

Weekend

Your regular section is inside

PROMOTED CONTENT



STEM THIS WAY

With science, tech and engineering attracting more women than ever, the future is looking female



PIONEERS WHO MADE OUR WORLD

FEMALE scientists have often been eclipsed by their male counterparts but the fact there are now more than one million women in the Stem (science, technology, engineering and maths) workforce for the first time is a step towards a more equal future. The pioneering women who have influenced energy sciences may not have had the same recognition as men but these unsung experts shaped our knowledge and advanced the progress towards green energy. As world leaders prepare for next month's Cop26 climate change conference in Glasgow, there's never been a more pertinent time to celebrate the women scientists who have worked on one of the most important Stem issues – producing energy in a way that is kind to the planet.



KATHARINE BURR BLODGETT
PHYSICIST AND CHEMIST
1898-1979

New York-born Katharine Burr Blodgett was 20 years old when, in 1918, she became the first female scientist ever to be hired by US conglomerate General Electric's research laboratories. She worked on a project to create "invisible" glass that gave no reflection. As well as having an important application in camera lenses, her work was fundamental to several areas of energy efficiency and renewables, including in the creation of solar panels with coatings that enhance efficiency and make them water-repellent.



MARIA TELKES
BIOPHYSICIST AND INVENTOR
1900-1995

Hungarian Mária Telkes' accomplished career in solar energy research and development earned her the nickname "The Sun Queen". Having moved to the United States soon after graduating from the University of Budapest, she went on to create the first solar-powered home heating system in the late 1940s, and five years later invented a solar-powered oven. She helped the US department of energy create the first solar-electric residence, and her legacy is seen today on American rooftops and solar farms.



ANNIE EASLEY
COMPUTER SCIENTIST,
MATHEMATICIAN AND ROCKET
SCIENTIST 1933-2011

Annie Easley was a talented mathematician who broke barriers throughout her life. She worked for Nasa supporting the development of the widely used Centaur rocket launch vehicle, and became involved in groundbreaking energy research. She developed and implemented computer codes used to analyse and solve energy problems in outer space as well as on Earth. Her work included solar and wind projects, and the battery technology used for early hybrid vehicles.



ESTHER SANS TAKEUCHI
SCIENTIST AND EDUCATOR
BORN 1953

In the mid-1980s Takeuchi took on the challenge of increasing the power of batteries in cardiac defibrillators placed inside patients with irregular heartbeat. She instigated the use of new cathode materials, highly conductive electrolytes, and a novel cell design using a new type of battery one million times more powerful than its predecessor. As chief scientist at the US department of energy's laboratory, she advocates for research in battery science, including in storage for renewable forms of energy generation.



OLGA GONZALEZ-SANABRIA
CHEMICAL ENGINEER AND
INVENTOR BORN 1956

Born in Puerto Rico, González-Sanabria began a 32-year career with Nasa in 1979, working on the team developing batteries to power the International Space Station (ISS). In one 90-minute orbit, the ISS is in sunlight for just 55 minutes and, with its solar-powered electrical system, batteries play a vital role. During the other 35 minutes, the ISS is in the earth's shadow, so it relies on energy stored by batteries for power. This power system has allowed the ISS to be crewed continuously since 2000.



FRANCES ARNOLD
CHEMICAL ENGINEER AND NOBEL
LAUREATE BORN 1956

Frances Arnold was studying chemical engineering at the University of California when she combined her interest in biofuels with the emerging field of biotechnology. She modified the DNA of enzymes by inserting them into bacteria, making the enzymes into catalysts in the creation of cleaner fuels. In 2018 she became only the fifth woman to win the Nobel Prize in chemistry. She has said: "There are lot of brilliant women in chemistry. We are going to see a steady stream of Nobel Prizes [in chemistry] given to women."



STEPHANIE KWOLEK
CHEMIST AND INVENTOR
1923-2014

Kwolek's research into petroleum-based synthetic fibres for Dupont changed the world. By 1965, she had discovered liquid crystalline polymers that could be spun into fibres of incredible strength – an invention known as Kevlar. Today, among its many uses, Kevlar and other aramid fibres are used in the lightweight composites of wind turbine blades. These low-density polymers have excellent environmental and thermal stability and impact resistance, helping to minimise weight on the blades and increase the efficiency of energy transfer.



ANGELA BELCHER
BIOLOGICAL ENGINEER
BORN 1968

Texas-born Angela Belcher has made a career out of finding surprising and innovative solutions to energy problems. As head of the Biomolecular Materials Group at MIT in the United States, Belcher brings together the fields of materials chemistry, electrical engineering and molecular biology to engineer viruses that can create batteries and clean energy sources. She was *Scientific American's* research leader of the year in 2006, and the following year *Time* magazine named her a "climate change hero".

THE WOMEN POWERING CHANGE

Within some of the UK's most innovative green energy initiatives, women are taking the lead. So what's it like to try to transform the industry in a traditionally male-dominated sector?

Adriana Laguna's job is to try to bridge the gap between technology and the government's net zero goals. "The next five years are key," she says. "If we don't start planning strategically for the future now, we won't be ready." She is discussing climate change and the UK's preparedness to deliver zero emissions by 2050. Laguna is certainly ready.

The technology, the engineer insists, is there. Laguna heads up the Stakeholder Engagement and Strategy team at UK Power Networks, a network distribution company that owns and operates the electricity cables across London, the southeast and the east of England. "The electricity system has been constructed around generation and consumption. Suddenly, we have the technology that does both. My role is not only figuring out the tech and ensuring the network is ready for more renewables, but also

designing the commercial solutions that make sense for our customers."

For householders, one key step in switching to more renewable energy sources, such as wind and solar, is getting a smart meter. Smart energy systems play a crucial role in upgrading infrastructure to make it future-



We're on track but some bold decisions need to be made

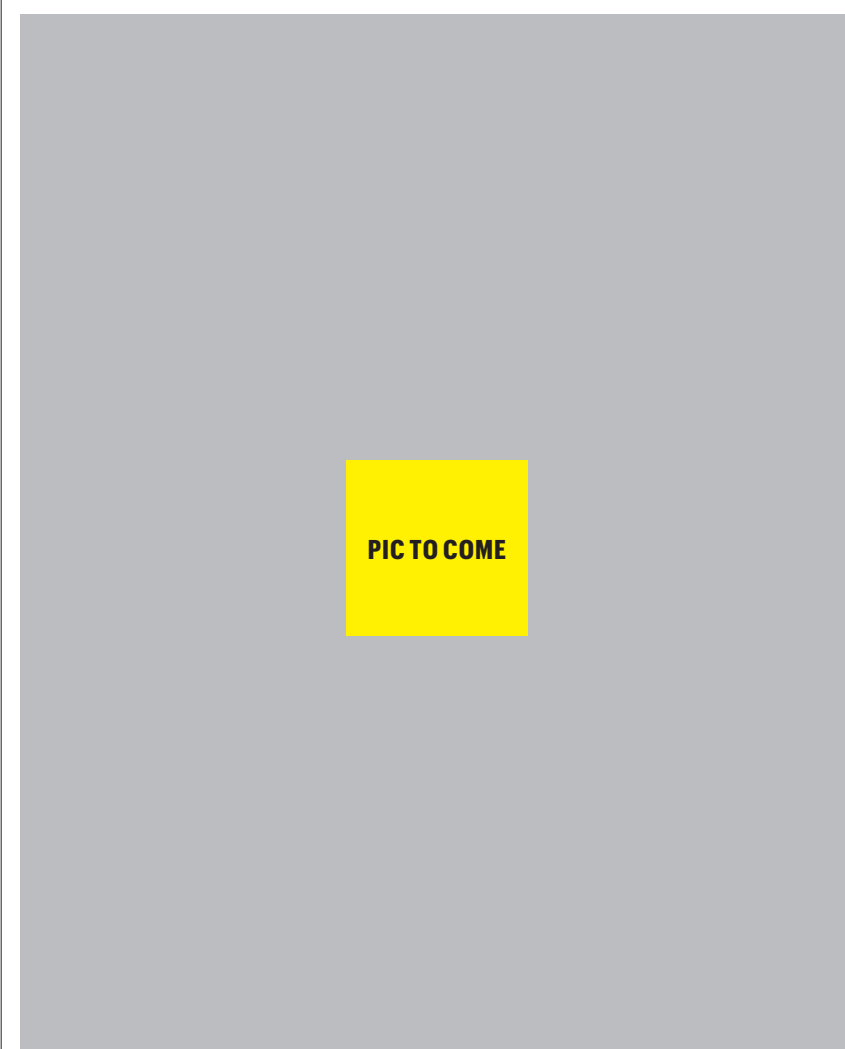
ready, and they enable individuals to be part of the network too.

Laguna, who previously oversaw Mexico's renewable energy plan, is cautiously optimistic about our chances of reaching carbon

neutrality before the clock runs out. "It's a stretch, but I still think we're on track. Some bold decisions need to be made and the electricity network has to be an enabler, not a barrier. We're slowly moving in the right direction. Tech wise, we're there. It just needs to make financial sense. When we reach that point, it will be easier."

For the first time, there are one million women working in the Stem sector in the UK, with

around 50,000 in professional engineering roles. The stats are less encouraging when it comes to the energy industry – just 5 per cent of executive board seats in UK-based companies are held by females and 61 per cent have no women on their board at all.* While more than half of UK Power Network's Innovation team are women, she admits to operating in a male-dominated space. It's a reality in harsh contrast to her background. Her



PHOTOGRAPHY: SEBASTIAN NEVILS, HEINZ TROLLI, SCIENCE PHOTO LIBRARY, NASA, GETTY, SHUTTERSTOCK, ALAMY

PIC TO COME

Adriana Laguna: 'No one undermined my grandmother or said she should have been at home'



Dr Enass Abo-Hamed: 'It's leaky all the way to the top – the more you progress, the fewer women you see'

grandmother, a Harvard-educated oncologist and gynaecologist, not to mention mum of seven, single-handedly introduced the smear test to Laguna's native Mexico. "That's what I grew up around. No one undermined my grandmother or said she should have been at home."

Dr Enass Abo-Hamed shares Laguna's frustration. The CEO and co-founder of H2GO Power, which develops safe and low-cost hydrogen storage technologies, says women

are disadvantaged "across the entire journey, from Stem education to career decisions. It's a leaky pipeline all the way to the top. The more progress you make across the pipeline, the fewer women you see."

The pioneering Abo-Hamed set up H2GO aged 28, during her PhD at Cambridge. At the time, no one was talking about hydrogen in the clean energy conversation. She's heartened by the progress made in the seven years since she launched

the company. "A lot of consumers are now choosing renewable energy to power their homes, even if they have to pay a little bit more for it," she says.

Smart meters, adds Abo-Hamed, play a vital role in the transition to the green economy. "They intelligently measure how we consume energy, where we can introduce improvements and where we score poorly in linking to and monitoring consumer behaviour. They have a valuable impact on reducing carbon consumption."

She is as passionate about getting more women involved in the clean energy sector as she is about making renewables affordable for all, participating in regular events to encourage other young women to step forward.

Likewise, Laguna makes a point of speaking at conferences and events for women in energy. "Until I started going to all these forums, I hadn't appreciated how important it is to get up and present. When you stand up there, you're enabling other women to do the same."

It's not just about representation. Much as Iceland's women stepped into positions of power following the 2008 global recession, Laguna

believes women are best equipped to tackle the environmental crisis. "Women are creative in ways men aren't. All these energy problems are really complex. There are a lot of vested interests involved. It's not just about the technology – women can do that side of things, without question. I think it's the next step that gets more complicated and needs a lot of understanding of where everyone is coming from. We all want the same thing: to reach net zero, and everyone is



When you speak at an event, you're enabling other women to do it too

defending their bit Women are more capable of saying, 'I get where you're coming from. Maybe you need to hear this argument.' We're more empathetic."

It has been 14 years since Laguna completed her masters in public

environment policy and only now does she feel confident that the message is being received.

"Everything we were being told would happen is happening. I've been on this train for a while, but people are just catching up. It's a shame but it's motivating to see. The tech and commercial solutions are in place. A lot of it just needs consumer buy-in. When customers do make the switch, we'll be ready."

*PWC Powerful Women, 2015

GREEN MACHINES

Join the energy revolution and contact your energy supplier to request a smart meter. For more information visit smartenergygb.org



THE GREEN ENERGY EXPERTS OF TOMORROW

Stemettes is welcoming back its very first members to support a new generation

Inspiring young women to work in Stem is all about making them believe in themselves and the exciting possibilities of a career where they can make a difference.

Stemettes is an award-winning enterprise working to inspire and support young women and non-binary people into careers in Stem.

“What we do is having a positive impact – you just have to put the right role models in front of young people so they can see a place for themselves in the Stem future,” says Stemettes chief operating officer Yasmin Lodhi.

“We’ve been running for eight years and the folk that came along at the start when they were about 14 now have jobs in Stem, and are coming back to support the next generation. So far we’ve engaged with 60,000 youngsters through our events, programmes and online interactions.”

Stemettes was set up in 2013 by Dr Anne-Marie Imafidon for girls to learn skills such as coding and problem-solving in a fun, safe environment. At the time, girls were slow to pick Stem subjects at A-level or as degree subjects, which in turn had an impact on how many women went into Stem careers.

Lodhi says that’s changing, with energy and sustainability key areas of interest for many Stemettes. “We ran a programme called Outbox in 2015, which we are running again now,” she says. “The original had 115 girls working for six weeks on business incubator programme ideas combining digital and business skills.

“All of them got their businesses seed-funded, and they were all around environmental impact and sustainability. That wasn’t the brief; they could work on anything – yet, interestingly, all of them chose sustainability.” That demonstrates the keen interest in that sector.



“More women working in Stem or sustainable investing will not just be an investment in our planet, but also an investment in ourselves and in our future.
University of Warwick maths student Joely, 18, founder of Pioneer, a non-profit empowering more girls to pursue maths and related careers”

“I believe our generation has the power to innovate and inspire change during this sustainability crisis.
Ayushi, 20, computer science student, London”

“I believe that I, like everyone else, have a responsibility to take action on sustainability, not only for my own future but for people across the world and for generations to come.
Abbey, 15, Surrey”

“I think women should be eager to take action, because a greener future needs equality worldwide – including gender equality.
Sneha, 15, West Yorkshire”

“I’m hopeful and excited for a future where UK firms value sustainability and eco-friendliness as an important objective.
Sanjana, 17, economics student, Henrietta Barnett School, London”

“If we all just cared together, thought together, planned together and worked together, we can lead by example – together.
Poppy, 16, East Yorkshire”

“I want to be part of the UK’s energy sector, as it is a forward-looking industry where I would be able to contribute to a more sustainable future.
Jaynie, 17, London”

“We control our world’s future. What we can do, we should do. And whatever we do at the moment, we can always do more. We must be proactive, vocal, willing, persistent, aware, because that is what will bring achieving our ambition for a more sustainable world much closer.
Vindya, 15, Carmarthen”

“Young people have the power to change the world. Let’s use our homegrown talent and technology as a catalyst to unite and make the world greener and more sustainable.
Lella, 17, North Yorkshire”

