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The professional journal of the Nuclear Institute

Vol. 17 #4 • July/August 2021 • ISSN 1745 2058

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Nuclear Future is published six times a year by the **Nuclear Institute**

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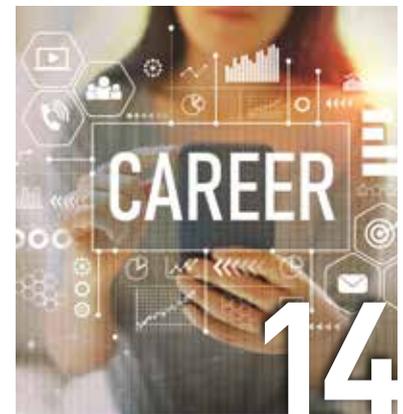
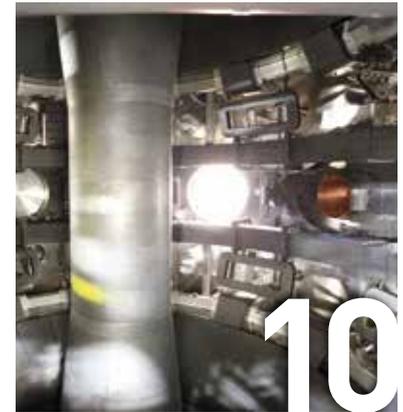
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IN PERSON

“I was fed up being on the outside, banging on the door. I wanted to be on the inside making change from within.”

Kirsty Gogan, former climate activist turned policy influencer, on nuclear comms, ‘Impossible Burgers’ and how the industry can help deliver net zero.

Kirsty Gogan was bunking on a couch at a friend’s house when she landed her first job – as the Deputy Prime Minister’s press officer. Since that moment, she has jumped from stone to stone, creating or being a part of many of the building blocks that have shaped, and continue to shape, the future of environmental planning and the position nuclear plays within it.

As an environmental activist, she had originally been involved in several famous protests to “make some noise” about climate change. The radical move into government - thanks to the owner of the aforementioned couch who worked in the department - was greeted with derision by activist friends, who called her out for “going over enemy lines”. She concedes she “had no idea how to dress for an office” but in terms of a long-term plan, she knew exactly what she was doing.

“I was fed up being on the outside, banging on the door,” she explains. “I wanted to be on the inside making change from within. I was completely out of my depth and I had a very tough year, a very, very steep learning curve, but I had some great mentors. I am very hardworking and I actually really cared about the content and the subject matter. I think that made the big difference.”

Gogan took that governmental insight, blended it with her still-burning activist mentality, and moved into the non-profit sector, where she developed the Planning for Climate Coalition. The team created a full policy document, written in the same style as the government would, had it backed by the stakeholder community and handed it to them ‘on a plate.’

This led to a major change in policy, ensuring a material consideration of climate change is made in every planning decision. The government took the credit – but that did not matter at all to Gogan. “The secret of successful campaigning,” she explains, “is it’s the outcome that you care about, not the glory or the credit.”

THE GIFT OF NUCLEAR

Gogan's transition to the nuclear world was somewhat of a surprise, driven in part by a rather bizarre wedding gift: Sir David MacKay's book called 'Sustainable energy – without the hot air.'

Having grown up in the mid-1980s, Gogan had absorbed "all the 'nuclear apocalypse' children's literature" and, as an environmentalist, she concedes she was "by default, anti nuclear - I hadn't really interrogated that, it was just 'that's part of my identity'."

The book number crunches through the challenges of achieving the then climate targets using existing technology, just with renewables, and also lays out the facts around nuclear energy. "Suddenly, everything I thought I knew turned out not to be true," she recalls. "The volumes of waste, the risks associated with nuclear, even the costs."

At the same point, Gogan was approached by the Department of Energy and Climate Change and ended up being selected to run the public consultation on nuclear new build for the National Policy Statement (NPS) on energy. It was as if the stars had aligned.

"My curiosity was piqued and I thought either I could go in and apply a lot of integrity to it, or someone else may do it and they won't care," she states. "We had to take a neutral view and I was in quite a good position because I genuinely was very undecided. I was certainly not pro-nuclear at that time."

"I had expected people to be worried about safety, waste and security but they were actually worried about dust, disruption and noise from construction. They were also really interested in the potential to create a whole generation of new jobs that would enable their children not to have to move away."

"The nuclear industry really had not acknowledged the importance of climate as a driver with nuclear."

The consultation developed a forum of NGOs, which still continues today inside government. It analysed many locations that are now designated sites for potential future plants. It also enabled Gogan to try to align nuclear with climate change.

"When I was talking about climate, frankly, it was falling on stony ground at that time," she recalls. "The nuclear industry really had not acknowledged the importance of climate as a driver with nuclear, and a lot of people were actually deniers, even then in the industry."

BENEFITS NOT RISKS

Then came Fukushima. The incident in Japan was a hammer-blow to progress in nuclear and Gogan's role moved to leading the evaluation of the national communications response. What she found in the research she undertook was, to her, a revelation.

"I read lots of documents from the WHO and the UN about what had happened at previous accidents, including Chernobyl," she says. "I was shocked to discover that the biggest public health impact had been fear of radiation, not radiation itself, and that the same tragedy was unfolding at Fukushima."

This ultimately led to the revision of the Nuclear Emergency Planning and Response guidance, requiring the assessment of risk "beyond radiological protection" and the evaluation of the "health impacts of countermeasures." The whole research experience made it clear to Gogan that,



Kirsty Gogan, Managing Partner, LucidCatalyst - CV

Gogan attained an MSc in Politics, Business Strategy and Environment at Birkbeck, University of London, and is an expert consultant to industry, academic networks and NGOs.

After her early days as an environmental activist, she gained more than 15 years' experience as a senior advisor to Government on climate and energy policy, including 10 Downing St, and the Office of the Deputy Prime Minister.

She is now managing partner of LucidCatalyst, a highly specialized international consultancy focused on zero carbon technology options for large-scale, affordable, market-based decarbonization of the global economy. She also chairs the UK Government's Nuclear Innovation Research and Advisory Board (NIRAB) Cost Reduction Working Group and is also Co-founder of TerraPraxis.

- Senior Press Officer, Office of the Deputy PM (2001-05)
- Comms Manager, Town and Country Planning Association (05-07)
- Head of PR, Futerra Sustainability Communications (07-09)
- Acting Head of Comms / Deputy Head of Strategy, Department of Energy and Climate Change (09-10)
- Deputy Head of Civil Nuclear Security, Department of Energy and Climate Change (11-12)
- Head of Communications, Nuclear Industry Association (12-14)
- Global Director / Co-founder, Energy for Humanity (14-20)
- Managing Partner, LucidCatalyst (16-Present)
- Co-founder, TerraPraxis (21)



without radical change, nuclear would never be able to get beyond its smokescreen of fear.

“It made me realise that the industry, unfortunately, has reinforced negative perceptions in its attempts to reassure people about them,” explains Gogan, citing nuclear and power market policy analyst Malcolm Grimston’s theory that by constantly reassuring people about how safe the industry is, it’s actually reminding everybody how dangerous it is.

“Ever since then, I’ve really worked hard to talk about the benefits of nuclear and the value proposition. Perception of risk is very closely linked to the perception of benefits. For example, we’re happy to get into a car and drive, even though it’s really dangerous, and that is because we perceive more benefits than risks. We’ve never really done a good job at demonstrating the environmental benefits of nuclear energy in the context of the much larger risks of continued use of fossil fuels.”

CHANGING PERSPECTIVES

Gogan carried that valuable insight into her next position as Director of Communications for the Nuclear Industry Association, where in 2012 she created the Low-Carbon Alliance between nuclear, renewables and the carbon capture and storage industries. At the time, the thought of nuclear aligning with renewables was a relatively far-reaching one.

It was such a landmark that when it was announced the FT ran the story on its front page and most national newspapers also covered it in depth...even the Guardian. “When I went into work that day, I genuinely didn’t know if I was going to get sacked or given a pay rise,” recalls Gogan. “The industry was so uncomfortable with that at the time, on all kinds of levels, particularly about climate statements and about Greenpeace welcoming such a statement.”

Almost 10 years on, that sustainability and nuclear conversation has absolutely transformed and, asked whether this was one of the big drivers to actually trigger the recognition, Gogan says: “I think it probably was. To get positive press coverage in the Guardian, for nuclear, this had never happened before. By joining up with renewables, we could access it.

“After the initial statement, we jointly hosted events at the party conferences, meetings in the Houses of Parliament, and they were packed, the best attended events we’d ever had. You had all the tribes coming into the room, so there was this real energy about it. The government loved it because it mirrored policy, and it created this cross-party consensus around nuclear and renewables that hadn’t existed before.”

At the same time, Gogan steered towards another

“If it’s too expensive and slow to make a meaningful difference, then you can’t really depend on [nuclear] as a climate solution.”

landmark with the creation of the UK’s Women in Nuclear chapter, something that again was driven by research and insight, after a survey showed that almost a quarter of those in the industry were women, many often progressing into leadership roles.

“Incredibly, nobody had ever asked these questions before, it was all anecdotal,” says Gogan. “The survey showed the nuclear industry was outperforming other STEM sectors, where the average representation of women is about 11%, so this was a really positive story.”

REWARDS OF REPETITION

Having been won over by nuclear, Gogan co-founded Energy for Humanity, a non-profit advocating for nuclear energy as a climate solution while also joining forces with climate change policy analyst and advisor Eric Ingersoll to co-found consulting firm LucidCatalyst.

Nuclear was now being spoken of alongside other types of power production in conversations on net zero, but one major challenge remained: dispelling the myth that nuclear is expensive and that its development is slow. So, she set out to gather data sets on nuclear efficiency and cost-effectiveness to present the case to the wider world that nuclear can be a viable, dependable climate solution.

“I recognised what was missing was the civil society based advocacy for nuclear,” recalls Gogan. “But if it’s too expensive and slow to make a meaningful difference, then you can’t really depend on it as a climate solution.”

The first study undertaken, commissioned by the Energy Technologies Institute, was on nuclear cost drivers. It evaluated the 30 most recently completed nuclear plants, using a detailed scoring methodology to define the best practices that lead to good cost and schedule outcomes. The research clearly showed that cost effective development was, essentially, down to programmatic benefits, all of which would be entirely transferable into the UK context.

“The cost outcomes aren’t technology or country specific, they’re really to do with the capability and experience of the delivery partners,” Gogan explains. “When projects are first of a kind, as they are in the US and Europe, they require very large investment to establish the skills, qualify the supply chain, license the design with an inexperienced regulator and do a first-time build.

“Even at Hinkley, with two units, the first has all of those one-time costs but on unit two, you do not have to spend the vast majority of that money again. You have the design, the skills and capabilities, the labour force is trained, the supply chain is qualified, the project leadership know what they’re doing, the site is set up. So unit two just goes very fast and is built for much lower marginal cost.



“We’re seeing projects around the world being delivered for around \$3,000/kilowatt through a really focused programmatic approach. Even now, the vast majority of plants around the world are currently being delivered for less than \$4,000 a kilowatt. That’s compared to the \$12,000/kW first-of-a-kind projects being delivered in the US and Europe right now. But it’s very understandable how those lower costs are being achieved – you just keep repeating and repeating and you become faster and more efficient.”

WHERE ARE THE NEW-BUILDS?

Despite the increasing acknowledgement of nuclear’s relevance and importance for the future ‘net zero’ grid, Hinkley Point C is the only nuclear power station currently under construction in the UK. It is the first in more than 20 years, yet many of the projects planned for sites recommended in the aforementioned NPS have ground to a halt in recent years.



the government committing to procuring them through the regulated asset base (RAB) model, for example? With most of the recent completed projects around the world, we've seen an incredible economy in installing four units instead of two. Wylfa could accommodate four units. Licensing would be challenging, but not insurmountable, given the political will."

PROGRAMMATIC PROGRESS

Plans for a fleet of 16 SMRs across the UK, announced by Rolls Royce earlier this year, take the programmatic approach to another level. These smaller plants were described by the BBC as aiming "to re-engineer nuclear power as a very high-tech Lego set" and building them as modules reduces cost through parallelisation, automation and construction in a controlled factory environment.

According to Gogan, however, their success is not a given. "We really need SMRs to be delivered for less than \$3,000 a kilowatt if they're going to have large markets," she proposes. "From the analysis we've done in this space, the SMR developers have two important ways to achieve a low cost approach: product design and delivery design.

"The biggest feature of high cost, delayed projects is that they start construction without a completed design. We've seen it over and over again that the product design teams in the vendor organisations are doing a really good job at designing for low cost, but they have to also follow it through and ensure that the delivery design is also going to achieve low cost.

"Frankly, having a traditional engineering, procurement and construction (EPC) and a customer that doesn't really understand cost drivers risks bumping your outcomes from \$3,000 a kilowatt to \$5,000 a kilowatt, and there we are back in the uneconomic zone again.

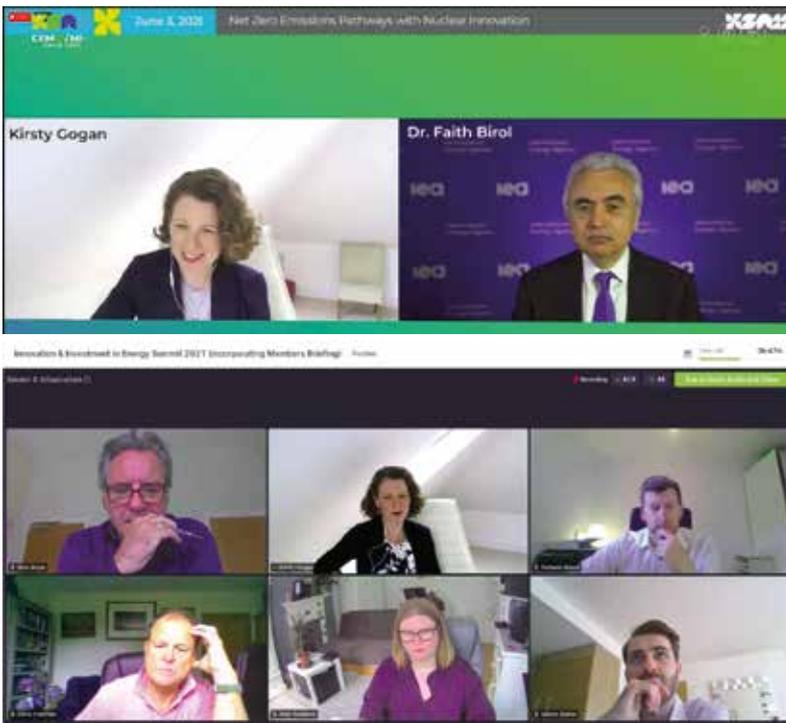
"For success, it needs intelligent customers that understand these cost drivers and demand certain levels of performance and design completion – and by that I don't just mean the drawings are done, I mean the design for constructability, for manufacture and assembly, is locked down and has been properly tested."

Planning permission is still being sought for Sizewell C, but three projects – Wylfa, Moorside and Oldbury – have either been cancelled or shelved, largely because of financing problems, while Bradwell remains in the early technical stages.

The scrapping of the Wylfa Newydd project, earlier this year, was blamed on the absence of a clear funding package – something that is not entirely surprising given the two EPRs being built by EDF at Hinkley Point C are estimated at a total cost of about £20bn.

"It's incredibly challenging to raise the amount of capital needed for a first-of-a-kind project in the current environment," says Gogan. "We've seen over and over again that betting the farm on massive complex infrastructure projects in a country like the UK, with inexperienced construction and supply chains, it's very, very difficult. But there are things government could do to de-risk those investments.

"At Wylfa, for example, why not build four units and have



THINKING OUTSIDE THE BOX

While SMRs (which have actually been around for longer than you may think) represent the most near-term effort to steer nuclear in a new direction – not as a replacement for large-scale generation but alongside it – there are even more creative concepts starting to see the light of day that have the potential for large-scale adoption, most notably around co-generation and large-scale hydrogen.

Very high-temperature gas-cooled reactors (VHTR) are an excellent source of process heat, capable of providing the 950 °C outlet temperatures required for hydrogen production. Poland, South Africa, the USA, South Korea, China and Japan are all working towards solutions, with Japan’s JAEA achieving a world-first temperature of 950 °C in 2004 and delivering more than 150 hours of continuous hydrogen production using the sulfur-iodine process in 2019.

According to the World Nuclear Association, “replacing fossil fuels with nuclear heat promises much in energy security, price stability and reduced regulatory risks” and is “the only option if carbon dioxide emissions are to be avoided.” With the launch of their latest venture, TerraPraxis, Gogan and Ingersoll have now turned their efforts to getting this application some serious airplay.

“Moving into non-power sector applications is a really important new direction for nuclear,” says Gogan. “When we launched TerraPraxis, we published a report called ‘The missing link to liveable climate’, which set out the opportunity for nuclear technologies to be really, really useful in the dedicated production of very low cost, very large scale hydrogen. It completely transforms the business model for the industry.

“It means you’re no longer limited to siting your project close to transmission and limiting the size of those projects

to the appetite of the electricity market. It enables, then, refinery scale operations in a location of your choosing, to make commodities that are storable, transportable and exportable to global markets.”

Surely, though, with electrification of the automotive industry gathering momentum, and building heating moving towards rooftop solar, has hydrogen not turned up too late to the party?

“No, no, no, no, definitely not,” contests Gogan. “The light transport sector, cars and so on, is a very good fit for electrification, but it’s the heavy transport that we are worried about, shipping and aviation. If shipping were a country, it would be the fifth largest economy in the world in terms of emissions – and as people get richer, transportation of goods by sea is only going to increase, as is the number of people that are going to want to travel.”

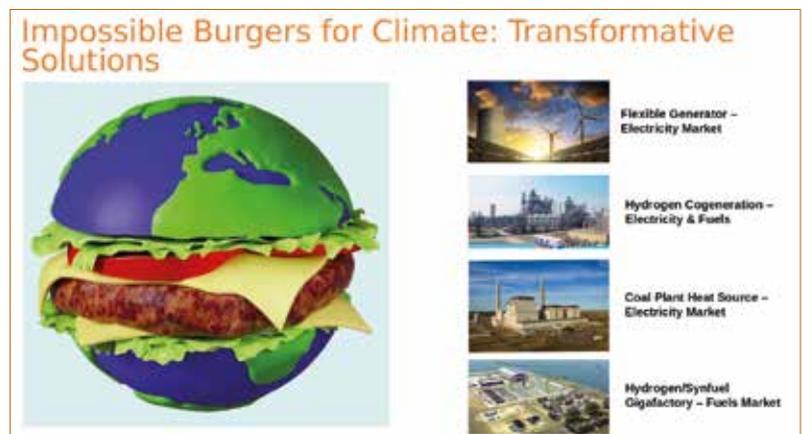
The liquid fuels market is already four times bigger than the electricity market, Gogan cites, and the potential is already here for hydrogen-produced ammonia to replace the fossil fuels used in shipping and hydrogen-based synthetic hydrocarbons to do the same in aviation. If and when that happens, the world will need a lot more hydrogen. Step forward nuclear.

“Have you heard of the impossible burger,” asks Gogan. “It’s a plant-based meat substitute that is a drop-in substitute. It looks like a burger, tastes like a burger, costs the same as burger, and you can buy it in any Burger King across America. Climate solutions need to be impossible burgers - so they don’t require behaviour change, people don’t need to pay more and they don’t require changes to energy’s infrastructure, such as new storage, transport and distribution.

“Ammonia and synthetic hydrocarbons are ‘impossible burgers’ for climate that can be used right now, ammonia with a little bit of retrofitting to engines, but synthetic hydrocarbons as a direct drop-in substitute for aircraft jet fuel, just without a lot of the nasties.”

HOT AIR

If large scale hydrogen production is to be one of the kingpins of nuclear’s future, Gogan believes this can be achieved through Gigafactories, which could deliver a refinery-style solution, or shipyard-manufactured offshore platforms, which have the potential of using an existing



world-class construction environment to deliver low-cost designs based on current oil and gas industry platforms. And, if current progress is anything to go by, it won't take long to become established.

"Advanced heat sources are being demonstrated and will be commercialised in the second half of this decade," says Gogan. "A lot of people don't realise how close they are to completing their licensing and building demonstration plants. Very soon we're going to see a lot of high temperature heat sources available and with the supply chain capability that already exists, we could be achieving very low cost, very large-scale fuel production by 2030.

"Ten Gigafactories could entirely replace the UK's current oil consumption with a tiny environmental footprint, using existing brownfield, coastal refinery sites. With the offshore platforms, 14,000 loads could provide an entirely decarbonised replacement for the oil and gas supplies currently forecast to still be supplying our energy by 2050."

In addition to this, advanced heat sources with lower outputs can be used to re-power coal plants, combining with thermal energy storage to become a clean dispatchable generator that can continually run at full capacity and either charge the 'battery' or dispatch electricity to the grid through turbines.

"Essentially, the coal burning bit of the coal plant will be replaced with a new source of steam," explains Gogan. "The rest of the old coal plant - the turbine and transmission - will be kept running. That's two-terawatts of electricity generation that could still be operating by 2050, without emissions. This enables you to substantially de-scope your project if you just have to install a new heat source rather than an entirely new power plant.

"We have to re-power those coal plants, we can't assume that they're just going to shut down and people are going to abandon those assets. We should be re-purposing as much of the existing infrastructure as possible. It's the 'Impossible Burger' again, and it's likely to be a very large market for these advanced reactors, more so than building new plants necessarily everywhere."

GETTING THE MESSAGE OUT

The pieces of the jigsaw are on the table, but for Gogan and Ingersoll, the next step is not putting them together. The next step is getting the investors, the regulators, the operators, the construction teams, all the people who can put them together, to walk up to the table and see the jigsaw, recognise the solution, then re-create the same jigsaws again and again.

"It has to be about cost, speed and scale," concludes Gogan. "Those are the core organising principles the industry needs and they are what it's missing right now. I think that would be really transformative in the mindset. Designing for low cost, designing for a very fast, very rapid rate of deployment, and designing for really large-scale production to achieve climate-scale solutions."

For Gogan and Ingersoll, it's all about multiples. It's creating a fleet of advanced heat source powered 'coal' plants, not just one; it's building a Gigafactory with 20 gigawatts thermal to make a meaningful amount of hydrogen; it's building the latest versions of traditional energy-generating plants, but with more reactors to achieve economies of scale.

QUICKFIRE QUESTIONS

Q: Who is your professional mentor?

A: I am incredibly fortunate that Eric Ingersoll has been my inspirational, motivational mentor for several years.

Q: What has your nuclear career highlight been to date?

A: Honestly, working with Eric to unleash creativity and determination to tackle the hardest parts of the decarbonisation challenge. The strategies we are working on could transform our prospects for avoiding catastrophic climate impacts and this gives me hope.

Q: If there's one thing you wish more people knew about nuclear, what would that be?

A: The transformative potential of this technology to de-scope, de-risk and lower the cost of achieving net zero could make mid-century decarbonisation feasible and within reach.

Q: What advice would you give to young people seeking a career in this field?

A: We need you! If you're interested in changing the world for the better, not only in energy, but in medicine, space travel, agriculture and ecosystems, the sky is the limit. Bring your talent, creativity, leadership and ambition to bear on the great challenges of the 21st century.



"Unless that story is told, policy makers have no idea; investors have no idea; and there's no demand from the climate community, who actually enable these things to happen," explains Gogan. "The issue is the transformative potential is not currently represented at all in energy systems modelling.

"I think once it is actually described, there will be a much better awareness and understanding of how these applications could de-risk our chances of actually achieving net zero by reducing the overall infrastructure build, new transmission and investment that's needed. That's when all of the facilitative actions that are needed to realise that potential will start to mobilise."

Gogan has come a long way from her activist origins, but that passion for driving change has never faded. She has turned from nuclear naysayer to nuclear advocate, and now she and Ingersoll could be steering nuclear to a big future. "By incorporating these strategies," she promises, "we could dramatically change our prospects for achieving net zero."