



EnerGeo Newsletter

Count Down Net  Carbon

04

OCTOBER 2021
ISSUE

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CEO Message:

"Has it really been a year?" WOW,



Karl Farrow
- CEO CeraPhi® Energy

On the 14th of September 2021 we held our first AGM in line with our first year of operating. What a year it has been! Proof that when a group of people are committed and determined to make a change and a difference anything can happen:

COVID19:

With international travel bans, national lockdowns, businesses closing and furloughing staff, we decided to build a business. A year on, we have operating companies in the UK and USA and regional representation North and South America, Middle East and North and Sub-Saharan Africa.

We employ more than 16 full time people and a multitude of full-time and part-time contractors, with multiple patents filed, contracts signed and a large backlog of projects ongoing...

THE EXIT EFFECT:

The effects of Brexit maybe being blamed now for shortage of food on shelves, too few lorry drivers and many other things. The fact is, when you really understand the macro effect, that most of these things have been building through many governments through many years and Brexit or no Brexit would have made little difference whatsoever. Most of this mess is a consumer demand issue generated by uncertainty and lack of a good solid strategic plan. If politics was run like a business, we would not have these issues.

ENERGY CRISIS:

Natural gas is more than double the price it was. It was at the same time last year, with a widespread shortage yet a global sentiment to rapidly move away from fossil fuel within a global decarbonisation mandate. As the well-known environmental activist Jeremy Clarkson said: "That if we nail our colours to the mast of green power, events will inevitably gang up to ensure that one day, we'd have none at all." There has to be a transition and we are on the early stages of a transition with a long way to go, but we will get there and we have to get there.

FUEL SHORTAGE OR NOT:

Who didn't see that coming you may say? Whatever or whoever we want to blame for this, it's mainly been fuelled by consumer hype, a natural instinct of the herd mentality, unfortunately.

CLIMATE MANDATE:

G7 in Cornwall, COP 26 Glasgow, a big year for the UK and quite frankly a positioning test for the government and more importantly for those of us who can provide an impact change or solution to some of the challenges.

Those of us who actually live in this reality know that the 'Climate Emergency' has been an emergency for decades. Whilst most will judge this government for its failures to deal with it, multiple governments around the world have failed, and continue to fail, their frontline defenders and local communities globally who face threats and even murder for standing up for their land and environment, and in some case still do not have energy.

Whilst the UK may have been the first country to declare a 'Climate Emergency', it's still pretty unclear to most people what that means. While drawing a line in the sand may seem a starting point, we are a very long way from the finishing line, and for many, the route and distance is still very unclear, so I can safely say it won't be this government or future ones in the near term that fix the problem. So, we shouldn't waste our time and efforts looking up to the government to provide the solution. The quick we realise that we, the consumers, have to drive the change the quicker things will change and governments can do what they do best and regulate and police...

The climate and our planet may seem like everyone else's problem and that only governments can fix it. We, as individuals, the consumers, create the demand and we do have the ability to impact change within our decision-making process daily to fix the problem, each and every one of us.

Transitioning to Net Zero

John Sewell – Energy Transition Advisor at Ceraphi Energy



Much has been written and promised by governments and organisations over the last few years about the transition to net zero carbon emissions by 2050 and indeed with COP26, hosted in Glasgow, now only weeks away the call for action grows ever stronger.

There is no disputing that we all have to change, both personally, organisationally, and nationally if we are to make the significant change required to reduce carbon emissions to net zero by 2050, begin to arrest climate change, and make the world a more sustainable and healthy place for our children, grandchildren and future generations.

As a father of four children and, currently, six grandchildren, this issue is real to me. I want them and others to have a brighter and safer future and we all have a responsibility and obligation to play our part in the solution to providing this.

Much has been publicised over the last few years about eliminating the use and future extraction of fossil fuels. In some eyes this may be a laudable objective but is it realistic? We are currently unable to find real alternatives to the use of fossil fuels in hundreds of products, outside of transportation, power, heating and cooling, that we have all become accustomed to. A world without plastic derivatives, borne from oil, is very difficult to imagine and comprehend and is society ready to accept this?

This is where the word “transition” becomes so important and is the key to tackling the global climate change problem that we are faced with. I find it very difficult to envision a world without the use of hydrocarbons, but we can find ways to reduce the amount we use, and we can find ways to offset the emissions produced both through extraction and use.

Renewable energy sources such as wind, solar, tidal, nuclear, etc are all playing their part in reducing carbon emissions with investment, R&D, technology, and political messaging all making great strides to speed this up. Indeed, many have received and continue to receive substantial financial support from the UK and other countries governments to enable the incubation and global emergence of these technologies.

Whilst all sources of renewable energy, carbon offsetting and storage, all play their part in the solution to net zero, they are not the full solution as supply intermittency issues, as recently experienced in Texas, demonstrated. The recent spike in wholesale gas prices demonstrate the fragility of the market and we are moving towards a world of higher oil, gas, and carbon offset prices and taxation.

The 2020s and 2030s must be seen as the geothermal decades where significant support should be given by government and investors to realise the vision of a sustainable net zero world by 2050

We need to have secure baseload, zero emission renewable energy as a significant part of the future solution. Geothermal Energy can be, and should be, a significant part of the solution going forward.

I have worked for over 40 years in the oil and gas business both in the UK and overseas and so understand oil and gas production and also the great strides that companies have made, and continue to make, to reduce their impact on the environment. But the world demands, and rightly so, that more is done and needs to be done, if we are to safeguard the future of our next generations.

Nine months ago I joined CeraPhi Energy as an energy transition advisor and currently chair its Advisory Board, which consist of likeminded experienced individuals who want to make a difference for our future generations. I was excited by the vision of the company and how the use of scalable Geothermal energy can make a significant contribution to the 2050 net zero objective. This is not a sales pitch for CeraPhi Energy; however it is a plea for governments and organisations to recognise and acknowledge the significant contribution that 24/7 scalable geothermal energy can make in the transition to a net zero world.

The Government's biggest ever renewable energy support scheme of

£265 million

£200m

for continued support of offshore wind

£10m

for established onshore wind, solar and hydropower

£55m

for less established technologies (includes Floating Offshore Wind, Tidal Stream, **Geothermal**, and Wave) of which £24m is ringfenced for floating offshore wind

The concern – 88% of the funding going towards intermittent renewable energy and not 24/7 baseload heat & energy. **What is wrong with this picture?**

There are significant opportunities to extract deep geothermal energy (The heat beneath our feet) by repurposing existing closed-in or abandoned oil and gas wells, of which there are hundreds of thousands worldwide, or drilling new purpose-designed geothermal wells and using the latest downhole heat exchanger technology. Zero carbon geothermal heat can be used for a number of applications such as electrical power generation, heating systems, farming and agriculture, cooling, water desalination, to name just a few.

The repurposing of no longer used wells and infrastructure for geothermal use, where safe and commercially viable to do so, makes sense.

The UK government must get behind and actively support the R&D and greater use of geothermal energy in the UK. The 2020s and 2030s must be seen as the geothermal decades where significant support should be given by government and investors to realise the vision of a sustainable net zero world by 2050. The industry has the potential of transitioning thousands of jobs from existing hydrocarbon industries as well as attracting new young talent who want to be involved in low carbon industries that safeguard the future of our planet.

The repurposing of no longer used wells and infrastructure for geothermal use, where safe and commercially viable to do so, makes sense.

The government announcement on 13th Sept 2021 for the biggest ever renewable energy support scheme of £265M is laudable, but when you look at the details it gives cause for concern and certainly does not give any confidence that the government is giving the right attention to 24/7 geothermal energy. Of the £265M:

- > **£200M for continued support of offshore wind**
- > **£10M for established onshore wind, solar and hydropower**
- > **£55M for less established technologies** (includes Floating Offshore Wind, Tidal Stream, **Geothermal**, and Wave) **of which £24M is ringfenced for floating offshore wind**

The concern - 88% of the funding going towards intermittent renewable energy and not 24/7 baseload heat and energy. What is wrong with this picture?

We at CeraPhi Energy and other geothermal companies and organisations need the help and support that emerging offshore wind and solar have received in the last decade from the UK and other governments to turn the geothermal vision into a reality, achieve net zero by 2050, and help to make the UK a centre of excellence for geothermal technologies and use.

Geothermal needs to be an integral part of the solution to net zero 2050.

PIVOT 2021 Geothermal Reimagine

Oil and Gas Well Repurposing: Turning Liabilities into Assets

CeraPhi Energy CEO Karl Farrow joined a global panel of experts during PIVOT 2021 at Geothermal Reimagined PIVOT 2021 discussing Repurposing Wells - Turning Liabilities into Assets - Moderated by Matthew Silvio Pioneer Natural Resources Company -

if you missed it you can see it here:

https://youtu.be/VJu14emp_RU



**Oil and Gas Well Repurposing:
Turning Liabilities into Assets**
Moderated By: Matt Silvio, Pioneer Natural Resources

Karl Farrow
Founder and CEO,
CeraPhi Energy

Robert Pilko
Strategic Relations Director,
Blade Energy Partners

Maria Richards
Geothermal Lab
Coordinator, SMU

Salina J. Derichsweiler
CEO,
Transitional Energy

PIVOT 2021™ *Geothermal.
Reimagined.*

The Planet Saver – Green Business of the Year

CeraPhi is delighted to have been nominated for the Green Business of the Year award by the British Chamber - one of the UK's most prestigious business awards. Each year hundreds of high-performing companies are put forward for the specialist categories and compete for the coveted National Chamber Business Awards.



The awards receive widespread interest as they are unique in identifying the very best in business from every region in the UK. The winners are the organisations that set the highest standards for others to follow across a wide range of sectors.



IGas shares hike 58% on announcement of CeraPhi Heads of Terms

IGas Energy PLC shares rose by 58% after it announced it has agreed in principle to jointly develop geothermal energy projects with CeraPhi Energy.

CeraPhi Energy is undergoing a feasibility study in a Heads of Terms agreement with IGas Energy, the largest operator of onshore oil and gas wells in the UK, to repurpose wells using its proprietary technology.

The first project will be sited in the Lincoln area on one of IGas's existing sites. The development will capitalise on IGas's deep local knowledge, surface infrastructure and existing wells and CeraPhi's proprietary technology, CeraPhiWell™, a closed loop downhole heat exchanger to repurpose existing onshore assets with no drilling to produce clean baseload geothermal energy.

This pathfinder project will be used to demonstrate the commercial potential for geothermal energy production from repurposing existing oil and gas assets for direct heat for agriculture, residential heating and cooling, and the development of hybrid energy systems generating both heat and power.



Stephen Bowler, IGas CEO, said:

"The signing of the agreement with CeraPhi is another important step in IGas's drive to diversify its operations, adding to the ongoing work on hydrogen production and carbon storage and bolstering our established geothermal offering.

As local authorities and other large-scale users of heat transition away from fossil fuels we are receiving an increasing number of enquiries looking to geothermal as a solution and through this growing pipeline of development opportunities, IGas is well-positioned to deliver a solution to the long-term decarbonisation for heat in the UK."

Karl Farrow, CeraPhi Energy, CEO said:

"The repurposing of oil and gas wells to access subsurface thermal heat to produce baseload clean energy has to become a primary step to developing a wider appreciation of what geothermal can provide us. This agreement with IGas is yet another demonstration of the energy transition harnessing existing skills and expertise that we have in the UK to support a net zero 2050 target."





Celebrate World Geothermal Energy Day

Celebrating the first World Geothermal Energy Day

CeraPhi Energy's fourth newsletter coincides with the inaugural World Geothermal Energy Day introduced to celebrate and herald the achievements of geothermal energy around the world and the people driving it.

On Sunday October 17, focus will be on acknowledging and highlighting our industry, the individuals dedicated to geothermal energy projects and developing technology to produce more renewable, clean, reliable heat, cooling and electricity and promoting it as a key component of the drive to net zero.

Why October 17th? The date was specially selected to acknowledge a famous geothermal event in Pompei that occurred in the year 79 AD. Geothermal is represented by the power of Vesuvius.

All at CeraPhi Energy passionately believe that we are entering the decades of geothermal, when scalable, reliable, 24/7 baseload cost-effective geothermal is embraced globally as indispensable to delivering zero carbon systems to buildings, industry, agriculture and homes around the world.

The pandemic has accelerated progress of our industry, with virtual meetings, events, and webinars connecting like-minded people across the world to share technologies, ideas and research quicker than might have happened in real life.

We will be joining others across the industry on Sunday, taking to social media to celebrate geothermal energy's diversity of application and crucial role in the green recovery and action on climate change and its dependable and efficient support of industry, healthcare, food production, agricultural, residential, and power sectors.

Take part and share your geothermal testimonials and case studies with World Geothermal Energy Day.org

[#worldgeothermalenergyday](https://twitter.com/worldgeothermalenergyday)

GEAA – Geothermal Energy Advancement Association



Advocacy for increasing Geothermal Energy investment announces addition of eight Founding Members

With CeraPhi Energy as one of its Founding Members, the recently-formed Geothermal Energy Advancement Association (GEAA) announced on the 13th of September its latest eight new additions to its list of Founder Members.

GEAA is a not-for-profit stakeholder-driven association that advocates increased investment in and awareness of this sustainable source for zero-carbon power, heat, and hot water. GEAA aims to promote geothermal, its future role, and the necessary policy and legal frameworks needed to accelerate its use. It is open to all those interested in advancing geothermal energy and its role in helping transition to a Net Zero world using less petroleum.

Founder Members include energy companies, universities, institutions, and professional services. Earlier this year, GEAA announced six Founding Members. Our further eight Founding Members are each leaders in understanding and developing geothermal energy. Together, GEAA now has a Board of Founding Members comprising 14, each one a leader in the energy transition.

Commenting on today's announcement, Chair of the GEAA Board Chris Sladen said: "Today is a great step forward in advocating geothermal as one of the solutions to the global climate crisis. Our Founding Members are not just passionate about geothermal, they have the skills to develop solutions, and they have the skills needed to explain these solutions. I am particularly pleased that we have universities, energy companies, institutions, and professional services all working together to advocate a world of lower carbon energy with geothermal as a central solution to key energy challenges".

On the next steps, the President of GEAA, Professor Jon Gluyas, Director of the Durham Energy Institute at Durham University, noted: "The next year is critical to putting plans in place for a low carbon world, post-COP 26. Through GEAA, we plan to deliver concise messages that get to the heart of the changes needed in providing and distributing low carbon geothermal heat and power."

- > The new eight Founding Members are:



- > The Association has a global reach and seeks to promote a global understanding of the potential for development of geothermal energy.
- > The previously announced six Founding Members are:



Geothermal Energy – Towards a Sustainable Future

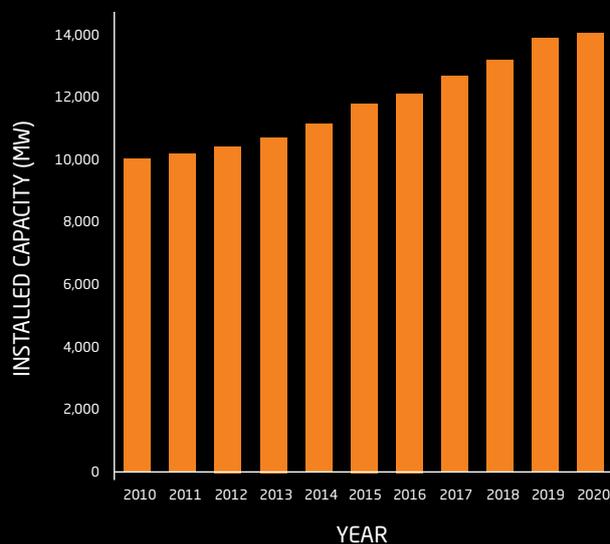
Centre for Energy Efficient and Sustainable Technologies

CeraPhi Chief Technology Officer Iain Pittman is joining forces with Professor T.G. Karayiannis and Dr J. Tyacke, of the Centre for Energy Efficient and Sustainable Technologies (CEEST), at Brunel University, to simulate the thermofluid processes in a deep geothermal well and, based on UK sub-surface conditions, estimate the thermal energy available at the exit of the well.

Geothermal energy is in the form of heat within the sub-surface of the planet. It can be used directly, through heat exchangers, to provide a clean renewable form of heating or in a highly efficient way to produce cooling through Ground Source Heat Pumps (GSHP). It can also be utilised as the renewable energy source needed in Organic Rankine Cycle (ORC) plants to produce electricity. The growth of geothermal energy plant installations world-wide verifies the importance of this renewable source of heat.

The UK pledged to cut its greenhouse gas emissions by at least 68% by 2030 in a coordinated effort to achieve net zero emissions by 2050. Within this framework, geothermal energy is a necessary component of any energy solution mix as the country strives towards this goal. At the same time, the utilisation of geothermal energy will create significant business opportunities, home and abroad, and new jobs for the UK workforce.

Geothermal Energy (irena.org)



The UK geothermal market has historically been focused on GSHP, which require low-depth ground installations [Deep Geothermal Energy – Economic Decarbonisation Opportunities for the UK, Arup 2021]. However, engineering advances, and in particular in slim-hole drilling technologies, that can achieve up to 8-10 km geothermal wells [Cutright, The Case for Geothermal Energy, Bureau of Economic Geology, 2009], plus the use of existing infrastructure and smaller area footprint compared to other renewable sources, make generation of electrical power from low-to-intermediate temperature locations a cost competitive reality for the UK. In fact, a recent study by the Durham Energy Institute concluded that deep-geothermal energy resources can meet all UK's heat requirements for up to 100 years [Gluyas et al. Proc. Int. Mech Eng., Part A, 2018].

One of the key parameters in designing geothermal plants, be it direct heat-to-heat utilisation, GSHPs or for the production of electricity, is the energy available at the exit of the geothermal well. This can be measured, for example, in terms of temperature, pressure and mass flow rate of the working fluid exiting the well.

Professor T.G. Karayiannis and Dr J. Tyacke of the Centre for Energy Efficient and Sustainable Technologies (CEEST), at Brunel University, are joining forces with Iain Pittman, Chief Technology Officer of CeraPhi Energy Ltd, to simulate the thermofluid processes in a deep geothermal well and, based on UK sub-surface conditions, estimate the thermal energy available at the exit of the well.

The research will involve an assessment of a basic well design as a benchmark solution followed by a study of novel designs aiming to enhance the heat transfer rates from the well. This part of the work is funded through a BRF Award and CeraPhi Energy. Integration with an ORC plant will form the basis of subsequent studies.



ESG is not about having policies, it's about living it in all we do

Welcome to Ilse Bermudez, CeraPhi Energy ESG advisor



Ilse Bermudez
– CeraPhi® Energy ESG advisor

Ilse Bermudez has joined CeraPhi Energy to shape, develop and communicate its ESG (Environmental, Social and Corporate Governance).

A former oil and gas engineer, who spent more than 12 years working for Wood Group, Ilse is passionate about the key ESG pillars of Planet, People, Principles of Governance and Prosperity and how they must underpin everything the company does and shape its corporate behaviour, values and ethos.

ESG is an evaluation of a company's collective conscientiousness for social and environmental factors and must be a priority for everyone involved in CeraPhi.

Her personal story behind her switch of direction to renewable geothermal energy was a 'reset' after moving to the UK with her family and wanting her professional life values to align with her personal values of 'saving the world', building on the "little changes" her family has made to be more environmentally friendly, that if everyone made would mean a big difference.

She was drawn to CeraPhi's mission to provide clean energy and wanted to help achieve that goal.

"I wanted to be in something else, to play a part in saving the world. I have the understanding of the industry and the technical part of it, and am passionate for ESG, and feel I have a real contribution to making a difference to offer."

"The UK has the opportunity to become a pioneer of geothermal, a world leader. I am looking forward to telling our ESG story."

For Ilse, ESG is not about having policies, targets and measurements, it's about living ESG and it running through every activity.

Unless there is day-to-day proof behind the policies and targets, it's a waste of time, she believes.

Sustainable businesses with clear ESG are stronger businesses and, as CeraPhi is a new company, she is keen to fill the blank canvas for CeraPhi's strategy to be centred on ESG.

"CeraPhi is very new and investors want to know how we are behaving and how ESG figures in our business.

"ESG is about how you work with your people, how a company manages itself, in terms of measurements and reporting.

"It is all about making everyone live better for the future so we have clean air, jobs, training. We will be telling our ESG story in everything we do."

Using the United Nation's 17 sustainable goals as benchmarks, she is currently setting out how CeraPhi can achieve those goals, how its clients can also work towards the goals with CeraPhi, the services the company can provide and where money should be invested and how the reporting system works.

"With all that in mind, CeraPhi is also a business, an ambitious new business, and all our risk has to be identified. We need to appeal to investors so we need to demonstrate ESG in our behaviour and activities. This is what investors are looking for. They want to know how we are behaving and not what we because investors are much more conscious."

How CeraPhi works as a business will be under scrutiny not only by investors but by potential clients and employees. "We want to be inclusive, attract young people to want to come to work with us, attracted not only by what we do but by how we operate as a company, how we behave and our intrinsic values."

So far, CeraPhi has joined the Race to Net Zero, is joining the United National Global Compact and is working towards signing the Armed Forces Covenant.

CeraPhi's first intern tackles Norfolk hotspots

CeraPhi Energy hosted its first summer intern when sixth former Beth Suckling dedicated her six-week break to researching some of the hottest geothermal spots in Norfolk.

Seventeen-year-old Beth Suckling, an A level student at the STEM-focused University Technical College Norfolk, researched the area around her home in West Norfolk to draft proposal and business case to present the case for geothermal to councils and organisations in the hottest spots.

West Norfolk Borough Council is one of the latest UK councils to declare a climate emergency and has some of the best gradients for geothermal heat production in the UK.

Beth put together a proposal to demonstrate how accessing heat could be used directly for heating, or, because the temperatures were high enough, could be made into electricity.

Karl Farrow said engaging young people and giving students the opportunity to work with the CeraPhi team was fundamental to the business' mission.

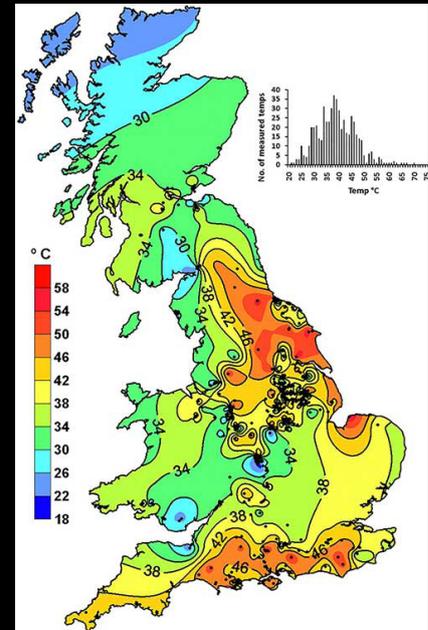
"The CeraPhi team has brought together so many years of energy industry experience and we are adapting our oil and gas experience to geothermal. To be able to share that experience to inspire young people, introduce young people to different aspects of renewable energy and give them a start in the industry is what we will do whenever we can."

Beth, a prestigious Arkwright Engineering Scholar, discovered geothermal energy and CeraPhi when she moderated a webinar earlier this year.

The CeraPhi team were so impressed, they invited her to work with them from July to September.

"I knew nothing about geothermal energy. It has really turned my head and how I think about things now."

Beth will be delivering sessions about geothermal to Year 12s - first year A level students - at the UTCN to spread the word about different renewable energy forms.



"It was so interesting to find out about using direct heat, reusing wells, drilling new wells and the technology CeraPhi has developed.

"I feel really lucky to have got to sit in on Teams calls with the team and find out about the geology behind it and observe everyone working.

"It gave me confidence and experience listening to the team in the office. I got a great insight into working in a small company with a team and everyone was so welcoming and helpful."

"The project is still developing and I hope it will be something that will be taken forward."

Beth is in her first year of studying A levels in maths, further maths, engineering and physics at the University Technical College Norfolk, with ambitions of a career in renewable energy via a degree level apprenticeship.

Beth Suckling
- CeraPhi Summer Intern



Welcome to CeraPhi's economics and financial analyst intern

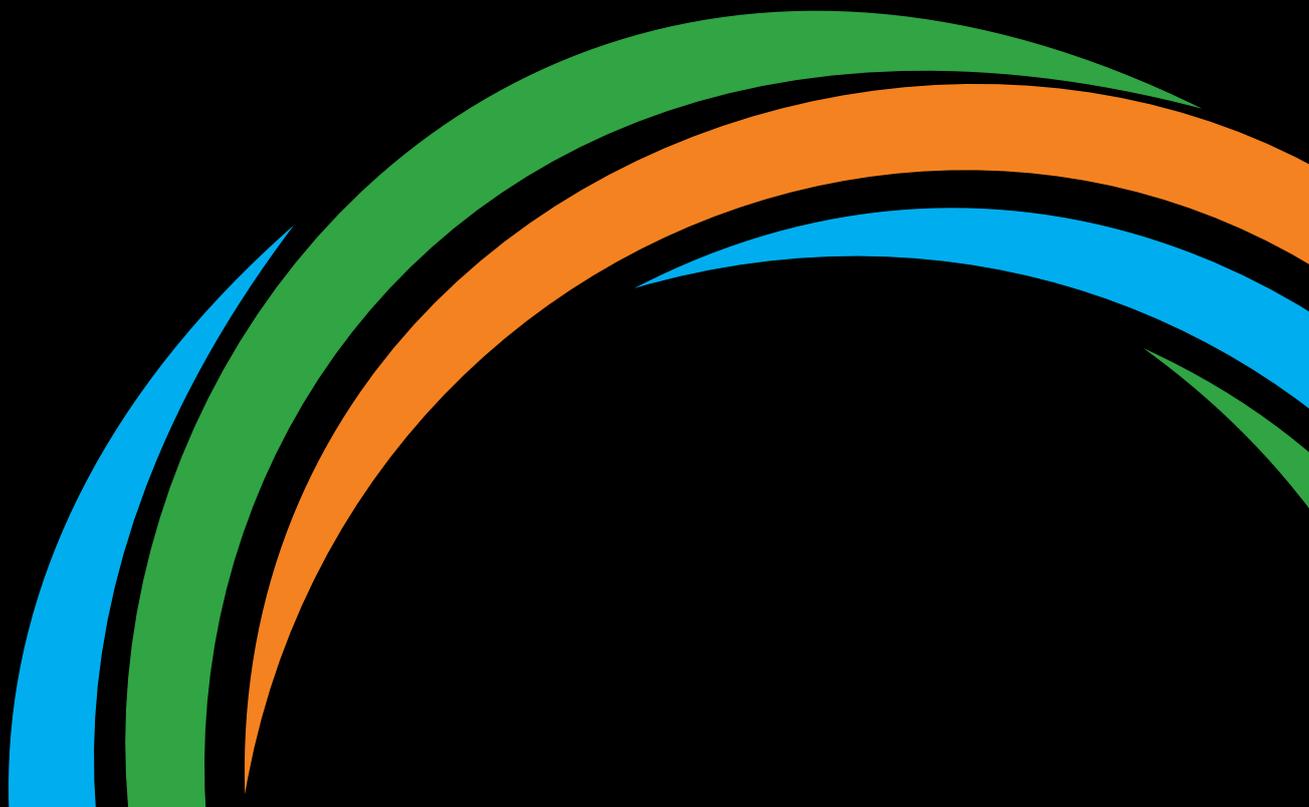


George Karayiannis
- Economics and
Financial Analyst

CeraPhi continues its investment in young people with its first Year in Industry intern.

George Karayiannis, a third year student studying BA (hons) in business management and economics at Nottingham Trent University's Nottingham Business School, has begun a year's internship as an economics and financial analyst with the CeraPhi team.

George will be working closely with Martin Hindicky, CeraPhi's chief business officer.



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