that 6 x 60kW would handle the load and provide redundancy. This provided not only capital savings to the client, but also considerable operating savings and freed up power.

B Match the airflow to the load and remove conflict:

In systems with oversize cooling capacities, many operators run all the systems all the time. For 12oC ΔT, 250m3/hr/kW is required, whereas, for 10oC ΔT, 300m3/hr/kW is required. In a recent improvement programme with Arup, fan absorbed power was reduced by an incredible 90%; this included upgrading the fans to EC type with tight load management. All systems should operate as one to avoid conflict with central sensor control and intersystem LAN's.

C Manage the Underfloor Pressure:

Systems were typically designed around maintaining underfloor pressures of 75Pa / 0.3". More modern systems operate at 20Pa and the floor tiles are designed around this. As pressure x volume is power, it is important not to over pressurise the floor. Note that up to 8W per kW of room load (10oC ΔT) can be eliminated by reducing the pressure from 75Pa to 20Pa.

D Raise the operating temperature within the Room:

Conservative IT managers continue to persevere with operating temperatures as low as 18oC. Raising this set-point increases the efficiency of any cooling system. For instance, with direct expansion systems, 1oC increase in evaporating temperature can increase the system efficiency by 3%; reducing the condensing temperature on the other hand by 1oC offers 2%.

E Manage Supply and Return Air Path – Aisle Containment:

With open rooms, where air movement is not controlled, a high level of mixing can occur causing the system ΔT to be compromised. Aisle containment can be used

on the cold or hot aisles to manage this process and ensure that the maximum ΔT is attained for the room.

F Free Cooling:

If access can readily be gained to a source of outside air, and if the local Standard Operating Procedure (SOP) allows it, then direct air free cooling is an option with a short payback. If the SOP is conservative with regard to humidity, then the span over which the free cooling operates can be reduced. Fluid free cooling options with external drycoolers, where internal coils can be added to the airside plenums or the units themselves.

G Extend / Raise the operating envelope:

Many rooms are managed on very tight operating bands forcing dehumidification and humidification at the extents of the bands. Many direct expansion systems will tend to bottom out at 35/40% RH due to the normal operation of the direct expansion coil. In many cases, it is highly unlikely that dehumidification is required and depending on the integrity of the vapour barrier, a small amount of humidification may be required in very cold outdoor temperature conditions.

Finally, do not forget the lights ! – there may be several kW available here with switching them off or replacing them.

Digital means fully distributed not just partially decentralised

Submission:

My area of specialism is disruption dynamics and with more than 20 years' experience in various form of innovation I have come the conclusion that disruption happens.

Disruption is driven by one of the primary forces in physics – entropy. As a species, we build things that we need and for a while they work well, but over time they start to breakdown. An unconscious alliance between the emerging victors and the vanquished incumbents sees an all too familiar narrative play out. Those who 'have' eventually get greedy or stale while those who 'have not' get more desperate or more optimistic as the cracks appear.

The incumbent ignores the threat at first but eventually viciously attacks the attacker. Resistance is futile however, as the insurgent dynamic is one of 'monkeys with typewriters'. – given enough of them and you will eventually get the complete works of Wiliam Shakespeare. It doesn't matter how many attackers you kill off the smell of decay is too tempting. It promises the riches of the incumbent's past to the winner of the newcomer lottery. Every wave learns from the last, so like superbugs defeating antibiotics eventually society will find that it takes less energy (money) to build a new house that to keep repairing the old one.

I came as a partial novice to the Energy Sector in 2014 with a 14-month stint building bridges between industry and the International Energy Research Centre (IERC) based in the Tyndall Institute in Cork. I say partial novice because my father was the local electrician in this beautiful host village of Cong. I spent all my free time growing up working on either: maintenance or repairs in the local Sawmill (now long gone), maintenance and installation in the local Quarry (still going strong) or rewiring homes where the original rubber-insulated wire and brown Bakelite fittings needed replacing. Many of the houses in North Connemara that I rewired with my dad as a teenager were originally wired by him as an apprentice during the later stages of rural electrification. Unfortunately, my father passed away in 2013 so I never got to discuss my work in the energy sector with him, but I suspect he would not have been surprised by the inevitable progression of technology. I also suspect that for all its complexity this next wave will only have a fraction of the social impact of the wave he had the foresight to catch in the 1959.

I present this biographical note to highlight an empathy with the homeowner in the face technological change. Market forces will decide the outcome of the disruption facing the energy sector, like every sector before and while they can be artificially slowed down by monopolies and cartels the prize is too great for the tide to be stemmed for long. People will make local decision based on their own needs and will not be swayed by rational arguments about grid stability or future demand. Brexit and the spectre of Donald Trump are testament to the fact that when society is not happy with the status quo and in the absence of a complete alternative, they will vote for half-baked ideas. Disruption relies on this.

When I arrived in the energy sector in 2014 I found an industry still struggling with the low carbon disruption and its implications. It seemed it was so distracted by wind that it was ignoring the bigger threat posed by the tsunami of digital disruption that was hitting all sectors. Digital is not about decentralisation, that's its least threatening first

Damian Costello

DECODE®

About Damian Costello:

Damian Costello is a Digital Technology futurist and MedTech Innovation expert.

As a futurist in such industries as Medical Devices, Pharmaceuticals, Consumer Electronics, Telecoms, Financial Services, and Energy. Damian uses deep expertise in disruption dynamics to create far reaching scenarios that inform and future-proof the strategy of businesses large and small.

As an innovation expert, Damian works with Medical Device and Pharmaceutical companies to identify opportunities, develop new products, services and collaborations, and to find innovative solutions to the technology and organisational problems impeding success.

A natural storyteller and generous teacher, Damian inspires innovators and entrepreneurs to, first believe in, and then to achieve the previously impossible.

gambit, digital is about complete distribution of all decision-making.

The following is a thought experiment rather than a prediction, but it illustrates the problem of not thinking the dynamic through fully before acting. Yes, decarbonisation is the primary challenge in the supply side of the energy equation but digital disruption is an even bigger threat to the demand side. To homeowners, smart metering is just digitally enhanced centralised control. It is not the fundamental step towards decentralisation that evolution is poised to reward. Disruption dynamics suggests that that fundamental step in the 'right direction' is more likely to l come from outside the sector. The non-travel interloper Expedia was founded as a division of Microsoft in October 1996 killed off the travel agents, and its non-energy equivalent is exactly the type of entity that could steal the customer from utilities.

In manufacturing, too, digital means fully distributed not decentralised. Imagine a world where sensors were tracking each task, much less each machine, line or plant. Such granularity will create opportunities for efficiencies not currently possible. The Internet of Things, the Cloud and Big Data are new highways. Imagine if each workstation, tool and task had a sensor that spoke directly to the cloud without the need for any central hub. Imagine the addition of the 5G communication technology that is working towards a millisecond response time control loop reliable enough for autonomous vehicles. Imagine more and more 'lights out' facilities optimising production and energy consumption while been managed remotely from headquarters with the help of artificial intelligence.

Again, this is just a thought experiment and not a prediction, it is intended to highlight the fact that there is no ultimate intermediate position. Considering the inherent stability of the distributed internet compared to the centralised electricity grid, this ultimate evolution is so superior to the analogue pyramid that its realisation is completely inevitable.

History tells us the transition cannot be centrally controlled, it may be managed in parts but for most players it just needs to be navigated. The classic disruption prognosis here is either a credible alternative emerges just in time to prevent system collapse or the system collapses. There is no progressive scenario where the old ways are reinstated and life returns to the old normal.

The Energy Transition in Erris Co Mayo. Public, private and community sector initiatives.

Submission:

The twenty-first century is expected to bring many challenges for energy systems across the globe. The energy transition and the long term structural change involved in moving to a low carbon economy are imminent, and this changing energy environment is having a profound impact on the way in which energy is viewed. The traditionally high degree of perceived separation between the typical consumer and energy generation is diminishing and the overall effect is the potential for a higher level of local energy autonomy, i.e., the ability of a community to function and even prosper with less need for imported and centrally-generated energy. This approach to energy is playing an important role in sustainable development at both the community and the regional level. It has implications for the local and wider economy and technical energy system.

A Sustainable Energy Community (SEC) is a community in which everyone works together to develop a sustainable energy system for the benefit of the community. This is achieved by: aiming, as far as possible, to be energy efficient; using renewable energy where feasible; and developing decentralised energy supplies. The Sustainable Energy Authority of Ireland (SEAI) is driving this initiative, and will sign three year partnership agreements to support communities develop SECs. This partnership approach allows each SEC to provide local knowledge, time and people; whilst SEAI will assist with supports like skills development, funding and access to a technical support panel. There are almost 40 communities signed up to the SEC programme nationally since the launch in early 2016, and rollout is ongoing. All eight of the Regional Authority regions are involved, and the SECs are a variety of structures and sizes.

The benefits derived from the SEC networks are:

- Social: 65% of SEC's involved new partnerships across public, private and community sectors; these multi-stakeholder mechanisms are key to project delivery. Projects can address energy poverty and improve social wellbeing and cohesion.
- Economic: SEC initiatives produce financial savings due to reduced energy use and generate local employment. Innovative financing models can deliver sustainable, self-financing projects.
- Energy: SEC initiatives produce real energy savings with 100's of GWh of savings contributing to energy policy at different scales.

There are five steps to the SEC Model once the community group is established and after interest in joining the SEC network has been expressed. They are:

1. Commit. The first stage of the proposed model is to develop a community charter and sign a three year agreement with SEAI. SEAI have supports in place to develop a Master Energy Plan

2. Identify. The second stage is to commence the Master Energy Plan with SEAI, and explore the options within the project

3. Plan. This stage involves putting together a programme of activities based on the Master Energy Plan. An assessment of the core competencies that will assist the transition will be carried out. The resources and skills that have been identified

Orla Nic Suibhne

Údarás na Gaeltachta

About Dr Orla Nic Suibhne:

Government of Ireland Postdoctoral Fellow.

At the start of 2016, Orla was awarded a two year Postdoctoral Fellowship from the Irish Research Council. University College Dublin are the academic hosts for the research project, and the Sustainable Energy Authority of Ireland is the Enterprise partner. Orla completed her PhD at the National University of Ireland in Galway which was again funded by the Irish Research Council. Her research investigated the implementation of Energy Management Information Systems using an adapted Adaptive Structuration Theory model. The research was driven by technological advances, increased environmental awareness, rising energy costs, legislation, and end-user perceptiveness; and the model encompassed smart metering, automated load controls, demand side management, building energy management systems, and on site generation (combined heat and power). From Feb 2014 – Dec 2015, she was employed by Údarás na Gaeltachta to coordinate an INTERREG IVB funded project entitled GREAT (Growing Renewable Energy Ap-

following consultation with 24 community energy champions are: strong partnerships/ local energy champions, integrated planning, strategic financing, energy efficiency, renewable energy, smart energy and sustainable transport.

4. Take action. This stage allows for deeper community engagement, and the implementation of "quick energy wins". Communities also report on the on the energy saving measures adopted so far and assess these measures. There is a link in this stage of the SEC model to the existing SEAI "Better Energy Community" (BEC) Programme that has operated since 2012. In 2016, the BEC will provide €20m in direct funding to a total investment in energy efficiency is almost €48 million, supporting more than 700 direct and indirect jobs right across the country. This year's funding will provide for energy efficiency upgrades to more than 2,600 homes and almost 300 community and commercial facilities.

5. The final stage is to assess the impacts and share the learnings throughout the network.

The community of Erris in Co Mayo has engaged in energy saving measures since 2014 including the following: installation of energy efficient upgrades for buildings in the area (including all types of insulation, fabric upgrades, heating upgrades); adoption of Renewable Energy technologies (Photo voltaic cell arrays to produce electricity, solar hot water panels, heat pumps, electric vehicles, wind turbines); Distributive Generation (Microgrid demo site to include PV/wind); and Smart Grid technologies (smart meters, intelligent building controls). This bottom up approach is working with real energy savings outlined below.

plications and Technologies). GREAT aimed to accelerate the deployment of Smart Grids in North West Europe. There were 10 European partners and a budget of €2.8m.

Structure of Funding

Year	Cost for energy retrofitting	(BEC= SEAI's Better Energy Community Programme)	KWhs Saved	Electrical Savings per year (15c/kWh)	Thermal Savings per year (5c/kWh)
2014	€340,163	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	194,143	€29,121.45	n/a
2015	€385,729	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	323,624	€48,543.60	n/a
2016	€402,777	80% SEAI BEC 20% Home Owners	373,470	n/a	€18,673.50

The Challenges:

Submission:

- No Bank so funding is difficult.
- Brexit – Currency variation and upsets confidence.
- No confidence, the biggest word in our language.
- Shortage of skilled workforce.
- False claims & crazy awards (60% to legals)
- No system to collect money, legal system is an ass.
- Too much red tape.
- No subsidy like R.H.I.
- Grid connection is impossible.
- 10 kW wind turbine forget.
- Biomass for driers almost impossible.
- The recession has a lot to answer for.
- Economy is really fragile.
- Nobody wants to give a decent price for the job and then you cannot collect so you are beaten on both ends.
- Corruption is widespread.
- Power always corrupts and absolute power corrupts absolutely.

The good news:-

- We are survivors and we will succeed.
- Determination – Determination – Determination.
- Entertain only positive thoughts.

Tim Crowley

CROWLEY ENGINEERING

About Crowley Engineering:

Tim Crowley Ltd. Trading as CROWLEY Engineering.

- Mechanical Engineers
- Design and Build

Some Facts:

- Established: 1971
- Turn Over: € 12m
- Export: 30%
  Staff: 100
- Target: € 20m
- Target: 50%
- Invest in new machinery €800K in 2016, now we prepare for next 30 years.

Industries Served:

Feed Mills

- Grain Handling and Drying
- Brewing and Distilling
- Chemical and Pharmaceutical
- Waste Handling and Processing
- Seaweed Processing and Drying
- Architectural Engineering
- Marine Engineering Pontoons

Goods:

- Dry materials handling equipment

- o Silos | Conveyors | Elevators | Fans
- Pelleting Equipment
- Drying Equipment
- CHP Plant 1 – 2MW EI

Services:

- Turnkey Solutions
- Engineering Dept Staff 12
- Fabrication Workshop
- o CNC Punch CNC Plasma
- o CNC Brake Presses 4m
- o Plate Rolling
- o Ring rolling to 180mm
- o Built in crane handling facilities
- o Sand Blasting and Painting
- o Turning | Milling | Slotting
- Installation | Moving of Heavy | Sensitive
- Plant
- Site Crews
- Engineering Spares

Hobbies: Vintage | Restoring Castle

Pet Hates: Over charging by Solicitors | Barristers | Medical Consultants | Corruption

Comment: "Entertain Only Positive Thoughts"

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The importance of an integrated ICT strategy in Energy Management.

Submission:

''Energy loss = Energy gained''

Energy changes form. It can be used, distributed, harnessed and re-used.

''Knowledge = Power''

Knowledge = Processes + Information (Data + Structure)

Processes can be mapped using applied supply chain process engineering methods (or processes are re-engineered through Lean-ICT mapping)

Information can be compiled (Information is derived from Data constructs)

Data can be collected and meaning can be derived from it using data analytics

Do organisations have the ICT strategy to manage their Energy Assets?

''If you cannot measure it you cannot manage it'' Jack Welch GE

Frank Murray

Piercom

About Frank Murray:

Frank Murray is Chairman of Piercom Limited the first spin-out company at UL in 1993 and an advanced information technology solutions engineering company serving the Aviation, Industrial and Electronics sectors. Frank is also Managing Partner at The Linkage-Partnership an advanced networking consultancy focussed on international business networking and collaboration in R&D.

Frank is interested in advanced manufacturing engineering and specifically interested in Big Data Analytics and Cloud initiatives. Piercom specialise in bespoke development of Knowledge frameworks and control systems that manage KPIs and KPAs. Dell, Banta, FLEX and a number of GE companies have ued Piercom services in supply-chain engineering development. Piercom were appointed to the national Information Society Commission by the Irish Prime Minister to leverage ICT as part of Ireland's embrace of a holistic ICT society. Frank's international experience at US, UK, Swiss and Japanese industrial enterprises sees international benchmarking as a key to advancing ICT adoption as a lever to societal and economic change.

As CEO at Piercom from 1998-2008,

Frank led the company to the award of the prestigious Washington based Smithsonian Institute Medal for Innovation in business and services. Piercom develops a number of advanced engineering solutions for General Electric Aviation Services and SES Aircraft Engine Leasing for Boeing and Airbus fleets. Piercom designed and engineered the first Aviation ''web configurator" for a BOEING 737. Other notable clients are Analog Devices, Kostal GmbH and Arista Networks and Hilife tools to name a few.

In 1998 Frank as European MD led a successful trade sale of Powercom Europe the software division of Briggs & Stratton to ARI technologies.

Frank has seen significant changes in IT over his 35 years in the Industry significantly contributing to technology and business practice change for the industry. In the 90's Frank oversaw the move by market leader DEC (HP) in user based licensing generating an additional €200m in revenues for the company€1Bn division. Frank spent ten years at DEC Geneva as the head of the European Software Division.

Frank holds Bachelor of Science Degrees in Mathematics, Chemistry, Analytical Techniques and Instrumentation from the National University Ireland. Frank's postgraduate management education was at INSEAD, Paris; IMD, Lausanne and IFL, Stockholm from 1984-1989 where he completed the International Advanced Management Program. He serves on a number of Boards and has delivered a number of keynote addresses at international conferences and at academic institutes.

About Piercom:

Piercom Limited apply a holistic project management approach to integrated technology management across advanced mixed Engineering paradigms to deliver solutions from control towers, knowledge frameworks and provide data analytics constructs that can be managed by ICT in design, manufacturing and supply chain environments. Our mission is architect, develop and deploy the Knowledge infrastructure around the product Supply Chain in Energy, Design and complex mixed engineering projects.

Low Energy Building Quality Needs Top-Down Legislation and Bottom-Up Leadership

Submission:

Opinion pieces are dangerous things. **"One accurate scientific measurement is worth a thousand expert opinions"** as' Admiral Grace Murray Hopper' is reputed to have warned.

But sometimes an opinion can be a useful way of airing a view which might be at best, a hunch, a value judgement, or maybe even a scientific fact. The low energy strategy **passive house design** is fast approaching 25 years of scientific facts, and so the challenging question for practitioners today is how can we best link exemplary construction with everyday building practices and on-site behaviours. 'Top-down' legislation – as per Ireland's recent Building Control Regulations (2014/15) – is of little use without a simultaneous 'Bottom-up' transformation in the way we educate our workforce, commission, tender and construct buildings. We urgently need significant social housing yet we have ungainly legislation and a dearth of leadership. This opinion piece is based loosely on the following facts, value judgements and hunches. Which is which, I leave to the reader.

1. Small decisions are often agonised over, while really big decisions are made with abandon. Significant policy decisions, particularly when politically opportune, rarely get the scrutiny and circumspection they deserve. 14. Dublin is Europe's capital city for solar space heating suitability. A house in Ireland can meet more than 20% of its space heating demand through solar for eight months of the year, versus seven months in Hamburg and six in Frankfurt.
2. The really difficult things in construction are full of small decisions. The person making decisions on site should be encouraged to take responsibility for them. 15. More people die annually as a result of bad housing than die on the roads, or by suicide. We need to ask why this is not a priority issue for society to address.
3. Trying to design a low energy building without adequate airtightness is akin to watering a garden with a sieve. The intentions of Part F of the Building Regulations are not aligned with the aspirations of Part L. Excess renewables are not an adequate substitute for poor construction. 16. Every €1 spent locally within communities to create good low energy social housing returns €3 to €4, based on savings made against fuel poverty, reduced hospital stays, better health outcomes, job creation and increased disposable incomes.
4. The 23% VAT rate on professional services (such as passive house design) negates the use of such knowledge, denying future generations of the long term benefits. All insulation materials should also be zero vat rated. 17. Addressing why people die due to bad housing requires money, effort, sweat and maybe some tears. Above all it needs government departments to talk to each other – Health; Social Protection, Environment; Energy; Prime Minister and Finance. One suspects this isn't happening.
5. Sub-contractors do not a good main contractor make. PPPs are not a panacea for quality or effort. Low tenders destroy cooperative construction. 19. If professionals cannot shout 'STOP' against building control regulations which are paper heavy, legally fraught, expensive to implement and not fit for the consumer, then who does?
6. You cannot change a building control system in two years; the entire Irish system

Martin Murray

PASSIVE HOUSE ASSOCIATION OF IRELAND

About Martin Murray:

Martin Murray is an architectural graduate of Bolton Street COT, Trinity College and Rice University, Houston, Texas. He is a Fellow of the RIAI, a Fulbright Scholar and an architect in private practice in Ireland; he is also a former chairman and founding member of the Passive House Association of Ireland and a current Director. His architectural practice is principally involved with energy renovation projects across a wide range of building types.

needs to be significantly re-thought and education, professional and training systems need time to change. 21. Architecture in general is neither a fine art nor utilitarian engineering; it is a craft-based skill combined with intelligent, beautiful design. Good construction is the result of collaboration and communication and shared values, not unreasonable lowest cost tendering.

7. Ireland's new building control system is a privatisation of risk, and a deskilling of local authorities. (In line with the fact that Ireland is one of the most politically centralised administrations in Europe). 22. No amount of inspection plans, site inspections or occupancy certificates will protect a project against a tradesperson with the attitude: 'I am only here from the neck down'. To quote Admiral Hopper again, 'you manage things; you lead people'.
8. Good politicians everywhere are good at being re-elected; everything else is a bonus. 23. Good low energy buildings start with south facing strategies. Planners need education in low energy design and site planning.
9. Government departments protect their own budgets first; cooperation with other departments does not appear to be part of their default value system. 24. Front doors do not always have to face the public road. Windows do not have to ape traditional proportions and construction. Comfort, low energy and good architecture are mutually inclusive.
10. Construction quality is a challenge from the bottom up as much as from the top down; we need a strategy to meet in the middle; blue collar and white collar makes green collar. 25. Fenestration can be aesthetically subjective; in PHPP, fenestration is objective regarding energy use. If north points have to be shown on plans let them be relevant to the design. Inappropriate orientation costs money.
11. Many skills within the construction industry can only be taught through apprenticeship. Architecture might well be one. In 2014 only four plasterers in Ireland registered for apprenticeship.
12. Dublin is Europe's capital city for solar space heating suitability. A house in Ireland can meet more than 20% of its space heating demand through solar for eight months of the year, versus seven months in Hamburg and six in Frankfurt.
13. More people die annually as a result of bad housing than die on the roads, or by suicide. We need to ask why this is not a priority issue for society to address.
14. Every €1 spent locally within communities to create good low energy social housing returns €3 to €4, based on savings made against fuel poverty, reduced hospital stays, better health outcomes, job creation and increased disposable incomes.
15. Addressing why people die due to bad housing requires money, effort, sweat and maybe some tears. Above all it needs government departments to talk to each other – Health; Social Protection, Environment; Energy; Prime Minister and Finance. One suspects this isn't happening.
16. 'Professionalism' is dead; killed by lowest cost tenders. Professional institutes have become mere trade unions for their members' interests; they might be better served by being more vocal advocacies for their communities.
17. If professionals cannot shout 'STOP' against building control regulations which are paper heavy, legally fraught, expensive to implement and not fit for the consumer, then who does?
18. Lowest tenders are not necessarily better; average tender values give a more accurate reflection of true project costs and also 'professional' services.
19. Architecture in general is neither a fine art nor utilitarian engineering; it is a craft-based skill combined with intelligent, beautiful design. Good construction is the result of collaboration and communication and shared values, not unreasonable lowest cost tendering.
20. No amount of inspection plans, site inspections or occupancy certificates will protect a project against a tradesperson with the attitude: 'I am only here from the

neck down'. To quote Admiral Hopper again, 'you manage things; you lead people'.

21. Good low energy buildings start with south facing strategies. Planners need education in low energy design and site planning.
22. Front doors do not always have to face the public road. Windows do not have to ape traditional proportions and construction. Comfort, low energy and good architecture are mutually inclusive.
23. Fenestration can be aesthetically subjective; in PHPP, fenestration is objective regarding energy use. If north points have to be shown on plans let them be relevant to the design. Inappropriate orientation costs money.

To achieve real build quality we need a **regulatory control system** that rewards scientifically verifiable strategies such as passive house. We need a system that helps develop design skillsets and apprenticeship pathways through a stable construction sector, addressing fuel poverty, attracting low property tax and meeting local building regulatory requirements.

We need a planning control methodology that allows strategic construction -stage revisions to refine energy use and focuses expenditure not just on paper trails but on good construction, adequately paid for by real average tender procedures. We need building contractors with verifiable construction skills, rewarded for having permanent specialist staff and project management skills answerable to a trained and supported local building control authority, in turn supported by a planning authority who might intervene within the free market to control ill-considered planning applications.

If we actively support design influenced by science we may yet bridge the gap between blue and white collar and create a green collar construction sector that holds its rightful place within the economy of a country as opposed to being its economic flywheel. A top down legislative environment without responsible contracting, bottom up skills and verified design strategies serves no good.

Community Engagement in Energy Development

Submission:

Traditionally, the Irish public have been supportive of renewable energy development. Many recognise wind energy as a valuable resource which will help Ireland become less reliant on fossil fuels for our electricity requirements and increase the balance of payments. Renewable energy (wind and solar) represents one of the few rural enterprises that is growing. But in recent years, the public mood has been turning against some individual wind farm developments and related infrastructure. This change in mood has been mainly associated with the largescale wind farm and grid infrastructure projects. The multi-route design approach swept large areas across the country into an anti-pylon/anti-wind position.

It is important that developers take a critical view of the scale and size of the receiving landscape. A one size does not fit all. Engaging proactively with the leaders in the local community early in the design process can be very worthwhile. The developer can try to address concerns, adapt plans and take suggestions on board more easily, allowing the final design submitted to the local planning authority to be robust and inclusive. The existing planning guidelines, published in 2006, will be updated in the coming months and is expected to address some of the issues that have caused concerns in communities in recent years (1).

The recent Energy White Paper (2015) (2) outlines the vision for 2030 where: 'citizens and communities will be active participants in the energy transition, with robust public and stakeholder engagement in energy policy, and effective community consultation on energy infrastructure developments'. Some specific actions include supporting 'community participation in renewable energy and energy efficiency projects, via the SEAI —', 'examining shared-ownership opportunities for renewable energy projects in local communities'; 'supporting, in particular, the emerging energy co-operative movement as one means of facilitating community participation'. Currently there is only one community owned wind farm in Ireland: Templederry in Co Tipperary.

There are many other forms of community engagement and supports. The Irish Wind Energy Association (IWEA) Best Practice Guidelines (3) provides some guidance on how developers can engage with and support local communities through the development phase and recommend ongoing engagement through the life time of a wind farm. Many existing wind farms are proactively engaging with their communities (e.g. sponsoring sports clubs and community groups). For example, there are almost twenty separate wind farm Community Benefit schemes listed by SSE alone for local communities to apply to in 2016. Since 2006, around €4.5m has been granted in Ireland to community groups through the SSE Airtricity Community Funds, which endure for the lifetime of the associated wind farms. SSE's approach supports energy efficiency and social sustainability projects in the locality around the wind farms, prioritising groups within a 5km vicinity (4).

The solar industry is in its infancy in Ireland. The scale of development planned (5000 MW queued) will need to be carefully managed in terms of community engagement. There are lessons to be learned from the wind industry.

In summary, it is important that everyone supports the transition to a new low carbon economy that will bring benefits to all including carbon dioxide reduction,

Richard Walshe

ART GENERATION

Synopsis:

In summary, everyone has a role to play in the transition to a new low carbon economy that will bring benefits to all. By proactively engaging with the leaders in local communities at all stages of the development and operation of renewable energy projects, the likelihood of community acceptance is increased.

Takeaways:

- Everyone has a role to play in the transition to a new low carbon economy
- One size does not fit all
- Communication, engagement & leadership are key
- Benefits locally and to the Irish economy

About Richard Walshe:

Richard Walshe is the founder and principal of ART Generation (2002). He has been involved in the power generation business for 25 years. He has hands on experience in all aspects of project development from wind resource assessment, landowner leases,

increased security of supply, decreased cost of electricity, direct employment, increased disposable incomes for landowners and supports for local communities. The general public needs to be brought on that journey and learning is part of the process. By proactively engaging with the leaders in local communities at all stages of the development and operation of renewable energy projects, the likelihood of community acceptance is increased.

References:

1. *Wind Energy Development Guidelines for Planning Authorities (the Guidelines) under Section 28 of the Planning and Development Act, 2000*
2. *White Paper: 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030' (2015)*
3. *IWEA Good Neighbour Best Practice Guidelines for Community Engagement (2013)*
4. *http://ireland.sse.com/being-responsible/responsible-community-member/community-funding/sse-airtricity-community-fund-2016/*

environmental impact assessments, planning, grid applications, site layout design, turbine selection, financing, project management and construction. In recent years, he has successfully completed deals with several blue chip energy companies including Bord Gáis (now Brookfield), Element Power, Enercon, GE, Viridian and Gaelectric. He is currently constructing the Foyle Windfarm in Kilkenny (9.6 MW) and Gurteen Windfarm in Tipperary (2.3 MW). He retains interests in a number of other windfarms including Ballymartin/Smithstown, Loughderryduff, Maas and Shannagh. He is developing a number of early stage solar and windfarm projects. He is also developing the Grange (Ballymakaily) OCGT project in West Dublin (115 MW) which secured planning permission in 2015.

Richard has extensive international experience in the engineering, procurement and construction (EPC) of open cycle gas turbines (OCGT), combined cycle power plants (CCGT) and conventional thermal generation plants. He was a project team leader with ABB Head Offices in Mannheim, Germany and Baden, Switzerland for several years, where he managed multi-disciplinary teams delivering turn-key EPC contracts in the Indian, South East Asia and European markets.

About ART Generation:

ART Generation was established in 2002. The company develops, builds, owns and operates renewable and thermal projects in Ireland. It has successfully developed a large number of projects with a number of blue chip energy companies. The company has a pipeline of new developments in wind, solar and thermal.

The Lumcloon Energy Story

Submission:

There are three divisions to the business: the first is the provision of outage support to power plant owners such as the ESB. This can involve short notice repair for emergency shutdowns to planned repair and preventative maintenance programmes, working on steam and gas turbo-generator units.

The second division is where the company has built a respected reputation to become the erectors/installers of choice. It provides a full service installation and maintenance service to a range of customers including, Siemens, GE, Doosan Skoda, ESB, SPX and GEA where the company is contracted to install original equipment for these highly respected manufacturers. This can only be achieved following an exhaustive qualification process to prove competence to work on such highly technical equipment.

The third tranche of the business is installation work such as the erection of Air Cooled Condensers (ACCs), where competence and reputation are key to contract awards where Installation can only be performed by qualified and experienced personnel.

Since establishment, RR Projects has grown significantly and now has a core team of 75 people which has an annual turnover of €10 million.

Some notable project examples:

- Bord Gáis, Whitegate IPP, Cork 2009
- CNIM, Waste to Energy Jersey, 2012
- Mongstad Oil Refinery, Norway
- GE, CHP Plant Workington, 2012/13
- SPX, Ferrybridge Waste to Energy, UK
- HZI, Buckinghamshire Waste to Energy, UK
- HZI, Dublin Waste to Energy, Ireland
- HZI, Cornwall Waste to Energy, UK

RR Projects is currently providing erection and installation services to HZI on the Poolbeg waste to energy project Dublin. It provides Consultancy and technical project management personnel to the EPC contractor in addition to manpower crews for the project construction.

Separately, the company is contracted to procure, manufacture and install the interconnecting pipework for the turbine for Doosan Skoda.

Nigel identified an opportunity to increase the efficiency of installation and operation of one of the major components of a power plant, the Air Cooled Condenser, and began the development of the MACC (Modular Air Cooled Condenser). Building on and

Nigel Reams

LUMCLOONENERGY

schwungrad ENERGIE

About Nigel Reams:

Nigel Reams is the founder and Managing Director of R & R Mechanical Ltd., (now trading as RR Projects), Lumcloon Energy and Schwungrad Energie, each of which are involved in the energy and power industry.

Nigel has been to the fore in developing innovative technology for the energy and power sector, initially focusing on the Irish market as a template for international replication. He is considered as one of Ireland's premier energy entrepreneurs/innovators, one who has seen concepts developed through to deployment. He has travelled extensively applying his trade and has built upon his technical and managerial abilities to start, develop and grow his business operations since 2003.

Nigel trained as a mechanical engineer with Bord na Mona and progressed to become an aircraft maintenance engineer with Team Aer Lingus where he learned to apply his high quality of technical workmanship.

initial personal investment in R&D the MACC concept Through the EU FP7 programme Nigel developed and deployed the MACC on a Concentrated Solar Power plant in Australia during the highly successful €5.7 million MACCSol project. RR Projects and the MACC technology received the Research Award from the Sustainable Energy Authority of Ireland, recognising its potential impact on energy efficiency.

Having gained extensive experience with rotating machinery, he identified an opportunity in the rotational equipment marked and so founded R&R Mechanical ltd. in 2003.

The evolution of the energy industry, as it transitions to renewable energy sources, opened new/additional business prospects which Nigel has targeted, diversifying his business operations and the establishment of two new companies, Lumcloon Energy in 2008 and Schwungrad Energie in 2013.

Nigel has put a complementary team of experts together to form Lumcloon Energy, who have developed a 300MW plant to deliver energy less system services to the electricity grid. The original plan was to have a 300MW flexible multi-unit CCGT plant to follow the wind generation. This is a shovel ready project which has significant support from the local community, as it is located on the site of a decommissioned power station and has the potential to return economic prosperity to the area. More recently, Lumcloon has begun developing, in parallel, a 300MW high power battery project which could result in enhanced use of his 300MW grid connection asset.

Lumcloon appreciates and respects the local support and as such has provided IT resources and Novel JUMP Maths programmes to the schools and also provide financial support to local charities.

Lumcloon have been requested by the Ministry of Industry and Trade in Vietnam to deliver a seminar to the Electricity Regulatory Authority of Vietnam on the Electricity Market in Ireland, providing an insight into the development, implementation and operation of a deregulated electricity market.

Schwungrad Energie developed Europe's first grid connected flywheel/battery hybrid, which was seeded by Nigel and is supported by EU Horizon 2020, Enterprise Ireland, Sustainable Energy Authority of Ireland and EirGrid. This €1.95 million project to demonstrate the technologies ability to stabilise the grid, has attracted the interest of major utilities, power project developers and technical magazines. A major utility has expressed interest in collocating the technology with their existing power plant to increase the value of their asset in an evolving electricity market.

Schwungrad continues to be invited to speak at industry conferences on topics relating to grid stability issues and energy storage and use these opportunities to disseminate the project results. The project was featured in the Energy UK "A Future of Choice" documentary.

Schwungrad were invited to speak at a conference of large industrial energy users (Pharma, Tech, Medical Devices etc.) where a new application for the technology was determined. With support from a consortium of industry stakeholders, Schwungrad will develop an Energy Research Centre of Excellence with renewable generation and simulated load where issues facing industry can be tested, isolating their operation from risk.

His interest in energy storage has resulted in the concept of a second generation integrated energy storage and material production technology, which uses molten salt for the reduction of metal oxides. This project has been awarded €250,000 in funding to develop and demonstrate the technology.

Nigel is a keen aviation enthusiast and has maintained his connection with aircrafts through the years, regularly attending international air shows and completing the Private Pilot Licence programme after which he was licenced as a Private Pilot.

The forgotten Energy

Submission:

The objective of this article is to share some facts about the ignored/forgotten free energy, which is at the disposal of any business, but herein the focus is on the Irish food processing industry.

The Irish food processing industry uses a large proportion of energy on:

- Refrigeration in cold rooms where temperature is ranging from 1.5^{o}C to 8^{o}C
- Heating of space/water and process applications
- Lighting of work space

Indeed a great deal of the aforementioned sustainable energy users can be obtained for free or in the extreme at a very low cost.

Starting with lighting; the recommended level of lighting for office work is 500 Lux (lumen/m2), and for shop floor factory is up to 750 Lux. Having said that, the available free lighting through natural sunlight and can be obtained in the office/shop floor through eco-design of windows and , which can be achieved through windows and or clear roof cladding would be at least 50% of the required lighting level in a dark day and higher in a full sunny day. Thus applying the right design in your facility would reduce your lighting electricity bill substantially.

Another potential sustainable energy user is heating and steam processing, which can be best achieved through energy recovery of plant, such as refrigeration or CHP. In many situations a 100% of heat demand can be achieved for only a one off initial investment.

In many food processing applications, refrigeration energy counts over 50% of the total energy bill. To offset this energy, there is free cooling, which is a technique that relies on ambient temperature to provide cooling to food applications. The concept is not refrigeration, but uses mechanical energy such as extraction fans, aluminium ducts and or free dry coolers along with air handling units to transfer the cold ambient temperature from the outside to the inside of the chill room. As shown in Figure 1, a large part of the season the outside temperature is averaging +10^{o}C, where many hours during the winter months temperature is well below 5^{o}C, which present an opportunity to offset the base load demand of the total refrigeration energy that can be extended for many hours during night time throughout the year.

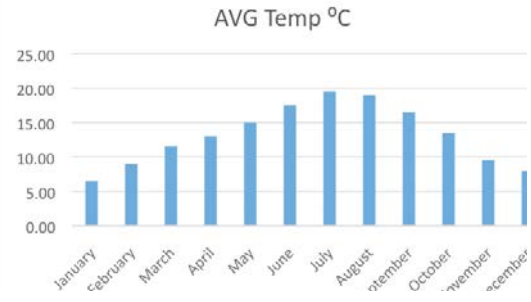


Figure 1 Ireland average temperature distribution

In summary, more attention is needed to incorporate eco system design to adapt to surroundings environment to get the best out of available free energy.

Wasim Haskiya

Keelings OUR PASSION DELIVERS

About Wasim Haskiya:

Wasim Haskiya is high profiled Energy/Sustainability Engineer woks at Keelings. Expertise in: Energy management systems (EnMS) and ISO 5000; Origin Green; Sustainable Manufacturing; Mechanical Engineering and Project Management; Robotics & Nanotechnology.

Wasim obtained a PhD degree in Robotics to work in research and lecturing in Mechanical Engineering, then run own IT business, and research in robotics and nanotechnology.

During recession time Wasim has completed a Master of Engineering degree in Sustainable Energy Systems to join Keelings till present time…

Research Interests: Energy Data Analytics; Energy Storage; Energy Efficiency; Sustainable Manufacturing; Nano-Manufacturing; Micro-Robotics

Achievements: Grants; Over 10 Publications

IoT Digitisation (finding the secret sauce, business needs to insight delivery)

Submission:

Dave Clarke

Smart Manufacturing Alliance

The advent of IoT Digitisation heralds the possibility of creating entirely new ways to build a direct and personal relationship with customers on one hand, and have the greatest level of individual product tracking on the other. The executive C-Suite understands the opportunity, but they are wholly un-informed on how to go about setting the data value initiative up for success. From their perspective, some think it is the same as a software product selection process. That is to evaluate different suppliers and pick the best one based on cost, terms, functionality and other key metrics. But, it's more than just selecting a software product.

There is no doubting that the Technical Landscape of IoT and Big Data architectures that support storing of IoT data is a crowded one. The complexity of the technical landscape as well as the predominance of open source software has led to companies that take the leap into the digitisation / big data / IoT world having the challenge of building an extensive software development team. This is often a more than subtle transition to a software development world from their core business. So, the question of how best to manage this transition arises and a question of the differences between time to value versus effort to value in deriving the desired value from their data arises.

Having worked with many customers in the last 5 years in the analytics space, the two biggest determinants of a successful path to deriving value from data that I have seen are appropriate executive sponsorship and internal / external collaboration frameworks. The executive sponsorship is needed to 'knock people's heads together' as an old Cork colleague of mine once said. The two heads being the IT department and the business function. The collaboration requirement is nuanced in that there may be several ways in which this can be achieved. Sufficient executive sponsorship together with employees and processes that support inter department integration and cooperation are fundamental to success.

A by-line that is often noted in this space is 'Fail fast, fail often'. What does that mean, and is it something that senior executives want to go around saying? I try to explain this another way. You have a business question / problem or opportunity that you think can be answered by the data that your business creates or has access to. The quicker you can find out if the data will answer the question that better. I have built agile methodology's to achieve this and I often say that those investigative initial projects have two successful outcomes. The first is that you find the insight / answer to your question that you were looking for. The second 'successful' outcome is that you don't

find the answer. Some might see that as a fail, but you have learned something. You need to change the question or get more data to answer the one you have. The quicker you can iterate through this process, the faster you can get the right answer to the right question.

Now, for some things that I think the IoT space in Ireland needs. The first is sufficient support for start-ups in the data analytics space. I was invited by the German-Irish chamber of commerce on an IoT study tour of companies, universities and research institutions in the Ruhr valley. On a visit to the CITEC University in Bielefeld, I heard how they give up to €50K worth of free support for start-up companies to take their research ideas to market. Ulrich Ruckert, their head of Cognitronics and Sensor Systems explained his reasoning. Companies pay taxes to the government, the government gives grants to the university to do it research so he feels an obligation on the universities to give something back to industry. What a great idea!

Another area that I think progress could be made is whether there is space for a better data science language? Language is used to convey ideas. Although I can readily see how using a principal component analysis on a wide data set, a logistic regression on a dependent variable of interest coupled with a decision tree model will help implement a predictive capability for managing that same dependent variable, does my business user understand what I am saying. A new language may not be needed, but we need more stories. This is the best way of conveying the value of data science techniques to potential business sponsors.

How smart manufacturing will lead to a more sustainable global manufacturing environment

Submission:

Gerard O'Connell

Rockwell Automation

Economic growth and prosperity depend on the availability of energy in several forms to support our expectations, which include electricity that enables us to prepare our meals, provide heat our homes, educate our children and go about our daily activities.

Every day, we use energy to produce basic necessities such as food and water, operate health care facilities, manufacture medicines to maintain a long and healthy life, build cars and, in some cases, run cars as well as power infrastructures in urban areas.

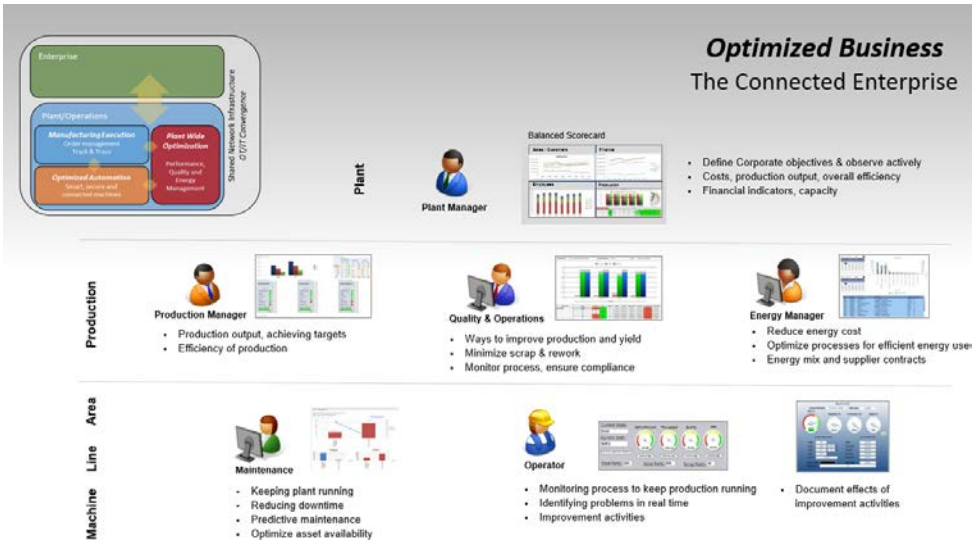
Not only are we individually consuming more energy than our predecessors, there is no denying the population is increasing, with predictions of approximately 9 billion global citizens by 2040. Recently, the Brookings Institute estimated that the middle class population will grow from 1.9 billion in 2010 to 4.7 billion by 2030. Now, why should we be interested in the middle class?

To answer that question, the middle class is an important threshold where the consumer starts to have discretionary spending power. In short, consumers are then able to purchase more than simply the necessities to survive. As a result, people buy electronics, travel more, purchase cars or larger homes, and can afford better healthcare.

Industrialization accounts for 30% of the global energy consumption, of which, the electrical sector represents 50%. Predictions suggest industrial energy consumption will grow by 40% between now and 2040, and this is predominantly in sectors such as steel, cement, pipelines, plastics, textiles and electronics, among many others. In fact, some research predicts that without more energy efficiency gains, this figure would be closer to a 130% increase.

Simply put, smart manufacturing provides everyone in an organization the relevant and actionable information they need to improve production performance. Energy efficiency is achievable with the availability of real time plant and organization wide performance data. In turn enabling better informed operational decisions like load balancing and maximising off peak running. Through full integration of all current technologies, we are moving towards using past performance, and analysis of such data to deliver optimal future process operating parameter, which will lead to more efficiency gains.

A 'Connected Enterprise' where data is readably available is a prerequisite to realize benefit and value from any Smart Manufacturing initiative. Central pillars to achieving The Connected Enterprise include the need to converge Information Technology (IT) and Operations Technology (OT). We are at the inception of the next industrial transformation…….



Ask yourself, without these energy efficiency gains thanks to more efficient motors, application of VFDs and smart metering, combined with The Connected Enterprise, would we maintain the same level of global population growth? Would we see a growth in the middles class population of 2.8 billion or a growing level of impoverishment? We can all dwell on these questions.

Re-imagining energy generation

Submission:

Jim Smyth

Airsynergy are an innovator of revolutionary, cleantech products which generate an affordable, renewable, secure power supply. For the past eight years, the company has worked tirelessly with an unrivalled technical team to ensure that it creates ground-breaking products which can make a massive difference to people's lives.

In the last couple of years alone, there has been a marked shift in how energy is generated. According to a report by the Department for Energy and Climate Change (DECC), low carbon generation methods such as wind, solar and biomass have increased from 37% to 45% from 2014-2015. Whilst coal plants have succumbed to closures and conversions in recent years, renewable energy generation has flourished; particularly wind energy. However, traditional wind turbines have failed to provide adequate power globally. A solution was required in the renewable energy sector. Airsynergy's radical products can generate electricity almost anywhere; providing power in 80% of the world's land mass.

Two-in-one wind turbines which utilise revolutionary technology have been created by Airsynergy to ensure that maximum performance is guaranteed. Airsynergy's Total Energy Solution (TES) is a small wind turbine which utilises patented technology. This consists of a multi-bladed augmenter, which accelerates the airflow, increasing power. This innovative product can provide €4,000 plus worth of renewable electricity annually – providing a fast return on investment and making it the most affordable, renewable, energy generation solution available. The technology which this wind turbine possesses means it is able to provide 100% more power production when compared to any similarly rated turbine in the market right now. This performance is outstanding, considering they are often only as tall as a two-storey house.

Similar technology is evident with Airsynergy's Renewable Power Unit (RPU) – a wind and solar powered streetlight which offers clean power to towns and cities. These units are comprised of a small wind turbine, similar to the TES, and a solar panel to help light up the world's urban and remote areas. Here, the velocity of the wind flowing past the blades is increased by a multi-bladed augmenter to generate high power and a high amount of electricity.

Unlike traditional streetlights, they are completely renewable, aren't connected to the grid; meaning no trenching and ducting costs, and are able to provide excess power which can be used for auxiliary purposes. These two products, which utilise wind and solar power, are a wise investment as they act as an insurance policy against often unstable gas and electricity prices.

Airsynergy also has a sister company, onesynergy, which shares the same values and missions; to provide energy-efficient solutions which benefit the end-user. onesynergy's specific aim is to create products which reduce the energy consumption of buildings and properties; something which has continued to spiral, despite warnings of an energy shortage. The PAVEL is an innovative air extraction unit, which contains no moving parts and is able to naturally extract air from a building, halving the energy costs, reducing the carbon footprint and negating the use of expensive extractor fans.

In the 21st century, we can no longer afford to rely on coal and gas for reliable

power – nor should we when there are a multitude of viable, renewable options on the market. Wind and solar products which utilise unique technology is the future for energy generation, and this is a future which is provided by Airsynergy and onesynergy products.

Feasibility studies: Delivering the potential on site.

Submission:

At Arup listening to the things that make an asset valuable to our clients, and to their buildings users, gives direction to our designs. Precise performance and lasting value is delivered by embracing collaborative innovation, transparent decision making and early identification of the best ideas.

Delivering energy savings begins with a fundamental design question "Is there a better way of doing this". Through framing this question in the widest possible context and immersing yourself in the problem, uncovers a real understanding of different opportunities and how to sieve out the most appropriate ones.

Our feasibility studies at project inception stage set out demonstrable savings through the identification of key performance indicators and metrics. Through these and life cycle cost analysis a measurement and verification plan is uncovered to support the recommendations.

These recommendations are developed to encompass the three main elements of any project: quality, time and costs. Our design seeks to adjust these factors independently – improving all three. Innovative design should improve quality while reducing programme time and cost.

Being involved in a project from inception to post-handover allows us to realise the full project potential and verify the savings accruing with our clients. This is a key element as future investments can build on the foundations of past successes, ensuring continuous improvement of energy reduction measures.

Underpinning all of this is collaborative design, for us informed clients are key to successful projects.

Tadgh Hickey

ARUP

About Tadgh Hickey:

Chartered Building Services engineer with 15 years' experience at Arup. Project experience includes manufacturing industry, data centres, Energy from Waste and commercial developments. Guest lecturer to final year energy students at UCC.

About Arup Consulting Engineers:

Global Firm of Consulting Engineers with over 480 qualified and accredited engineers and staff based in our Dublin, Cork, Limerick and Galway offices.

Compressed Air Opportunities

Submission:

Compressed air is often regarded as the fourth utility (along with water (steam), electricity and gas) in manufacturing and process environments. It provides force for simple and powerful mechanical solutions. It drives pistons/ cylinders used in lifting and moving. It powers the opening and closing mechanism and valves. It offers relatively low capital costs and is quick to install. However, it has the highest energy cost of any utility and is prone to leaks. In the UK, compressed air accounts for approximately 10% of industry's electrical consumption. Given that many estimates put the percentage of the input energy converted to usable compressed as low as 7-15%, it is no surprise that changes in how we use compressed air could lead to substantial energy savings for manufacturing in Ireland.

Compressed air systems offer low cost solutions to solving mechanical movement issues in manufacturing and process facilities. It is fast acting, easy to install, understand and repair. It has no real ATEX issues when used with non-metallic components so in many ways it is an idea utility. However, it is, in most facilities, a massive energy cost and energy waster. Statistics from the UK seem to indicate that 10% of the industrial consumption of electricity goes on compressed air systems (CAS). In Ireland, industry uses approximately 9.3million MWh per annum (based on 2013 data). If we assume that Ireland, which doesn't have as big a manufacturing base as the UK, only uses 5% (and this is a low estimate) of this figure for compressed air generation then factories and other process industries are using just over 460,000MWhr per year. To put this into perspective, this is equivalent to same electrical consumption as 85 thousand houses or the entire domestic electrical demand of Galway County. Conservatively, 90% of this is wasted in the process of generating the compressed air and is generally lost as heat. A further 10-50% (averaging around 20%) of the compressed air produced is then lost in the system through leaks, before it able to do any work. This represents a huge loss, in financial terms to Irish Industry. If the price paid for electricity is, say 14c/kWh then the cost to Irish industry, running standard compressed air systems, is €60 million across the industry each year.

A reduction in system pressure, repairing of leaks, an element of heat recovery at the generation stage and smart use of the system could save Irish industry millions per annum.

It is prudent to ask if compressed air is required or if another, albeit possibly higher capital cost, solution offers a better lifetime cost. It is also important to ask if systems are being run when they are not required as this is wasting energy, money and resources when there is zero return. Can the heat of generation be utilised in some way to reduce the overall loss. For instance this "waste" heat could be recovered and used to preheat air for air conditioning systems, to preheat water etc. Leaks within the system could be detected and repaired on an ongoing basis. Companies can address these items now even on existing systems. Another fundamental question that needs to be asked is ' Does the system need to run at 6bar or higher?". A reduction in 1 bar in operating pressure would reduces losses through leaks and also reduce energy consumption by 7% according to Atlas Copco, a leading compressor manufacturer.

Compressed air systems are costing industry millions of Euro. Some remedial work and investment in existing systems will pay off handsomely in reducing energy bills.

Fergus Whelan

MALONE engineering group

About Fergus Whelan:

Fergus is the Group Engineering Director at Malone Engineering Group. They specialise in full service project delivery in the Food & Drink and Pharmaceutical sectors. They are an international company, operating in Ireland, UK, Poland and Canada currently. Much of thier workload involves energy recovery or reducing energy losses within utility systems (e.g. steam or compressed air).
Prior to joining Malone Group, he worked as a project engineer, project manager and contract manager in the renewable energy sector.
He was involved in the design, planning, installation or construction of numerous large and small windfarms throughout Ireland.
He is a Chartered Engineer with a masters degree in renewable energy.

Why do manufacturers not provide (design) retro fitted kits to make older equipment more energy efficient?

Why does it cost so much for a SME be energy efficient?

Submission:

Sean Ryan

Thormac is a leading custom plastics, injection moulding and contract manufacturer which has been manufacturing in Shannon since 1979. We specialise in plastics design, prototyping, large part moulding & value added assembly. We manufacture in our 40,000 sqft facility, which includes a clean room, with over 19 machines of varying ages ranging from 30 Tonne to 1100 Tonne. We work with a varied range of engineering plastics including Silicone, PA66, PA6, PC, PVC, PMMA, TPU, PBT, PVDF

The management team completed a management buyout of Thormac eighteen months ago. Of the nineteen machine we purchased the predominate brand is Sandretto. We have had these machines assessed by a Romi engineer and the feedback was that generally the machines are in good shape and with proper preventative maintenance that they will have a long life yet.

However, the engineer emphasised that we could not improve performance only extend the life of the machine. This suggest that the machines themselves are in very good working order even though they are between 10 and 20 years old. If we wanted to have more energy efficient machines, he recommended buying a new machine instead. As lean practitioners' this is counter intuitive. The sales representative has sent me pricing for new replacement Romi's.

We have decided to invest in three new Wittman Battenfeld machines, the first has been on site since February and already we have cost savings on our energy bill as the usage decreases. However, we do not have the financial resources to replace all nineteen machines. What we need to do is extend both the life and performance of some of the remaining machines.

After doing some research, it appears that none of the 'established' plastic injection moulding machine manufacturers offer a retro fit or at least the manufacturers of the machines that we currently own i.e. Sandretto, Demag, Desma, Kawaguchi & MIR. However, some of the lesser known brands do offer this facility. Nevertheless, not all brands are the same and here we are comparing Mercedes with Dacia

http://www.ptonline.com/articles/making-older-hydraulic-injection-machines-more-energy-efficient

http://itoplas.com/en/products/injection

http://www.electrex.it/en/company/595-saving-energy-in-the-plastics-industry.html

Now looking at some of these sites there appears to be potential solutions to these problems. Is there anyone that has retro fitted kits to older machines to improve performance and in their experience does it give the projected return on investment.

COP21 and Me

Submission:

COP21 and its global targets while very noble are also very removed from daily life. It is impossible to relate to 2% reduction in Global Warming and 20 Billion dollars for less developed economies to meet their aggressive environmental challenges. How does the individual relate global targets to his or her daily life?

Pope Francis has said that the environment is ' a personal moral issue that we must all address'. How does one currently address this moral issue?. The most obvious way is to calculate your individual carbon footprint : the sum of your long haul, short haul flights, your annual car mileage and the amount of energy needed to heat and feed us. Having calculated this Footprint we are then encouraged to donate to non profit charitable organisations that then us the money collected to plant trees to compensate for the carbon we have consumed in our annual footprint.

For those of us of a certain age we will recall from history that this is exactly what Martin Luther objected to in the pre-reformation Catholic Church. By purchasing indulgences it was possible to wash your soul free of whatever sins you had committed. Luther argued strongly that personal morality demanded personal responsibility for one's actions and that is by direct action not financial contribution could one redeem one's soul.

By extension if the environment is a' personal moral issue' then we cannot absolve our failings by donating to just causes : it is only by direct action . What I would like from Cong is a direction and assistance how to relate the Noble vision of COP21 to my daily life and that of my family and immediate community.

Eamonn Murphy

University of Limerick

About Eamonn Murphy:

Professor (emeritus) Quality and Applied Statistics , Department of Mathematics, University of Limerick.
Director (independent) Irish Manufacturing Research (IMR) Chairman of the Research, Enterprise and Development Board of Limerick Institute of Technology .
Founder and Director of the Irish Centre for Business Excellence(ICBE)

Engaging Technology: Data to Excellence

Submission:

People love technology, and to engage with technology is to be human. The archaeological evidence of early human's use of tool fragments from the homes of our first human ancestors tells stories of family groups gathered together learning the skills required for survival. Small refinements and occasionally leaps in technology where made of a timescale that spanned centuries, most likely in response to environmental changes forcing adaptations to be made.

Today our love of Smart Electronic Technologies has made them ubiquitous, and the array of competing technologies is blistering, with companies all striving for pre-eminence in their sector. Technological refinements no longer take centuries or even decades, they can be implemented in months. Technological leaps also appear frequently, as do the prevalence of 'me too' or imitator technologies.

Unfortunately many of these 'new' technologies are also little more than an innovation in how the data is presented. The actions required for capturing value, such as; asset protection, water & energy optimisation and reducing total cost of operation often remain dependent on individual expertise. Often requiring data to be pooled together from multiple systems.

Group benchmarking and optimisation projects across multiple sites have enabled improvements in value capture, opening up individual site knowledge and sharing lessons learned across wider groups. The number of members in a knowledge group has increased, mainly through plant assessments reviewing operational data. Knowledge remaining key to converting data into value captured and often depended on the right people and data being manually linked together into an appropriate network of experts..

Over the past 2 decades NALCO Water Industry has passed through several epochs. Firstly; basic measuring and monitoring, then data logging and communication in the form of alarms. More recently data points have been presented in a simplified Dashboard formats. Up until relatively recently for us converting this data to knowledge that will problem solve and optimise asset life, water and energy use has similarly been dependent on individual knowledge of Utilities Engineers, Plant Operators working with our Sales and Service experts being pooled together into a network.

Such advances have enabled my company to identify and respond in real time issues such as; when de-aerators aren't operating correctly, condensate return has been contaminated and cooling tower blowdown is excessive. When coupled with advanced modelling software that calculates the optimal water chemistries for each individual system design and operation these are powerful tools for reducing Total Cost of Operation and protecting vital resources.

For example recently one of our customer in Ireland uses condensate from the Evaporators as feed water for the two 10 bar package boilers. Historically the condensate occasionally had upsets where some contaminated water was passed forward to the boilers. This caused scale formation on the level probes resulting in the boilers tripping out. As a precaution the TDS set point of the boilers was always set at a very low level typically 600 ppm.

Simon McLain

NALCO Water
An Ecolab Company

About Simon McLain:

Simon McLain is a District Manager at NALCO Water, a technology company that provides Total Water Management solutions to diverse range of Industries. With eighteen years' experience in Water related industries Simon now leads a Team of Technical Sales Representative and Equipment Engineers who serve the Irish Market.

Nalco suggested that dump valves be fitted onto the return lines which would dump condensate based on conductivity. This coupled with advanced modelling software the use of Nalco Nexguard chemistry has allowed the boiler TDS set point to be increased to 3500ppm resulting in significant water and energy savings.

Energy & Water Costs and Credits				
Blowdown Energy Cost	€/year	37,065	8,553	28,511
Blowdown Sewer Cost	€/year	4,670	1,078	3,592
Makeup Water Cost	€/year	2,802	2,299	503
Sub Total (Costs)	**€/year**	**44,536**	**11,930**	**32,606**
Returned Condensate Fuel (Credit)	€/year	-52,397	-50,158	-2,239
NET SAVINGS or (COSTS)	**€/year**	€/year		**30,367**
Calculated Cost of Steam*		14.17	13.81	0.36
NET CO_2 EMISSION SAVINGS (INCR)	fuel is #4, #5, or #6 fuel oil		metric ton CO2 / yr	**440**
NET WATER SAVINGS (INCR)			Million liters / yr	**4.2**
NET ENERGY SAVING (INCR)			GJ /yr	**6,026**

Excellence in the near future is about engaging the technology and networks of experts to not just react to out of spec. data or seek optimisations, but to connect multiple digital technologies and automatically take action to capture value.

The next Technological leap in enabling Excellence is the automated connectedness that is linking devices, with digital knowledge databases and people (from local site to boardroom). NALCO Water has recently partnered with Microsoft to produce technologies that capture data from multiple sources, uses knowledge database recommending actions to key personnel, and then automatically taking the corrective action that engages both people and technology.

For instance, the digital technology has now makes the water and energy nexus visible to the Boardroom where they can see the Cost of Operation Performance of each if their process systems online, benchmarking against each other and comparing to the optimised model.

It is now at the stage when if an out of specification condition is detected and cannot be corrected automatically, for example a failed probe resulting in excessive water or energy use. A work order for the probe's replacement will be automatically generated; the nearest service employee identified and assigned the work. Their equipment stock checked to ensure they have the appropriate replacement parts and orders placed to replace parts used then their visit to site scheduled. Eliminating the requirement for individuals to spend time manually manage each step in the chain, enabling them to focus on the value capturing activities.

The Excellence is engaging technology that automatically understands the challenge and automatically implements a fully connected response that involves technology and people. Excellence is giving a voice to the data.

The Internet of Intelligent Things – Intelligence at the Edge

Submission:

Mark Burkley

Individual homes and businesses can now viably produce as well as consume energy. The "Internet of Energy" or "Energy IoT" is an emerging vertical use case for Internet of Things (IoT) technology. A secure, intelligent gateway at the network edge will make each site capable of distilling valuable information from large volumes of measured data and bring economic and environmental benefit to prosumers – the new generation of producers and consumers.

Energy IoT and Prosumers

Excess produced energy is most commonly used to offset imported energy. It can also be sold back to the grid at a reduced rate if this is allowed by the electricity utility. A recent trend is that it can also be stored for later use or sale. Storage options have matured with products such as the Tesla Powerwall, as well as batteries from LG and other companies, available for purchase by domestic consumers. Energy can be produced by a variety of means including wind and solar PV but also through hybrid combined heat and power (CHP) energy systems. PV is probably the most viable domestic option and the cost of PV is consistently declining. Surprisingly, in cloud-covered Ireland we can average 2.4 hours of sunlight per day for PV generation. Micro CHP or domestic CHP units are now available too and make efficient use of heat energy that would otherwise be wasted. Producing electricity locally has of course several advantages such as elimination of transmission losses (the national grid consumes 30% of electricity produced in Ireland). It can lower the maximum import requirement which lowers monthly fixed tariffs. It lowers the overall peak demand from the grid when combined with smart infrastructure to participate in load shedding or load scheduling. When we consider that 10% of the cost of electricity supply infrastructure goes to providing the last 1% of electricity then this saving becomes significant. And finally, locally produced energy from renewable sources will of course also be greener and cheaper than utility generated energy from fossil fuels.

IoT advantages

IoT gateway technology at the edge, in a home our business, brings many new capabilities to both utilities and prosumers. IoT enables the analytics of more variables than ever before, including energy consumed by location, demography, business and occupation. Data can be analysed quickly and converted into "actionable insights" to offer competitive advantages.

IoT can provide real-time data streams for energy usage and excess capacity available. It can use this data to optimally manage which energy source electrical loads should use. It can schedule loads to use cheap electricity and, in a process referred to as load shedding, it can schedule loads to consume any excess electricity that is available. Using scalable IoT technology, this optimisation can be performed at a local or national level.

An intelligent IoT gateway at the edge provides horizontal integration by combining energy generation systems such as heating, solar or wind, which may be from different vendors. It enables the gathering of usage patterns, distribution of production and, where necessary, the control of pricing. It can use weather forecasts, and sunrise/sunset times as inputs into load scheduling. It can monitor and optimise battery charge cycles, charging when energy is cheap and discharging when expensive. It can provide real-

emutex
where software meets silicon

About Emutex:

Emutex is a leader in embedded software engineering and specialises in enabling embedded systems to connect customer solutions to the Internet of Things (IoT). Commonly referred to as the "intelligence in the edge", its core product is ubiworx™, an IoT gateway software framework that embedded systems use to bridge sensors and actuators at the edge to data storage and data analytics services in the cloud. Combining ubiworx with its professional services capability, Emutex works closely with its customers to build bespoke IoT solutions for remote monitoring and control applications in a variety of sectors including energy, environmental, industrial and vending.

time control inputs, including PID control, even if internet connectivity is unavailable. An IoT gateway can act as a bridge to combine multi-vendor generation and management systems that use a variety of protocols, providing translation from MODBUS, CAN, BACnet, ZigBee, LoRa, etc. It can aggregate and normalise data from many sources and act as a future proof interface to changing infrastructure. Limits and filters can be set on data inputs to generate alarms or to discard outliers. Most importantly, it can pre-process and filter data before transfer of information to management systems and users. IoT gateways transfer "information not data" as well as providing for remote device management, operations and maintenance via web interfaces and smart phone apps.

Smarter Systems with IoT

Smart grids spread the intelligence of energy distribution and control systems from some central core to peripheral systems. Smart energy meters have M2M or IoT connectivity and speak standard protocol such as M-Bus. Smart neighbourhoods are urban scenario with connected gateways. The key to success is the demonstration of the benefits that producers, consumers, and users can obtain from intelligent and efficient management of energy distribution. Advice can be available in real-time for optimising energy costs. Other benefits are to provide asset management and fault tolerance, control, demand management, system configuration and support and integration of distributed resources.

Security

Securing a meter against physical tampering with is very important. Securing a device connected to the internet is many times more important since an attack can come from anywhere in the world. Already we have seen several reports of smart meters and other connected devices being compromised. Attacking a connected device may be done simply to thwart billing systems or it may be more ominous. Several vulnerabilities have already been published in protocols such as M-Bus. Requests have been made for government oversight of IoT devices as networks of compromised devices may be used as attack vehicles themselves possibly even being used by political groups to inflict widespread outages or other damage. The best defence is to use a secure IoT gateway with a robust embedded operating system that supports strong encryption and is software-upgradeable. Security breaches that are infeasible today will become possible or even likely in the future so having secure, over-the-air upgrade capability is mandatory. Encryption of data-in-transmit and data-at-rest is vital to prevent tampering or unauthorised access to sensitive data. Use of strong, hardware based, client authentication is vital to prevent cloning. All of these require a capable IoT gateway at the edge to protect more vulnerable and less capable equipment behind it.

Distributed Energy Markets

A smart gateway can use real-time data to make decisions about the current "value" of units of electricity. For example, if the battery charge level is high and high winds are forecast or if it is early in the day and sun is forecast then the gateway could decide energy is cheap and can be sold at a low price. Or if the battery charge is low and the wind is calm and it is night time it might decide to buy at a higher price. Connected gateways could register live bids and asks at one or more energy exchange marketplaces. These marketplaces could then match buyer to sellers and balance demand on the grid and unit pricing in real-time. Units bought or sold become contracts to be delivered with a defined window (e.g. one hour). Installations without an IoT gateway would have to pay a fixed price for import and receive a fixed price for exported units. These fixed prices would naturally be less attractive than the dynamic pricing and so would encourage more and more installations to join the exchange. Utilities could also participate, offering for example, hydro power in winter time at a low price or fossil fuel driven energy at a

perpetually higher price. These exchanges would fully enable the concept of a smart grid and the rise of the prosumers will distribute the source of energy.

Conclusion

Intelligent edge gateway devices in an IoT network are a critical component to enabling the energy IoT. Intelligent gateways provide a multitude of key functions from data mining and analytics to fault monitoring to real-time load scheduling, all done securely and reliably. Going forward, gateways will also play a critical role in enabling intelligent energy systems and be an active component in the smart grid and decentralised production of electrical energy.

Could Ireland become Self Sufficient in Energy?

Submission:

Vincent Cleary

glenisk
for an organic Ireland

For many years, I've been intrigued by this question and I've come to the conclusion that yes, we could exist, survive and eventually thrive without imported fossil fuels. However, the disruption to our daily lives, and the burden on the exchequer would be too great to handle on our own; we would need help and a lot of it.

Help from whom? Europe! On the model whereby Ireland assists its off (habitable) shore islands with energy solutions, Europe could assist Ireland in its move to reduce GHG emissions to negligible levels, perhaps achieving a carbon neutral/positive environment.

Could we harness the power of ocean currents, namely the Gulf Stream, through mega-turbines – akin to old Mississippi Riverboat-style turbines, in reverse? Providing Ireland with a new inexhaustible source of clean energy? Naturally, studies would need to determine what implications, if any, such an initiative would have on the flow of Gulf Stream – we wouldn't want to trigger a new Ice Age.

Ireland should look to further developing its other natural resources, particularly wind resources, as we are the 3rd windiest country in the world (although the Scots might beg to differ). Ireland should engage all levels of society on a basis of inform, participate, reward – across communities. This could be accomplished with non-intrusive roof-fixed new design wind-powered turbines and/or solar panels. This initiative must also empower society – encouraging everyone to take ownership – a collective endeavor in the national interest. If required, special feed-in tariffs for private homeowners would encourage buy-in, if only for the duration of a return of their individual capital investment.

Could we look future-proofing our infrastructure by incorporating electricity into new roads to enable electric vehicles (large and small) to remain charged through passive exchange? Thereby enabling smaller batteries, lighter cars/HGVs because of the less battery to vehicle weight ratio?

Europe could enable Ireland establish a Research and Development facility for new technologies – a centre of excellence – that could constantly stream (unpatented – in the interests in serving all) innovations.

In essence, not only does Ireland need internal 'joined-up' thinking to commence but as does Europe need to equally step up to the plate and overcome its collection of Nations vying for their own selfish needs. This would be new and unchartered territory for 1 single Sovereign State but with the financial and intellectual focus that Ireland would need to draw upon from Europe in order for any such a project any chance of succeeding without damaging Exchequer Returns. Ireland in return, could be seen as a Global template for future self-sufficiency and ultimately help save the World.

How can energy storage be applied to industrial energy applications ?

Submission:

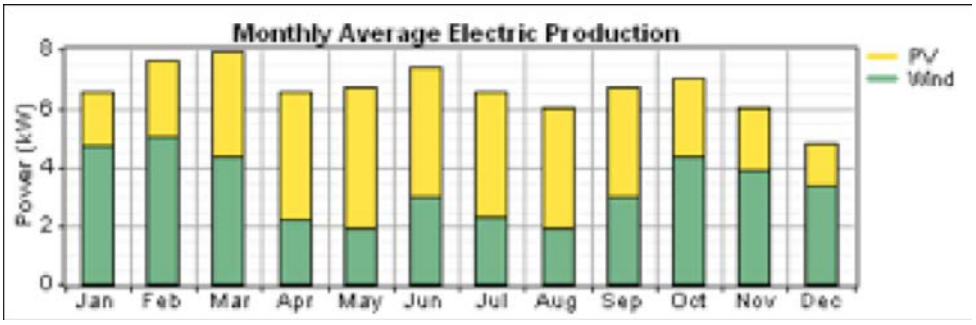
My topic today relates to the deployment of energy storage to industrial energy applications. Many industrial/enterprise facilities are rightly concerned with security of supply and the need to deploy renewables to decarbonise the overall enterprises carbon footprint. Since around 2007 I have been focused on a challenge, which is how can renewables be shaped with energy storage to deliver the type of quality power system that industrial consumers require.

The various forms of renewable energy generation have been rapidly declining in price to a point where they are at or less than the cost of conventional fossil generation. There now exists what I would consider a once in a generation opportunity to completely decarbonise electricity generation. The absence of any meaningful carbon tax and historically low fossil fuel prices distort this scenario somewhat but the overall trend is heading towards low cost reliable industrial power, particularly for embedded generation.

redT is commercialising a vanadium redox flow technology. This technology is suitable for long duration and constant cycling. It is quite unlike any other 'batteries' because it utilises the reduction and oxidation of the same material, meaning that charging and discharging can be virtually unlimited. The material never wears out. This long life aspect of the system and its robustness means that it is very useful for high duty cycling. We like to think of our system as an energy storage machine.

Other battery systems such as lithium ion and lead acid have specific applications. These can be used in combination with flow systems. redT is examining the application of these systems with super capacitors and other battery technologies to develop hybrid options.

Industrial energy consumers are concerned with cost. Some examples of this have been developed out and obviously exact costing depends on location, solar regime and wind regime. There is an interesting pattern of wind and solar in Ireland, see diagram below. What I have done here is run two generation series with wind and solar. What is interesting about this is that the PV generation increases when the wind is decreases.



Not completely a flat profile but using this method a 100% renewable system of

John Ward

redT energy storage

About John Ward:

John Ward has over 15 years experience as a director in the renewable energy sector. He is currently a non executive director of redT which he co-founded with camco clean energy in 2009. He is also the largest majority shareholder of redT through his investment vehicle alchemy projects . He is also the director and owner of three operational wind farms in Ireland and was previously director and co-owner of the 38 MW Sorne Hill windfarm. In each case, John designed, financed and developed/ operates the facilities.

Although now focused on energy storage, John has previously advised on the development of approx. 200 MW of new wind capacity in Ireland, and a number of solar energy facilities in Africa. Arising from this extensive operational experience in the wind and solar sector, he identified the need for a robust energy storage technology, which would deliver an entirely renewable energy system.

He holds a degree in Applied Science from University College Dublin and a Masters Degree in Landscape Architecture from UCD.

John joined the board of redT as a Non-Executive Director in February 2016.

embedded generation could be designed, with storage smoothing out intra day fluctuations in wind/PV.

redT is installing entirely renewable systems in South Africa. These systems will entirely displace the existing expensive diesel generation. The overall long term cost of energy is approx.. half the cost of diesel with no emissions.

So sometimes I have to remind myself of the statement above. There is now a long term renewable power system which is fully recyclable, creates no waste and lasts for over 25 years. It is half the cost of diesel powered generation and for embedded generators I would estimate that is around 25% cheaper than grid power, perhaps less. In addition, you also get a large backup power source. No need to backup generators.

Think about it. It really is quite something.

We have partnered with Jabil (NYSE:JBL) to manufacture our systems for us, which allows us to concentrate on the development and marketing of our technology.

With their assistance we have developed our supply chain, and created a series of modular factory tested units which can be deployed rapidly. Using Jabil's expertise in manufacturing has enabled our designers to develop a system with them which can be broken down into sub assemblies, so we can quickly set up facilities wherever there is demand and produce systems in volume within a very quick timeframe.

All these benefits are great but what our customers really want is something at a competitive cost. We are continually improving the technology and as a result we now have a product offering which is technically adapted but at a competitive cost and manufactured to the highest international standards.

The opportunities for industrial energy consumers to entirely hedge their energy costs is now well within the current time horizon.

The Role of Dynamic Energy Storage in Facilitating Further Renewable Generation onto the Grid.

Submission:

Frank Burke

SCHMUNGRAD

Ireland is an island with limited interconnection and we already have high levels of renewable generation so EirGrid is experiencing issues now which other Grids will only face in a few years' time. Significant further renewable generation on the grid will be required so that Ireland can meet its renewable energy targets in 2020. There is a limit to the amount of non-synchronous intermittent generation which EirGrid can accept onto the grid at any one time while still maintaining grid stability.

Most people are aware that renewable generation is intermittent and/or unpredictable in its output. Energy storage over several hours can be used to mitigate this problem i.e. store the output of wind or solar PV at times when it is particularly windy or sunny and then feed it back into the grid at times of low wind or sun and/or times of high demand. However, there is another problem of grid stability of which most people are not aware.

Up till now, conventional plant with heavy generators and heavy steam turbines, which were synchronised to the grid, had sufficient momentum to stabilise the grid – to ride through the bumps. The more wind and PV running, the less heavy conventional plant there is to provide stability. One solution for EirGrid is to bring on more conventional plants and run them at minimum output just so that they are there to provide stability to the grid by being ready to inject power rapidly onto the grid if that is required e.g. if another large generator trips. However these additional generators running at minimum output just to stabilise the grid, displace renewable generation. Curtailment of wind is already an issue and will increase at a faster rate as more and more (non-synchronous) renewable generation is connected.

The solution is to have plant which can inject power rapidly onto the grid when required without having to continuously produce energy. Dynamic energy storage such as flywheels and batteries will do this, providing synthetic inertia and other system services to provide grid stability. The flywheels use energy from the grid to speed up and store this energy ready to inject it back to the grid if it is required. Similarly the batteries use energy from the grid to charge them and hold this charge ready for use when required.

The vision for the future is a very high percentage of renewable generation so there will be very little conventional heavy plant on the grid to provide stability. Hence there will be a need for investment in new dynamic storage plant to provide the stability. This has been recognised by CER which accepts that annual payments for system services can increase from the current €60m to, potentially, €235m by 2020. It has also suggested that connections for such plant be facilitated. A new market for system services is being driven by EirGrid through its DS3 (Delivering a Safe Secure System) program. It is proposed to have an auction in H1 2018 for long term contracts (up to 15 years) for new plant. If the required plant is to be built, it is important that these auctions go ahead in 2018 and that the contracts include long term price certainty. Without that, funding will be extremely difficult, the plants will not be built and the grid will not be able to accommodate the level of renewables required to meet Ireland's renewable energy targets in 2020, 2030, 2050.

Examples of Compliance Organisations with an focus on the Environment

Submission:

Brendan Tumilty

TRUFORM

Independent Organisations that point the way, promote and support sustainability in the industrial world in the interest of our environment

(1) Global Reporting Initiative (GRI) is an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as:

- **climate change**
- **human rights**
- **corruption**

GRI's Vision is to create a future where sustainability is integrated to every organization's decision making plan.

GRI's Mission is to empower decision makers everywhere, to take action towards a more sustainable economy and world.

(2) The UN Global Compact is the world's largest corporate sustainability initiative. It is a call to companies to align strategies and operations with universal principles on:

- **Human rights**
- **Labour**
- **Environment**
- **Anti-corruption**

And a further call to take actions that advance societal goals around these issues where the need arises.

UN Global Compact sets out 10 Principles seeking commitment through CEO's to implement universal sustainability principles and to take steps to support UN goals.

(3) Sedex is a global organisation dedicated to driving "improvements in responsible and ethical business practices" in global supply chains.

It helps us to reduce risk, protect our company reputation and improve supply chain practices. Members endorse and adopt principles under the following headings:

- **Labour Standards**
- **Health & Safety**
- **The Environment**
- **Business Practises**

A key goal, for example, is to drive improvements in the ethical performance of global supply chain.

(4) Carbon Disclosure Project (CDP)

Works to transform the way the world does business to prevent dangerous climate change and protect our natural resources.

Members contribute by reducing carbon footprint and staying more environmentally aware.

Members believe in:

- **Preventing dangerous climate change**
- **Protecting our natural resources**
- **To minimise environmental risk**

How Wind Energy can help Decarbonise our Generation

Submission:

We are living in interesting times, and are lucky enough to be part of the biggest global energy transformation since the industrial revolution. Sadly the driver for this is climate change and the devastating effects it is and will continue to have on the human inhabitants of our planet. As a result of COP21 over 190 countries have agreed to limit temperature rise due to climate change to less than 2 degrees, with a goal of 1.5 degrees above pre-industrial levels, primarily through a move away from fossil fuels. The science is definitive, the debate is over, and the world has decided to decarbonise. Our only choice is to lead or lag in this revolution and now as we look towards setting our EU 2030 renewable energy targets it is time to decide how ambitious and innovative Ireland should be. We need to identify our energy strengths and play to them. Why do we import 85% of Ireland's energy needs and only produce 15% domestically when we are surrounded by a resource that could move us towards energy independence?

The push to decarbonise the world's energy generation has not been led by governments or policy makers, but by citizens and businesses. These citizens are the consumers that our manufacturing depends on, and their choices are increasingly leaning towards sustainably produced products. Cost efficient green energy is simply good for business. This is not lost on our leading companies, and we have seen Irish and world leading companies with Irish operations become early adopters of renewable energy, looking beyond Irelands EU RES-E target of 40% of electricity generation by 2020, and setting their own target of powering their business from 100% renewable energy in order to provide leadership, manage costs and meet their customers' expectations.

There are two main ways to contribute to the decarbonisation and the sustainability of Manufacturing in Ireland. There are opportunities for companies to produce their own electricity on site, known as Autoproduction, with companies such as Munster Joinery, DePuy Synthes Johnson & Johnson, Astellas, and Country Crest Foods choosing on site generation, including wind turbines, to ensure a sustainable and cost effective solution to their energy needs. The other main routes to decarbonisation is through ensuring that the electricity you are purchasing is from renewable energy, for example IKEA choosing to own a wind farm in Co. Leitrim, and Facebook contracting with Brookfield Renewables, a renewable energy company producing electricity from clean renewable wind energy.

So why should Irish manufacturing embrace renewable wind energy? Numerous studies including Vayu's 2015 Annual Energy Report reinforces the fact that wind energy reduces the wholesale price of electricity. This sometimes surprises people who have consistently been fed a narrative of renewable energy costing us additional money, but it follows the logic of supply and demand. Our electricity demand, and indeed our heat demand is highest in winter, when wind energy delivers its highest production. Since this wind energy increases the supply of electricity, it also reduces the wholesale price and insulates us from input fuel price rises we would otherwise see carrying through to the wholesale electricity prices. As the world decarbonises and we move away from fossil fuels this hedge against fuel prices, EU fines, and carbon taxes through the use of renewables will become increasingly important.

Brendan Heneghan

IWEA
Irish Wind Energy Association

About Brendan Heneghan:

Brendan is the interim CEO of the Irish Wind Energy Association (IWEA). IWEA is committed to the promotion of wind energy in Ireland and beyond as an economically viable and environmentally sound alternative to fossil fuel generation. He has been involved in wind energy since 2003, when he joined ESBI, having previously worked for CRH across various group companies and countries. In 2006 he joined Wind Prospect Ireland, and became a Director of Wind Prospect Ireland in 2011. Brendan is a Chartered Engineer and during his thirteen years in the renewable energy industry has project managed the pre-construction and construction of numerous wind farms throughout Ireland, has worked on wind farm projects in Scotland and Wales, and has provided technical support to a number of international wind energy projects.

So how much wind and renewable energy can we incorporate? This year we will generate 25% of our electricity from renewable energy, primarily wind energy. At any given point in time EirGrid can presently incorporate up to 55% renewable electricity on our national grid, and this is set to increase to 60% later this year, and up to 75% within the next few years. We are international leaders in incorporating these levels of renewables on our electricity system, and the solutions we already have can be used to help other countries along their decarbonisation path. By 2020 we have a target to generate at least 40% of our electricity from renewable energy sources if we are to avoid EU fines and we have sufficient consented wind energy projects with grid connection offers to achieve this. Overall across electricity, heat and transport we need to use at least 16% renewable energy by 2020 to meet our RES target and avoid EU fines. Each percentage point shortfall from target will result in fines of between €60 million and €140 million (SEAI estimate), so it would be advisable to aim for a higher level of renewable electricity to balance potential shortfalls in our heat and transport targets. A RES-E target of 53% renewable electricity by 2020 would be an excellent insurance policy against other technologies and sectors failing to deliver on our 2020 RES targets.

And what about continuing to embrace and support the communities who host renewable energy projects? Irish communities have been successfully living near wind farms since 1992 and we have over 220 windfarms in Ireland today. An IPSOS MRBI pole earlier this year showed 70% of people in favour of wind energy, with only 10% opposed. An Irish Independent survey published this month shows that over 86% of respondents support the rollout of more renewables even if they have an impact on the landscape. Wind energy alone has created over 330 direct jobs per year for the past three years and this rate of job creation is set to continue with a further 1,100 direct jobs being created between now and 2020. In good news for rural Ireland not only are the projects rooted in rural Ireland and support rural communities throughout Ireland, but so are many of the jobs that have been created in an industry, while in parallel reducing the wholesale price of electricity for all electricity consumers.

So why onshore wind energy and what else should we consider? As we transform our energy generation from reliance on imported fossil fuels which have such negative effects on our climate and our security of supply, to clean abundant renewable energy we need to look at a range of technologies and supporting technologies. Technologies to support renewable energy include interconnection to Britain and European energy grids, a range of energy storage solutions, and smart demand side management. All of these will feature in Ireland's energy infrastructure in the years ahead. Other forms of renewable energy are not yet as cost effective as onshore wind energy, but like wind energy the costs are reducing as technology improves and they will also feature to a smaller degree in Ireland in the years to come.

And what should Irish manufacturers be looking to our government, policy makers, and energy regulators to deliver on in the years to come? Renewable energy can present a golden opportunity for the Irish manufacturing industry.

- In order to ensure the most cost efficient production of electricity, and hence lower cost energy and increased competitiveness for our leading manufacturers, we need to ensure a level playing field for wind and renewables when compared to other types of electricity generation. We should request that our government does not persist with a tripling of local authority rates on renewable energy projects, or a five-fold increase in local authority contributions for renewable energy developments, and, if we are permitted to use the latest and most efficient

generating technologies, then Ireland can benefit from low cost electricity produced from our own natural renewable resources rather than relying on fossil fuels.

- Our regulator needs to ensure the Integrated Single Electricity Market allows renewables to trade effectively in the market, and ensure we have a connection policy that allows wind energy projects to connect to our grid in a timely fashion, and not wait over nine years and counting for a grid connection offer.
- Manufacturers should be pushing policy makers for increased opportunities for sustainability, including simplifying process in relation to both Autoproduction and auditable purchasing of renewable energy (e.g. Guarantees of Origin).

The words JFK delivered in his memorable address to the houses of the Oireachtas during his visit to Ireland were truly inspiring and apply equally to our transformation to renewable energy as they did when first spoken by him about peace and freedom in 1963 “I believe profoundly in the future of Ireland, that this is an isle of destiny, that that destiny will be glorious, and that when our hour has come we will have something to give to the world, my friends Ireland’s hour has come”.

IoT and Taming the Energy Beast.

About Normal Crowley:

Norman Crowley

Norman is the founder of The Cloud, Europe's largest wifi operator, which he sold to Rupert Murdoch's BSkyB in 2011. At the age of 26, Norman founded Trinity Commerce, one of the first e-commerce services companies in the world, which soon grew to cover five countries and employ 150 people. In 2001, he co-founded Inspired Gaming Group, turning it into the world's largest player in Server Based Gaming (SBG) by 2005, floating it on the London Stock Exchange in 2006 and selling it to a PE group two years later. Crowley Carbon, his most recent company, was founded with the vision of being a major player in the global energy efficiency market. It has developed and patented a range of technologies that reduce energy use in everything from industrial chillers and large motors to high efficiency heat exchangers. The company has established a foundation and is developing a Centre for Climate Change, due to open this year, in Powerscourt, County Wicklow, where adults, children and corporates can learn more about climate change and methods of reducing greenhouse gases.

CROWLEY CARBON

COOLING THE PLANET

Avoiding common pitfalls on the road to achieving Leadership in Sustainability.

Synopsis:

Leadership companies are seen as those that align their sustainability strategies and their internal culture and values. To deliver real organisational value, sustainability programmes must have senior management buy in and address longer term behavioural change in an organisation.

Despite the difference across sites and sectors there are a number of common pitfalls that arise time and again including:

- Achieving genuine Senior Management leadership
- Avoiding the Data Management Land Grab.
- Addressing long term behavioural change issues
- A focus on adhoc projects and short term goals in the absence of long term strategy or programmes

At Central Solutions we are deeply involved in supporting many of Irelands leading organisations in achieving leadership in sustainability through our direct client work and through running a number of flagship national programmes like the EPA Large Water Users CoP and National Lean Water and Energy Skillnet.

Paul Conheady

Central Solutions

About Central Solutions:

Our expertise is in designing and delivering world class solutions for our clients that deliver optimum efficiencies and drive transformational change.

We help our customers achieve operational excellence through the delivery of innovative programmes that apply lean methodologies and focus on international standards. We work with large private sector companies and public sector organisations across 3 main areas:-

- Enterprise Solutions
- Sustainability Programmes
- Online Training

Have you considered the Accelerated Capital Allowance for your next energy efficient equipment purchase?

James Kennedy

MAZARS

Energy is a critical input into the production and consumption patterns that support economic and social wellbeing. However, many forms of energy use contribute to the environmental and climate challenges societies face today. Taxation is a key tool by which governments can influence energy use to contain its environmental impacts – OECD (1).

Having first been introduced in Finance Act 2008 and extended until the end of 2017, the Accelerated Capital Allowance (ACA) is a tax incentive which aims to encourage companies to invest in energy saving technology. In effect, the scheme allows businesses seeking to reduce energy costs by investing in energy efficient equipment to benefit through the tax incentive. With this in mind, it is important to note that the equipment must be included in the list of energy-efficient equipment approved by the Minister for Communications, Energy and Natural Resources in order to qualify under the scheme.

So what does this mean? Basically, the ACA allows companies to write off 100% of the purchase value of qualifying energy efficient equipment against their profit in the year of purchase (2). In comparison, the wear and tear allowances for machinery or plant, which are generally given over an eight year period at an annual rate of 12.5% of the capital expenditure incurred. However, this scheme is only available to companies which incur expenditure on approved energy-efficient equipment for use in their trade and the equipment must be owned by the company. Equipment that is leased, let or hired will not qualify for the allowance (3).

The ACA, as detailed in the Finance Act, covers 10 different equipment categories and 52 associated technologies, which can be found on the Sustainable Energy Authority of Ireland (SEAI) website (4). Fundamentally, the goal of the scheme is to encourage businesses to purchase plant and machinery that is highly energy efficient and thus make significant savings on energy costs and reduce carbon emissions. It is estimated that up to 85% of any company's equipment procurement needs can be sourced through the ACA list of highly energy efficient products (5).

In summary, the ACA benefits a company by increasing its cash flow and by reducing both its Tax liability and energy costs. In parallel, this incentive allows a company to align to the SEAI's mission to transform Ireland into a society based on sustainable energy structures, technologies and practices

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Use of Energy Test Beds in Promoting Best Energy Management Practice.

Submission:

Benefits of the Test-beds for Industry

Test-beds are a strategic resource for Cork Institute of Technology (CIT) from which it can develop new, industry-focused research which in turn informs new curricula across the Faculty of Engineering and Science. Specific benefits for industry include:

- Access to diverse expertise at Cork Institute of Technology (CIT) from various engineering and ICT disciplines
- Facilities allow the trialing of new technologies in partnership with private industry and other academic institutions in close to "real-world" operating environment
- Generation of independent performance data for analysis by researchers
- Potential for collaboration with companies in the energy sector through linked projects and as a gateway to funding from national and EU sources

National Sustainable Energy Test-bed (NSBET)

The National Sustainable Energy Test-bed (NSBET) is located at the Nimbus Centre in CIT and is part of Litmus which is a public facility that develops, tests, trials and demonstrates applications, products and services. It includes three test-bed areas: Energy; Water and Community. Nimbus houses a wide range of expertise in the field of embedded systems (providing business-oriented teams with enormous technical and research experience capability) and has an open floor plan which is ideal for retrofitting power management systems and deployment of smart energy solutions.

National and international industries avail of the world class equipment and a Nimbus support team to carry out research and development in both real-life and controlled environments. The test-bed is also available to other higher education institutes and researchers through European Commission funded research projects. This facility is a whole-building 'energy and power management technology demonstrator' scalable to a district or campus level. It is available to national and international commercial entities within the energy space as an enabler to trial R&D work, particularly within the areas of demand side management, and issues concerning intermittency. Several companies have worked on the test-bed to date and have had positive experiences with the world-class equipment and the support provided by Nimbus staff.

Key technologies that form the foundation of the development of this test-bed include:

- Building demand-side energy management
- Building supply-side (micro-grid) energy management

Matt Cotterell

CIT CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

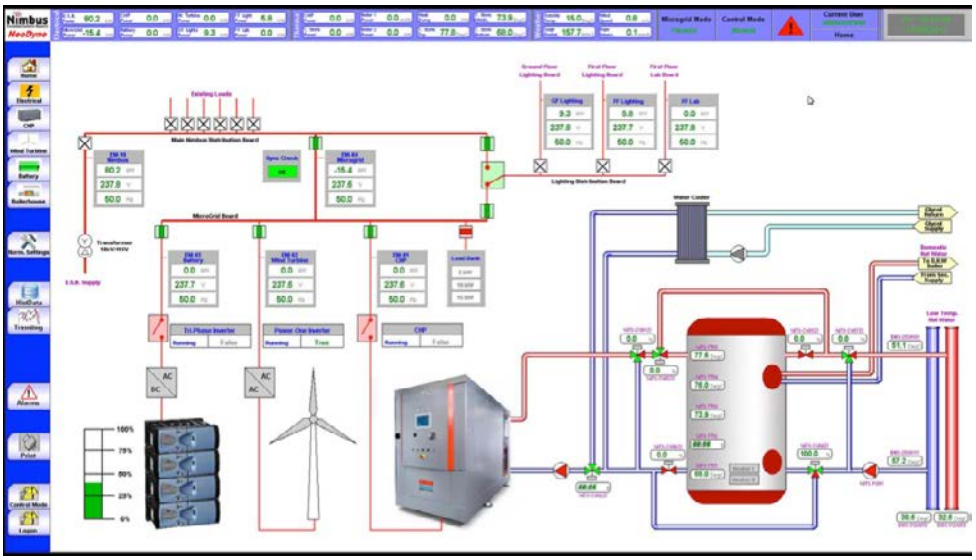
Synopsis:

Energy test-beds are a strategic resource for Cork Institute of Technology (CIT) from which it can develop new, industry-focused research which in turn informs new curricula. Specific industry benefits include:

- Access to diverse expertise at Cork Institute of Technology (CIT) from various engineering and ICT disciplines
- Trialing of new technologies in partnership with private industry and other academic institutions in close to "real-world" operating environment
- Generation of independent perfor mance data
- Potential for collaboration with companies in the energy sec tor through linked projects and as a gateway to funding from na tional and EU sources
- Overcome systems connectivity and data exchange challenges

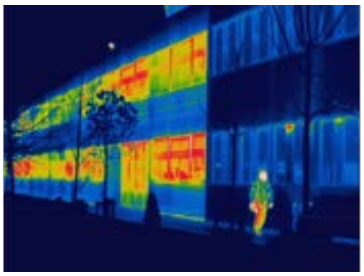
- Building energy diagnostics
- Pervasive wireless sensing for low energy buildings
- Micro-grid power electronics and power control.

Each of these sub-topics has a strong demonstration component. This smart energy test-bed provides the capability to demonstrate and capture relevant data.



The energy micro-grid comprises multiple non-dispatchable and dispatchable renewable energy sources and energy storage, integrated with existing HVAC and building management systems. Non-dispatchable sources are renewable energy generators which produce energy in an unpredictable and variable manner e.g. wind turbines, wave energy or photovoltaic panels (PV). Use of non-dispatchable sources leads to savings in energy costs and a reduction in the overall use of energy from non-renewable sources. Dispatchable sources are energy generators which may be switched on or off when required. Examples of these are diesel generators or combined heat and power (CHP) plants.

National Building Energy Retrofit Test-bed (NBERT)



The NBERT is located in the Zero2020 refurbished section of the 1974 building at CIT. The NBERT hosts lecturers, researchers, industry consultants, and visiting academics. The test-bed consists of a state of the art interior where occupants partake in a "living lab" environment for research studies into human dependent topics such as thermal comfort and demand side management.

The NBERT interior utilises a range of building monitoring/control technologies:

- Zonal air temperature and RH remote sensing
- Variable perforated shading
- Automatic window opening control
- Automatic lighting control
- Passive cooling and ventilation

Takeaways:

- Inspire the upcoming generation about climate change and sustain able development
- "Show me the Data" : Energy Apps can motivate individuals and enterprises to improve their en ergy performance metrics in the same way as fitness Apps
- Publicise best practice in various sectors
- Highlight the career opportuni ties/role models in the sector and the impact they have locally and globally

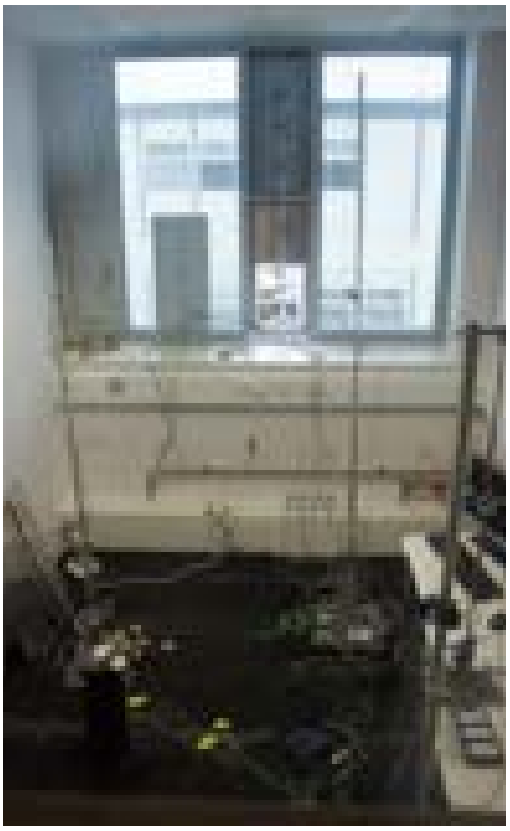
About Matthew Cottrell:

Matthew Cotterell is Head of the School of Mechanical, Electrical and Process Engineering in Cork Institute of Technology (CIT). He obtained bachelor, masters and doctoral de-grees in mechanical engineering from UCD. The School offers a wide range of programmes at craft, technician and engineer level and is also active in research across a wide range of disciplines. A unique feature of the School is it's innovation ecosystem that encourages students to develop and evaluate ideas into prototype products/systems and to evaluate them in terms of performance, com-mercial potential and sustainability. The Sustainable Energy Engineering honours degree programme in CIT produced it's first graduate cohort in 2010 and is accredited by the Energy Institute. The programme team has developed strong links with industry through undergraduate/graduate placement and collaborative project work. Graduates of the programme have gained employment across a wide range of organisations and are now leading and implementing projects in energy management and new technology appraisal/introduc-tion. CIT has developed a number of energy test-beds that demonstrate best practice in energy management; modelling and analysis of the data generated is the focus of a number of doctoral level research projects across the School.

Matthew was the founding manager Centre for Advanced Manufacturing & Management Systems (CAMMS) in CIT which offers a comprehensive range

The NBERT micro-grid is a photovoltaic, wind turbine and battery integrated power system. The virtual smart grid comprises the national grid, NBERT building, NBERT micro-grid and the CIT main campus building. The micro-grid powers the Zero2020 building area while also exporting power to the national grid. The micro-grid comprises:

- 24kWp PV System (static)
- 5kWp PV System (dynamic tracking)
- 5kWp Wind Turbine
- 1350Ah Lead Acid Battery.
- Grid tie inverter.



Future Outlook

Plans are underway to expand the existing test-beds from building-level to campus-level in conjunction with partner companies. This will incorporate self-contained student accommodation, a large health and leisure facility where there is a CHP plant in operation and a further 300kW CHP within the Institute. When the campus level project has been implemented the focus will move to expanding further to a district level resource. This presents many challenges in terms of systems connectivity, data exchange and data visualization.
The capabilities of OPC client-server technology are used to develop an open system that will allow controlled access to system performance data.

of training and professional development programmes to industry. His research interests include the modelling and optimisation of manufacturing processes. He is Hon. Secretary and Past Chair of the Irish Manufacturing Council (IMC) that organises the International Manufacturing Conference held annually in Ireland since 1984. The Conference is hosted each year by a third level college in Ireland (both north and south). Energy issues relating to manufacturing have featured strongly at the Conference in recent years.

Contacting Matthew Cottrell:

Websites www.cit.ie http://nimbus.cit.ie/ http://ctc-cork.ie/ http://messo.cit.ie/

Facebook https://www.facebook.com/myCIT

Twitter https://twitter.com/CIT_ie

LinkedIn https://www.linkedin.com/company/cork-institute-of-technology

YouTube https://www.youtube.com/c/mycit

About CIT:

CIT currently has in the region of 14,000 registered students with over 2,500 new entries year on year. Of these approximately 7,000 are full-time and the remaining are part-time. The main campus is in Bishopstown, while the Crawford College of Art and Design and the CIT Cork School of Music are located in the city centre. The National Maritime College of Ireland in Ringaskiddy is a constituent college of CIT and is a purpose-built facility operated under the public-private partnership model; the public partners being CIT and the Irish Naval Service (INS) and the private partner is Focus Education.

The Faculty of Engineering and Science supports best practice in the energy sector through its education and research programmes. It offers a wide range of programmes at craft, technician and engineer level and is also active in research across a wide range of disciplines. A unique feature

is the innovation ecosystem that encourages students to develop and evaluate ideas into prototype products/systems and to evaluate them in terms of performance, commercial potential and sustainability. The Sustainable Energy Engineering honours degree programme in CIT produced it's first graduate cohort in 2010 and is accredited by the Energy Institute. The programme team has developed strong links with industry through undergraduate/graduate placement and collaborative project work. Graduates of the programme have gained employment across a wide range of organisations and are now leading and implementing projects in energy management and new technology appraisal/introduction. CIT has developed a number of energy test-beds that demonstrate best practice in energy management; modelling and analysis of the data generated is the focus of a number of doctoral level research projects across the School.

The Nimbus Centre at CIT is Ireland's largest research centre devoted to embedded electronic systems and the 'Internet of Things'. Nimbus provides space for over 80 researchers and also manages the National Sustainable Building Energy Test-bed (NSBET); this facility is a whole-building 'energy and power management technology demonstrator' which is scalable to a district or campus level.

The Clean Technology Centre (CTC) at Cork Institute of Technology has been providing innovative and effective resource efficiency solutions since 1992. CTC is widely accepted as the leading waste-prevention focused body in Ireland. CTC has a proven track record in promoting and delivering best practice in environmental protection and resource efficiency (materials, energy and water) to a wide range of public and private organisations.

Why Industry needs Smart Energy Citizens.

Submission:

"We cannot solve our problems with the same thinking we used when we created them."

Albert Einstein

The climate change crisis that we now face is a direct result of the enormous amounts of fossil fuels we choose to burn on a daily basis. If we are to have any impact on the human activities that are causing the climate to change, we must first change our thinking.

This essentially means abandoning our ingrained dependence on fossil fuels, which has evolved over many human generations. The developed world is designed, built, and engineered to run on a cheap, readily available supply of the primary fossil fuels: coal, peat, oil, and gas. So its not just our thinking that needs changing, it is also every piece of engineering that relies on fossil fuels, from power stations to manufacturing plant and machinery to transport and home heating. But there's another reality. While there are some fantastic emerging technological innovations in the field of energy efficiency and renewable energy production, one simple fact remains; the decisions people take will save energy more quickly than technology can.

Today you cannot buy a car, a washing machine, or new window for your home, or even a light bulb etc without knowing the carbon-emissions effect of its production, use, and demise. A whole new language has emerged worldwide to describe how we need to reduce our dependence on fossil fuels to meet globally agreed carbon-reduction targets. The baseline statistics and target efficiencies may vary from country to country, but the overriding need for carbon-emissions reductions and fossil fuel energy savings is the same.

Climate change policy has silently embedded itself in legislation worldwide, and its not just industry, but every individual needs to quickly come up to speed with these developments because the price for not doing so will be detrimental to our very existence.

As an energy auditor, I have visited numerous industrial buildings over the last few years. I have visited Factories with diverse and distinct manufacturing processes, factories with small and large energy teams, factories with best practice in terms of international environmental energy standards and factories that have achieved a wide range of energy savings across their facilities.

However the most successful factories in terms of energy savings and achieving energy efficiencies all have one thing in common. That one thing is not the technology because that varies, its not international standards because they can often be a box ticking event, nor is it training because this always varies, neither is it the size of the energy team nor the size of the management budget. Equally it's not necessarily the astute business owner, the incisive director, the team leading manager or the dedicated employee. Though it's usually one of these.

It's the individual, who may rank anywhere in the company, who has the passion and commitment to deliver change. In other words, what they have in common is a smart energy citizen.

Paul O'Reilly

ORS

About Paul O'Reilly:

Paul O'Reilly is an award-winning entrepreneur, speaker and energy consultant with over 25 years experience advising both public and private sector organizations on energy saving matters in the built environment.

Paul is a founding member of ORS, an internationally acclaimed project management and consulting engineering company. The company specialises in delivering sustainable engineering services. Paul is currently advising clients on sustainable issues particularly with regard to energy efficiency, including interpreting government and EU legislation and advising clients on financial models and green funding opportunities including the use of energy performance contracting (EPC) for the delivery of energy efficiency projects.

Paul is an experienced sustainability engineer and has written many articles on energy conservation, sustainability and renewable energy generation and recently published a book "The Smart Energy Citizen's Guide to Save Energy…".

While the goal may be to reduce our dependence on fossil fuels, the solution, if there is to be one, must firstly involve creating a new respect for energy and the part it plays in our lives. As the best philosophers tell us ‘energy follows thinking’ so if we don’t change our thinking we are destined to destroy our world. We all need to think differently.

A Data Centre Energy Crisis or a Rebirth of Cool

Submission:

The Impending Crisis

Data centres are now the fastest-growing energy consumer group worldwide. Estimates put last year's total world energy consumption by data centres at 416.2 terawatt-hours (that's edging towards half a trillion kilowatt-hours). Here are some facts to put this into perspective;

-This is significantly higher than the UK's total energy consumption (about 300 terawatt-hours)

-It translates to on average almost 50 gigawatts of power being consumed 24/7. This is over twice the peak power produced by the Three Gorges Dam in China. Alternatively, you would need over 100 combined-cycle power stations, like the Poolbeg Generating Station in Dublin (Ireland's highest capacity power station) to meet this demand.

-U.S. data centres consume about 90 terawatt-hours annually, the equivalent energy use of about 6.5 million average American homes.

-Currently, data centres are consuming about 2-3% of the worlds global electricity supply and producing 2% of the world's greenhouse gas emissions.

-Data centres now have higher carbon emissions than the aviation industry.

-In Ireland, a conservative estimate is that there is currently about 311 megawatts of data centre load on the Irish Grid on a 24/7 basis. This is equivalent to 7% of current winter peak load and 8.6% of summer load.

Problematically, the world's total energy consumption by data centres is projected to triple in the next decade, despite innovations targeted at making them operate more efficiently. For Ireland, EirGrid expect an additional 1gigawatt of data-centre base load by 2020. That's more than the output of Ireland's two highest capacity power plants combined.

Interestingly, big web-scale data center operators like Microsoft, Facebook, Google, who tend to run very efficient data centers, only comprise a small fraction of the world's total data centre energy footprint. The brunt of the consumption is by much smaller data centres; mid-size enterprise data center, local government IT facility, university IT department etc.

Analysts say that the rate of data centre growth with associated escalation in energy demand is simply not sustainable beyond the next 10 to 15 years. Clearly we have a big and growing problem and some suggest that the only long-term solution will have to involve major cuts to our internet use in the future. Either that or switch to a black &

Tony Robinson

Trinity College
The University of Dublin

Synopsis:

Data centres are the fastest-growing energy consumer group worldwide. The total energy consumption by data centres was 416.2 terawatt-hours last year. It is not the Google and Facebook server farms that are the main source of the problem; it is the numerous small data centres scattered around the globe. These are typically very inefficient, especially when it comes to the cooling of the servers, which accounts for about half of the energy consumption. Focus on improved air handling is the first step towards mitigating the impending energy crisis. New concepts, like Open Bath Immersion, can cut energy consumption by half.

Takeaways:

- Smaller data centres consume the lion's share of the energy con sumed by the data centre industry as a whole because they are so numerous and are generally run very inefficiently, mostly due to poor air handling, and this is lead ing towards an energy consump tion crisis
- Immediate steps must be taken to mitigate the escalation of small data centre energy consumption

white internet. I do not think any of us want that, so the question is 'what are we going to do about it'?

The Rebirth of Cool

Fact: About half of the energy consumed by data centres is used to cool the servers.

The smaller data centres consume the lion's share of the energy consumed by the data centre industry as a whole. As it turns out, these data centres are the ones with the most inefficient cooling systems. The main culprit? –overcooling. Refrigerated air is the coolant fluid used to keep servers cool. Smaller data centres tend to lack control systems that can manage air temperature and airflows. Therefore, since reliability supersedes efficiency, the air cooling system is run at full capacity full time; this is termed redundancy. Flooding the entire data centre with cold air is also a brute force method used to deal with hot spots; servers that run hotter than others. Of course this is wasteful since the rest of the servers are running unnecessarily cold.

A necessary first step towards slowing the rate at which data centre electrical energy consumption is escalating is simple: improve the cooling system of the smaller data centres. Simple fixes such as ensuring proper air routing (about 40% of the air can bypass the servers), installing control systems and ensuring that the hot exhaust air doesn't mix with the cold supply air are straight forward and incredibly effective. For example, Future Resource Engineering focused on improvements to the cooling system of 40 data centres and projected savings of 24 million kWh total.

Air is of course a terribly ineffective coolant fluid. Can we get rid of air and with it the power hungry CRACs, air handlers or hot/cold aisles?

The answer is yes.

Open Bath Immersion (OBI) technologies are now being researched whereby the servers are completely immersed in a low boiling point dielectric fluid. With a little bit of engineering on the integrated heat spreader (IHS) and surface morphology, boiling directly on the surface of the IHS can offer more than sufficient cooling of the server CPUs/GPUs etc. The vapour that is generated is simply condensed by room temperature water being pumped through tubes which sit above the liquid free surface. Thus, the only energy cost is for running a pump and a fan, which is almost negligible. This simple yet effective technology has the potential of cutting data centre electricity consumption in half. A prototype boiling OBI data centre is currently operating in Hong Kong. Allied Control, who are operating the system, claim it is 4000 times more efficient than an equivalent refrigerated air system and that their OBI data centre is likely the most energy efficient one on the planet.

or extreme measures, like limiting internet use, may result

- Simple fixes to the air handling can improve data centre cooling and have significant energy savings
- Open Bath Immersion technol ogy, where servers are immersed in a low boiling point dielectric fluid, has to potential to halve the energy consumption of data centres

About Tony Robinson:

Tony's specific expertise is in experimental and computational thermal sciences. He has 15 years' experience in heat transfer, fluid mechanics and applied energy research in Ireland, France, Canada and parts of Africa. He is the author of over 130 peer reviewed papers. Also author of 60 technical reports for industry, business and professional organizations and 7 patents. He is also the director of Confluent Research Ltd., a thermal consultancy focused on industrial product development and thermal trouble-shooting. In-line with national and global energy priorities, Tony and his team perform research that specifically targets the critical need for improved energy efficiency of thermal energy transport and conversion technologies as well as developing novel clean energy devices. The research underpins the rational use of energy with regard to the reduction of energy use as well as clean generation with their consequent reduction of greenhouse gas emissions. To achieve this, the research focuses on both the fundamental science of enhanced heat transfer as well as innovative systems level engineering of clean technologies for biomass, geothermal, solar thermal, energy storage and waste heat recovery applications.

About Trinity College Dublin:

Trinity College is the sole constituent college of the University of Dublin, a research university in Ireland. The college was founded in 1592 as the "mother" of a new university, modelled after the collegiate universities of Oxford and of Cambridge, but, unlike these, only one college was ever established; as such, the designations "Trinity College" and "University of Dublin" are usually synonymous for practical purposes. It is one of the seven ancient universities of Britain and Ireland, and is Ireland's oldest and top ranked university.

The Future Flexible Electricity System

Submission:

If you had the option to power your business with very large volumes of clean, cheap renewably generated power in the future, though it is provided in an inflexible way, could it be facilitated?

This submission asks the question how far can we go on facilitating in-flexible renewables using flexibility on the demand side?

The OLD Way

- Traditional Fossil Fuel powered generators provide reliable, always available, but dirty and expensive power to customers who don't think about the source of the power or respond to the variability or availability of the generators.

The CURRENT Way

- Up to 55% of Ireland power comes from Renewables
- EnerNOC and other DSUs contract with 400MW of customers in Ireland to provide flexibility to the Grid at times when providing more power to the system is excessively costly or impractical. This may happen at peak demand times, when the system is ramping up or down, or when the availability of some other sources has not been forecast correctly. Also some customer are available to increase demand if there is an abundance of wind on the system by switching off their CHPs, and so reduce wind curtailment.
- Electricity costs are suppressed by the cheap renewables and customers earn by providing flexibility services to the Grid

The FUTURE Way?

- Energy will be cheap at times of high wind/solar availability.
- Energy will be extremely expensive at other times.
- Fixed and wires charges will make up the largest proportion of energy users bills to help finance balancing resources.
- Customers will have the opportunity to greatly reduce their bills by responding to these signals. They may do this by identifying small ways in which their plant could participate in the following:
  - System services participation (DSU, rapid frequency response, UPSs, Back Up Generation)
  - Electricity storage (batteries)
  - Product storage (intermediate product storage, ice-banks)
  - Moving production times (energy price prediction, automation)

If you had the option to power your business with very large volumes of clean, cheap renewably generated power into the future, though it is provided in an inflexible way, could it be facilitated?

Patrick Liddy

ENERNOC

About Patrick Liddy:

Patrick Liddy is a qualified Electrical Engineer BEng, CEM, MIEI. Patrick's resume also includes Technical Advisor and Program Manager roles at the Sustainable Energy Authority of Ireland (SEAI) in addition to numerous energy consultancy engagements with a diverse multinational and indigenous client base.

In 2011 Patrick founded Activation Energy DSU Ltd, Ireland's first Demand Side Unit (DSU), a business that combines modern software with the electricity industry. The software and associated services developed by the company provide significant savings to large energy users in Ireland by allowing them to directly participate in the wholesale electricity market (SEM) and quickly acquired a significant presence in the Irish market. This position lead to strong interest from an American Nasdaq listed leader in the sector (EnerNOC) which acquired the company in early 2014.

Patrick and Activation Energy are generally regarded as leaders in innovation and change in the Irish electricity sector, as well as being the largest operator of DSU in Ireland by a long distance. Patrick sits on the majority of stakeholder forums and boards in relation to the operation of the electricity system in Ireland.

Following the acquisition Activation Energy by EnerNOC, Patrick took on the role of Director for Regulatory Affairs and Operations in Ireland. He was quickly promoted to Director for UK and Ireland where he also has responsibility for EnerNOC's British Demand Response business.

Addressing regulatory challenges facing the development of Solar Farms in Ireland.

Submission:

Kevin O'Regan

MALONE O'REGAN
ENVIRONMENTAL SERVICES Ltd.

Ireland has committed to generating 16 per cent of its overall energy requirements from renewables by 2020 under the EU's plan. If Ireland does not meet these targets, it could be hit with fines of between €100 million and €150 million for every percentage point it falls short. Currently it is reported that about 8 per cent of the country's energy requirements comes from renewable sources.

There are increasing difficulties in securing both sites and relevant permissions for onshore wind-farms. This has opened up opportunities for other alternative energy providers such as the solar industry. The priority for solar companies to-date has been identifying amenable land owners, that are ideally located within a suitable distance of a capacity enabled, sub-station. Once secured, operators then typically concentrate on securing a grid-connection. However, such connections are rendered useless without the necessary statutory approvals.

Yet, it is this step of securing the necessary statutory approvals through the Planning and Development Regulations that is currently holding up many alternative energy projects in Ireland.

Guidance on wind farm development for both Local Authorities and developers has been issued. Unfortunately, other forms of energy supply, such as Solar, Anaerobic Digestion, CHP, are bereft of such guidance. This can result in planning applications coming under increased scrutiny from a Local Authority perspective on the basis that they may be unsure of potential impacts arising from such developments. It can also result with increased submissions from third parties leading to delays to the planning application process.

As a vastly experienced Environmental and Engineering consultancy, MOR have successfully delivered numerous large and medium scale renewable projects through the Irish planning system. We would advise that the steps that need to be undertaken to increase the potential for success of obtaining planning on such projects should include:

- *Undertake a due diligence assessment on prospective sites to screen out sites where significant environmental and engineering constraints may present a challenge at planning stage. In the event that certain issues such as a protected archaeological site is identified as this early stage, it may result in the site no longer being viable, but at least a decision can be made before any significant investment has been made.*
- *Once a suitable site has been identified, undertake a screening exercise so the planning application can be focused on the key issues. Solar PV currently is not listed under Schedule 5 of the Planning and Development Act requiring an Environmental Impact Statement (EIS), therefore to-date no solar farm developments regardless of scale has needed an EIS.*
- *Undertake pre-planning consultation with the Planning Authority and other key stake-holders, as applicable, in advance of lodging a planning application. In the absence of guidance these consultations should also be used as an opportunity to inform the Planners about the development. For example, a lot of Planning Authorities are seeking "Glint and Glare Reports" for solar projects without fully understanding what they involve, or the meaning of the results.*
- *Consult with Local Residents to alleviate any potential concerns that they may have, in*

order to ensure that any such concerns can be addressed as part of the design.

- *Submit a high quality planning application.*

From a policy perspective, if the Government wish to meet their renewables target then the timely preparation of Planning Guidance Documents for Renewable Energy would go a long way to streamlining the Planning Process.

Energy monitoring and reduction – the role of manufacturing informatics.

Submission:

There are many opportunities to reduce energy costs in manufacturing from redesigning production systems and processes, to more efficient operation and management of existing systems. Roland Berger Strategy Consultants estimate that energy intensive industries can get a 4-fold return on investment in energy efficiency measures and technology through to 2050 [1]. ZVEI [2] estimates that exploitation of automation technology can deliver energy saving of between 10 and 25 % in machines and plants deployed in Germany. Similar opportunities exist in Ireland. The total turnover of Irish industry was €102.4 billion in 2014. A recent survey of 40 manufacturing companies in Ireland identified energy costs as ranging from 2-7% of total turnover. If we assume a base level of 5%, measures that would yield a 20% reduction in energy usage would benefit manufacturing in Ireland to the tune of €1 billion. Hence investing in energy reduction technologies and operating strategies is not just an environmental imperative – it is also good business.

The starting point is putting in place a comprehensive energy monitoring infrastructure in order to collect detailed energy usage data, which can then be analysed to determine where the best energy reduction opportunities lie. To be effective, monitoring of energy usage needs to be at the component level rather than machine level, and be at appropriate spatial and temporal resolutions, to capture the dynamics of energy use and flow throughout the production cycle. This is a challenging task due to the diversity of standard and non-standard communication protocols and interfaces that exist on industrial machines, inaccessible propriety systems, and the absence of the necessary localised sensing, data acquisition and external transmission functionality on legacy systems. QUB [3] and IMR [4] are actively working on developing low-cost non-obstructive retro-fit monitoring solutions in this space leveraging recent advances in wireless, internet of things (IoT) and cloud technologies.

Manufacturing informatics, which can be loosely defined as the use of ICT and data analytics in manufacturing, is a multi-disciplinary field spanning, engineering, computer science and mathematics. It draws on a range of scientific fields, including statistical data analysis, machine learning, modelling, optimisation and control, to identify opportunities for, and deliver enhanced performance from manufacturing systems. It is at the heart of the Industry 4.0. As such, it has an important role to play in energy monitoring and reduction. We have a variety of possibilities, including:

- **Data driven modelling for low-cost energy monitoring/inference of energy usage** (a.k.a. soft sensing) – by relating more readily available process variable and control input data to component energy usage, soft sensing models can be developed to predict energy usage. These models can then be used across multiple production machines reducing the need for comprehensive energy monitoring infrastructure on all machines.
- **Data analysis to identify energy usage patterns and causalities** (temporal and

Seán McLoone

Queen's University Belfast

Synopsis:

Manufacturing informatics, which spans several scientific fields, including statistical data analysis, machine learning, modelling, optimisation and control, is a key enabler for low-cost energy monitoring, and for the identification and delivery of a range of energy cost reduction opportunities. These are briefly introduced in this article and the need for strong academic-industry partnerships to overcome the barriers to realising these opportunities highlighted.

Takeaways:

- Comprehensive energy monitor ing infrastructure is needed in or der to identify and fully exploit energy reduction opportunities.
- To be effective, monitoring of energy usage needs to be at the component level rather than machine level, and be at appropri ate spatial and temporal resolu tions.
- Manufacturing informatics, which is at the heart of the Industry 4.0, has a key role to play in energy

spatial) – potentially leading to actionable energy reduction insights. For example, analysing the ramp-up of oven temperature profiles at start-up can highlight cost savings in relation to reduced ramp-up and stabilisation periods, and reduction in energy use during idling periods.

- **Optimisation of production and maintenance scheduling** to minimise energy costs. Optimisation can be employed across all aspects of process design, operation and scheduling to minimise cost and maximise performance. In the context of energy reduction, where there is flexibility in scheduling production and maintenance activities, scheduling can be optimised to align peak energy usage with periods of low energy cost/high levels of renewable generation (as reflected in time-of-use (ToU) energy tariffs).
- **Generation of a demand-response revenue stream** – If short-term interruptions in production can be tolerated, and there is sufficient flexibility in scheduling production, a particularly attractive proposition is to provide demand-response auxiliary services to the electricity market [5]. This has the twin benefits of providing an additional revenue stream (offsetting energy costs) and supporting the decarbonisation of electricity generation.
- **The development of advanced control solutions for energy efficient process operation** – Poorly tuned control loops can lead to increased energy losses as well as accelerated degradation of valves and actuators. Data analysis can help identify control loop performance issues and highlight where more advanced control methodologies such as self-tuning/adaptive control [6] and Model Predictive Control (MPC) [7] may be of benefit. Self-tuning controllers adapt control parameters to remain within the desired performance envelope as operating conditions change, while MPC can directly consider energy consumption as part of the control performance objective.
- **Enhanced equipment health monitoring** – Monitoring energy usage variation can provide valuable data for, and enhance the performance of, equipment health monitoring systems. This in turn facilitates the development of predictive maintenance strategies, enabling more timely and cost effective maintenance interventions, and ultimately more energy efficient plant operation.

Realising these possibilities will become increasingly important as we strive to meet the demanding climate change targets agreed at COP21. The challenges for many manufactures, especially SMEs, are the up-front investment in energy monitoring infrastructure and accessing the informatics expertise needed to exploit energy reduction opportunities. These challenges can be addressed by strong academic-industry partnerships targeting innovative bespoke solutions, and the development of undergraduate and graduate training programmes in this highly sought after skill set.

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monitoring and energy reduction.

- Strong academic-industry partner ships targeting innovative bespoke solutions, and the development of undergraduate and graduate train ing programmes in manufacturing informatics are needed to over come the barriers to realising energy reduction opportunities.

About Seán McLoone:

Prof Seán McLoone is Professor of Applied Computational Intelligence, Director of the Energy Power and Intelligent Control (EPIC) Research Cluster, and Principal Investigator for the Pioneer Research Programme on Intelligent Autonomous Manufacturing Systems (i-AMS) at Queen's University Belfast. His research interests are in computational intelligence techniques and data analytics with applications in smart-grid and advanced manufacturing informatics. Specialist areas include predictive modelling, unsupervised sparse feature selection, clustering and blind identification. His research activities to date have been supported by funding from a range of sources including Science Foundation Ireland, Enterprise Ireland, EPSRC (UK), FP7 (Europe) and industry. His research has a strong application focus with many projects undertaken in collaboration with companies in the manufacturing and power sectors. At a professional level, Prof McLoone is a Chartered Engineer, a Fellow of the Institute of Engineering Technology (IET), a Senior Member of the Institute of Electrical and Electronic Engineers (IEEE) and a non-executive Director on the Board of Directors of Irish Manufacturing Research. He also severs on the editorial boards of the international peer reviewed journals 'Engineering Applicators of Artificial Intelligence' and 'Transactions of the Institute of Measurement and Control'.

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See www.qub.ac.uk/epic

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3D Metal Additive Manufacturing-A Paradigm Shift in Engineering Manufacturing and a Potential Source for Energy Conservation

Submission:

In today's world where global warming is on the rise with every passing year, Energy conservation is becoming important both from environmental and economic point of view. There are numerous ways in which one can conserve energy. It is reported that industrial sector where in manufacturing forms key part consumes about 37% of the world's total delivered energy. A consensus is now beginning to emerge that Additive Manufacturing (AM) can pave the way for innovation, mass customisation with reduced material and energy usage. AM saves energy by eliminating production steps, using substantially less material, enabling reuse of by-products, and producing lighter products. This blog discusses about Metal Additive Manufacturing and what SEAM facility at WIT can offer to Irish based industries in this fast emerging field.

The additive manufacturing process commences with a 3D digital image from a newly generated CAD software design or a digital scan of an existing component. A computer file is then generated that slices this image into cross sectional layers that are sent to the additive manufacturing machine which creates the component utilising a layer upon layer selective deposition technique. What makes this manufacturing process so disruptive is the design freedom it allows, creating the capacity to manufacture complex component shapes with internal geometries and infrastructure which cannot be replicated utilising with conventional subtractive processes. Novel geometries enabled by AM technologies can also lead to performance and environmental benefits in a components product application. Furthermore, it also creates the opportunity to completely change the supply chain management and distribution network for engineering components, bringing the manufacturer closer to the customer. Digital files will be distributed to regionalised additive manufacturers near their customers, capable of a manufacturing a wide range of products on demand without the need for retooling, eliminating the need for need for large inventories of products and spare parts.

In the SEAM Gateway our mission is help translate the potential of 3D Metal Additive Manufacturing Technologies to Irish companies. The Gateway has on site in Waterford an EOSINT M 280 which is based on the innovative DMLS (Direct Metal Laser Sintering). It is equipped with a 200 W fibre laser which melts fine metal powder and builds up the product layer by layer. This method allows you to create products with extremely complex geometries including elements such as free-form surfaces, deep slots and coolant ducts.

Because 3D Metal Additive Manufacturing is an emerging technology with slower unit fabrication times and higher capital equipment costs than traditional methods, the early adaptors have been typically been one off high value added components. Examples of this include tooling for injection moulding where the optimised design of internal cooling channels greatly enhance productivity. The capacity to produce complex customisable components is of particular interest to high value added

SEAM's EOS M280 3D Metal Printer

Ramesh Raghavendra

Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

Synopsis:

Energy Conservation through Metal Additive Manufacturing and what SEAM can offer for Irish Industries in Metal AM
Synopsis: In today's world where global warming is on the rise with every passing year, Energy conservation is becoming important both from environmental and economic point of view. There are numerous ways in which one can conserve energy. It is reported that industrial sector where in manufacturing forms key part consumes about 37% of the world's total delivered energy. This presentation discusses how additive manufacturing can pave the way for innovation, mass customisation with reduced material and energy usage through multiple examples. It then discusses what SEAM facility at WIT can offer to Irish based industries in the area of metal additive manufacturing.

Takeaways:

1. mportance of Energy conservation to reduce environmental burden
2. Additive Manufacturing as a means

sectors such as

- Bio-medical device where implantable devices can be customised to the patients offer huge potential, for example orthodontics and orthopaedic applications
- Aerospace where the reduction in the size and number of constituent parts can yield significant weight savings and resultant lower fuel costs
- Automotive industries- high end specialised automobiles such as F1 engine parts

Vertebra/Honeycomb structure built at SEAM

But there are significant technical challenges which need to be surmounted in order to widen range of use and performance of 3D Metal Additive printed components and devices including:

- A wider range of materials that can be used
- A greater understanding of material properties such as particle size, distribution, morphology and purity of the metal powder used in the additive process and the impact this has on machine process parameters, component density, reliability and surface finish.
- Heat treatment techniques post processing to increase strength and hardness of the device by reducing residual stresses created by the additive layer process.
- Enhanced capabilities in 3D digital design delivering more complex customised solutions

SEAM is uniquely placed within the Irish research infrastructure to address these issues and practically apply solutions relevant to the Irish manufacturing industry because of its high level of industry engagement and its wide range of materials engineering expertise and in house reliability and characterisation tools. These include a suite of X-Ray Micro tomography, 3D Finite Element Design capability, SEM, Mechanical Strength and Hardness Testing that can be utilised in combination to optimise and reduce the design cycle time from concept to a functioning prototype.

SEAM in partnership with its sister Gateways in the Technology Gateway Network, including APT which specialises in polymer processing technologies, is focussed on practically applying the emerging 3D Additive Manufacturing Technology innovations to Irish Industry. The core objective will be to generate exciting new products and capabilities for the 21st century Irish Engineering and Manufacturing sectors.

Click below to view a PDF of Ramesh's submission.

ramesh-raghavendra-seam_energy-conservation-through-metal-am-141016

to conserve energy

3. Additive Manufacturing paves the way for innovation and mass cus tomisation
4. SEAM at WIT offer Metal Addi tive Manufacturing Technologies to Industries

About Ramesh Raghavendra:

SEAM Centre Director & Technology Gateway Manager.

Dr. Ramesh Raghavendra is the Director of the South Eastern Applied Materials (SEAM) Research Centre. He holds Ph.D in Materials Science along with MBA and MS in Metallurgical Engineering. Ramesh worked as Senior Research Fellow at University of Limerick for five years, followed by 11 years at Littelfuse Ireland in Dundalk as senior Materials Technologst prior to joining SEAM in 2008. Ramesh has over 25 years of materials research experience in both industrial and academic environment and has over 60 peer reviewed publications and two patents to his credit. In his current role as SEAM Centre Director Ramesh has been instrumental in establishing collaborations with over 130 Irish based industries and successfully managed to deliver over 975 directly funded industrial projects in the last seven years. In addition, he has also successfully managed and executed several EI funded Innovation Partnership projects. He has also successfully coordinated an FP7-SME Project. For his contribution to Industrial services, Ramesh received KTI Award under Industrial Impact Category in 2015.

About SEAM (WIT):

SEAM (South Eastern Applied Materials) Research Centre based within Waterford Institute of Technology is an industry dedicated materials research and development facility providing innovative materials engineering solutions for wide ranging industrial sectors such as Medical devices, Precision Engineering, Pharma and Energy sectors in Ireland. SEAM, currently seed funded under Enterprise Ireland's Technology Gateway programme, has established itself as the first stop for companies seeking assistance on materials related issues that cannot be solved by utilising their

on-site resources. SEAM's metallic, polymer and ceramic expertise are proving invaluable to its clients due to offerings of its niche technologies (X-ray CT Scan, Finite Element Modelling & Metal 3D printing) and materials research capabilities to resolve their day to day process/ product and quality related issues. SEAM currently works with over 130 companies and has executed over 975 directly funded industrial projects to date since its launch in 2009.

Think big, act small; think small, act big; but do big things.

Submission:

Energy is the driving force of the universe, according to scientific principles and here, I thought it was money!

Ireland's manufacturing sector needs to achieve not just a transformative step in terms of productivity, innovation and competitiveness but should also support a positive eco-system1. These are grand words and ideas in a challenging global dictatorship of climate change demands. The EU under its collective COP21 objectives aims to slash greenhouse gas emissions by shifting away from fossil fuels. Ireland's target for 2020 is 20% reduction in CO2 emissions, is not realistic, as agricultural is it primary industry. The number of male and female cattle in Ireland2 as of June 2015 stood at 6963m, with Food Harvest 20203 targeting a 50% increase in milk production by 2020, where is the scope to achieve this target?

There are approximately 205,700 people employed directly in manufacturing, with support jobs bringing to 400,000 people under it remit and contributed €7.6 billion in payroll to the economy in 2011, with almost 95% of manufacturing firms employing less than 50 people. Exports of 'agency' assisted manufacturing companies were €78.5bn in 2012 up from €54.8bn in 2000, and have proven to be relatively resilient through the recession.1

Many existing firms in Ireland have already invested in necessary changes including; Lean, six sigma principles, automation, upskilling, new partnerships, investing in ICt's , but how have they identified ways to improve energy efficiencies? Recent Government investments in Technology Centers such as the i2E2 Energy Research Centre can play an impactful role by working with companies to develop innovative technology solutions. The world economic forum on manufacturing4 states that: affordable clean energy strategies and effective energy policies will be top priorities for manufacturers and policy-makers, and serve as important differentiators of highly competitive countries and companies.4

As a microbiologist, I suggest we think small with big 'innovative' actions.

Cast study 1: Let nature work for us, look to nature: create algae ponds, about 70 percent to 80 percent of all the oxygen we breathe comes from algae!5 Put a green roof on your (new) manufacturing building. They reduce storm water runoff volumes and peak flows; they can mitigate the urban heat island effects. Grass roofs can also cool buildings during summer months; a small reduction in pollution control and they can be designed to improve urban biodiversity. What about also a green wall for 'artistic' and functionality.

Case study 2: Think low grade hear recovery: boiler flue gas has a high temperature (~120oC) and relatively low humidity due to liquid fuel. The solution presented

Catherine Adley

University of Limerick
Ollscoil Luimnigh

Synopsis:

Look to nature, go green: green roofs and green algae, they will target CO2 emission and generate oxygen.

Takeaways:

- Talented people will provide future prosperity.
- Look to nature to somewhat target unrealistic COP21 targets.
- Small actions can lead to big outputs.

About Professor Catherine Adley:

Professor Catherine Adley is researcher and lecturer in microbiology. She has worked in the USA in NY at Cold spring Harbour Laboratory and Boston University; in the UK in the London School of Hygiene and Tropical Medicine and the University of Surrey. She has served on the Scientific Committee of the Food Safety Authority of Ireland and was a board member of the RDS. She served as Head of the Department of Chemi-

-combustion air to be pre-humidified using flue gas waste low grade energy as a last stage of cooling, plus providing substantial reduction of NOx emissions (~up to 3.5 times) without any increase in boiler efficiency, using a simplified second generation contact economiser6,7.

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cal and Environmental Science for six years at the University of Limerick. Her interests are in mankind's interactions and influences on the environment.

Industry 4.0 as a driver for a real-time Key Performance Indicators (KPIs) for energy consumption in Manufacturing.

Submission:

Results have shown that significant energy and cost savings are available to Manufacturing through low-cost changes in operations and behaviour. Savings of 10-20% can be shown where energy consumption has been managed as an intrinsic part of the Manufacturing process. Optimisation of technical Services has been shown to deliver energy savings of up to 50%. As the 'First' Fuel, Energy Efficiency is critical to reducing the waste of energy, in managing the time-of-use of energy and in reducing the ecological impact of factories. Only after the consumption of energy has been reduced as far as possible should alternatives such as Renewable Energy Systems or District Heating be considered.

Energy Management Systems, Lean Methodologies and Value Stream Mapping can clearly attribute the costs of energy consumption to the functions that control the means to reduce this consumption. The use of Specific Energy Consumption (SEC) indicators and Simple Payback Calculations are not acceptable measures of energy performance. Suitable Key Performance Indicators (KPIs) are available that link energy consumption with the driving factors of Production Volumes, Product Types and Weather and provide comparison with Best Practice as well as target setting and monitoring. Appropriate KPIs have been developed at the Factory, Value stream, Product and WorkCell Level linked to real-time measurements from the field and where insufficient metering is available, energy models have been shown to provide sufficient accuracy for energy management. Many reports have highlighted the non-energy benefits (NEBs) of energy efficiency measures with added-value of up to 2.5 times the energy savings.

In general, Irish Industry has failed to take meaningful steps to reduce the ecological impact of their operations and a significant cultural change is necessary to achieve the targets required. Business-as-usual has been the approach with some peripheral energy lighthouse projects to fly the 'Green Flag'. Facilities and energy projects have been widely outsourced leaving a disconnect between the business and its ecological impacts.

Developments in Smart Factories, heralded under the Industry 4.0 banner, have the potential to radically change the global manufacturing paradigm with a significant risk to the competitiveness (and survival) of the slow adopters. Resources efficiency, energy efficiency and the circular economy are keywords of Industry 4.0 and the widescale adoption of Cyber-Physical and IoT systems will provide unprecedented information flows on factories and on their production processes. Business-as-usual approaches will be quickly surpassed in the new environment as new opportunities for Smarter and Planet–friendlier products will be driven by consumers and by legislation. Manufacturing facilities that lead the way in adopting Industry 4.0 will also deliver significantly reduced energy consumption and ecological impacts as they will be integrated into their core business.

For large Companies the barriers of 'split' incentives, alternative investment opportunities and short payback periods ensure that viable energy efficiency measures are routinely not implemented. Government Policy should require mandatory annual audits and public disclosure on Energy Use and Carbon Emissions, at both production and product level. In time, efficiency targets and supply chain reporting should be introduced and gradually tightened. Verified Energy Savings should attract tax credits in order to promote savings and Large Companies should be supported to engage in

John Cosgrove

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Synopsis:

Significant savings are available in Manufacturing Plants where energy consumption is analysed correctly in relation to their driving factors (Production / Weather). The evolution of the Industry 4.0 Paradigm and the Internet of Things (IoT) is leading to the availability of data from the shop floor that can significantly change energy management approaches and drive savings of 20-30% of the energy consumed in factories. Suitable Key Performance Indicators (KPIs) are available at the Value Stream and Machine level that can provide comparison with Best Practice as well as target setting and monitoring. Irish Factories need to up their game to contribute to national targets and COP21 commitments.

Takeaways:

- Virtuous Circles of improved energy performance through en gagement, awareness, measure ment and metrics can deliver significant reductions in ecological impact from factories.
- Industry should adopt better KPIs for energy management

Energy Awareness activities (shared transport, cycle-to-work scheme, training) with their workforce as part of their Corporate Social Responsibility.
For Small to Medium Enterprises, the barriers of lack of knowledge, variable production operations, complex tariff structures and the low nett value of savings ensure that energy consumption and efficiency is not addressed at all. Government Policy should support free annual energy audits (with published summaries) of all SMEs with over 10 Employees along with financial supports (low-cost loans, credits) for viable energy efficiency measures.
For the required changes to be effective in line with COP21, Carbon Taxes on fossil fuels should be incrementally increased from now to 2030 with a rebate available to industries who demonstrate verified energy savings. In line with that, the Single Electricity Market (SEM) should be re-constituted with a greater emphasis on promoting the lowest carbon component of electricity generation, driving down the unit cost of electricity generated and promoting demand-side management.
In addition, the restrictions on exporting electricity should be abolished in order to promote the development of Industrial symbiosis and the potential sharing of heat & electricity generating assets.

- Adding intelligence in production operations can drive energy savings.
- Mandatory annual auditing and reporting should be enforced for large companies and supports developed for Industrial SMEs.

Tackling energy and emissions over the supply chain.

Submission:

In the manufacturing industry, there is increasing focus on carbon footprint, which is typically expressed in terms of the quantity of greenhouse gas emissions emitted per unit of production. The carbon footprint of a product is generally reported as a static output at the end point of the production process, but, for the analysis to be of any real benefit in driving emissions reduction, the carbon footprint needs to be disaggregated across the supply chain so that carbon hotspots can be identified and managed. The drive to reduce carbon cannot, however, be seen in isolation. The interplay between emissions, energy use, labour and cost all need to be considered at each stage of the supply chain and overall.

In exploring these ideas, we investigated the manufacture of a large structural component in the aerospace sector and options for reducing emissions over its supply chain. A carbon analysis of the production of a composite upper wing cover of an idealised single aisle aircraft identified the dominant production processes as carbon fibre manufacture and composite part manufacture. Electricity was the largest contributor to each of these steps, and was responsible for 55% of overall emissions. The base case analysis assumed production took place in the UK, while scenario analyses considered outsourcing production to countries with lower electricity grid emissions. Moving production to Sweden, the country with the lowest greenhouse gas intensity of electricity in the EU, could reduce the emissions intensity of production by half – but the additional transportation required would lead to an increase in the overall energy footprint of production.

In fact, even switching to a low-carbon fuel while maintaining production in the UK might not provide a long term solution to reducing carbon footprint. This is due to possible future regulatory and legislative changes. Japan, a country with a large share of the global carbon fibre production capacity, is a case in point. Before the Fukushima accident in 2011, Japan's electricity mix was heavily reliant on nuclear power and had as a result a low emissions intensity. However, following the accident there was a move away from nuclear back to fossil fuels, and the emissions intensity of grid electricity rose from 350 gCO2e/kWh to almost 500 gCO2e/kWh in less than three years. A robust long term solution for emissions reduction must therefore also involve strategies to decrease energy use in the manufacturing process. Any changes to the manufacturing process need to be designed in the context of assembly and labour requirements, as these are key factors in determining costings and have a considerable impact on overall company profitability. With the aim of tackling and optimising emissions, energy and cost across the manufacturing supply chain, we are currently combining discrete event simulations with carbon and energy footprint life cycle analysis techniques in virtual environments.

High performance materials are typically associated with large complex global supply chains in which energy and emissions intensive production processes are required. Strategies to reduce carbon footprint cannot be developed in isolation. The

Beatrice Smyth

Queen's University Belfast

Synopsis:

High performance materials are typically associated with large complex global supply chains in which energy and emissions intensive production processes are required. Strategies to reduce carbon footprint cannot be developed in isolation. The interdependencies between emissions, energy, assembly, labour and cost require interdisciplinary analysis to evaluate manufacturing processes and redesign supply chains to be economically, technically and environmentally effective.

Takeaways:

- High performance materials are associated with complex global supply chains
- Carbon footprint cannot be seen in isolation
- The interplay between emissions, energy use, labour and cost should be considered at each stage of the supply chain
- Interdisciplinary thinking is required

interdependencies between emissions, energy, assembly, labour and cost require interdisciplinary analysis to evaluate manufacturing processes and redesign supply chains to be economically, technically and environmentally effective.

Acknowledgements: Dr Adelaide Marzano, Professor Adrian Murphy, and Dr Joe Butterfield, School of Mechanical & Aerospace Engineering, Queen's University Belfast.

About Beatrice Smyth:

Beatrice is a lecturer in the School of Mechanical and Aerospace Engineering, Queenís University Belfast, and is part of the Clean Energies Research Group. Specific areas of work include analysis and optimisation of energy pathways, supply chain energy and carbon impacts, resource quantification and mapping, life cycle analyses, land use change and economic assessment. The production and use of biomethane as a renewable fuel is a particular area of interest, as is the interplay between systems, such as the use of energy crops for wastewater treatment.

Prior to moving to Queenís in 2013, Beatrice worked in both the public and private sectors, mainly in energy/carbon management and in geotechnical and environmental engineering.

Contacting Beatrice Smyth:

http://www.qub.ac.uk/

You can contact Beatrice by email or see her work here.

Optimising Energy Efficiency in Manufacturing – Data Driven Modelling.

Submission:

When designing a new manufacturing line or facility, the focus is often on ensuring that production of quality product is achieved with the minimal capital investment to provide rapid return on investment. With this focus, often the operational impact on the environment is often overlooked entirely, or driven to meet specific regulatory restrictions. Indeed, in the meeting of regulations, concentration on the measurable indicators of compliance with regulations often means that other impacts are ignored completely.

Optimising the consumption of energy in manufacturing is not a simple task, as the requirements of production rate and quality often lead to conservative setting of control parameters to ensure the product is available when the customer demands. The significant differences between processes and manufacturing systems mean that the development of a "silver bullet" solution to reducing the energy consumption and environmental impact across a wide range of industries is difficult. However, with the development of control systems and networks more data than ever before is becoming available. In this context there is the possibility to develop model driven optimization approaches where measurements from the system can be used to improve the operation.

One such example was applied in the context of a job-shop environment where parallel stations were used to process product. Depending on the mix of product, the capacity of the stations was not always fully occupied however, as the time to bring a station to production was significant, all of the stations were left in a ready state with considerable energy wasted while no product was being processed. Modelling of the flow of material towards this station by reviewing the statistical progress of parts through the whole factory allowed the development of a strategy which enabled some stations to be switched to a low energy consumption mode when they were not required by considering the status of work in progress upstream. Using simulation modelling the effectiveness of this approach was examined and the point where the upstream flow should be monitored was established so that the operators could easily determine when the stations could be switched in and out of production.

A more recent development looks at the water-energy nexus, where the energy associated with ensuring waste water meets environmental standards before discharge has a significant impact in its own right. Often such plant is designed and installed to ensure it meets the legal requirements with little consideration of the efficiency of the process. Indeed, operators are often unaware of the specific energy consumption associated with such processes as they are often part of background facilities rather than direct processing of product. Here monitoring approaches and energy consumption models have been developed with allow the details to be understood. The next stage in this work is to link this energy modelling to specific water quality outputs across different technologies. Once completed this will enable modelling of the most appropriate solution to ensure that the standards are met with minimal energy consumption.

Paul Young

DCU

Synopsis:

With the greater availability of data from manufacturing tools and systems there is an opportunity to optimise the use of the energy resources available so that manufacturing has a lower impact on the environment. The secondary effect is that it should also reduce the cost of manufacturing by allowing the energy consumption match the demands of production and environmental protection more closely. To enable this requires the development of modelling approaches which can be driven by the data. Once developed the models can be used to determine the best feasible solution to allow efficient use of energy to meet production demands.

Takeaways:

- Modelling is required to un derstand the system behaviour in response to demand for product
- Energy modelling must be com bined with production demands
- Process energy consumption must be mapped to outputs
- Outputs from modelling process must be designed to enable imple

mentation

About Paul Young:

Dr Paul Young has been actively researching in the field of manufacturing since the early 1990's. He has worked extensively with a number of industries to model and improve their manufacturing systems through the application of data driven models. In addition he has worked in the area of vehicle design and vibration analysis. Across all of these disciplines the approach is that of analysing the available data from the system and then using a model based approach develop both an understanding of the characteristics and apply some form of optimisation to enable improvement.

He is a lecturer in the School of Mechanical and Manufacturing Engineering, where he teaches modules in mechanics, design, system analysis and optimisation.

About the Advanced Processing Technology Research Centre in DCU:

The Advanced Processing Technology Research Centre (APT) focuses on state of the art research activities in the areas of Production Technology, Sustainable Technology, Micro and Nano Technology, and Advanced Engineering Materials. The APT is a leading international research centre which as a primary goal strives to provide significant translational benefit to the wider community. Research projects undertaken within APT are conducted to a world class level and support local and internationally based enterprises. The APT research group has established a strong infrastructure of equipment and people in the area of processing technologies at DCU. APTs education and outreach events include seminars and courses which enable the transfer of processing technologies knowledge to the broader community.

Why investing in energy efficiency in industrial facilities can be more beneficial than adding generation capacity

Submission:

The Problem – Capacity Constraint An all too common issue in today's expanding manufacturing environment is the issue of increasing capacity to meet production demands. From an energy perspective expanding capacity means greater pressure on utility systems. The first reaction of most managers is to consider adding more capacity to de-bottleneck, provide redundancy or increase performance.At EM3 we have encountered numerous instances of this over the past few years and we have always take a step back and asked if additional capacity is the right answer. Certainly it is the simplest, most obvious and probably least risky solution, but not the best solution from an investment or cost of ownership perspective.

The Solution – Energy Efficient Design Some of the situations we have encountered over the past number of years which show how applying some focused engineering up front analysing alternative solutions to address constraints show the benefits of such an approach. The approach is common sense, but unfortunately not that common.

Case Study A

Medical devices facility needs more compressed air to serve additional production line.

Conventional Solution: The obvious solution is to add a new compressor, dryer etc. The knock-ons include more footprint in the plantroom, more power supply, bigger transformers, increase in MIC (electrical import from grid), increase in pipe sizes, higher maintenance costs etc.

Correct Approach:

- Apply Energy Efficient Design to the problem – look to reduce the demand of existing users
- Users of CA can be served with less energy intensive blowers at the point of use
- Address leaks and uncontrolled usage of compressed air in the production floor
- The users which set the pressure requirements of the system changed to use boosters – effectively increasing the capacity of existing compressors.
- Air using Applications such as agitation, motive power, actuation etc. can be accomplished with an electro/mechanical alternatives.

Result

The actual result in this case allowed new line to be accommodated without any additional compressors and the specific air consumption per product output was reduced significantly.

Case Study B

Food Manufacturing Facility needs more chilled water to meet the processing demands post milk quotas.

Conventional Solution: Add more refrigeration capacity and beef up the chilled water distribution. The impact on the site again is a significant capital investment in generation equipment, bigger pumps, bigger piping, more electricity, bigger transformers, MIC increase, and higher maintenance costs.

Correct Approach:

- Apply Energy Efficient Design to the problem – look to reduce the demand of existing users
- Identify existing users of chilled water that could use cooling tower water instead
- Increase regeneration on some users to shrink cooling demands
- Add heat recovery in systems that don't have heat recovery
- Reduce parasitic loads from pumps running unnecessarily
- Eliminate passing valves

Result

- ✓ No new generation equipment bought.
- ✓ Performance per m3 of milk processed increased significantly.
- ✓ Free cooling and heat recovery installed.
- ✓ Product cooling performance increased

Donall O'Brien

Synopsis:

An expansionary climate in Irish manufacturing is a wonderful opportunity to increase energy efficiency within a manufacturing facility, but only if the correct approach is taken. SEAI have the EXEED program which gives financial assistance to companies interested in taking the right approach and using the right methodology – as defined in IS399. The biggest barrier to taking the correct approach is schedule and lack of information. Typically, doing the right thing costs less when it comes to industrial energy and utility systems. Not having the plan in place to meet the increased capacity demands, or not having the information available to allow the analysis to be carried out results in the default – increases in generation capacity.

Takeaways:

- In an expansionary manufacturing climate investing in energy ef ficiency has the potential to solve capacity constraints, debottleneck facilities and increase productivity

Case Study C

Nutritional Facility requires more steam to meet demands of planned capacity increase.
Conventional Solution: Add more steam boiler capacity and beef up the steam distribution. The impact on the site again is capital investment in generation equipment, distribution, bigger piping, more gas usage, more water usage, and higher maintenance costs.

Correct Approach:

- Apply Energy Efficient Design to the problem – look to reduce the demand of existing users
- Identify existing users of steam that could use recovered heat or lower grade heat such as hot water
- Increase regeneration on some users to shrink heating demands
- Add heat recovery in systems that don't have heat recovery
- Eliminate passing valves
- Actual result in this case allowed new line to be accommodated without any additional compressors and the specific air consumption per product output went up significantly.

Result

- ✓ All low grade heating demands were taken off steam system and a hot water network included
- ✓ CHP added to generate site electricity and waste heat used to serve low grade heat users
- ✓ Steam generation system reduced in size by 30% instead of increasing
- ✓ Gas consumption drops even though the base load of electricity is being generated from gas
- ✓ Thermal Efficiency of the site increases substantially
- ✓ Product cooling performance increased

About EM3

EM3 is a specialist energy management company providing consultancy services to large industrial users across the globe. We have 19 Engineers providing energy consultancy, design, project management, construction, commissioning and our unique energy efficiency reporting service.

whilst reducing energy costs for no additional capital.

- Process knowledge and timely planning of capacity increases with the facility/energy stakeholders will allow the investment to be channelled into energy efficiency instead of the simple addition of generation capacity.
- SEAI and NSAI have provided the tools and the support to foster the implementation of Energy Efficient Design across Irish industry. Industry needs to reach out and accept the support and instil a culture whereby the energy status quo within manufacturing facilities is challenged when a window of opportunity presents itself.

The proposed effects of Annex SL on the revised ISO 50001

Submission:

Gerry Higgins

Like all management systems standards, a review of ISO 50001:2011 was conducted in 2016, five years after its publication to review it for relevancy. ISO reviewed the standard and decided to update the standard to conform to the Annex SL and its High Level Structure. ISO formed a new Technical Committee, TC 301, to develop the new Energy Management System Standard. TC 301 is currently working on the Committee Draft of the standard with the final version scheduled for release in January 2019. In the following article, we will discuss the proposed effects of the adoption of Annex SL on ISO 50001.

Annex SL was developed to ensure that all new/revised (post 2012) ISO management system standards would share a universal format, irrespective of the specific discipline to which they relate, such as energy, quality, environment. Annex SL outlines a high-level structure, identical core text, and common terms and core definitions. This new structure means that even when requirements are largely unchanged between ISO 50001:2011 and ISO 50001:2019, they are often found under a new clause/sub-clause heading, in order to fit the new structure.

Having the common requirements specified by Annex SL allows management system standard writers (TC 301) to focus their time and efforts on only developing the discipline-specific requirements.

Annex SL allows easier implementation and integration of multiple management systems (e.g. energy management, environmental management, health and safety management, quality management etc.) as these standards have an identical structure and identical core requirements. This will streamline implementation and the on-going maintenance of such systems.

Applying a new structure to management systems through Annex SL may result in challenges initially, until those responsible for implementing and maintaining ISO 50001 adjust to the new requirements outlined in ISO 50001:2019.

For organisations who currently have the principles of ISO 50001:2011 embedded in their operational processes, the transition to the new standard should be reasonably straightforward. However, organisations who are barely conforming to the requirements outlined in the current standard, will face a considerable challenge to meet the requirements outlined in the new standards, most notably relating to the organisation's culture and approach to management systems. For example, top management will be required to take a more hands on approach in the newer version to ensure conformity of the EnMS.

Changes within ISO 50001:2019 mean organisations will need to review and where necessary refresh their current cultures. The behaviours of interested parties related to the EnMS, including those operating at the most senior levels, will come under increased

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About Gerry Higgins:

Gerard Higgins is the CEO of Antaris Consulting Ltd., which specialises in implementing Energy, Environmental, Quality, Health and Safety, and Integrated Management Systems.

The company is also involved in training and offers various courses in energy, the environment, quality, health and safety.

Antaris is accredited to ISO 9001, ISO 14001, ISO 27001 and OHSAS 18001.

He has over 30 years' experience in technical and management consultancy in Irish industries. He has a primary degree in engineering and a Master's degree in Business Administration and is a Fellow of the Institution of Engineers of Ireland.

He has worked in partnership with SEAI for over 10 years and has conducted gap analyses and implementation projects of IS 393:2005, EN 16001:2009 and ISO 50001:2011 in a large number of organisations in Ireland.

He is a registered lead assessor for ISO 9000 and ILAB and is an IEMA accredited environmental auditor.

scrutiny.

A summary of the principal changes as a result of moving from ISO 5001:2011 to ISO 50001:2019 are outlined below:

He has lectured on energy, environmental, quality and health and safety issues in Ireland, the UK, the US, Eastern and Central Europe and Asia.

He is author of "The Irish Guide to Environmental Management Systems".

Context of the organisation (Clause 4)

This requires the organisation to identify any external and internal issues that have the potential to impact the ability of their EnMS to deliver energy performance improvements. The organisation must also determine the relevant needs and expectations of their relevant interested parties – i.e. those individuals and organisations that can affect, be affected by, or perceive themselves to be affected by, the organisation's decisions or activities.

Leadership (Clause 5)

Top management must now demonstrate that they engage in key EnMS activities rather than simply ensuring that these activities occur. This requires top management to actively involve themselves with the operation of their EnMS and be accountable for its results. References to the role of "management representative" are removed in an effort to reinforce the requirement to see the EnMS integrated into strategic and operational 'processes, rather than it being operated as an independent system, with a separate management structure and processes.

Risk-based thinking (Clause 6)

The organisation must evidence that they have determined, considered and, where deemed necessary, taken action to address any risks and opportunities that may impact (either positively or negatively) their EnMS´ ability to deliver energy performance improvements.

In addition, references to 'preventive action' have been removed from the standard, however the core concept of identifying and addressing potential nonconformities before they happen remains intact.

Communication (Clause 7)

Communication with interested parties plays an important role in an effective EnMS. The organisation needs to be sure that the information provided both internally and externally is consistent with the information generated by the EnMS.

Improvement (Clause 10)

As in the current standard, organisations have been required to improve their EnMS and their energy performance. Now in the proposed standard they are required to improve the suitability, adequacy and effectiveness of the EnMS. This can be achieved by implementing energy saving opportunities, reviewing the results of analysis and

evaluation, management review outputs, use of the energy policy, energy objectives, reviewing the results of analysis and evaluation, audit results, corrective actions and management review.

Terminology (Clause 3)

This clause contains the terms and definitions used in the standard, regardless of whether they come from Annex SL or were added by TC 301.

New definitions from Annex SL include, for example:

continual improvement – recurring activity to enhance performance
documented information – information required to be controlled and maintained by an organisation and the medium on which it is contained
risk – effect of uncertainty

Documented Information (Clause 4 – 10)

References to requirements for documents and records have been replaced by the term "documented Information", which has to be "maintained" in the case of documents and "retained" in the case of records.

Proposed structure of ISO 50001:2019 compared to ISO 50001:2011

ISO 50001:2019		**ISO 50001:2011No.**	
Clause title	**Clause No.**	**Clause No.**	**Clause title**
Introduction	0	0	Introduction
Scope	1	1	Scope
Normative references	2	2	Normative references
Terms and definitions	3	3	Terms and definitions
Context of the organisation (title)	**4**		
		4	**Energy management system requirements (title)**
Understanding the organisation and its context	4.1		
Understanding the needs and expectations of interested parties	4.2		
Determining the scope of the energy management system	4.3	4.1	General requirements

Leadership (title)	**5**		
Leadership and commitment	5.1		
Energy Policy	5.2	4.3	Energy policy
Organisational roles, responsibilities and authorities	5.3	4.2	Management responsibility
Planning (title)	**6**	4.4	Energy planning (title)
Actions to address risks and opportunities	6.1		
General	6.1.1		
Energy review	6.1.2	4.4.3	Energy review
Energy baseline	6.1.4	4.4.4	Energy baseline
Energy performance indicators	6.1.5	4.4.5	Energy performance indicators
Planning action	6.1.6		
Energy objectives and planning to achieve them	6.2	4.4.6	Energy objectives, energy targets and energy management action plans
Support (title)	**7**		
Resources	7.1	4.2.1	Top management
Competence	7.2		
		4.5.2	Competence, training and awareness
Awareness	7.3		
Communication	7.4	4.5.3	Communication
Documented information	7.5		
General	7.5.1		
		4.5.4	Documentation
Creating and updating	7.5.2		
Control of documented information	7.5.3		
Operation (title)	**8**	4.5	Implementation and operation (title)
Operation planning	8.1	4.5.1	General
Design	8.2	4.5.6	Design
Procurement of energy services, products, equipment and energy	8.3	4.5.7	Procurement of energy services, products, equipment and energy

Performance evaluation (title)	**9**	4.6	Checking
Monitoring, measurement, analysis and evaluation	9.1		
		4.6.1	Monitoring, measurement and analysis
General	9.1.1		
Evaluation of compliance	9.1.2	4.6.2	Evaluation of compliance with legal requirements and other requirements
Internal audit	9.2		
General	9.2.1	4.6.3	Internal audit of the EnMS
Internal audit programme	9.2.2		
Management review	9.3	4.7	Management review (title)
General	9.3.1	4.7.1	General
Management review inputs	9.3.2	4.7.2	Input to management review
Management review outputs	9.3.3	4.7.3	Output from management review
Improvement (title)	**10**		
General	10.1		
Nonconformity and corrective action	10.2	4.6.4	Nonconformities, correction, corrective action and preventive action
Continual improvement	10.3		

The Energy Transition

Submission:

Owen Wilson

EI IRELAND

About Owen Wilson:

Owen Wilson is Chief Executive of the Electricity Association of Ireland, the representative body for the industry on the island, having previously over 32 years industry experience working with ESB in a number of management roles. Dr. Wilson was also chair (2008-14) of the Environment and Sustainable Development Policy Committee of Eurelectric, the European electricity industry association, and a member of its executive e committee. He has worked closely with a range of stakeholders on key national and EU energy, climate and environmental policy issues.

For over 100 years the electricity system presented a profoundly stable business model in the broadest sense with modest incremental developments in generation and networks technologies. Then the world of electricity changed, slowly initially but with the rate of change now accelerating to wholesale revolution. A number of clear drivers are causing this change:

- A revised political philosophy that sought to drive efficiency, innovation and cost reduction through deregulation and privatisation
- Technology developments in generation and the pace of these developments, particularly renewables
- The application of communications technology and with it the creation of "Big (enormous) Data".

However, from an industry perspective, overarching all of these developments and providing added impetus to each has been the growing body of scientific evidence confirming human induced climate change is a real and increasingly urgent threat to global economic wellbeing and the wellbeing of the planet in general. In response, the industry expects that electricity generation must come with zero emissions at the latest by 2050.

Why the focus on electricity? It is because, critically, electricity has the ability to contribute significantly to the decarbonisation of the overall energy system and deliver the required national, European and global "energy transition". The above drivers dictate that the future electricity/energy system will be:

- Decarbonised,
- Decentralised,
- Digitised and, with the potential application of block chain technology,
- Democratised

Decarbonised electricity

As of now, decarbonisation can only be delivered in Ireland exclusively through the adoption of renewable energies given the legal prohibitions on nuclear and carbon dioxide storage. Biomass, biofuels and biogas will have roles to play in meeting energy demand however, on a purely cost basis, it remains likely the most significant contribution will continue to be delivered by wind generation. Solar photovoltaics (PV) will play an increasing role as this technology continues to develop and reduce dramatically in cost. Elsewhere in Europe nuclear will also continue to play a role.

Ongoing innovation in demand management and energy storage technologies will progressively improve the ability to manage very high levels of penetration of variable

generation. However, until the reliability (and cost) of such systems approximates to current levels of expectation for the continuity of supply, then some form of flexible, firm back-up generation is required. Most probably such back-up will comprise gas turbines that emit CO2. Consequently, as a policy need, **Government should revisit its approach to the transposition of the EU's Carbon Capture and Storage Directive.**

Decarbonised energy

Electricity generation is responsible for a declining contribution (less than 30%) of annual CO2 emissions from total energy use. The significant majority of emissions arise mainly from the provision of heating and transportation services. As noted, a number of options arise that can facilitate decarbonisation of these sectors including biomass, biofuels, biogas and structural changes through improved building standards and public transportation services. However, land availability for food production coupled with environmental and sustainability considerations will limit the scope for renewable fuels for both heating and transport. However, electricity is also in a strong position to meet the this challenge and in the process also improve energy efficiency and increase the share of renewable energies in these services. As is happening elsewhere, Government should initiate policy measures to support the electrification in heating and transport. A first step would be to **reconsider the metric used to measure energy efficiency, which today in a carbon constrained world equates 1 kWh of energy from coal to 1 kWh of energy from wind.**

A further benefit for Government arises as a result of the manner in which CO2 emissions are regulated with an emission trading system (ETS) sector for generation and large industry and a non-ETS sector comprising all other emissions. Consequently, replacing fossil fuel use by electricity in heating and transport results in the full reduction in emissions to the atmosphere from the fuels substituted. **The role of electricity as a least cost means to reduce emissions from heating and transport should be actively supported.**

Decarbonised economy

Ireland has a unique greenhouse gas emissions profile as a result of the continuing large contribution from agriculture. Consequently, Ireland faces a major challenge in meeting its EU emissions obligations. This puts Ireland in a position where it must be first mover in Europe on a range of policy issues, including those highlighted above. The recent climate and energy White Paper provides a useful starting point and **the measures it identifies should be evaluated in detail and progressed with urgency.**

Decentralised

Falling renewable technologies prices coupled with legislative requirements on zero emission buildings will ensure the localised development of on-site electricity generation. This brings positive benefits but also some important challenges, in particular the need to maintain investment in critical back-up generation and networks infrastructure and to ensure social equity. Wide scale distributed generation with almost zero short run

marginal cost is fundamentally altering the cost structure of the industry towards fixed costs. However, the pricing regime continues to be based on variable consumption. As battery storage costs also fall, more homes and buildings will move towards an almost "off-grid" environment. As a result cost recovery for all fixed investments falls on a declining number of generally lower income households. Attention needs to be given by **Government and regulators to the cost and price issue now to ensure investment and maintain social equity.**

Digitalisation and Democratisation

In the not too distant future we will see tens of thousands of localised generation and energy storage units, hundreds of thousands of smart meters and millions of enabled household devices. Communication technology will connect all these elements moving the industry into the realm of "Big (Mega) Data". These changes and will further revolutionise the industry and the relationships between those who produce, consume and store electricity – which in many cases will be the same entity. How, when and at what overall cost it happens depends on the flexibility and supportiveness of the policy and regulatory frameworks. How it is paid for will be an equally important challenge and one critical to ensuring the economic and social wellbeing of society.

Professional Development in the Energy Industry – Education v/s Training

Submission:

Ian Boylan

As the European Energy Efficiency fades into the background of the raft of national and European energy legislation that we as energy professionals need to deal with, the main focus of the energy industry appears to have been focussed on a small number of the areas addressed by the directive, obligation schemes for suppliers (Article 7), Energy Audits and Energy Management Systems (Article 8); Promotion of ESCo's (Article 18), and Demonstrating the exemplar role of the public sector (Article 5) being the ones that immediately spring to mind. In the background there is also additional work behind the scenes laying the groundwork for other areas addressed in the directive such as improvement in building regulations – to improve the energy efficiency of buildings but one area of the directive appears to have been largely left to one side – Article 16.

Article 16 of the directive is part of what is called the Horizontal Provisions, generally seen as attempting to ensure that across the European Union we take a consistent approach to implementation of European requirements – thereby supporting the principle of free movement of goods and services. This part of the directive deals with the availability of qualifications, accreditation and certification schemes for the energy sector at a national level – to ensure the technical competence, objectivity and reliability within the sector is delivered and maintained.

My belief is that this in an area that Ireland can further lead the way in Europe through promotion of competence and recognition of competence as opposed to minimum standards. The ISO 17024 accreditation approach provides a clear mechanism where we can push towards this aim.

Watching closely the effects of various schemes that have been used to implement the various schemes used throughout Europe to implement the various requirements of European requirements it was clearly seen that where a compliance based approach has been implemented – for example taking the energy audit scheme in Ireland and ESOS in the UK, where organisations have been required to undertake energy audits – to meet a compliance requirement laid down by the directive – it was easily seen that the direct result was a quick fall in the standards delivered of energy services delivered. This appears to have effectively come about because organisations did not particularly want to spend money on getting energy audits completed – for the sake of it – and therefore focussed on how these could be done for the cheapest possible cost.

Following this where individuals are seen to be able to "meet the requirements" of delivering an audit for €X, then why would the organisation pay €2X to get the audit completed – to meet the requirements.

This in my opinion leads to the requirements to focus on competence and ability to deliver as opposed to minimum standards in the energy area. One of the key focus points that Ireland needs to focus upon is the binding European 2020 targets.

About Ian Boylan:

Ian is Director of Target Energy, a small Irish based energy consultancy company with a global outreach providing its clients with independent energy advice based on sound engineering principles, coupled with experience and integrity.

Target Energy's focus is based on the best principles of energy management, making best use of existing systems first, improving efficiency of operational use and essentially looking at the low cost energy reduction options.

Ian is one of Ireland's energy sector that can clearly be seen to be recognised internationally. He has delivered services to clients across Ireland, UK, Spain, Italy, USA, Canada, Ukraine, New Zealand, Armenia and other countries.

Ian is a leading member of the Association of Energy Engineers, a Global organisation with members in 91 countries worldwide. He delivers certified professional training on their behalf in Western Europe, he chairs the AEE International Certification Board and is the incoming president for 2017, only the second time in the fourty year history of AEE that a

We have seen where Ireland is making progress towards its binding targets – but no guarantee that we will get there – and we have already, where possible taken credit for measures previously taken that were allowable to feed towards these targets so the remainder of the targets need to come from "new delivery of savings"

The minimum requirements that have been seen to have been delivered across some sectors where audits have not really delivered any meaningful potential improvements that are cost viable for business and does not do the energy sector any justice, nor assist in delivery of meaningful progress towards our energy savings targets.

My belief is that in Ireland we need to look carefully at delivery of quality energy services rather than quantity, and to look closely at how we can ensure that we move away from minimum standards. If we look across other professions such as accountancy, the legal sector, medical sector etc – none of which are ideal – BUT in every case there is a mechanism for instigating a "fitness to practice" review and persons that are not fit to practice are not allowed to practice – at least not as sole entities.

I believe that Ireland should take a lead in this area for Europe and move towards competency driven energy services

non-USA based individual has been elected as the organisations president, and the first European. Currently AEE President elect, he was previously secretary of AEE in 2015.

Additionally Ian is a leading expert in the international Energy Management Standard ISO50001 and has worked and spoken internationally on this topic.

Education:

- E (Electrical Engineering) – University College Cork
- Eng.Sc (Sustainable Energy) – University College Cork
- Chartered Engineer – Engineers Ireland
- Certified Energy Manager AEE
- Certified Energy Auditor – AEE
- Certified Measurement & Verification Professional – AEE
- Certified Water Efficiency Professional AEE
- Certified Building Commissioning Professional – AEE

Expanding energy horizons

Submission:

DesignPro Ltd is a leading provider of precision automation and machine build services. Established in 2004 in west Limerick the core functionality of our business over the past 12 years has been designing custom machines mostly for large multinationals and blue-chip companies. A core value that we pride ourselves on is our commitment to remaining innovative and flexible. We work across a large variety of industries, everything from automotive, cosmetics, food and medical device. Our diverse portfolio of projects and flexible approach in providing unique solutions to client's needs has distinguished us in the marketplace. In June 2015, we moved to a 110,000ft^2 building, 36,500ft^2 of which we have now completely overhauled and is operating smoothly. We have a staged plan of development for expanding out through the building over the next few years; 2017 will see us grow to 56,500ft^2.

As the company grows, so is our range of services and projects. We have aligned ourselves with market leaders in the provision of high end solutions – especially with the focus upon the smart factories of the future. A key decision over the past few months was becoming a system partner integrator for Kuka Robotics in Ireland – a company at the cutting end edge of this technology.

In 2014 we were approached by a local company GKinetic Energy Ltd who wanted us to draft and build a 1:4 scale of an innovative tidal turbine. The design and concept was completely unique and since then we have also built and helped deploy a full scale 10kw river turbine device which was tested in a purpose built facility. We are now invested in seeing this device reach full commercialisation and in January of this year we successfully secured H2020 Phase 1 funding to expand out on our business plan and progress the project within the company.

Next year we intend to take a 25kw device to France and conduct more detailed testing for a minimum period of 6 months – then followed by a 60kw device in the same test site but also redeploying the 25kw device to another site in another region of the world. We refer to these devices as utility scale – ranging up to 100kw. In the background, further development is ongoing by GKinetic Energy Ltd on larger scale devices – up to 1MW.

All of this is necessary to help us reach our goal of having a full range of hydrokinetic river devices on the market by June 2019. At this stage we are looking at various different technologies and the how they can benefit the device going forward. Most businesses are well aware of the energy incentives and funding available to physically make a business more energy efficient but not as many businesses are considering how they could be a perfect fit as a partner or supplier to an innovative renewable energy project.

The technology development is just one piece of a complex business model for ensuring these concepts and designs reach the market. Sales, installation, maintenance and R&D activities are all necessary stages that many businesses could be in a prime position to

Paul Collins

DesignPro

Synopsis:

The move toward green energy is something we must now all get on board with. Expanding our energy horizons means a change in behaviour, both in how we run our businesses but also how we can directly get involved in developing exciting new energy concepts.

Takeaways:

- By remaining flexible and innovative the company is now heavily involved in the commercialisation of small scale, river turbine devices
- We recognise that the global energy crisis is something that affects us all and we need to adapt our way of thinking to be more open to upcoming opportunities that the inevitable shift toward green energy is going to bring
- Many businesses could be perfectly suited to becoming a much needed partner or supplier for a unique renewable energy project but just haven't considered this, it's time to start looking at the

provide but just haven't considered. The move toward green energy is something we must now all get on board with. Expanding our energy horizons means a change in behaviour, both in how we run our businesses but also how we can directly get involved in developing exciting new energy concepts.

exciting opportunities green en ergy is bringing and how we can get involved

- DesignPro Ltd is a leading provider of machine build and precision automation services

About Paul Collins:

Paul Collins is the owner and Managing Director of DesignPro Ltd (www.designpro.ie), a leading provider of custom machine-builds and precision automation services. Established in 2004 and now based in Rathkeale, Co. Limerick, the company has won numerous awards including 'Overall Winner of the National Enterprise Awards 2013' and 'Best SME at the Limerick Chamber Regional Business Awards 2015'. With over 16 years of personal experience, Paul has extensive knowledge of design, engineering and automation practices and has worked with some of the biggest Multinationals in the industry including BorgWarner, Nestle and Boston Scientific. Staying true to their core values of being innovative and flexible, in 2014 DesignPro took on a very unique renewable energy project for the design and build of a small scale, river, hydrokinetic turbine. In January this year the company was successful in receiving H2020 funding to support this project which is progressing very well and successfully demonstrates how a company can expand its energy horizons.

About Design Pro:

DesignPro Ltd is a leading provider of precision automation and machine build services. Established in 2004 in west Limerick the core functionality of our business over the past 12 years has been designing custom machines mostly for large multinationals and blue-chip companies. A core value that we pride ourselves on is our commitment to remaining innovative and flexible. We work across a large variety of industries, everything from automotive, cosmetics, food and medical device.

Challenges to Energy Implementations

Submission:

There is great potential to reduce energy consumption and minimize its total cost by using existing technologies—and without changing the everyday habits of consumers.

Many people focus on opportunities that require high-tech new systems or on conservation efforts that reduce the benefits from energy. Yet there is great potential to reduce its consumption and minimise its total cost by using existing technologies—and without changing everyday habits. So why haven't these prospects been realised already? Four fundamental barriers stand out. Energy efficiency typically requires large upfront investments to achieve savings that accrue later. In addition, it has low mindshare, and opportunities are fragmented across billions of devices in more than 100 million locations. Finally, the organisations that would be primarily responsible for implementing energy efficiency find it hard to measure, which makes them less motivated to act.

Realising the full range of savings may require a comprehensive energy policy, but regardless individuals and companies alike must become more aware of the importance and profitability of change.

In the commercial sector, payback times, capital constraints, and procurement can be problematic. Industrial sites, for example, generally have tight budgets, and many companies now require a one-and-a-half- to two-and-a-half-year payback. Managers may ignore attractive energy-efficiency projects because companies fear to hurt their credit ratings by raising debt. Fear also causes risk-averse plant managers to replace failing equipment with the same models rather than more up-to-date and energy-efficient ones—but inventory carrying costs prevent many distributors from offering them anyway. And even many industrial-procurement operations focus on upfront rather than total costs (lifecycle cost).

Niall Kiernan

Global Green Consultancy
Growth Through Sustainability

About Niall Kiernan:

Niall Kiernan is an award-winning entrepreneur and sustainability consultant, advising both public and private sector organisations on energy saving matters.

Niall is the founder of Global Green Consultancy, which helps clients save money on energy, waste and water costs, improve productivity and increase compliance through the completion of technical studies, impact assessments and ISO international standards.

Capturing Value from Disruption

Submission:

Kim McClenaghan

The last 100 years have witnessed an explosion of technology as the industrial revolution progressed into the era of the consumer. Technology development windows continued to shrink while markets grew at increasingly faster rates than occurred in the past. But the power sector has not kept pace with other industries and has been neither a leader nor a fast follower of technology adoption.

The sector has maintained a natural reluctance to 'jump' into new technology without extended periods of testing and evaluation – sometimes lasting decades. But in the immediate period ahead, utility companies will need to completely change their approach to innovation and technology adoption or face becoming increasingly side lined as a series of transformative waves hits the sector.

The accelerating pace of change

A look back on various technologies that have appeared since the 1960s illustrates the slow pace of technology deployment among utilities. Whether automated generation control in the 1960s or advanced gas turbines in the 1980s, it took 15-20 years for utilities to widely adopt what was available in the market. Similarly, control and digital relays were available for system operations in the 1980s but again it took 15-20 years for this technology to widely take hold in the grid and network. Advanced metering rollout is still a long way off high penetration, both globally and on the island of Ireland, even after more than ten years of technology availability.

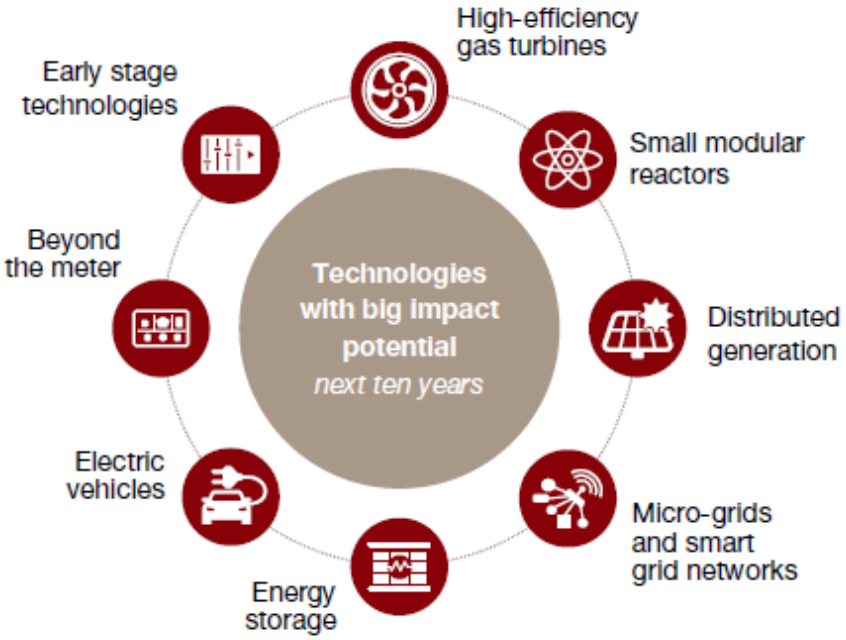
Contrast this pace of adoption to what has happened in new industries over the last several decades. While it took more than 55 years for telephony to achieve 50 million customers, it only took 18 years for personal computers, 15 years for mobile phones and ten years for the internet to achieve the same level of customer adoption. And consider the short time frames for various applications, games and novelty devices to reach similar levels. This now happens in single-digit years as technology-based product and application value is made available to consumers at internet speed.

Disruptive technologies

Numerous technologies are emerging that could dramatically affect the future of the utilities industry and current costs. We focus on those that appear more likely to be commercialised within the next ten years and could have a widespread impact on traditional elements of power infrastructure. These technologies must be reviewed, with a look at both their economics and likely proliferation. The choice of these technologies is also supported by many of the findings of a study on the future of energy systems in Germany, Europe and the world by the year 2040, which included in-depth consultation with 80 recognised international experts from the energy sector and related industries. Of those technologies identified only small modular reactors are unlikely to be relevant in Ireland over the period in question.

About Kim McClenaghan:

Kim is the Energy and Utilities lead within the Consulting division of PricewaterhouseCoopers Ireland. He is a Chartered Engineer and has over 15 years consulting experience with a proven track record in successfully delivering transformative projects in the sector.



For utilities, this accelerated pace of change that comes with technological change is both an opportunity and a threat. As customers become more aware of technology possibilities that can provide useful applications in their lives, they are quick to seek out these offerings. Customers are not receiving their product and technology knowledge from their utilities; rather, they are obtaining information from non-utility sources on the internet, other customers and non-traditional entrants to the utility grid and customer businesses.

Five future scenarios

What could these technology breakthroughs mean for incumbents, new players in the market, and large energy users? Whether companies are providers of power generation, managers of an electric Grid, retailers of power and energy solutions, or large energy users, many of the technology evolutions we discuss could have a significant impact on their businesses.

'Losing touch' – a future where utility companies lose touch with their customers as other players take control of the customer energy hub. Incumbent utilities provide simple delivery of wholesale energy at the cheapest price with an energy 'hub' performing all routine and value-added functions for the consumer.

'Off grid' – the centre of gravity shifts away from the main grid to onsite generation and storage as well as distributed generation attached to micro-grids. The grid becomes more akin to a source of back-up power and utilities face a number of dilemmas on what role to play in a more diversified power system and how to maintain underused and costly power infrastructure.

'Mobile and virtual' – electric vehicles become the norm, creating the need for substantial infrastructure investment and the opportunity to use vehicles as a mass storage source.

Local utility networks and circuits face tremendous strain. Utilities have the potential to capture several sources of value from this scenario but face considerable competition from a range of other players.

‘Data rich’ – ubiquitous, intelligent sensors collect energy flow and performance data across all levels of the network, and regulators require utilities to allow data access to third parties. Value shifts away from traditional utilities toward those who can collect, process, interpret, and convert these data to offer knowledge-based, value added energy management services to customers.

‘Scaled down’ – large business customers start to install their own decentralised and scalable generation for their own usage. As technology continues to progress, smaller and smaller commercial and industrial customers migrate toward a new era of ‘site-based’ generation. Traditional utilities see a diminished role with their larger customers and are not able to avoid disintermediation for their largest load entities.

Many of the technological developments add to the real threat of separation between utility companies and their customers. And when customers determine they are willing to consider or outright adopt emerging technology alternatives, they will seek out these products and services from wherever they can. If the sources of this information are those offering the technology or products themselves, rather than the utility, then disintermediation between the utility and its network and its customer is not long to follow.

Creating a level playing for Manufacture and Energy Saving. EN 1254/5 ERP Ventilation Products for Buildings.

Submission:

mike-o-donoghue-eco-design-presentation-ahu-22-june-2016

Mike O'Donoghue

MARK EIRE BV

The numbers never lie.

Submission:

Liam Tolton

SECOND SIGHT
TECHNICAL

Many companies just pay their electricity bill without ever really understanding the nature of their electrical consumption. If you understand the details of your electrical consumption you can discover significant opportunities for saving !

You can do this by initially reviewing your bills and using some features of the suppliers on line system. The quality of these systems is quite variable so not all of them give you the full picture. I use specialist software to generate detailed excel based spreadsheets and graphical analysis to dig into the true nature of the client's electrical consumption.
We used this software to analyse the 2014 Christmas Shutdown period for one client in a large manufacturing site where some critical equipment must operate 24/7 throughout the year. The average load was ca. 2.2MW. Following the analysis a structured shutdown was implemented in the following year and in the 2015 Christmas Shutdown the average load was reduced to ca. 1.4MW giving savings of € 21,000 euro over the Christmas break in return for an afternoon's work for 2 people !

Further reductions are planned for the 2016 Shutdown period !

"What is good enough for today is not good enough for tomorrow" – A Continuous Improvement Culture

About Tom Cafferkey:

Tom Cafferkey

As Chief Operations Officer at LotusWorks, Tom is responsible for the strategic growth and development of the LotusWorks organisation. To remain as a leading engineering and technical solutions provider, Tom is driving growth at LotusWorks through continuous organisational and process improvement. Much of Tom's time is spent building and progressing relationships with decision makers in the Bio-Pharmaceutical, Medical Device, ICT & Advanced technology sectors. Tom's strengths rest in his ability to prioritise and communicate business objectives necessary to achieve LotusWorks goals, he is entrepreneurial, flexible, and has an innovative approach to operational management. Tom has led organisational transformation projects within LotusWorks and has played a crucial role in solutions development as the market has evolved.

About Continuous improvement at Lotusworks

At LotusWorks, we add value to the customer experience through our company culture and behaviour. We provide dedicated personnel, which are solid performers and deliver results to clients in tune with their strategic objectives. Our solutions are tailored towards the needs of clients on a case by case basis and are optimized by our Lotus Workers being mindful and adaptable to different company cultures. We create value by not taking risks for our clients and enforcing a 'no blame' policy – all issues get address and efficacious solutions found. We pride ourselves on our high level of expertise, professionalism and integrity. We don't let our clients down; you can count on us!

We believe what is good enough for today is not good enough for tomorrow. Therefore, we have adopted a Continuous Improvement culture which consists of a drive within our people to enhance processes, eliminate waste and reduce costs where possible. This results in incremental initiatives and innovations that help our teams and our clients to achieve the best practice. The formal Continuous Improvement Programme is deployed for our key clients. CI's are presented and if agreed by our clients they are adopted. On average our clients are adopting LotusWorks enabled improvements of €300k/quarter.

Lean is Green

Dermot Freeman

Submission:

Lean is Green

(How to use your Lean program to reduce energy usage, waste creation and ultimately costs while enhancing your Green Reputation)

For the last 30+ years, general manufacturing has been involved in continuous improvement in one format or another. In recent years, Lean is now being applied in the service, knowledge, financial and backroom support sectors. Any and all elements of businesses are being reviewed for waste and excess cost. This is also starting to apply to energy and the Green aspects as long as it does not required capital. In most decision makers minds, investing in Green initiatives is still not seen as being value for money. It's not "sexy" enough!

However, some multinationals are driving the Green agenda with the Corporate Social Responsibility objectives within their strategies and by using the significant purchasing power as a lever, they are forcing many of their suppliers to become Greener. Up until now, most SME enterprises have viewed the Green agenda as being an additional cost and so it has been left to the larger companies to pursue.

A Fundamental of Lean is the elimination of waste, in all of its forms. What if by doing this, you can also become Green. With every initiative, simply ask the question "Is this a good Green idea?" It needs to become a standard question. Simple initiatives can reap significant benefits.

- How can you make your product or its packaging more environmentally friendly. It is often the case that the customer does not require expensive packaging. Ask your customer "What do they want, are they prepared to help being Green?"
- Waste disposal is becoming a significant cost for some organizations and this can be addressed through the 3Rs – reduce, reuse & recycling, with recycling being the last resort as often it is dearer to recycle that it is to dump.
- Look to minimize both raw material stock and finished goods inventory. Aside from being a good financial idea, it reduces the amount of disposal that is required when it becomes obsolete.

- Reduction in the use of compressed air – the most expensive source of power.
- The use of BMS systems or protocols.
- Look to install intelligent lighting control systems in every new building initiative to ensure that they are not left on when vacant.

Investment in Green initiatives are often put on the back burner. This can be due to the fact that the payback is longer (typically 2 to 7 years) or whatever investment euros that are available are prioritized for business expansion. Most manufacturing entities fall into the general classification of 50% of their cost being materials, 25% being labour and 25% being overhead. Most costs associated with Green initiatives fall into the overhead classification and as a result, unless there is a significant overhead, for example power, the overhead element of the cost structure has been largely overlooked. However, for some companies significant savings have been made on the back of Green investments.

- Use of alternative heating (wood chip, geothermal, biomass)
- Where there is a constant energy requirement, use of wind turbines or CHP
- Heat recovery from waste streams, particularly compressor rooms
- Waste water treatment using Reverse Osmosis, reed beds & willow plantations
- Securing ISO14001, ISO5001 or even ISO2600(CSR)

We need to make investing in Green initiatives a real option for SMEs. This can be achieved through availability of cheap funding or tax incentives or other financial benefits that will allow the longer payback time to be shortened. The Enterprise Ireland's GreenStart & GreenPlus Initiatives do give support but not enough companies are taking up the opportunity. We need to make Green "Sexy" and the best way to do that is for it to save money.

Comprehensive Public Participation in our Energy Transition

Submission:

Theresa O'Donohoe

I have spent the past number of years advocating for the People's Energy Charter request for comprehensive public participation in Ireland's National Energy Transition Plan, NETP. A brief synopsis of the outcome is here and more in-depth report on my work is here.

The questions everybody asks are "What is comprehensive public participation and how do we do it?" Here are some thoughts but I have a full proposal in my latest blog here.

Comprehensive public participation in the national energy transition plan is vital so that its implementation will be widely accepted at least and actively participated in at best. We need a collaborative national vision and implementation strategy. Working together we can create a shared vision and commitment to its success.

The national transition must be transparent and participatory. From the outset the public must be included, working on the design of the consultation, integral to the creation of the vision and co-creators of the implementation plan. The Maastricht Recommendations on Promoting Effective Public Participation in Decision-making in Environmental Matters are a great basis for how to progress our NETP. A general recommendation for designing the legal framework for public participation in decision-making advises that for good practice it be created in consultation with the public – page 6.

In other words the public should be involved in designing the National Energy Transition Plan consultation.

I believe that we need someone dedicated to climate and energy in every local authority area. A Climate & Energy Transition Coordinator perhaps in every Public Participation Network (PPN) or similar structure. They will have a coordinating role for Climate and Energy awareness, information, education and participation in planning at community and local authority level. They will facilitate community led, collaborative climate and energy plans to ensure action to mitigate and adapt to climate change. They would work in conjunction with the PPN while collaborating with the Local authority, energy agency, local media, development companies and other bodies within the area. They would be tasked with collating the public vision for how the transition should happen while empowering people to engage in the policy and decision-making as well as inspiring them to take action in their own communities. Ideally they should be independent of the local authority.

I would like to see an energy forum in each local authority area. This will be a space for stakeholders – communities, council, business, industry, farmers, church, sporting bodies etc., to meet and explore climate and energy issues. This will also be the forum

About Theresa O'Donohue:

Coordinator of the People's Energy Charter and Convenor of Transition Ireland and Northern Ireland. Member of the Climate Committee at An Taisce and representative of Feasta, Foundation for the Economics of Sustainability at the Environmental Pillar. Founding member of Clare's Public Participation Network, PPN and member of Clare's Economic Development and Enterprise Strategic Policy Committee.

that discusses what needs to be represented at the National Energy Forum and Climate Dialogue. **This is especially important for rural areas where infrastructure decisions have historically been made centrally without the host communities input.**

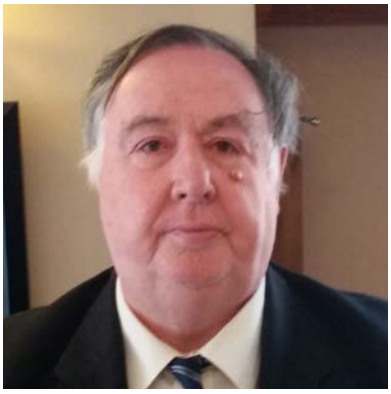
We need a national awareness-raising campaign on climate change and our need to co-create a NETP similar to those addressing smoking and road deaths.

Public participation in energy planning has been inadequate to date. Projects have mostly been industry led with some having the support of government, state agencies and strong lobby groups. This has resulted in widespread mistrust of government, state agencies and developers. Over the course of the past decade we have seen many energy project or policy opposition groups rise up including Shell to Sea, Wind Aware Ireland, Save Our Forests, Fracking Free Ireland, Turf Cutters United, Protect Our Coast and Save Our Seafront in Dublin Bay. The Right to Change movement that has emerged from the Right To Water campaign is also focused on our natural resources. I recently met with the Marine Institute who are coming up against opposition to research in renewable energy.

We really need to start collaborating now to create a shared vision and commitment to its success.

Exploitation of Clean Energy within Natural Clean Energy from the Earth's Resources

About Anthony Doyle:



Anthony Doyle

Background: I was born in Dalkey on 13th August 1954, I lived there for 40 years. I went in Harold Boys school in Dalkey, and for secondary school I attended Dun Laoghaire Tech, being very wilful I left school when I was 15 and I got a job at Kapp & Peterson, a local factory that made smoking pipes. I worked there for 13 years. When I was 33 years old, I discovered I had a creative talent in the form of art. From then I spent a year living in Kensington, London as an artist. It was a very exciting year, but a hard way to make ends meet. I continued to live as an artist when I returned to Dublin, and to date, I still paint. As my creativity grew, I found I had a talent for inventing things, from board games, to energy saving products such as radiators insulators and energy saving kettles.

In 2006, I met David Doherty who had a company called IBD, we went into business together and we formed D&A Concept Design. From there we invented and patented five different energy saving products, an energy saving kettle, a radiator insulator, a billy boiler, a hot plate that keeps food hot without using electricity, and an energy saving oven. We also created two two-player board games for which we have copywrited. We are also working on two other projects, one is relating to the generation of electricity in the sea, and the other is relating to solar power. The solar power project is used to desalinate sea water into fresh water. It works by direct sunlight which is focused on mirrors, focusing onto a hot spot, the spot is then heated to high temperatures. This technology has been around for some time but we have added another technology to it with the use of magnifying lenses. The lenses do not make a difference as far as energy is concerned, but can scale down the plant. There is no need in this day and age, for there to be a shortage of water, in African countries, or any other places with drought issues.

There is also the possibilities of using solar power and wind power for the generation of electricity in the mass production of hydrogen gas. These areas have been researched by the American Navy which have developed vessels which use hydrogen gas. The Norwegian Government have built a plant in the sea, and they are also hoping to produce hydrogen gas. There is no reason why Ireland cannot be in the forefront of this research and development to produce hydrogen gas using wind power as the cost of fossil fuels get higher, renewable energy resources like wind power have great potential in gaining hydrogen gases from the sea.

We are also working on a project which could link Ireland and the UK to the continent, with an undersea floating tunnel. We are engaged in this research. The Norwegian and the Italian Engineering company are in the midst of building one of these tunnels. The concept is simple, and there is no reason why Irish engineering companies cannot be in the forefront of projects like this. With all this work that I do, I do charitable work. I have done a large amount with youth groups in the past, and now I am engaged in other charities such as those for mentally ill people. I run social clubs for mentally ill people, and I organise holidays for them through this club. I am also dedicated to the cause of helping people with mental illnesses start enterprises and helping them to find jobs

Are We Serious About Climate Action? Energy in a Carbon Limited Future

Main Article: Energy in a Carbon Limited Future:

Does your company and sector say it is increasing carbon efficiency, saving energy and thereby mitigating climate change? If so, this post aims to show why this is not true and how your company and sector can actually get on a path toward climate-proofing future energy use – to help all our futures.

Stopping the rapid, human-caused global warming now occurring is an immense collective action problem for humanity. The global economy rests on energy availability and the predominant source of global energy remains fossil fuels – oil, gas, coal and peat. But, every unit of carbon dioxide released from burning fossil fuels results in a corresponding increment of additional global warming that is essentially irreversible on human time-scales, due to the additional solar energy trapped by the ever-accumulating CO2. Climate action requires global CO2 emissions to go to zero as soon as possible.

Paris Agreement ambition, to limit warming "well below 2ºC" in line with science and equity, already requires cutting emissions very fast indeed – in Ireland sustaining cuts of well above 6% per year. To meet the Paris target at least two thirds of fossil fuels in already known reserves will have to stay in the ground, especially the dirtiest. In Ireland, an immediate win for climate action would be to stop extracting peat, our biggest carbon store, and stop the loss-making burning of it for power generation. Many more, much smarter jobs can be had retrofitting our poor housing stock, saving public money and saving energy. Business-as-usual really isn't an option.

The foreverness of warming resulting from raised greenhouse gas concentrations in the atmosphere means that mitigating climate change can only said to be achieved if we can guarantee that our carbon-energy savings really will result in carbon staying in the ground forever. That is just not as easy as many otherwise-knowledgeable people assume. If we make cost savings by saving carbon through energy conservation, renewables use or efficiency measures, how can we guarantee that emissions are avoided to keep fossil fuel in the ground permanently? The answer is straightforward: by ourselves we cannot! Without strong system governance we or someone else will waste our efforts at some point in time. Supplementing on-going use of fossil fuel energy with renewable energy and efficiency gains is not enough; we have to ensure that we ultimately leave most already-known fossil fuel in the ground.

Paul Price

An Taisce

An Taisce' s Climate Change Committee

Synopsis:

If your company and sector is increasing carbon efficiency, saving energy, is it really thereby mitigating climate change? The answer is probably no. If we make cost savings by saving carbon through energy conservation, renewables use or efficiency measures, how can we guarantee 'saved' emissions are avoided forever to keep fossil fuel in the ground permanently?

The answer is straightforward: By ourselves, we cannot!

The key point is : cost-savings due to energy reduction or efficiency will only equate to mitigation if a company or sector operates within a governance system that guarantees a Paris-target-aligned pathway.

Takeaways:

1. BCommonly claimed 'climate solutions' – energy efficiency, increased use of renewables, and energy conservation – are not the same as climate mitigation.
2. To claim our carbon-energy savings as climate mitigation we must

The key point still to be learned is this: cost-savings due to energy reduction or efficiency cannot equate to mitigation unless a company or sector operates within a governance system that guarantees a Paris-target-aligned pathway, constraining total future emissions. At present, that is far from being the case. Even if achieved, collective, national emission-reduction pledges for Paris will result in very dangerous 3ºC warming. The EU carbon budget to 2030 is likely double the emissions of Paris-target ambition. With continued high emissions, as projected for Ireland and for the global economy, failure is as inevitable as it is untenable. It does not have to be so.

Sadly, the past generation has failed to face up to reality. Despite all rhetoric, annual global emissions have increased by 60% since 1990, rich nations have off-shored consumption emissions, and developing nations have increased their own emissions. To limit warming within the remaining 2ºC carbon budget, decarbonisation has to proceed much faster than considered up to now. Any and all delay simply increases the rate required. Cumulative problems mean escalating risks of real impacts for companies and for our societies.

So, yes we need to act much faster. But, crucially, for our savings to count as mitigation we also have to ensure that they are made within a 2ºC governance system. Therefore, companies and sectors need to push the nations they operate in very strongly to meet Paris-level ambition. Is your company and sector doing this in Ireland? If not, continued climate failure will be the real result: emissions savings will continue to disappear as cost-savings are spent and free-riders waste our efforts.

Actual climate mitigation means greatly ratcheting up national and EU emission regulation. Will manufacturing in Ireland push for Paris-level climate regulation, including on goods and trade? For all our futures, let's hope so.

make savings within a governance system that guarantees fossil carbon will permanently stay underground.

3. Since national and EU level gov ernance are failing to deliver systems in line with Paris-temper ature target ambition, all sub-na tional and international actors op erating within them must push them hard to ensure far greater ambition.
4. Stabilising the Earth's climate sys tem at the Paris-target level requires immediate, substantial and sustained CO2 emission reduc tions at rates far greater than those currently contemplated. It is up to us in every sector to make it hap pen quickly if we are to avoid the gravest consequences for our future.

Paul Price, Researcher, An Taisce:

Paul Price, a member of An Taisce's Climate Change Committee. Paul is a conservation carpenter with a MSc in Sustainable Development.

About An Taisce Climate Change (committee):

An Taisce is a charity that works to preserve and protect Ireland's natural and built heritage. We are an independent charitable voice for the environment and for heritage issues. We are not a government body, semi-state or agency.

An Taisce's Climate Change Committee

Terms of Reference: Human activity is now impacting the living environment on global scales. We are encountering multiple hard physical planetary boundaries, each with the potential for severe damage to global ecosystems in general and human welfare in particular. Of these, cumulative greenhouse gas (GHG) pollution of the atmosphere, and consequent widespread climate disruption is the most urgent, the

most potentially catastrophic, but seemingly the most resistant to effective societal response. The potential impact of climate change on the welfare of this and future generations is now so large that it determines the very possibility for achieving all other more specific objectives and goals of An Taisce. In this unique historical context, it is necessary for An Taisce to adopt an explicit mission of advocating for radical, urgent, large scale, and politically painful, climate policy action. The An Taisce Climate Change committee (ATCC) is established to provide the necessary expertise, analysis, advice and action to inform and support the An Taisce Board and Council in realising this mission.

Optimised Waste Heat Recovery through Pinch Analysis and Energy Storage; A Mineral Processing Example from Europe.

Submission:

Within the process industry, the production of mineral products consumes a substantial amount of energy. Hereby, a Pinch Analysis (PA) can show the optimal overall plant configuration the maximum possible heat recovery (HR) and thus, leading towards significant cost savings.

Developed in the 1970s by Bodo Linnhoff the PA is a powerful tool to optimise whole production plants in order to reduce their primary energy consumption. If a PA is conducted over a production process, it shows the total energy needed for the ideal process and ways to achieve this ideal state within the current non-ideal process. Applying economic values for all the process steps and possible improvements, it will also show the trade-off between investment- and operating costs. This is achieved by a systematic approach as follows: First, the system to analyse has to be define. As the approach of a PA is to step back from the existing configuration of the process plant, it is important to decide, which system needs to stay untouched. However, the more holistic the focus is, the bigger the achieved energy savings will be. The second step is to define the process requirements and the financial parameters for the existing Hot and Cold Utilities (HU and CU). Thus, it is crucial to question every process stream about its required temperature level to minimise external energy needed. After the scope is set and the requirements defined, the new heat exchanger network (HEN) can be constructed. Thus, showing the new optimised plant configuration and its resulting energy consumption. Energy saving is somewhat an everlasting process and most often, the focus lies on optimisation single equipment. However, the PA as one of the few theories of process optimisation shows the total theoretical energy savings possible, based on thermodynamic laws. Thus, one can directly see, how close the optimum HEN is to the theoretical potential of HR. It is clear that combined with the financial parameters to construct the new HEN, the optimal HR is a trade-off between utility costs and the payback period of the new measurements.

The following case study analyses a mineral production facility in Europe with an existing district heating network. Fed with the waste heat of the production plant, it provides part of the heat energy demand for the company's production and administration. Furthermore, the district heating network supplies several single and multi-family houses, as well as industrial enterprises and school buildings in two villages nearby. During production breaks on the weekends and during the week when demand for heat energy exceeds supply, oil boilers are used to handle the deficit. Thus, providing over 3.8 GWh thermal energy over a standard year.

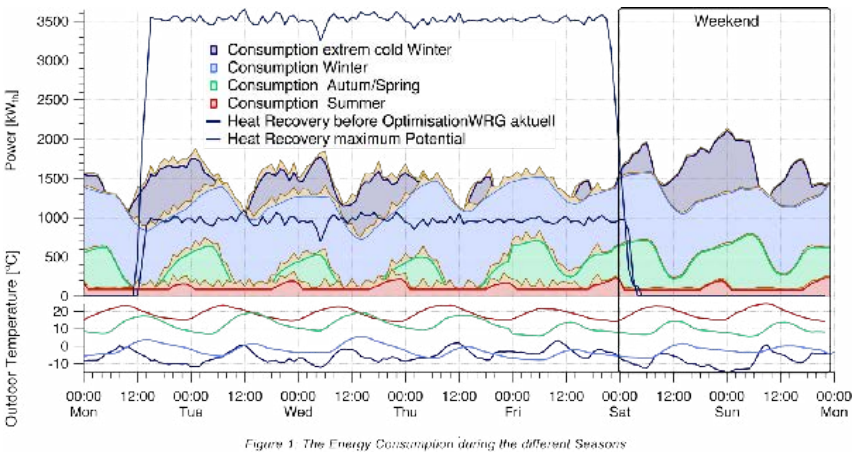


Figure 1: The Energy Consumption during the different Seasons

David Guthorl

International Student

Synopsis:

Within the process industry, the production of mineral products consumes a substantial amount of energy. Hereby, a Pinch Analysis can show the optimal overall plant configuration the maximum possible heat recovery and thus, leading towards significant cost savings.

The following case study analyses a mineral production facility in Europe with an existing district heating network which uses the facility's waste heat to supply two nearby villages.

The Pinch Analysis shows the economic optimum for the investment and operational costs by proposing a thermal energy storage which leads to annual savings of over 250000 € and 700 t CO2

Takeaways:

- Holistic systematic approach and holistic optimization (system design, energy supply, operating costs and capital costs)
- Statement regarding the absolute energy savings potential
- Prevents poor investments into

Measurements have been carried out over 3 weeks, showing that the oil burners provide thermal energy during the week even though the heat recovery potential would be more than sufficient to cover it fully on its own. Therefore, there is a significant amount of waste heat unused which dissipates to the environment. Furthermore, the conducted PA shows first, that through internal process optimisation the coke-heated melting furnaces could save another 8% of its demand leading to savings of over 200 000 € a year. Second, that an unused HR potential of over 5 MW thermal energy exists which could be used to increase the waste heat usage by the district heating network and thus, by reducing the oil burners activity leading to a significant CO2 emission reduction.

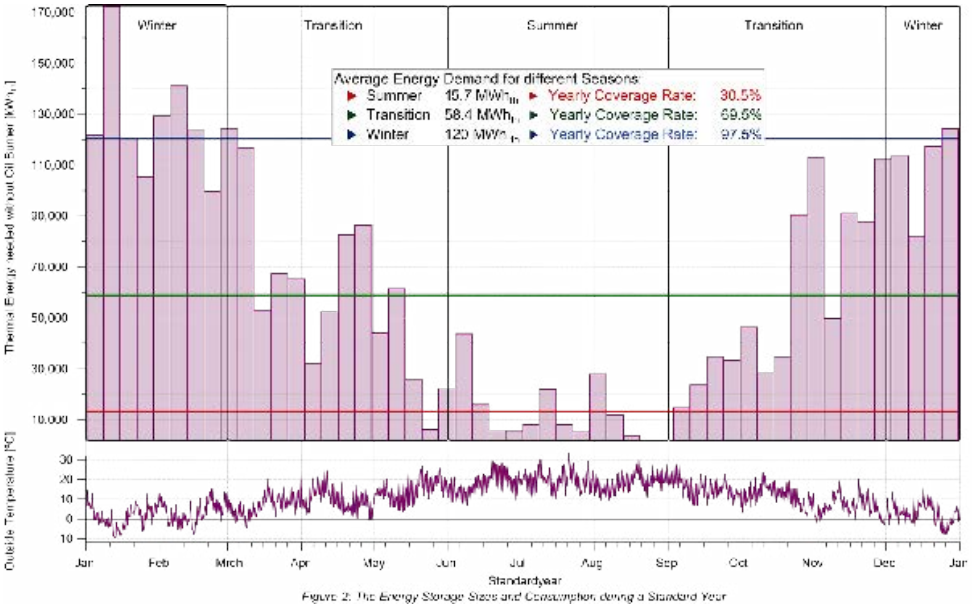


Figure 2: The Energy Storage Sizes and Consumption during a Standard Year

Based on the measurement, a simulation of the district heating network is being conducted, showing the different heating demand over the different seasons (see Figure 1). By changing the inlet as well as the outlet temperature level of the heating network, the usage of a hot water storage would become feasible. With a tank of 2800 m3, a cover rate of over 96% could be achieved (see Figure 2) and more than 3.5 GWh thermal energy be saved during the year and distributed over the weekends. Hence, leading to reduced oil burner activity and to annual savings of 250 000 € and saved CO2 emissions of over 700 t.
Further, the district heating network could be extended and provide another 200 dwellings with affordable and clean thermal energy from waste heat. With a payback time of 6 years the project is economically feasible and contributes to a smart cities strategy where industrial waste heat is transformed to useful heat for citizens.

Hereby, the PA is a powerful methodology to show the optimum plant configuration and the achievable energy savings together with the payback period of the proposed measurements.

incorrect efficiency measures such as the false integration of a heat pump
- Provides key data on how energy supplies, including solar energy and/or energy storage units, can be effectively implemented or dimensioned
- Shows where the current energy requirements of the process are; an element of Energy Manage ment Systems

About David Guthorl:

David recently graduated with first class honours from the masters programme Energy Management from Dublin Institute of Technology (DIT). In summer 2017 he will graduate from his second masters programme in Energy and Environment from Lucerne University of Applied Science (HSLU) in Switzerland. At HSLU, David has also worked as a consultant in process optimisation and pinch analysis.

He started his career with an apprenticeship as an architectural draftsman in Switzerland. Upon completion he planned and supervised the construction of multiple dwellings in the Energy Efficient Design (EED) standard. In his subsequent undergraduate studies in Mechanical Engineering at HSLU in Lucerne with a specialisation in Renewable Energies, he optimised a district heating network by installing an energy storage system.

With his in-depth knowledge of district heating networks, EED of buildings, pinch analysis and process optimisation, David will further pursue his ambitions to reduce industries energy demand.

Process Water Energy Strategy

Submission:

Medical device, Pharmaceutical, Food & Beverage and Manufacturing companies demand large quantities of water to produce high purity water. A more practical approach to reduce water usage is the development of efficient and effective water consumption program.

A water consumption program is broadly divided into two Key categories: Efficient and Effective Process plant Operation and Design, based on a review from the End to the Start of the process water plant.

Efficiency is a measure of the percentage of the total energy based on the water usage, so that it makes sense to optimise the operational parameters of the plant. Thus reducing the energy requirements for optimized plant performance.

Effectiveness is measured in terms of being able to remove the contaminants that are present in the water, and the ability to detect any abnormality in the fastest possible time. An effective system is also reliable and operates in such a manner that prevents contaminant concentration.

Approach to the Process Water System Energy Strategy.

Phase 1 Review of Plan

- Mapping of water consumption in real time.
- Analysis of energy needs associated with Process Water Technology
- Identification of focus area's work groups on the Key area's

Phase 2 Analysis

- Analysis of Cost associated with energy requirement.
- Optimisation of Process water usage technologies through parameter and set-point review.

Phase 3 Follow up

- Evaluation and implementation of savings initiatives

Challenges: Raw water Quality supply variations is one of the biggest challenges in the operation of a Process water system. Real time records monitor the Water Quality chemistry variations which are critical in determining the challenges to the performance of a system.

Joe Dunning

Dew Water Solutions

About Joe Dunning:

Joe Dunning is a Engineering Water Consultant with extensive experience (20 years) in Design, Commissioning, Validation and Energy on Purified Water Technologies for the Pharmaceutical, Medical Device, Semiconductor, Healthcare and Manufacturing industry. Joe has worked with Elga Process Water, Intel, Lam research and IBM throughout his career and holds a degree in BSc in Design, Innovation and Environment and BEng in Electrical Engineering.

"Gaining a competitive edge through energy saving"

Submission:

Andrew Lynch

BOLGERS
World Class Fabrication.
Passionate People.

Bolgers are a leading, well respected contract manufacturer who design, validate and produce precision fabricated assemblies and components to the Advance Manufacturing sectors of:

- Off-highway,
- Building and construction products, (BCP)
- Automotive,
- Medical Equipment,
- Power Generation/Distribution

Our value offering encompasses 3rd party accreditations (ISO9001, TS16949) with audited production metrics for "On-Time Delivery" and "PPM" scoring.

In the relatively near future, saving energy is going to be a key component in how SME business' can gain a competitive edge. At the moment, after materials and labour, energy costs (i.e. heat and light) are the single biggest cost contributor to our business.

Currently running at:

- 2013 – 4.8% of turnover
- 2014 – 5.1% of turnover

Closely linked to the above is what will become increased pressure on carbon footprint metrics, from large corporate OEM's and how our customer interface will change to help us, and consequently help them, achieve proposed energy savings (i.e. a lower carbon footprint) and potential cost downs from their respective supply chains.

Also Linked to this, is the discussion on products originating in Asia and respective proposed carbon tariffs on goods travelling long distances. – One of the fundamental purposes behind the Barack Obama ran initiative of "On-Shoring" in other words "Localisation v's Globalisation" – Which we take to mean as being an analysis of supply chain and to ultimately re-source supplied product closer to the manufacturing site, which consequently is situated closer to the end user.

What is important with regard to the business relationships is – As a forward-thinking, environmentally cognizant company that is ethically responsible, this can help appeal to our customers, and increase the trust element between the supplier/customer

About Andrew Lynch:

Andrew Lynch – Mechanical Engineer with qualifications in Business Development and Sales. 30 years, multi-disciplined, senior management experience in the indigenous Irish SME sector. Working within highly regulated industry sectors (Advanced Manufacturing, Medical, Pharma, Automotive, Electronics, Electrical, Computing), serving customers Internationally and locally.

Currently, Head of International Business Development. Providing manufactured, engineered solutions to a worldwide, blue chip customer base. Working with respective heads of purchasing and heads of engineering in Multi-National companies (e.g. Caterpillar, JCB, Perkins Engines, Cummins Engines, Medtronic etc.) to help them realise their specific business objectives.

relationship. This will become an important addition to the company value proposition, by way of potentially trading in carbon credits in the future.

My question to the forum is how can large corporate OEM's work with their SME supply chain to implement best practice and how we can assist one another to achieve these savings on a practical, measurable basis? With a relatively low "return-on-investment". Perhaps through the use of the following technologies:

- PV
- Solar Water
- Heat Pump
- Vari-speed servo motors on machines (can we retrofit)
- Lighting Technology
- Wind Power
- Thermal Loading
- Shift Utilisations
- Heat Recovery

Sources:-

http://www.mntap.umn.edu/mach/energy.html

http://www.reliableplant.com/(S(qn5hrujpp1jac2yiubusuj45))/Read/30035/energy-saving-tips

Electric Vehicles – Plug and Play.

Submission:

EV's are here to stay

Many still wonder about the reality of electric transport and headlines still appear, stating that 2016 has seen Electric Vehicles fall off the radar. However as with many articles, the devil is in the detail. EV registrations in Ireland have doubled year on year since 2011 with one slump year (for all vehicles) in 2013. The significant change this year has been that many of the registrations have been imports. EV numbers are still comparatively low, however they have reached a critical point and exponential growth is here.

The vehicle manufacturers are in the game; in fact it's a must for them. The Nissan Leaf is entering the 3rd generation with battery sizes up to 60kW due by the end of next year. Renault are due to announce an extended range version of the Zoe and Hyundai are introducing the Ioniq in full electric and plug-in hybrid models. BMW offer 4 plug-in models in Ireland and more will follow. The Audi/Porche/VW/Skoda group has launched a range of electric vehicles and plan to install a European wide network of High Performance Chargers. Let's not forget the media magnet that is Tesla, who are taking firm steps to develop their market in Ireland ahead of the Model 3.

With many manufacturers launching vehicles with real range values of 300 plus kilometers on a single charge, range anxiety is fast becoming a thing of the past. Electric Vehicles are here to stay, so we need to ensure that the environment is right to maximize the benefits and minimize the negative impacts of this new electrical load.

The largest single increase in domestic electricity consumption

The increase in uptake of EV's is already understood to be a potential negative impact on LV networks. Diversity calculations used in electrical network design are fast becoming out dated. However the problem need only be a problem, if we install dumb uncontrolled charging infrastructure. First generation domestic charging came in the form of 3kW loads, which draw power from the house for anything up to 8 hours. As vehicle numbers increase and battery sizes increase, the pressure will be for larger loads or at least longer charging durations. This may be in the form of two charge points for two vehicles or a 7kW charger to assist with larger battery sizes. From a network perspective there is also the consideration of how many vehicles are on a given network node and how to predict the nodes which will take the strain first.

Smart charging is the solution

The installation of smart electric vehicle chargers is essential if we are to avoid issue with voltage drops on our LV networks. As a solution this can be handled on a number of levels. Internally within the household, externally on the LV network node and externally on the MV network. The first immediate case addressed by Smartcharge is how to make 7kW charging available to consumers without negatively impacting on the load limitations of the premises.

Mark Daly

SMARTCHARGE

Synopsis:

Electric Vehicles have reached the point where they are here to stay. It is time to seriously consider how we address the battery recharging process. 'Dumb' charging, where the vehicle is just plugged in and charges at full power straight away until complete, is a recipe for disaster. Unless we add smarts to our charging devices, electrical networks will soon feel the pressure and network operators will need to invest large amounts to reinforce the substations and cabling to our housing complex. Smartcharge is one company thinking ahead and developing the electric vehicle charging solutions that the network needs

About Mark Daly:

Mark Daly, qualified in Electronic Engineering. His early experience was in electronic manufacturing and production, later moving into wider electro-mechanical roles. Mark first came to the Energy Industry in 1998 on the commissioning of a Combined Cycle Gas Turbine. With considerable expertise in control systems as well as O&M for ESB at one of Ireland's largest generator sets he has taken his experiences into the next generation of challenges to hit the energy business. 2011

Smartcharge can monitor the overall consumption in the premises and reduce charging rates back to 3kW during short periods where electric shower and other large consumers are demanding power, thus avoiding overloads.

Local LV networks, with some coordinated efforts can be equipped to provide similar turn down and prioritization functions for network nodes, in fact, this need not be limited to electric vehicles.

The MV Network can benefit from these same controls, with the added advantage that when voltage drop rather than overloads are the issue, MV transfomers with online tap changers can tap up, to compensate the line voltages.

With the benefits of communications and smarts, this can all be achieved in a proactive manner rather than a knee jerk reaction.

Business models and consumer choice

Networks operators may wish that consumers loads are limited, however if we wish to see sustainable transport solutions adopted by the motorist, we must at least meet them half way.

Security and safety of supply are essential, but they shouldn't be listed as an excuse for not developing innovative and beneficial ways to work. The energy market place needs to be updated to take consideration of new technologies, enabling the development of agile and sustainable business models where consumers choose Quality of Service requirements. Industry stakeholders must cooperate in the development of secure protocols, which identify anomalies and predict treats to the security of supply. In the end, technology solutions to our energy challenges will be found where the business incentive exists to resource them.

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saw him transfer to ESB ecars where his multi-discipline background was used to find close fits between the the energy sector and other industries such as ICT, Automotive and Telecoms. His stakeholder management skills were honed during this time while leading ESB's input into a number of EU funded projects as well as working with state agencies towards the development of policies and the support of Irish industry in an emerging market sector. Mark has been a key player in ESB's engagement with one of the energy industries most disruptive and exciting technologies.

Contacting Mark Daly:

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