



NNWI
New Nuclear Watch Institute



18 OCTOBER 2022

NNWI FORUM 2022

A Sustainable Future
– Addressing the Energy Trilemma

Host



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NNWI FORUM 2022

A Sustainable Future – Addressing the Energy Trilemma

- 08:30** Registration and Breakfast
- 09:00** Opening Welcome
- 09:15** Opening Keynote Presentation
King Lee, Director Harmony Programme, **World Nuclear Association**
- 09:45** Energy Security Panel: Accelerating Future Nuclear Projects

Chaired by Matthew Job, Partner, **Herbert Smith Freehills LLP**
- Yves Desbazeille, Director General, **Nucleareurope**
- Keisuke Sadamori, Director of the Office for Energy Markets and Security, **International Energy Agency**
- Tom Greatrex, Chief Executive, **Nuclear Industry Association**
- Fredrik Vitabäck, European Director, Market Development, **GE Hitachi Nuclear Energy**
- Ivan Baldwin, UK Business Development Director for Nuclear Power, **Bechtel**

11:15 ☕ Coffee Break

- 11:30** Economic Efficiency Panel: **Competitive Environment and Economic Growth**

Chaired by Phil Chaffee, London Bureau Chief and Deputy Editor, **Nuclear Intelligence Weekly**
- Tim Yeo, Chairman, **New Nuclear Watch Institute**
- Chris Heffer, Director of Nuclear Power, Infrastructure and Decommissioning, **BEIS**
- Antonio Vayá Soler, Senior Energy Analyst, **OECD Nuclear Energy Agency**
- Harry Keeling, Head of Industrial Markets, **Rolls-Royce SMR**
- Attila Hügyecz, Chief Economic Advisor, **Paks II. Nuclear Power Plant**

13:00 🍴 Networking Lunch

- 14:00** Environmental Sustainability Panel: **Delivering a Sustainable Clean Energy Transition**

Chaired by Saralyn Thomas, Chair, **Nuclear Institute Young Generation Network**
- Kirsty Gogan, Founder and Managing Partner, **TerraPraxis**
- Emilia Janisz, Director of Strategy, **European Nuclear Society**
- Rauli Partanen, Chief Executive Officer, **Think Atom**
- Shekhar Sumit, Head of Energy Transition, Sizewell C, **EDF Energy**
- Neil Hirst, Honorary Senior Research Fellow, **Grantham Institute, Imperial College London**

15:30 ☕ Coffee Break

- 15:45** Let's Energise Sustainability
Luc Van Den Durpel, Founding Partner, **Nuclear-21**
- 16:15** Closing Keynote Presentation
Martin Porter, Secretary General, **World Nuclear Transport Institute**
- 16:45** Closing Remarks
- 17:00** 🍹 Drinks Reception
- 19:00** 🚶 End

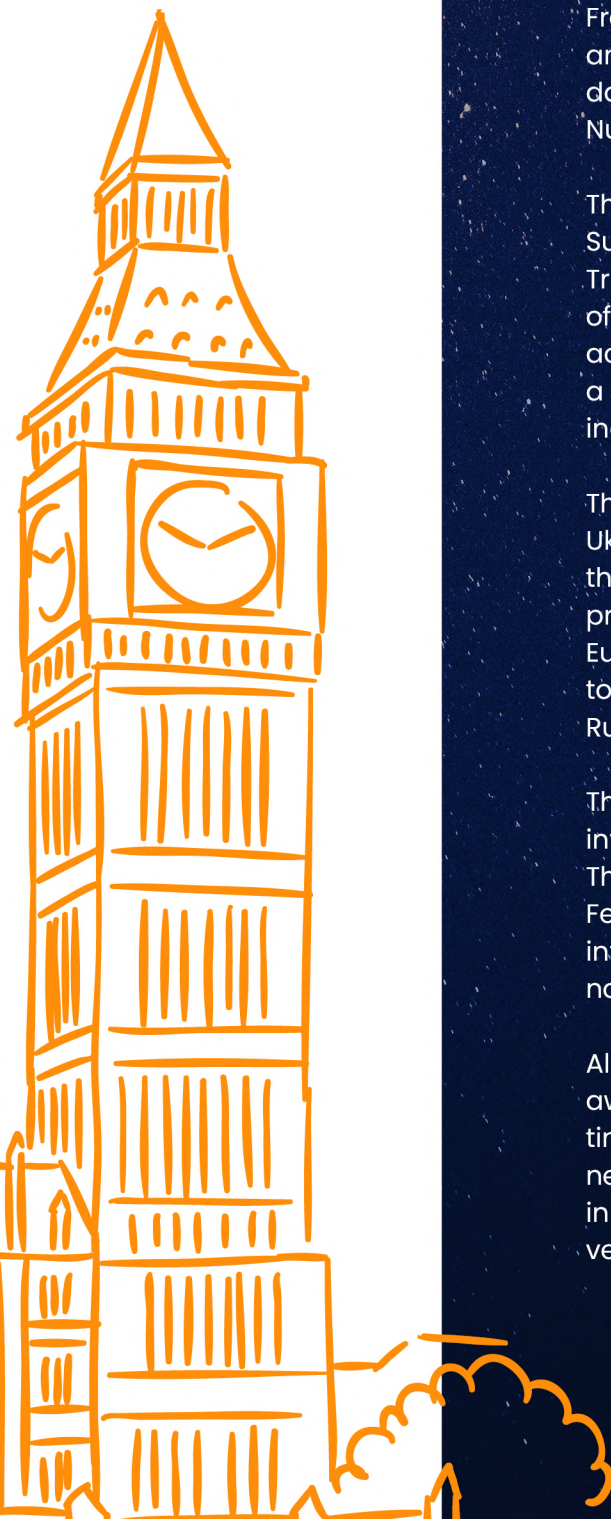
Organiser

New Nuclear
Watch Institute



NNWI is an industry supported think-tank, focused on the international development of nuclear energy as a means for governments to safeguard their country's long-term sustainable energy needs. We strongly believe that nuclear power is without which the binding Paris Climate Agreement objectives cannot be achieved and is therefore an essential part of the global solution to the challenge of climate change.

We believe that the right way to secure widespread recognition of the benefits of nuclear energy is to encourage the widest possible and best-informed debate about energy and climate change. This debate should highlight the benefits of nuclear power and its far-reaching applications that go far wider than simply the provision of low carbon electricity to tackle climate change. They include decarbonising transport, heating and industrial applications while continuing bringing high value solutions in agriculture and medicine.



Turning crisis into opportunity

Welcome to our 2022 Forum.

After two years of enforced isolation it is a pleasure to be able to meet in person again. We are very grateful to Herbert Smith Freehills for hosting us in their London office and providing refreshments throughout the day. We also thank our sponsors WNTI and Nuclear-21 for their support.

The theme of this year's Forum, 'A Sustainable Future - Addressing the Energy Trilemma', is extremely topical. At the start of 2022, in the wake of COP26, the need to accelerate the clean energy transition was a top priority for nearly all policy makers and industry leaders.

Then in February came Putin's invasion of Ukraine and the painful sudden reminder that neither energy security nor stable gas prices can be taken for granted. Overnight Europe woke up to the fact that it was far too dependent on oil and gas imported from Russia.

The jump in energy prices which followed the invasion triggered a sharp rise in inflation. This caused central banks, led by the US Federal Reserve, to respond by raising interest rates. As a result economic growth is now slowing down across much of the world.

All this turbulence has diverted attention away from climate change. At the same time however the timetable for reaching net zero is getting tighter. Keeping the rise in average surface temperature to 1.5C will very soon be unachievable.

Even limiting it to 2C requires action on a far bigger and faster scale than the policies being pursued by governments around the world. The gap between the aspirational pledges made by political leaders and what is actually happening on the ground has grown alarmingly during 2022.

Yet this should not be the case. Most of the measures needed to address climate change also strengthen energy security and stabilise prices. Solar and wind power for example, which together account for a growing proportion of renewable energy, are not imported and no price tag attaches to sun or wind.

Similarly greater energy efficiency is the best no regrets energy policy which cuts costs, reduces carbon emissions and promotes security. It is incentivised by the very rise in prices which hurts consumers. In conjunction with wider use of carbon pricing the current crisis could drive new investment into low carbon technologies in all industries.

Ever since NNWI was established in 2014 we have argued that nuclear power is an essential part of the global solution to climate change. There are now clear signs that support for nuclear is growing. The outlook for the nuclear industry is now better than at any time since the last century.

The discussions at our Forum will shed light on how nuclear can help turn a crisis into an opportunity. Together with renewables and other low carbon electricity generation technologies it can provide truly sustainable solutions to the urgent challenges now facing the world.

Host

Herbert Smith
Freehills LLP



Herbert Smith Freehills is one of the world's leading international law firms with a stellar reputation in the energy and infrastructure sectors. We are, for example, the only firm to have been ranked by Legal 500 as "tier 1" in every category of Projects, Energy and Natural Resources in this year's review of UK law firms.

We are one of a very small number of firms with proven capability to advise on the full range of issues that can arise in a nuclear new build project. We understand the characteristics of the nuclear industry in the UK, its regulation and revenue support structures, with experience of nuclear new build from projects like Hinkley Point C and Sizewell C. We previously advised EDF on its acquisition of the British Energy existing nuclear fleet and have broader experience of the nuclear sector issues such as NDA/decommissioning.

Outside of the UK, we have been involved in nuclear projects in Abu Dhabi, Canada, Finland, France, Hungary, Jordan, Lithuania, Poland, Romania, Russia and Turkey.

This builds on a strong foundation in developing and financing complex infrastructure projects, with market leading credentials in UK projects like Hinkley Point C, Thames Tideway Tunnel (the forerunner of the RAB based revenue model for Sizewell C), the NeuConnect interconnector and the HS2 high speed rail project. Across Europe our experience includes key infrastructure projects like the Rv.555 Sotra Link project in Norway, the IJmuiden sea lock project in the Netherlands, the Budapest to Belgrade high speed rail link and the D4R7 road project in Slovakia.

Our aim is to bring this wealth of experience to new engagements in an ordered and commercial manner – we understand that our perspective only counts when applied in a commercial context. We are perfectly placed to carry solutions across from other situations and to use the latest legal technology from across the energy and infrastructure sectors to provide efficient solutions to the problems and issues that routinely arise on complex projects.

Sponsor

World Nuclear
Transport Institute (WNTI)



We are the World Nuclear Transport Institute, the voice of the nuclear transport industry.

With over 20 years' experience, we are the leading international organisation representing the collective interests of the radioactive materials transport sector, and those who rely on safe, secure, efficient, reliable and sustainable transport.

We have detailed technical knowledge and expertise allowing us to represent our members' interests and the collective views of industry. WNTI membership is a mark of quality, which identifies companies as part of an experienced group of professionals actively aiding the nuclear transport industry to change whilst maintain the highest standards.

Sponsor

Nuclear-21



Nuclear-21 is an independent expert cabinet providing bankable decision support driving policy, strategies and business development towards optimised nuclear-based solutions.

With more than 300 person-years of collective experience and expertise in nuclear policy, strategy and business development, we provide our customers with new perspectives in business development. Our mission is to support you in nuclear technology-to-business decisioneering. We seek to ensure your strategic and programmatic performance in nuclear energy, nuclear medicine, radioactive waste management, radiation diagnostics and radiation applications in clean technologies.

We seek to enrich our client's decisions on nuclear policy and business strategies towards the development of safe, economic and sustainable nuclear solutions. We operate worldwide with offices currently in Belgium, France and the United Kingdom.



WELCOME ADDRESS

by **WORLD NUCLEAR TRANSPORT INSTITUTE**

The World Nuclear Transport Institute is honoured to be associated with New Nuclear Watch Institute and pleased to be able to contribute to the success of the 2022 Forum. The world of nuclear energy is at a very important and pivotal moment in its evolution as the advent and onset of fourth generation reactor technologies becomes a reality and we can justifiably proclaim a contribution to sustainability and decarbonisation. Small modular, advanced and micro reactors offer many opportunities, not only to replace or supplement early generation designs, but also to present an invitation for emergent nations to join the nuclear energy world and benefit from the sustainable 24/7 supply of energy that nuclear offers. In supplementing other renewables, nuclear can help us become less reliant on fossil fuels and make net-zero a real aspiration!

With this optimism is also a caution, our aspirations need to be supported by cradle-to-grave consideration of all the enabling processes and activities that preserve our legacy of being a safe and secure industry. Policy, regulation, security, public acceptance, safety, emergency readiness and transport, to name but some, all need considerable thought and effort to ensure we progress on a right-first-time basis. Our reputation as proud custodians of an excellent safety and security record will only be preserved if we enter this next generation and achieve the same, or better, standards of stewardship. This is something that we must protect. It is entirely appropriate that we reflect on all the good that has been done, learn from our 'could do better' experiences and overlay this with the opportunities that the new technologies and our excellent people provide us.

The prize of opportunity is being offered to us but is only realisable if we do not trip ourselves up. Overlooking

a critical enabler will derail or stifle this opportunity, as will crippling bureaucracy, as will narrow-band thinking. Agile thinking on the key issues and enablers will get us over the line but only if we align it to the high safety and security bar that has already been set. Many new actors will enter our industry and we must help them understand and attain the standards required to establish and preserve governmental and societal acceptance. We need no reminding that one slip by any one from our community may have the potential to impact all our industry.

"In the World Nuclear Transport Institute, I look forward to this challenge and will do all I can to drive standard setting, industry collaboration, regulatory development, stakeholder education and public acceptance. WNTI looks forward to enabling all that our nuclear future offers." says Martin Porter, Secretary General.

by **NUCLEAR-21**

Our planet's hospitality for us all depends on how we shall be adapting our unsustainable use of scarce resources of any kind while minimising the environmental impact also for all.

We need to accelerate, i.e. energise, our transition towards such a more sustainable world. The past few decades have increasingly brought proof of what our future might become if we blindly and dogmatically continue our business-as-usual behaviour. Such accelerated, energised, transition will also require a sustainable energy provision where more integrated energy systems maximise the effectiveness to decarbonise our energy needs and services, that ensure an affordability for the energy generated and, downstream, all activities using such energy, and be equitable to all, not at least to our environment.

Nuclear-21's newest initiative "Let's Energise Sustainability" is providing both a methodological assessment framework as well as energy systems scenario analysis with a specific focus on how (intra-)nuclear energy systems can and will need to ensure that our sustainability objectives get truly energised ... while ensuring decarbonised energy optimising the transition towards such sustainable futures.

The challenges are indeed unprecedented as we essentially need to re-organise our infrastructures regarding energy, water, industrial and residential organisation/urbanisation and transport next to major changes in a lot of other domains as well. Today, some 50 years after the previous major economic development in OECD-countries, most OECD-countries face a replacement phase of such critical infrastructures shaping the future outlook and performance of our society at large. Most non-OECD countries' continuous socio-economic development can already embrace the lessons learned from these OECD-countries and can move towards more sustainable systems straight away despite, for many, being challenged by the technical-economic capabilities to deploy such advanced energy systems.

The sustainable development goals (SDGs) are all important though many of these become empowered, directly and indirectly, by the provision of sustainable energy. Accordingly, energising the trajectory towards an overall sustainable future demands (lots of) sustainable energy ... and a less dogmatic approach in choosing such sustainable energy systems. The world at large cannot afford anymore inefficiencies in opting for truly sustainable energy systems.

Nuclear energy was envisaged as the energy source empowering socio-economic development during the 1960-70s and, again 50 years later, we're still and again facing the same energy challenges aggravated by a pressure on our environment which is increasingly posing existential threats to our habitat.

Nuclear energy can deliver the required sustainable energy facing these challenges but needs to refocus on those intranuclear systems we seek to and can deploy during the coming decades in various energy market segments. Nuclear energy is hereby uniquely positioned as providing virtually unlimited energy amounts while being sustainable on its own.

Only through nuclear energy use, one can truly energise sustainability.

Opening Keynote



King Lee is the Director Harmony Programme at World Nuclear Association leading the Harmony Programme, the nuclear industry's vision for the future of electricity. In this role Mr Lee heads a team promoting nuclear energy by working with the nuclear community to engage with key policy makers and stakeholders on the important role of nuclear energy as part of the clean energy system for sustainable development.

KING LEE
DIRECTOR HARMONY PROGRAMME
WORLD NUCLEAR ASSOCIATION

Speaker Biography

Mr Lee led strategic cooperation with key international institutions, such as United Nations Economic Commission for Europe (UNECE), Association of Southeast Asian Nations (ASEAN), Clean Energy Ministerial and World Energy Council, on development of nuclear power.

Previously, Mr Lee was Head of Nuclear Development at Lloyd's Register, where he led strategic business development and provided technical and commercial oversight to support major nuclear projects in the UK, China, Korea and UAE. This includes advice to government and industry leaders on regulatory and safety issues in relation to the nuclear industries. He has also been involved in a range of power and energy projects with considerable experience on risk and assurance management.

Mr Lee is the Chair of UNECE Nuclear Fuel Working Group and Vice Chair of UNECE Group of Experts on Cleaner Electricity Systems. Mr Lee was the Vice-Chair of the Energy Institute Process Safety Committee. He is a member of the Nuclear Energy Agency (NEA) Nuclear Innovation 2050 Advisory Panel and Clean Energy Ministerial (CEM) Flexible Nuclear Campaign Working Group.

Exploring Nuclear Energy's Role in Pathways to Net-Zero

The global energy system is a complex cornerstone of all economies. Decarbonizing the energy system through a rapid transition from fossil fuels to low- and zero-carbon technologies is vital to achieving net-zero emissions. The presentation will present the United Nations Economic Commission for Europe (UNECE) Carbon Neutrality Project. The project conducted energy modelling of all low- and zero-carbon technologies exploring at a range of scenarios, including technology deep dives, exploring the full potential of nuclear energy. The project developed a toolkit to support policymakers to make informed decisions towards the implementation of the 2030 Agenda for Sustainable Development and the Paris Agreement.

Closing Keynote



MARTIN PORTER
SECRETARY GENERAL
WORLD NUCLEAR TRANSPORT INSTITUTE

Martin entered the UK nuclear industry, joining BNFL at Sellafield, in 1983 to take up a post in the emerging health science of Occupational Hygiene. Martin is a University of Manchester Occupational Health Post-Graduate and worked for 25 years in the field of Occupational Hygiene and Chemical Safety at Sellafield. In 2008 his work as a senior event investigator introduced him to radioactive material transport and a change of career ensued when Martin was appointed Head of Operations for nuclear transport at Sellafield Limited.

Speaker Biography

In his position as Head of Operations for nuclear transport at Sellafield Limited, Martin was responsible for many fuel, high level waste and reprocessed product shipments around the globe. During his time at Sellafield he was a Board Member and Chair of the UK nuclear industry transport committee (RAMTUC), a Board Member of the UK radioactive transport emergency response mutual aid scheme (RADSAFE), Chair of the World Nuclear Transport Institute (WNTI) Back-End Working Group and a member of the World Nuclear Transport Institute (WNTI) Advisory Committee.

In April 2020 Martin took up his current role as Secretary General at the World Nuclear Transport Institute, based in London, UK. In his WNTI role, Martin is focussed on helping ensure that future nuclear missions are transport-enabled with the appropriate capability and fit-for-purpose international regulations.

Let's Energise Sustainability



LUC VAN DEN DAURPEL
FOUNDING PARTNER

Luc Van Den Daurpel graduated in 1989 as civil engineer and nuclear engineer from the University of Ghent (Belgium) where he also obtained his PhD on nuclear energy systems analysis. He initially conducted research at the Nuclear Research Center in Belgium as nuclear engineer, operations manager for research reactors and program manager for advanced nuclear energy systems.

Speaker Biography

He joined the OECD Nuclear Energy Agency in Paris (France) in 1998 to conduct international studies on advanced nuclear energy systems and specifically advanced nuclear fuel cycle R&D and waste management.

Early 2002, he joined US-DOE's Argonne National Laboratory (ANL, US) in the context of Generation-IV and specifically nuclear energy system scenarios aimed at optimising the spent fuel and nuclear materials and waste management in the USA as well as in other countries. He acted as international expert at OECD/NEA, IAEA and EU expert groups regarding nuclear R&D and regulatory aspects regarding spent fuel and waste management.

Since March 2009, he became Scientific Director and International Expert at AREVA NC's Corporate Research and Innovation Directorate and since October 2011, he became Vice-President Strategic Analysis and Technology Prospective at AREVA's Corporate R&D. Within AREVA he was in charge of prenormative R&D, standards and codes, strategic R&D, international partnering and spent fuel, nuclear materials and waste management developments.

After leaving AREVA in March 2015, he launched the expert cabinet Nuclear-21 supporting governments, utilities, industry, regulators, waste agencies and R&D-laboratories in nuclear science and technology decisioneering.

His personal interests are focused on the technical and financial challenges in transitioning towards sustainable energy systems including, especially in the nuclear field, the positioning of nuclear energy, international development and the internationalisation of the nuclear fuel cycle.

He is member of the Scientific Council of the Commissariat à l'Énergie Atomique et Énergie Alternatives (CEA, France) and Board member of the American Nuclear Society (ANS) next to executive committee member in various organisations and learning societies.

SPEAKERS

Energy Security Panel



Partner

MATTHEW JOB
Herbert Smith Freehills LLP

Matthew focuses on the range of structures used to finance projects, assets and business in the infrastructure, power and natural resources sectors.

His expertise covers traditional bank-led project finance, project bonds and institutional debt; he also advises on structures involving multilateral agencies such as EIB and EBRD and/or Sovereign entities such as export credit agencies and/or the UK Infrastructure and Projects Authority, commodity hedging and revenue securitisation/monetisations. Matthew has a particular history of working with the UK government to provide support for the financing of UK infrastructure projects and businesses, for example in his work on new nuclear, Network Rail and Thames Tideway Tunnel.

Matthew has a reputation as a versatile finance lawyer able to cover the range of financing structures used to finance projects, business and assets in the energy infrastructure and natural resource sectors.



Director General

YVES DESBAZEILLE
Nucleareurope

Yves Desbazeille is French and graduated in electrical engineering from the Ecole Supérieure d'Electricité ("SUPELEC") in France in 1991 and studied on an MBA program in the early 2000s.

During his successful career Yves Desbazeille has been involved in different businesses and responsibilities at EDF: nuclear engineering, hydro and thermal power projects management in France, USA as well as in Asia, where he was for 5 years. His last position as EDF representative for energy in Brussels has provided him with an in-depth knowledge of the EU institutions and Brussels' stakeholders and of the energy and climate stakes for Europe.



Director of the Office for Energy Markets and Security

KEISUKE SADAMORI
International Energy Agency

Keisuke Sadamori took up his duties as Director of the Office for Energy Markets and Security at the International Energy Agency in October 2012. Previously, he held the post of Deputy Director General for Policy Co-ordination at the Ministry of Economy, Trade and Industry (METI) in Japan.

He had been involved with the IEA for a number of years as IEA Governing Board Representative for Japan and as Co-Chair of the Standing Group on Long Term Co-operation. Over the years, Mr Sadamori has served in the Cabinet of the Prime Minister of Japan and has co-ordinated numerous important projects, including work following the Fukushima-Daiichi accident in March 2011.

SPEAKERS

Energy Security Panel



Chief Executive

TOM GREATREX
Nuclear Industry Association

Tom Greatrex became Chief Executive of the NIA on 1 February 2016. Formerly MP for Rutherglen and Hamilton West, Tom was shadow energy minister from 2011 – 2015 and the opposition's lead spokesman on nuclear energy, electricity market reform, smart grid and metering, carbon capture and storage, interconnection and both onshore and offshore oil and gas. Leading the scrutiny of the Energy Act and the Infrastructure Act in the last Parliament, he secured a number of amendments to the proposed legislation. He also served as a member of the Energy Select Committee from 2010 and from 2007-2010 was a policy adviser in the Scotland Office, including on energy.

Since 2015, he has been an independent policy analyst working in the energy sector for a range of clients, a frequent media commentator on energy issues, and a regular columnist for Utility Week. In a varied prior career, he was Director of Corporate Affairs for the NHS in Scotland, a chief officer in local government and a GMB trade union official in England. Outside of work his main interests are family, football (Fulham) and film.



European Director Market Development

FREDRIK VITABÄCK
GE Hitachi Nuclear Energy

Fredrik Vitabäck is the European Director of Market Development for GE Hitachi Nuclear Energy (GEH), which is headquartered in Wilmington, NC, USA. Fredrik has been in the nuclear industry for 12 years and has a wide range of experience in Market and Product development, Sales and Strategy, over the full portfolio of GEH offers. Prior to his current role, Fredrik served as the Northern Europe Sales Executive based in Sweden, from 2017-2022 where he led the marketing and commercial operations of services, customers' investments, and fuel cycle support, across the Northern Europe operating fleet

Fredrik received a B.A. in Business Administration and a B.S. in Power Engineering from MidSweden University. During his study he received a fully funded Scholarship in UK studying at business school (CBS) and worked in parallel in the university as assistant tutor in Mathematics and programming.



UK Business Development Director for Nuclear Power

IVAN BALDWIN
Bechtel

Ivan Baldwin is Bechtel's UK Business Development Director for Nuclear Power, with a portfolio covering GW scale, SMR, AMR, and Fusion. Bechtel has led the delivery of 75,000 megawatts of nuclear power, spanning 7 decades. Bechtel was the delivery partner to the Wylfa Newydd, Horizon Project, and has subsequently been working with BEIS and partners on the alternative project for this important site.

Ivan is also the President of Women in Nuclear UK, the first man to hold this position in recognition of the much bigger commitment required from men, to make the nuclear industry an inclusive industry of choice.

SPEAKERS

Economic Efficiency Panel



London Bureau Chief
and Deputy Editor

PHIL CHAFFEE

Nuclear Intelligence Weekly

Phil has been working for Energy Intelligence since 2006, where he started off in the Research & Advisory division contributing to the Crude Oil Handbook. In 2007, he was involved in helping launch the publication that became Nuclear Intelligence Weekly (NIW), first as the market reporter focused on the nuclear fuel markets.

In 2009, Phil became deputy editor of NIW and helped expand its coverage of the nuclear industry in Europe, Africa and the Middle East. As both a reporter and deputy editor, he has been involved in covering some of the biggest stories in the nuclear industry over the past decade: the 2009 scandal that brought down the leadership of Kazatomprom, the 2011 Fukushima crisis, the 2015 Iran nuclear deal, the bankruptcy and sale of Westinghouse, and the shift from an industry centered in Europe and the US to one centered in Russia and China.



Chairman

TIM YEO

New Nuclear Watch Institute

Tim has a longstanding commitment to the nuclear energy industry dating back three decades to when he was Minister of State for the Environment with responsibility for climate change policy in the UK Government. He later served in the Shadow Cabinet as Shadow Secretary of State for Trade and Industry before being elected as chairman of the UK Parliament Energy and Climate Change Select Committee.

Tim is Chairman of ElecLink Limited, a subsidiary of Getlink SE, which owns and operates a IGW electricity interconnector between France and Britain. He is a consultant and former Executive Chairman of Powerhouse Energy Group plc, a listed UK company developing technology to convert plastic waste into hydrogen. Tim is the Honorary Ambassador of Foreign Investment Promotion for South Korea and has worked in China on climate related projects including the design of China's carbon trading markets and on carbon capture utilisation and storage with the UK-China (Guangdong) CCUS Centre.



Director of Nuclear Power,
Infrastructure and
Decommissioning

CHRIS HEFFER

BEIS

Chris Heffer became Director, Nuclear Power and Decommissioning at the Department for Business, Energy & Industrial Strategy (BEIS) on 31st August 2021.

Chris was previously the Deputy Trade Commissioner for North-East Asia based in the British Embassy in Tokyo for six years where he was responsible for Trade and Investment across all sectors, including Nuclear. Before that he worked in Strategy and Customer Insight roles in the Department for Business, Innovation and Skills, and Department of Health. He also led Drugs and Alcohol Policy within the Public Health Directorate of the Health Department.

Prior to joining the Civil Service, Chris was a Senior Manager at Deloitte, working in variety of sectors, including Life Sciences, Manufacturing and Consumer Business in Japan, Germany, France and the US. He studied Engineering, Economics and Management at University, and was a Sponsored Engineer during that time at Ford Motor Company UK.

SPEAKERS

Economic Efficiency Panel



Senior Energy
Analyst

ANTONIO VAYA SOLER

OECD Nuclear Energy Agency

Since 2018, Antonio provides techno-economic analyses and policy advice to OECD/NEA Member Countries on the role of nuclear power in electricity systems in wide range of areas including long-term operations, nuclear costs reduction opportunities, variable renewables integration costs and system modelling, small modular reactors and non-electric applications, and nuclear innovation in digital transformation and advanced manufacturing.

He has also been involved in the Gen IV International Forum initiative for 3 years where he has fostered cooperation between the industry and research laboratories through the Senior Industrial Advisory Panel, and participated as well in several technical committees on advanced reactors, including molten salt and high temperature reactors.

Before joining the OECD/NEA, he was project lead engineer at Framatome. He holds a Master's degree in nuclear engineering from Supélec and an MBA from Université de la Sorbonne, France.



Head of Industrial Markets

HARRY KEELING

Rolls-Royce SMR

Harry is responsible for developing opportunities to provide carbon free power direct to industry. This includes the provision of consistent and predictable levels of clean energy for desalination, data centres and the production of hydrogen and synthetic fuel.

After completing a Master's Degree in Engineering at the University of Bristol, Harry joined Rolls-Royce in 2010. His career in Rolls-Royce has involved a range of senior project delivery and business development roles, covering multiple sectors from Commercial Marine, Commercial Aero, Submarines and lastly Civil Nuclear. He also holds a Masters in Nuclear Technology.



Chief Economic Advisor

ATTILA HUGYECZ

Paks II. Nuclear Power Plant

In his role as Chief Economic Advisor at the Paks II. Nuclear Power Plant, Attila is responsible for the design, construction, and installation of the two new nuclear power plant units of Paks II. He also served as Head of Department for Nuclear Energy Analysis, where his main tasks included electricity and energy market analysis, evaluation of energy and other related policies.

The Paks II. Nuclear Power Plant contributes to the growth of national economy and the continuation of the safe, climate friendly and affordable supply of electricity of Hungary.

Prior to joining Paks II., he was Deputy Head of Department for Strategy and Energy Policy at the Hungarian Ministry of National Development and Energy Market Researcher at the Institute for World Economics of the Hungarian Academy of Sciences.

SPEAKERS

Environmental Sustainability Panel

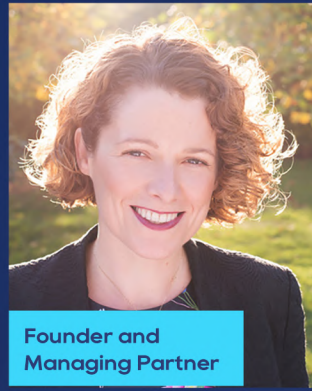


Chair

SARALYN THOMAS
Nuclear Institute Young
Generation Network

Saralyn is a Senior Consultant working in nuclear safety case development at Abbott Risk Consulting Ltd. Saralyn has over 6 years' experience in the nuclear industry and has worked for a variety of clients on safety case development, as well as radioactive waste management and delicensing projects. Saralyn has been an active volunteer of the Nuclear Institute and Young Generation Network (YGN) since 2016 and joined the committee in 2019. Saralyn is now Chair of the YGN and previously oversaw the YGN's presence at COP26 in Glasgow and their #NetZeroNeedsNuclear campaign.

The Young Generation Network (YGN) is the young member's branch of the Nuclear Institute (NI), the Professional Body and Learned Society for the Nuclear Sector in the UK. The YGN has been in existence for over 20 years and currently consists of approximately 1,000 members. Their mission is to encourage and develop the UK's early career nuclear professionals, and ensure that their voice is heard in shaping the future of our sector.



Founder and
Managing Partner

KIRSTY GOGAN
TerraPraxis

Kirsty Gogan, Founder and Managing Partner of TerraPraxis, is an internationally sought-after advisor to governments, industry, academic networks and NGOs. She has 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. Kirsty is Managing Partner of LucidCatalyst, a highly specialized international consultancy focused on large-scale, affordable, market-based decarbonization of the global economy. She is a member of the UK Government's Nuclear Innovation Research and Advisory Board (NIRAB).

Kirsty's voluntary work includes having co-founded Energy for Humanity (EFH). She serves on the Board of Nuclear Innovation Alliance, as well as Voices for Nuclear, and has been appointed to serve on a new committee of the US National Academies of Sciences, Engineering, and Medicine.



Director of Strategy

EMILIA JANISZ
European Nuclear Society

European Nuclear Society Director of Strategy, advocate of nuclear science and technology with over 10 years of experience in the EU legislation process of energy and climate matters. Leader of the Nuclear for Climate movement, bringing over 150 nuclear associations together and successfully making sure nuclear is part of the conversation at the UN COP conferences. Women's rights activist in her free time.

SPEAKERS

Environmental Sustainability Panel



Chief Executive
Officer

RAULI PARTANEN
Think Atom

Rauli is an award-winning science writer and communicator on energy, climate, environment and nuclear. His most recent books include *The Dark Horse - Nuclear Power and Climate Change* (2020) and *The Age of Energy - Understanding Growth, Prosperity, and Environmental Destruction* (2022). Currently he leads the think tank Think Atom, writes for various publications, is a frequent guest in both Finnish and international podcasts, and acts as an energy analyst for the Finnish Ecomodernist Society and RePlanet Europe - two pro-science environmental organisations that he has also been co-founding.



Head of Energy
Transition, Sizewell C

SHEKHAR SUMIT
EDF Energy

With over 15 years of experience advising infrastructure and energy projects around the world, Julia joined EDF Energy in July 2017 to focus on Hinkley Point C, Sizewell C, Bradwell B and the decommissioning of advanced gas-cooled reactors. Prior to her present role, Julia led a cross-practice team advising on power projects as Partner and Head of Power and Renewables for UK, US & Europe at Herbert Smith Freehills LLP, focusing on defence, nuclear decommissioning and transport projects. Julia is now working with Government to identify an innovative way for Sizewell C to be funded at best value to electricity consumers, and with potential investors.



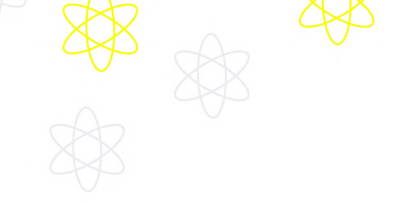
Honorary Senior Research Fellow

NEIL HIRST
Grantham Institute, Imperial College
London

Neil Hirst is an Honorary Senior Research Fellow of the Grantham Institute, Imperial College London. He has recently been working with China's Energy research Institute of the NDRC on a joint project on China and International Energy Governance. He is the author of *The Energy Conundrum*; *Climate Change Global Prosperity* and *the Tough Decisions we Have to Make*.

From 2005 to 2009 Neil was a Director of the International Energy Agency. Initially, as Director for Technology, he pioneered the IEA's flagship technology publication, *Energy Technology Perspectives*. Subsequently, as Director for Global Dialogue, he forged closer relations and joint programmes with IEA partner countries, especially China, India, and Russia.

Before that Neil was a senior UK energy official with responsibilities for international energy policy and (at different times) most domestic energy sectors. Politics Philosophy and Economics from Oxford University and an MBA from Cornell USA.



Articles

Addressing the Energy Trilemma

Europe's energy crisis: nuclear benefits

Yves Desbazeille, Director General, Nucleareurope

Europe is the midst of an energy crisis. A growing number of families and businesses are facing the prospect of no longer being able to pay their energy bills. Discussions are already taking place about how to avoid a potential blackout this winter. The reality is that not only is Europe struggling to get hold of enough energy to meet demand, but the cost of its energy imports are also staggeringly high. This crisis has been building over the last two years – the current situation in Ukraine has simply exacerbated a growing issue. But unfortunately, governments are trying to find a short-time solution to what is essentially a long-term problem.

What we are starting to see today is a change in how the public, in particular, view nuclear. Many are starting to question whether the phasing out of nuclear power plants, for example in Germany and Belgium, is really such a good idea (especially when they plan to replace this lost capacity with increased gas imports). And more and more seem open to the idea of building new nuclear reactors.

The reality is that nuclear can bring several benefits to help tackle the current (but likely long-term) energy crisis. Many reports have shown that extending the life of the existing nuclear fleet is the cheapest option. Therefore, in order to try and ensure affordable energy prices, governments need to seriously consider extending the lives of all their entire nuclear fleet (when it is economically and technically justified). But this will only take us up to 2035-2040 and so governments need to start considering the construction of new nuclear reactors in order to provide a solution in the longer term.

The benefits of maintaining the existing nuclear fleet and embarking on a realistic new build programme are multiple. Not only will it contribute towards ensuring an affordable supply of energy it will also help ensure security of supply. First of all because nuclear power plants operate 24/7 and can easily support an energy system which includes variable renewables. Secondly because they reduce dependence on imports of both fossil fuels and raw materials – apart from the fact that only a very minor quantity of uranium is required to produce a massive amount of energy, there are abundant sources of uranium available from a variety of regions.

Beyond the current energy crisis we also have to consider the climate crisis which the world is facing. Here too, nuclear is part of the solution because not only is it low-carbon, it is also sustainable.

Nuclear Power and Secure Energy Transitions

Keisuke Sadamori, Director of the Office for Energy Markets and Security, International Energy Agency

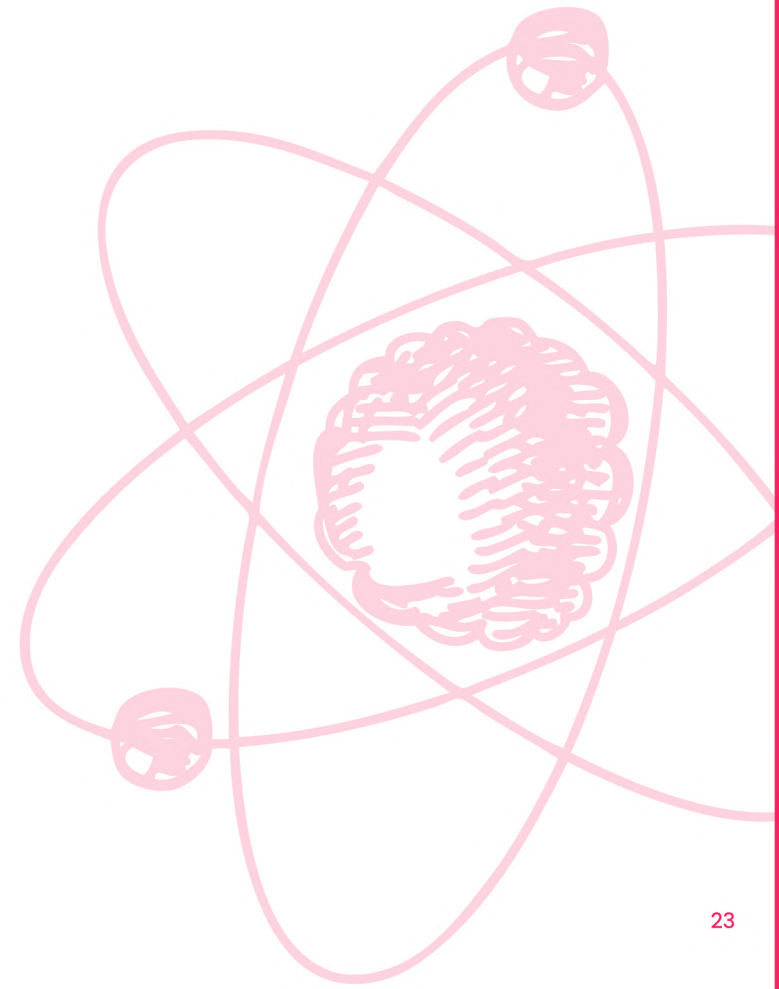
IEA released a report titled “Nuclear Power and Secure Energy Transitions” in June 2022, which took a comprehensive look at nuclear energy’s role in building secure, sustainable and affordable energy systems.

There are two drivers behind this report. The first is energy security, as we find ourselves in the midst of a truly global energy crisis. The need for a diverse mix of non-fossil domestic energy resources is becoming clearer. A number of countries including Belgium, France, Japan, Korea, Poland, UK and US have taken action to boost the use of both existing and new nuclear plants as part of their energy security strategies.

The second driver is the climate crisis. The COP26 in Glasgow led to increased commitments by governments to reach net zero emissions. The IEA’s Net Zero Emissions by 2050 Roadmap (NZE) provided a key input to their thinking. These net zero pledges are also reviving interest in nuclear power.

The NZE calls for a doubling of nuclear capacity globally by 2050. To achieve this, global nuclear investment must triple over the next decade to over USD 100 billion, to both extend the lifetimes of existing reactors and to build new capacity.

Renewable sources like wind and solar will have a dominant share in the electricity mix, but with less nuclear, the path to net zero would become more technically challenging, more expensive and riskier. It would cost consumers an extra USD 20 billion per year to achieve net zero emissions by 2050 if nuclear construction fails to accelerate and lifetimes of existing reactors are not extended further.



For nuclear to make such a contribution, the nuclear industry has a lot of work to do. In advanced economies, cost overruns and delays have plagued the industry. As a result, firms in North America and Europe have lost market leadership, as 27 out of the 31 reactors that have started construction since 2017 are either Russian or Chinese designs.

For countries who opt to include nuclear as part of their future energy mix, government policies will have a critical role to play. Energy markets should fully recognize nuclear power's low emissions and dispatchable attributes. As well, governments will need to support financing of nuclear projects. And for industry, new nuclear projects must be delivered on time and on budget. To be compatible with the NZE, construction costs need to fall to around 5000 USD per kW by 2030 in advanced economies, which is about 40% below recent 2 experience. Further cost reductions could open up new opportunities for low emissions electricity, as well as for heat and hydrogen.

Policymakers also need to support technology innovation. Small modular reactors, or SMRs, are a promising technology that has seen a recent burst of development driven by a surge in government support – with grants for SMRs now measured in billions of dollars, 10-times the level of just a few years ago. The United States, France, United Kingdom, Canada, Japan, China and Russia are leading the way, with a race for who can deliver the first competitive projects.

Nuclear power has traditionally been associated with large-scale, centralized plants delivering carbon-free, baseload electricity over the grid, typically with large distances separating electricity generators and consumers. Recent innovation in advanced nuclear is changing this paradigm, with small modular reactors (SMRs) opening opportunities to provide customers with safe, reliable carbon-free energy generation closer to where it is needed.

GE Hitachi Nuclear Energy is innovating to develop nuclear technology like the BWRX-300 SMR which we believe is ideal for the UK. Global interest in this technology is significant. Ontario Power Generation (OPG) has selected GE Hitachi as technology partner for the Darlington New Nuclear Project and we are working with OPG to deploy a BWRX-300 at the Darlington site that could be complete as early as 2028. We are in discussions with the Tennessee Valley Authority about the potential deployment of a BWRX-300 at TVA's Clinch River site. In Poland, Synthos Green Energy, together with its partners, desires to deploy at least 10 BWRX-300 SMRs by the early 2030s. There's interest in the BWRX-

300 in several other nations including the UK, Sweden, Czech Republic and Estonia.

GE Hitachi's President & CEO, Jay Wileman recently wrote on LinkedIn about solving the energy trilemma and highlighted that "GE recognizes the urgent global priority of climate change and is taking critical steps to power the energy transition and advanced nuclear technologies are a key pillar of GE's energy transition leadership. The world needs us to lead and we're ready to focus on the singular mission to solve the energy trilemma – showing how nuclear energy can mean more affordable and reliable energy for communities worldwide".

GE Hitachi's Perspective on Addressing the Energy Trilemma

David Powell, Vice President Nuclear Power Plant Sales UK, GE Hitachi

Nuclear power can play a key role in addressing the energy trilemma of energy security, affordability and environmental sustainability of energy systems. Enabling more people to have access to sustainable, affordable and reliable electricity is a key United Nations Sustainable Development Goal: it reduces poverty and hunger, promotes access to education and health care and lifts the quality of life for everyone.

As the UK's energy crisis continues to cause hardship for many, it is crucial that we move forward quickly in implementing the UK government's Energy Security Strategy, published in April this year and emphasising the benefits of nuclear power as a key source of low-carbon, reliable and domestic energy generation. It is imperative that we move forward with the key commitment under this strategy to deliver 24GWe of nuclear by 2050 which is around a threefold increase in current installed capacity and which would cover 25% of the UK's expected electricity demand. Depending on the pipeline and size of projects, this could see eight more nuclear reactors come into fruition and the UK government plans to take one nuclear project to final investment decision (FID) in this Parliament and two projects to FID in the next Parliament. The setting up of the Great British Nuclear vehicle this year, tasked with helping projects through the development process and developing a resilient pipeline of new projects and launching the £120 million Future Nuclear Enabling Fund are encouraging enablers towards the overall strategy.



Accelerating Nuclear Project Delivery

Ivan Baldwin, UK Business Development Director for Nuclear Power, Bechtel

Today's increasing focus on energy security and climate change demands that countries across Europe and the globe make urgent plans for the rollout of new nuclear power.

The UK's own needs are significant, requiring nuclear to generate 25% of its electricity by the year 2050, the plans for which are being coordinated by a new body called Great British Nuclear. With nearly all of the UK's existing nuclear generation planned for retirement before the year 2030, the 24GW target amounts to approximately eight large and 30 small modular reactors being delivered in less than 28 years.

This will strain every sinew of our nuclear eco-system, from regulatory and financing through to skilled personnel and supply chain capacity. However, history proves that a major nuclear rollout is possible (at one time, Bechtel had 10 nuclear construction projects under way per year), but only when it is approached as a major industrial enterprise, with bi-partisan commitment. This challenge also brings massive opportunity for the UK, through the creation of high-skilled and high-paid jobs in some of the country's most economically challenged regions and in re-energising our once world-leading nuclear supply chain.

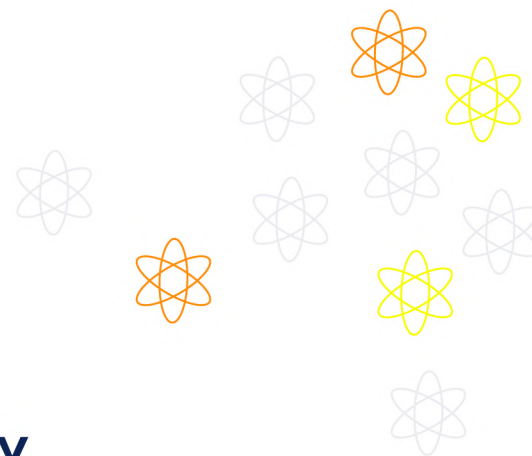
We should prioritise nuclear reactor technologies that are commercially proven, coupled with teams that have a track record of successful nuclear project delivery. For Wylfa, on Anglesey, widely regarded as the UK's best site for a large nuclear power station, Bechtel has been working in partnership with Westinghouse on a plan to construct AP1000 plants, leveraging lessons-learned from the team now delivering Vogtle Units 3 & 4 in Georgia, USA.

On August 4, 2022, Vogtle Unit 3 received approval from the U.S. Nuclear Regulatory Commission to load fuel. As of this writing, the plant owner, Georgia Power, is completing the final preparations to load fuel and begin the process of starting up the plant.

Meanwhile, Unit 4 is now 96% complete and is moving towards the final systems testing. This is first in a generation of new nuclear delivery in the United States, with detailed lessons-learned and a match-fit team ready to bring that knowledge and experience to de-risk the project at Wylfa.

Global market competition for nuclear is growing, not least close to home in Europe where new nuclear is in the near-term energy plans of a number of countries. Poland is committing to six new large-scale reactors to come online between 2033 and 2043, France plans to build 6 of its own new EPR 2 reactors and the Czech Republic is pressing ahead with two new reactors, not to mention all of the ambitions for new SMRs.

The world seems to grow more uncertain with the passing of each day. One of the world's first nuclear nations, the UK must get out of the blocks urgently on its new projects. This would unlock the additional benefit of de-risking delivery and achieving value for money, especially if we work closely with allies and likeminded partners, remembering that a nuclear partnership is a 100-year commitment.



Why Nuclear Power is Economically Efficient

Tim Yeo, Chairman, New Nuclear Watch Institute

The economic efficiency of nuclear power has three elements - stable costs, proven reliability and an almost zero carbon footprint. The recent turmoil in energy markets and the rapidly growing urgency of the climate change threat mean that these qualities have now become much more appreciated.

For years vocal opponents of nuclear power argued that it is too expensive. These critics have gone quiet now the cost of electricity generated by gas has soared above that produced by nuclear.

The availability of nuclear fuel from geographically and politically diverse sources has the big additional advantage that nuclear reactors will never be prevented from operating by a disruption to their fuel supply. By contrast there are now growing fears that relying on electricity generated by gas risks power cuts this winter.

Furthermore, extending the life of existing nuclear reactors, where this can be done safely, is the cheapest and quickest way to expand the world's supply of very low carbon electricity. At the same time the reliability of nuclear power is increasingly important as dependence on intermittent renewable energy sources steadily rises.

All this shows that nuclear is very economically efficient. Its appeal may soon be even greater if the high upfront capital costs of new reactors fall. This will likely be facilitated by technological progress and higher production volumes.

The arrival of small and advanced modular reactors could significantly lower capital costs per unit of output. Coupled with the introduction of floating reactors, SMRs will also widen the locations where it is feasible to deploy nuclear power. This will deliver reliable clean electricity to many smaller more remote communities for the first time.

The possibility of substantial investment in new nuclear capacity offers another way to cut costs. Boris Johnson's idea of building a new reactor in the UK every year was typically fanciful but a goal of eight new reactors over the next fifteen years is realistic.

To get the best value for money the Government should now invite tenders for two sets of four identical plants from the widest possible range of vendors. This will enable huge economies of scale to be achieved.

Political considerations may currently rule out bids from Russian and Chinese companies. Excluding Rosatom and CGN, whose proven technologies enable them to tender very competitively, certainly won't help Britain's consumers but is probably inevitable in the present circumstances.

Nevertheless in addition to EDF who are building at Hinkley Point and may start at Sizewell there are other potential vendors around the world from Japan and South Korea in the east to the US and Canada in the west.

This ambitious approach would restore the UK's reputation, at present jeopardised by fracking fantasies and proposals for fossil fuel development in the North Sea, as a global leader in the response to climate change. Even more importantly for the British people it would also create jobs, develop supply chain skills and unlock export opportunities.

Let's Energise Sustainability

Luc Van Den Durpel, Founding Partner, Nuclear-21

Our planet's hospitality for us all depends on how we shall be adapting our unsustainable use of scarce resources of any kind while minimising the environmental impact also for all.

We're all facing significant challenges with respect to our future given the unprecedented need to reshape how we see our future development and how we remain friendly to our host, this planet. Virtually all of these challenges can be resolved though virtually all depend also on the availability of sustainable energy as part of more integrated energy systems. While the demand for primary energy may be flattened or even decreased over time, the electrification and the use of higher value energy carriers as hydrogen are projected to soar during the coming decades. A sustainable generation of heat and electricity is therefore critical.

Nuclear energy can provide both, while essentially having been focused on the generation of electricity during the past decades. The reconsideration of more market-compatible nuclear reactors, for instance small modular reactors (SMRs), providing electricity though also serving heat demand is hereby of highest importance. The recent geo-political developments have once more shown that a robust and competitive energy generation is crucial as part of a reliable and strategic infrastructure policy beneficial to the overall socio-economic well-being of countries. It also emphasises the importance of more integrated energy systems thinking with optimisation of the whole energy balance and therefore also changing the energy market mechanisms driving the transition towards such more sustainable energy systems.

Standards and Competence

Martin Porter, Secretary General, World Nuclear Transport Institute

Having spent decades in the UK nuclear industry and, more recently, having been given the opportunity to lead the World Nuclear Transport Institute, I have maintained an enduring desire throughout to drive and maintain high standards and competence in our precious industry. At the same time, in the transport context, I have delivered many nuclear transport missions globally in the knowledge that I was only able to do so because, broadly, the public believe we do it safely and securely. The confidence that the public have in us must be reciprocated with an obligation, on our part, to do all we can to preserve that position of safety and security. As we push towards the end-state of the early generation reactors and get justifiably excited about future nuclear's optimistic horizon, our challenge is that we have to keep our 'eyes on the prize' and ensure that our high standards are not degraded in transition. Loss of corporate memory, insufficient due diligence and allowing standards to be diluted or eroded would all conspire to a lost opportunity.

As we approach the realisation of Gen 4+ nuclear reactors, and embrace all the opportunities that the new technologies offer us, it is time to plan and prepare for all that this brings. An essential part of that preparation is to ensure that all we have learned and attained to date, as nuclear operators, is gathered, refreshed and passed on to our future nuclear custodians. For over 60 years we have transported nuclear materials in such a way so as to have not had a significant release event. We have attained this performance level by the strict application of rigorous standards, prescriptive regulations, robust procedures and tested practices, all delivered by competent people. That is a performance position that most other dangerous goods communities can only look at with envy.

It is absolutely appropriate to get excited about our new nuclear ambitions and aspirations but there is a record of safety and security in nuclear transport that is so precious, in what it enables, that it cannot be lost and must be protected. Given the delicate position that our world is in, in terms of climate change alone, the opportunity to replace our fossil fuel dependence with a solution which embraces nuclear cannot be lost to an own goal of not being ready, resourced and configured. In saying this, however, we must also recognise that the potential offered by small modular, advanced and micro reactors is such that new nations and new actors will undoubtedly enter our industry. It is incumbent on all of us, and from a transport perspective WNTI in particular, to drive for maintaining the high standards and competence that has protected us thus far whilst helping the newest members to our industry get to the right level of practice. This is what WNTI delivers and it is what WNTI will continue to uphold.



Beautiful Nuclear is Deployable Nuclear

Kirsty Gogan, Founder and Managing Partner, TerraPraxis
 Rauli Partanen, Chief Executive Officer, Think Atom

In recent years, it has become more and more clear that nuclear is one of our most sustainable energy sources. It has the lowest lifecycle emissions, just 6 gCO₂/kWh for the European fleet, according to a recent study by UNECE. That is roughly half of the next best, including wind, some solar technologies and hydro power, which all come at 11-14 grams. Materials footprint is also among the tiniest of all energy sources, given the exceptional energy density of Uranium and the fact that while nuclear power plants are big and take a lot of materials to build, they also produce a lot of energy and can be operated at least 60, if not 100 years. Same goes for land-area, where nuclear has anywhere between 50 to 1000 times smaller physical footprint compared to wind or solar, per megawatt hour produced and depending on assumptions.

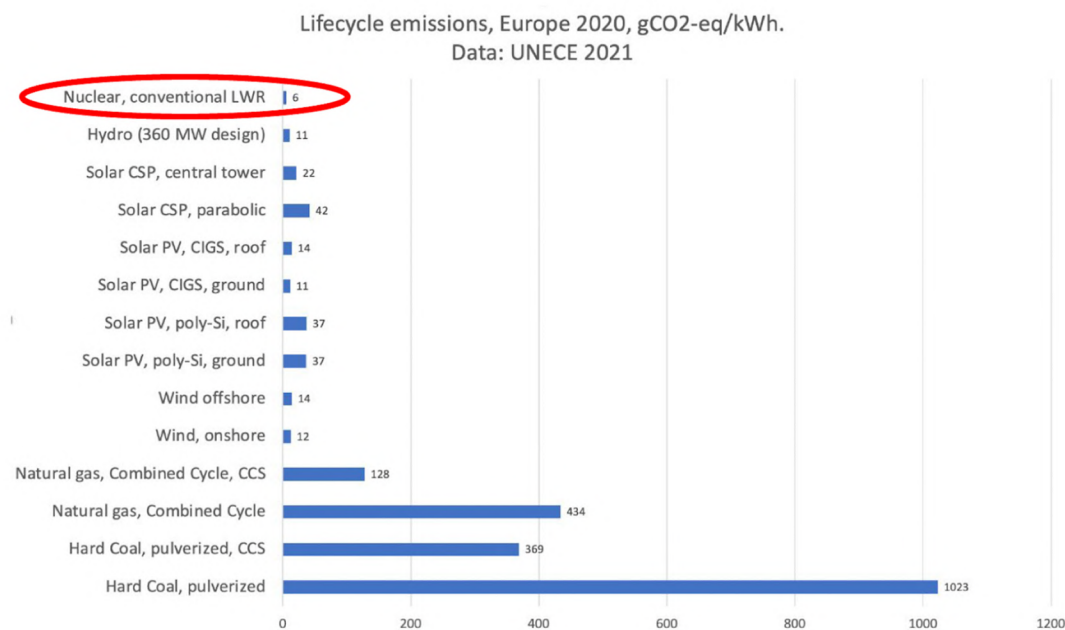


Figure 1: Lifecycle emissions from various energy sources in Europe, 2020.

Nuclear is beautiful, because all these properties it has – low carbon, low materials use, low footprint – lets us leave nature be free while still supplying civilization-scale amount of clean energy. But the latter of the promises has not happened. Instead of scaling to meet growing demand and replacing fossil fuels, many nuclear projects have been plagued with delays, cost-overs, and a multitude of other difficulties.

It is extremely hard to go out there and buy a nuclear plant, let alone to get it delivered within a reasonable timeframe and at reasonable cost. What we have now, especially in the west, are one-off projects starting every decade or two, where we lose most of the benefits of learning, standardization, and experience, and get all the downsides of trying to build a megaproject for the first time, over and over again.

And that needs to change. Nuclear needs to be deployed at 10 or even 100 times faster than what has happened recently. Given that permitting, siting and constructing megaprojects is hard and time consuming even if one gets good at it, we might want to look for other ways to deploy nuclear as well.

In two recent studies by Lucid Catalyst, we did just that. Let's start with shipyards. The world has some 280 shipyards, most with plenty of idle capacity available. Some of these shipyards could be used to build floating offshore-power plants at much lower cost and shorter delivery times compared to conventional on-land construction. There would be relatively little site-work needed, and even that could be done while the power plant was already under construction at the shipyard, saving time and money.

The scale at which these shipyards already operate is enormous. Instead of building 5 or 10 gigawatts of new capacity each year as we have done – perhaps just enough to replace retiring plants and then some – we could build dozens of gigawatts of new capacity just from a single large shipyard – or a few gigawatts from a medium sized one. Globally, we could add hundreds of gigawatts of new capacity each year, while the cost would be significantly lower than the recent western projects.

Or we could build a “Gigafactory”, pictured below. It would have a reactor factory sited right next to a synthetic fuels plant, replacing current oil and gas refineries. The reactor factory would manufacture for example 600 Mwt small, standardized high-temperature reactors, of which the first 36 units would be used as the energy source for the hydrogen and e-fuels manufacturing plant located next to the factory. After that, the factory output could be exported to another site.

We already know that nuclear is beautiful and sustainable. Now the nuclear industry, regulators, and society in general needs to prepare to deploy nuclear at a scale not seen before.



Figure 2: A Gigafactory making standardized reactor units at scale, which are used to populate the local hydrogen or e-fuels manufacturing plant operating at tens of gigawatts scale.

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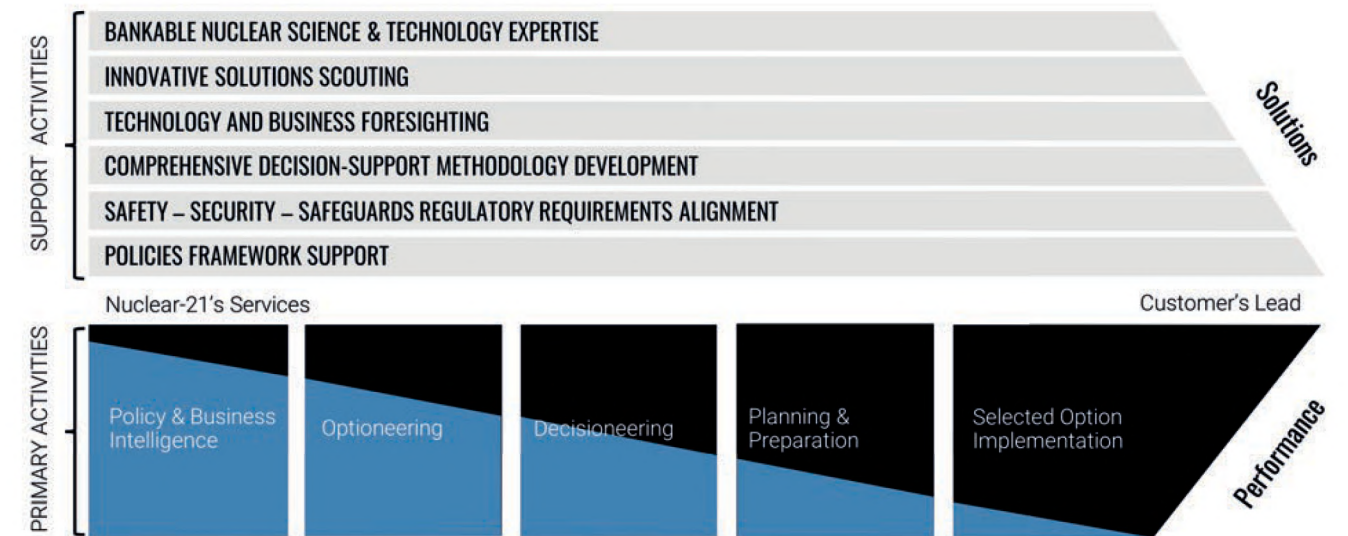
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