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In this Bulletin

For our third issue of Science, Technology and Security (STS) Bulletin, we focus on energy technologies from three perspectives: (1) fusion (including an additional article on advancements in fusion and AI technologies), (2) nuclear, and (3) hydrogen. These expert contributions were written by Dr Elias Carayannis, Professor of Information Systems and Technology Management and Director, European Union Research Centre, at George Washington University in Washington DC, USA, Dr Alvin Chew, Senior Fellow at RSIS, and Dr Frank Umbach, Adjunct Senior Fellow at RSIS and Research Director at the European Cluster for Climate Energy and Resource Security (EUCERS)/Center for Advanced Security, Strategic and Integration Studies (CASSIS) at the University of Bonn.

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Future Issues and Energy | *Benjamin Ang and Karryl Sagun-Trajano*



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Is the International Hype of Hydrogen Justified? | *Frank Umbach*


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STS is edited by the Future Issues and Technology (FIT) cluster and features thought pieces on key emerging technologies, such as artificial intelligence (AI), space, energy, quantum, technology


geopolitics, and smart cities. We aim to explicate novel technologies in relation to policy to facilitate discussion, information sharing, and collaboration.  [Click to read more.](#)

Benjamin Ang is Senior Fellow and Head of the Centre of Excellence for National Security (CENS) and oversees the FIT cluster. He is also Head of Digital Impact Research (DIR) at RSIS. Karryl Sagun-Trajano is Research Fellow for FIT.

Fusion Energy Technologies: Safeguarding National Security | Elias G. Carayannis


In the face of escalating global energy demands and the ever-growing concern for energy security, the exploration of sustainable alternatives has become paramount. Fusion energy technologies, as outlined in recent breakthroughs in fusion energy research, offer a promising solution. This article delves into the transformative potential of fusion energy, emphasising its inherent safety, minimal environmental impact and economic advantages. Beyond addressing energy challenges, the focus here extends to the critical role that fusion energy plays in safeguarding national security. As nations strive for cleaner, safer energy solutions, fusion emerges not only as a technological breakthrough but as a linchpin for ensuring strategic and resilient national security.  [Click to read more.](#)

Fusion Energy and AI: A Synergetic Overview | Elias G. Carayannis

In the rapidly evolving landscape of transformative technologies, fusion energy and artificial intelligence (AI) stand at the forefront, garnering increasing recognition for their pivotal roles in addressing pressing global challenges. Fusion, offering a clean and virtually limitless energy source, and AI, revolutionising the way we process information, are integral to our quest for sustainability and resilience. This rest of this article delves into the intersecting realms of fusion and AI, positioning them as public interest technologies with profound implications for national security. By exploring the symbiotic relationship between these innovations, we aim to underscore their collective potential in shaping a secure and sustainable future.  [Click to read more.](#)


Dr Elias G. Carayannis is Full Professor of Science, Technology, Innovation and Entrepreneurship, as well as co-Founder and co-Director of the Global and Entrepreneurial Finance Research Institute (GEFRI) and Director of the European Union Research Center (EURC) at the School of Business of the George Washington University, Washington, DC. Dr Carayannis' teaching and research activities focus on the areas of strategic government–university–industry R&D partnerships, technology road-mapping, technology transfer and commercialisation, international science and technology policy, technological entrepreneurship, and regional economic development.

Achieving Net-Zero Emissions Through Nuclear: The “New Clear” Energy of the Future | Alvin Chew

The world is abuzz with ambitions of reaching the goal of net-zero carbon emissions by 2050. UN Secretary-General Antonio Guterres has called on countries to align their climate action with the UN Sustainable Development Goals (SDGs) 2030, which can serve as a guiding framework to ensure a just and inclusive energy transition. SDG 7, a goal for sustainable energy, is aimed at providing access to affordable, reliable, sustainable and modern energy. There is only one source of energy that satisfies these four characteristics – nuclear. Nuclear energy forms an integral part of the net-zero equation. Among advanced reactor technologies is a class of high temperature gas-cooled reactors (HTGRs) that could enhance the civilian applications of nuclear energy to help countries meet their net-zero ambitions.  [Click to read more.](#)

Alvin Chew is a Senior Fellow at the S. Rajaratnam School of International Studies (RSIS).

Is the International Hype of Hydrogen Justified? | Frank Umbach

Clean hydrogen is currently the only real technology option for decarbonising the world's hard-to-abate-sectors such as heavy manufacturing and energy-intensive industries such as steel or the chemical sector. But a projected production of 38 mt of clean hydrogen, up from less than 1 mt today, demands a cumulative investment of US\$170bn in projects involving electrolysers and carbon, capture, utilisation, and storage (CCUS). But whether or to what extent the use of hydrogen can be adopted by other sectors such as transport, aviation or buildings remains to be seen owing to the uncertainty of future costs, commerciality, and further technological innovation. Given the technological uncertainties, recent cost increases, the need for technology innovation and criticism that the potential of hydrogen has been exaggerated, private investors and banks have become more cautious about investing in hydrogen projects as they are considered a risky investment. Although the international hype has not died down, governments, industries and independent experts have begun to realise that they need a more sober and realistic perspective.  [Click to read more.](#)

Dr Frank Umbach has been an Adjunct Senior Fellow of RSIS since September 2017. He graduated from the University of Bonn with an MA in Political Science and a PhD. He is currently the Head of the European Cluster for Climate Energy and Resource Security (EUCERS)/Center for Advanced Security, Strategic and Integration Studies (CASSIS) at the University of Bonn; and a Senior Lecturer at the University of Bonn; from 2017-2020, he was Visiting Professor at the College of Europe in Natolin (Warsaw) in Poland, where he taught “EU energy (foreign) policies”, and an Executive Advisor at ProventisPartners, Munich (an M&A company). He is also a consultant for UN-organisations, companies and NATO since 2012 on energy and climate security, giving regularly presentations at high-level NATO conferences and seminars, and the Gerson Lehrman Group (GLG). He is an internationally recognised expert on global energy security, geopolitics, critical (energy) infrastructure protection, and (maritime) security policies in Asia–Pacific as well as Russia/Central Asia. He is also a regularly invited expert for German public and private TV news channels on international geopolitics, energy and security policies such as the Ukraine- and Gaza-wars or potential conflicts in the Indo-Pacific region (Taiwan, South China Sea, Korean peninsula).

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