

MIT Industrial Liaison Program Faculty Knowledgebase Report

2022 MIT Madrid Symposium

March 17, 2022 9:30 am - 2:30 pm

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Eduardo Garrido
Program Director, [MIT Industrial Liaison Program](#)



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Eduardo graduated as Industrial Engineer at Universidad de Buenos Aires and has a MBA degree from IE Business School.

9:30 AM

Welcome and Introduction
Raimundo Pérez-Hernández y Torra
Director, [Ramón Areces Foundation](#)



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Raimundo Pérez-Hernández y Torra has been director of the Ramón Areces Foundation since 2008. A Law graduate from the Complutense University in Madrid, he joined the Diplomatic Corps in 1976.

Until he joined the Ramón Areces Foundation, his professional career was in Public Administration, where he held the positions of adviser at the Spanish Permanent Delegation to the United Nations; economic and trade adviser at the Spanish Embassy in France; Head of Protocol in the Spanish Prime Minister's Office, with the rank of director-general; executive chairman of the Organising Committee for the Spanish Presidency of the European Union Council, with the rank of under-secretary; Ambassador and permanent representative to the United Nations and other international organisations based in Geneva; chairman of the Executive Committee of the United Nations High Commission for Refugees. He has served as Spanish Ambassador to the Republic of Austria and Chief of Protocol at the Ministry of Foreign Affairs (MAEC), with the rank of ambassador.

Klaus Schleicher
Director, [MIT Industrial Liaison Program](#)



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9:45 AM

Scaling up low-carbon energy: Economic, Geopolitical and Environmental Impacts
Sergey Paltsev
Deputy Director, MIT Joint Program on the Science and Policy of Global Change
Senior Research Scientist, MIT Energy Initiative and MIT Center for Energy and
Environmental Policy Research (CEEPR)
Director, Energy at Scale Center



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Dr. Sergey Paltsev is a Deputy Director of the MIT Joint Program on the Science and Policy of Global Change, a Senior Research Scientist at the MIT Energy Initiative and MIT Center for Energy and Environmental Policy Research (CEEPR), and a Director of the MIT Energy-at-Scale Center, Massachusetts Institute of Technology (MIT), Cambridge, USA. He is the lead modeler in charge of the MIT Economic Projection and Policy Analysis (EPPA) model of the world economy. Dr. Paltsev is an author of more than 100 peer-reviewed publications in scientific journals and books in the area of energy economics, climate policy, transport, advanced energy technologies, and international trade. Sergey was a Lead Author of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). He is a recipient of the 2012 Pyke Johnson Award (by the Transportation Research Board of the National Academies, USA, for the best paper in the area of planning and environment). Sergey is an Advisory Board Member for the Global Trade Analysis Project (GTAP) Consortium and a Member of the Scientific Steering Committee of the Integrated Assessment Modeling Consortium. Additional information at:

<https://globalchange.mit.edu/about-us/personnel/paltsev-sergey>

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Currently, there is no magic bullet for fossil fuels—no one energy technology that can provide a cheap and reliable alternative capable of supporting the world's growing energy needs. Instead, decision-makers looking to lower greenhouse gas emissions must choose from an expansive menu of technology and policy options.

MIT economist Sergey Paltsev studies this array of technology and policy options, with the goal of easing any economic growing pains that might result from the world's energy transition. Though his research spans a wide range of topics and regions, it is tied together by a common thread: understanding the economic and climate impacts of energy decisions.

10:30 AM

The State of Fusion
Dennis Whyte
Director, MIT Plasma Science & Fusion Center
Hitachi America Professor of Engineering
Professor, Nuclear Science & Engineering



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Dennis Whyte is a recognized leader in the field of fusion research using the magnetic confinement of plasmas for energy production on a faster, smaller, and more innovative path. Dennis is a Fellow of the American Physical Society, has over 300 publications, and is heavily involved as an educator. He is widely recognized for his themes of innovation and the need for speed and economic viability in fusion. He has served on panels for the National Academies, the U.S. government, and the Royal Society. As director of Plasma Science and Fusion Center (PSFC) he presents the Center's vision to peer institutions and recruits faculty and scientists to the team. The core of the SPARC project was formed over eight years ago during a design course led by Dennis to challenge assumptions in fusion. Many of the ideas underpinning the high-field approach — including the use of HTS for high-field, demountable magnets, liquid blankets, and ARC — have been conceived of or significantly advanced in these courses. Dennis' leadership as director of PSFC has been a key enabler for the SPARC project, providing the stature necessary to bring the institutional and outside support to the project.

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Vast improvements in magnetic confinement of Plasma uses in MITs NET SPARC project expects to achieve net energy gain from fusion by 2025 and potentials commercial applications for the technology "could follow in the 2030s". Professor Dennis White will give an overview of the technology, economic viability and outline its path to commercialization.

11:15 AM

Networking Break

11:45 AM

The Role of Carbon Dioxide Capture and Storage (CCS) in Getting to Net-Zero

Howard J. Herzog

Senior Research Engineer, MIT Energy Initiative (MITEI)

Executive Director, MITEI's Carbon Capture, Utilization, and Storage Low-Carbon Energy Center



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Howard J. Herzog is a senior research engineer in the MIT Energy Initiative (MITEI) and Executive Director of MITEI's Carbon Capture, Utilization, and Storage low-carbon energy center. He received his undergraduate and graduate education in chemical engineering at MIT. He has industrial experience with Eastman Kodak, Stone & Webster, Aspen Technology, and Spectra Physics. Since 1989, he has been on the MIT research staff, where he works on sponsored research involving energy and the environment, with an emphasis on greenhouse gas mitigation technologies. He was a Coordinating Lead Author for the IPCC Special Report on Carbon Dioxide Capture and Storage (released September, 2005) and a US delegate to the Carbon Sequestration Leadership Forum's Technical Group (June 2003-September 2007). He was awarded the 2010 Greenman Award by the IEAGHG "in recognition of contributions made to the development of greenhouse gas control technologies". In 2018, he authored a book entitled *Carbon Capture* for the MIT Press Essential Knowledge Series.

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Carbon dioxide capture and storage (CCS) has the potential to be a significant player in helping the world reach its goal of net-zero emissions of greenhouse gases. While there has been a great deal of research and development of CCS technologies over the past three decades, CCS deployment has been somewhat limited. In this talk, I will discuss the present status of CCS and what is holding back its large scale deployment. Looking to the future, I will examine the different roles CCS can play, including decarbonizing power and industrial plants, producing low-carbon hydrogen, and removing CO₂ from the atmosphere. I will conclude by suggesting what is needed to accelerate the deployment of CCS.

12:30 PM

Waste-to-Energy for Climate Change Mitigation and Adaptation

Peter Godart
Postdoctoral researcher and educator
Department of Mechanical Engineering, MIT

Communities around the world face continual disruption to critical electricity and potable water infrastructure due to severe storms, wildfires, and other natural disasters that are becoming more frequent and potent due to climate change. At the same time, many such communities see their local ecosystems being polluted due to poor waste management, especially as debris from severe weather events causes waste streams to surge in volume. Instead of compounding the issue, what if debris and other refuse could be converted into clean fuels locally to power the generation of critical resources when they would otherwise be inaccessible? Aluminum, for example, is the most abundant metal on earth and is widely used in nearly every industry. Currently global recycling rates are limited by complications with sorting waste by alloy content, lack of economic incentive, and the recent restriction of waste exports to other countries. As a result, several million tons of aluminum are landfilled each year in the US alone, leaving a significant amount of potential energy sitting idle and unused. A new alternative strategy to managing this waste is to turn it into an energy-dense fuel that reacts exothermically with water to produce hydrogen and boehmite, a valuable byproduct used in various industrial and pharmaceutical processes. When exposed to air, bulk aluminum develops an oxide layer that prevents it from reacting with water at practical temperatures; however, recent research at MIT has shown that a minimal surface treatment of gallium and indium can disrupt the oxide layer at the grain boundaries, allowing this reaction to proceed to >95% completion. In this talk, I discuss my research on the science and engineering of turning energy-dense scrap aluminum into a water-reactive fuel for clean hydrogen generation, as well as provide a thermodynamic perspective on plastic and biomass waste streams and how they might be leveraged in a similar way to make climate adaptation and mitigation more effective and equitable.

1:15 PM

Roundtable
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Dr. Sergey Paltsev

Prof. Dennis G Whyte

Dr. Howard J. Herzog

Dr. Peter Godart

Wrap Up and Closing Remarks
Raimundo Pérez-Hernández y Torra
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