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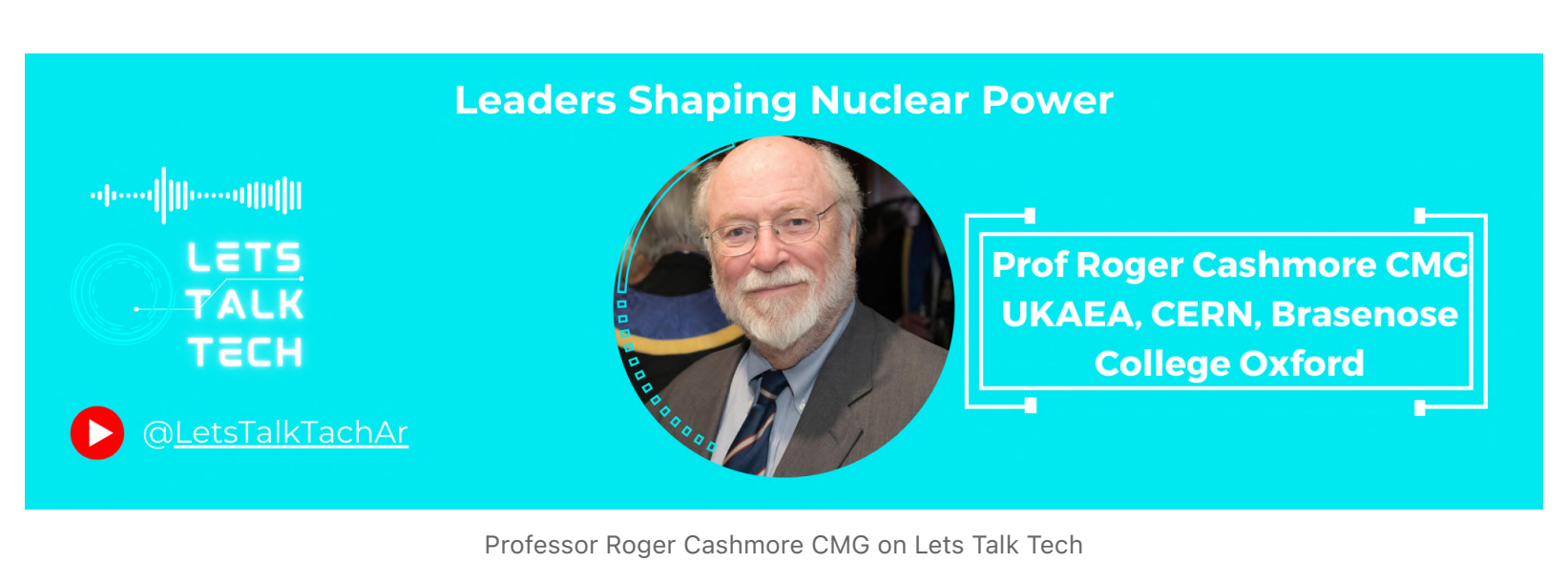
Leaders Shaping Nuclear Power
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Prof Roger Cashmore CMG UKAEA, CERN, Brasenose College Oxford

Professor Roger Cashmore CMG on Lets Talk Tech

Nuclear Power Renaissance

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41 articles

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Net Zero Needs Nuclear

More than 20 countries from four continents recognised at **COP28 UAE** in Dubai that net zero needs nuclear energy and launched the Declaration to Triple Nuclear Energy capacity globally by 2050.

The endorsing countries include the United States, Bulgaria, Canada, Czech Republic, Finland, France, Ghana, Hungary, Japan, Republic of Korea, Moldova, Mongolia, Morocco, Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, Ukraine, United Arab Emirates, and United Kingdom.

The nuclear energy market encapsulates the global industry involved in the production, generation, and utilisation of nuclear power as a source of electricity and heat for remote communities, universities, mining operations, industrial centers, data centers, and defence facilities.

Building on our coverage of trends shaping digital infrastructure's ever increasing energy demand (our Rolls Royce SMR **story**), we looked in this **video** at nuclear role in the green transition to a carbon free future.

Energy Demand to Triple by 2050

As global energy demand is set to increase 2-3 times by 2050, reliable base load sources of clean and secure energy has gone top of the agenda.

Nuclear is already providing 25% of the world's clean power. 3x 400 GWs today to get to 1,200 GWs requires new build of 1,000 GWs. At about $5M a MW or $5B a GW, that's $5 Trillion over 30 years or $167B a year.

Replacing 85% of the world's fossil fuel energy supply will be costly. As **Ray Dalio** commented, "the real power to change the world comes from practical, entrepreneurial people working in an entrepreneurial way to come up with ideas that justify getting funding. Big change doesn't come from the heads of already over-burdened states pledging to do uneconomic deals." We had heard **here** from **Microsoft** that hyperscalers are taking the lead and investing in clean tech.

The Nuclear Energy Market

I joined the European nuclear industry leaders gathered in London for the AtomToday congress to glean their perspective of the market in this **video**.

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Professor Roger Cashmore speaking with Lina Tayara in London

It kicks off with my interview with Professor **Roger Cashmore** CMG, Former Chairman of UK Atomic Energy Authority, Director of Research of European Organization for Nuclear Research, Principal of **Brasenose College, University of Oxford** who believes that solving climate change and energy issues are of prime importance in everything we are doing from now on. This is what he told us:

Solving the Global Warming Problem

NASA temperature spiral refreshens ones mind as to the problems we are trying to solve. We can see what's been happening to the earth temperature over the years. It is getting warmer. It takes off in the 1980s and 1990s. This is a reminder of the situation and the job we are doing. We are worried about the temperature that keeps going and its going because its driven by CO2, greenhouse gases.

The world's energy use was coasting in the 1900 then after the 2nd world war it starts to take off until we have this amazing amount of energy the world is consuming.

> The issue is dramatic. We are saying we will replace 85% of world's energy supply by new supply by 2050 or get rid of CO2. We have to do in 20 years what took us 80 years to construct. That is the problem of our society. All of us.

The emissions of greenhouse gases CO2 and methane are the two main culprits.

> CO2 remains in the atmosphere for 100 years.

And it's very mobile. If you burn something in China, within a week or two, the molecules will go to the other side of the globe. So there is no way to evade this climate change without solving the problem for the globe.

Methane is 35x more potent than CO2. It lives 20-30 years in the atmosphere. When it breaks down in the atmosphere the product is carbon dioxide.

Emissions in 2023 are greater than the ones in 2022 that in turn are greater than the ones in 2020. We haven't flattened off in carbon emissions yet. So it's only going to get worse. The largest pollutants are China India and the USA followed by Europe. They produce between them 50% of CO2 emissions.

Safety of Nuclear Reactors

Prof Cashmore maintains that nuclear is a safe way to produce electricity.

"Hydroelectricity is most associated with death. However

> we still need to convince people that nuclear is safe.

He acknowledges that Fukushima power plant accident was a great set back:

"It gave energy to nuclear sceptics. It shouldn't have done because no one died from the accident. It was mass enforced migration that caused deaths as it had been in Chernobyl 20 years earlier, not from nuclear reactors themselves. But people latched on to it as something dangerous without considering what the dangers really were. That played into the hands of a lot of people. Japan was the only country to have been attacked with nuclear weapons. A whole community there doesn't like nuclear."

Risks of SMR

The risks of SMRs are very little.

> The first reactors built 50 years ago produce the same amount of power that SMR will produce in future.

It's very difficult to make weapons from any of SMR material. People also worry about disbursing it but is it radioactive enough to be dangerous?

Role of Nuclear in Energy Transition

> A thumbnail of nuclear material is worth a ton of coal. It gives you an idea of nuclear storage and why one would want to tap into them.

"When you get reactors going to give you energy, they pour it out in a gentle and reliable manner. Unlike solar and wind, they need another system to go along with them to store the energy. Reactors give you a bed rock on which you keep everything running. They run for a long time without interference until you need to refuel them, once a year."

Climate Sceptics & the Development of the Green Energy Industry

Professor Cashmore spoke of his "unease with a great number of people particularly in the political world. In Britain, there will be elections in the next 12 months. Politicians are putting off decisions on some things that can cut down CO2 emissions because if they go ahead the *cost of living* will go up and lose them votes in the elections. We were going to stop sale of petrol and diesel for cars from 2030 as we move to electric cars. PM Sunak pushed that back to 2035. So we are still on the market for fossil fuel and CO2 continues to go up. We should have turned over and going down to meet the climate objective of 1.5C by 2050. We are not going to do that now."

> The sooner we cut down CO2 emissions the better because it hangs around in the atmosphere, it will be with us for the rest of the century.

Climate Change Between Politics and Science

On COP28, Professor Cashmore commented that 22 countries agreed to increase nuclear capacity 3x by 2050 which will help cut down emissions. It doesn't include India China or Russia who haven't agreed to doing that. "The big players are China India and the USA. They possibly didn't want to be bracketed with the West."

Nuclear as Pillar of Decarbonisation

Csaba Marosvari, Deputy State Secretary for Energy Security, Hungary argued that

> decarbonisation is not possible without the use of nuclear energy.

He is critical of EU ideological policy making and called for education to help with social acceptance.

The Case for Hungary

Mr Marosvari wants to capitalise on the potential of innovation of the energy industry and achieve 90% of Hungary's power generation to be carbon neutral by 2030. Right now its 65%. And to do so without compromising sustainability and affordability or security of supply.

Hungary maintains domestic nuclear capacity which provides large scale domestic low cost reliable supply of electricity that generates 44% of the country's power. They are also expanding capacity with a new £12.5bn project in partnership with Russia's Rossato, currently the largest in the EU, with a capacity of 2.4MW.

Social Acceptance

Mr Marosvari spoke of the need for education in the next couple of years that SMR are safe, to garner acceptance within society and policy makers.

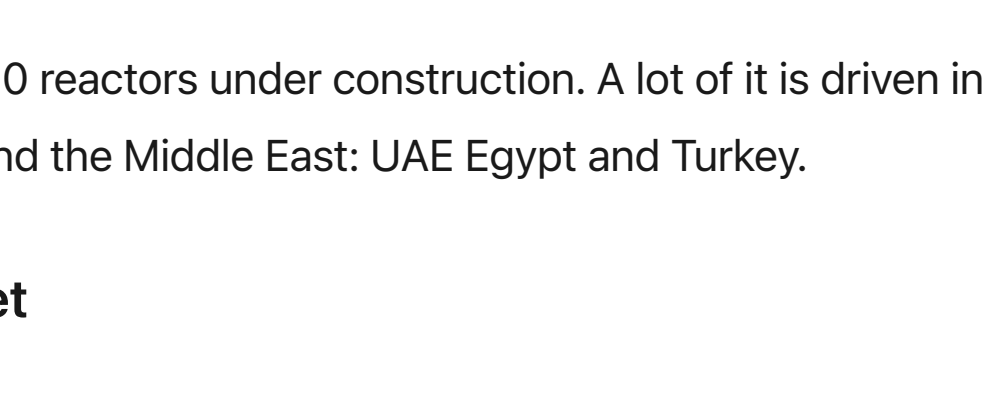
Scale of Challenge in the UK is Huge

Caroline McGurk, Director, sustainable infrastructure team, Ernst & Young LLP spoke of inclusion to represent the whole of society, the competition for talent with other countries and other sectors and the decline in nuclear operation capacity in the UK.

"The UK energy security strategy planning 24GW of nuclear by 2050. There is 1 nuclear power plant in the UK under construction that will have operating capacity of 3.2GW which is less than 15% of the requirement."

Skills shortage

20% of the workforce is women, far off the target of 40% by 2030.



Latest global nuclear trends

Global Nuclear Trends

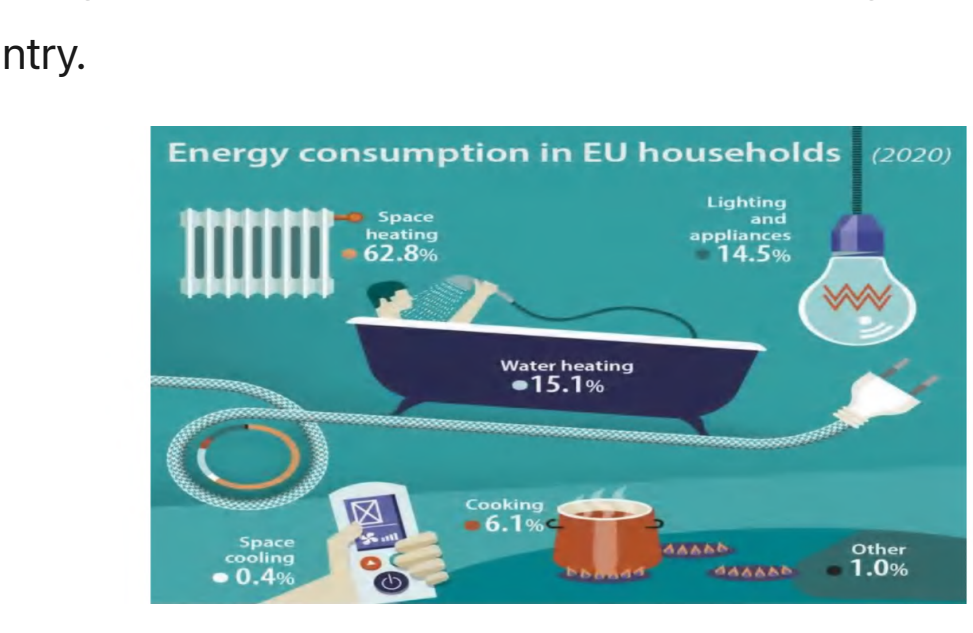
There are 60 reactors under construction. A lot of it is driven in Asia: China, Japan and India and the Middle East: UAE Egypt and Turkey.

EU Market

The European energy markets are in a very different situation from a year ago. Today, Europe is not fearing electricity blackouts or gas shortages, and the European economy has shown resilience and adaptability to the spike in energy prices it withstood in 2021 and 2022. EU energy and climate policies have changed following the energy price spike, too.

The view was that rather than extend blanket price-suppressing measures to control volatile energy prices, the EU should focus on long-term reforms needed to reduce Europe's dependence on fossil fuels. These include reforms facilitating investments in energy efficiency, renewables and power grids. EU-level funds for climate investment and the energy transition remain fragmented and overall inadequate to meet decarbonisation goals.

Professor **Radek Skoda**, Ph.D. in Nuclear Engineering from the Czech Technical University in Prague where he leads his nuclear research group shared perspective from his country.



Energy consumption in EU households

Cost of nuclear heating

Most electricity we use is for heating water. "Nuclear heats 3x cheaper than electricity and can be transported 40km meaning the nuclear facility can be in brown field. The cost of nuclear heating compared to natural gas especially these days is 10x cheaper."

Reactors Scare People

"If you tell somebody I am going to build a reactor next to you they will start protesting. You have to speak with the municipality who will then do their work. We don't need to build the reactor in the middle of the city. Electricity can be transported hundreds of km with power lines. Heat can be transported 40 km."

Professor Skoda cited the heating station next to the Pilsen beer factory providing cooling to the factory.

> When you have district heating you can easily, by absorption process, create chill. Kuwait City and Doha have district chilling system so you can provide a nuclear chilling source.

Job Opportunities

> We are going to need thousands of nuclear engineers.

"As the French did, we need to take engineers from bachelors programs and nuclearise them."

Pro-nuclear and anti-nuclear in Europe

Christhian Rengifo, Senior Consultant UxC expects 150+ reactors to be built worldwide over the next 2 decades, a rethink of new reactor technologies and market growth for small, advanced and micro reactor (SAMR).

"Fukushima accident stopped nuclear power and reactor construction. Since 2022 we have a new situation in Europe, the energy dilemma shifted. We were focused on sustainability and affordability. Now energy security has gone top of the agenda and that impacted policy in Europe."

Mr Rengifo believes nuclear power development necessitates a stable political system and summarised Europe nuclear landscape:

- Belgium has 41% of nuclear generation. There are elections next year and some parties have coalitions which complicate things. However this year 2 reactors should see a life extension of 10 years.
- Finland stopped one project because of the geopolitical situation but the government is pro nuclear.
- The Netherlands was working on making new nuclear possible but it collapsed because of policy differences and in the recent elections we don't know yet who will be the next government.
- Spain is not pro nuclear and have elections again but we wont see nuclear power. There are several reactors already generating 30% of power.
- Sweden has shut down a couple of nuclear reactors. They have 6 units and 28% of power generation. There is a new government assessing the possibility of nuclear power and SMR.
- Switzerland had a referendum in 2017. The decision was not to phase out nuclear but also not to build new reactors. That was the position of the public at the time so utilities are looking at 60-80 years life extensions.
- In other countries there is a debate about nuclear power but we don't know what will happen. In Norway a company is looking into SMR.

The Future of Nuclear Power More Positive Now than 10 Years Ago

COP28 having given a political impetus and visibility for the industry, it will now need to manage the challenges presented here . We will cover more perspectives in 2024, playing a part in advancing the conversation.

Thank you for following and engaging with our coverage. We wish you all a happy and prosperous 2024. May love, human equality and ethics in tech prevail.

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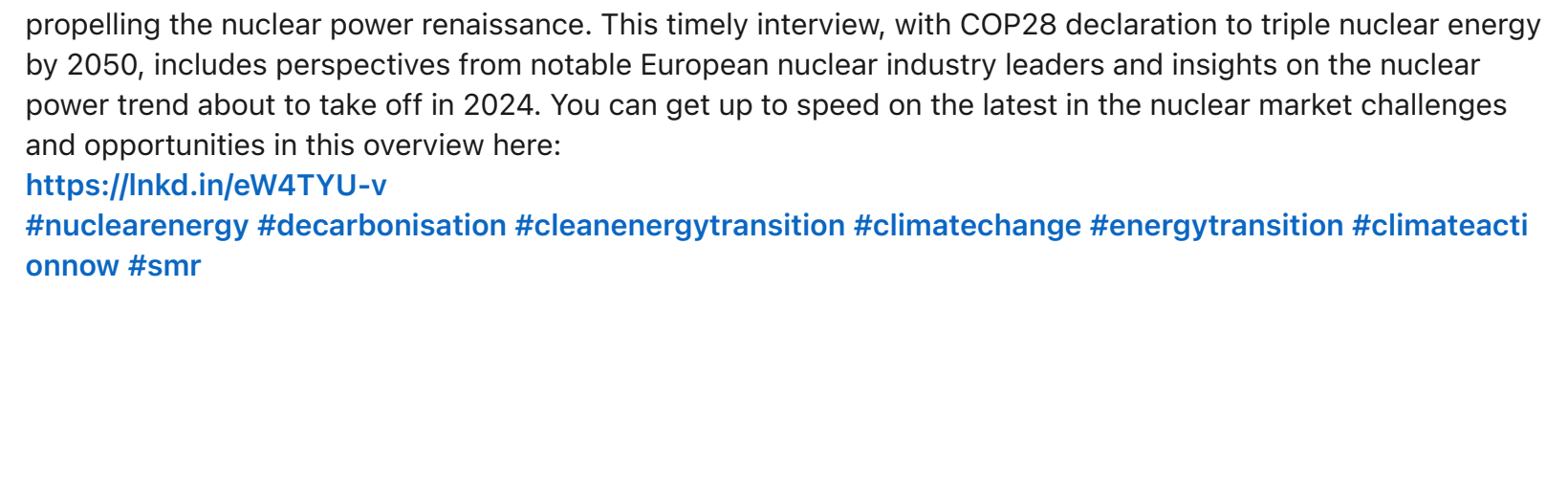
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Professor **Roger Cashmore** speaks with us on climate change and the role of nuclear in the energy transition propelling the nuclear power renaissance. This timely interview, with COP28 declaration to triple nuclear energy by 2050, includes perspectives from notable European nuclear industry leaders and insights on the nuclear power trend about to take off in 2024. You can get up to speed on the latest in the nuclear market challenges and opportunities in this overview here:
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