

# MIT Industrial Liaison Program Faculty Knowledgebase Report

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## Decarbonization

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November 7, 2024 11:00 am - 12:40  
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11:00 AM

Welcome and Introduction  
CJ (Changjie) Guo  
Program Director, [MIT Corporate Relations](#)



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Dr. CJ Guo joined the Office of Corporate Relations as a Senior Industrial Liaison Officer in July, 2015. CJ comes to OCR with 25 years of extensive global experience in technology innovations, portfolio management and business development in emerging and conventional energy sectors with leading multinational corporations in the US, China and Canada.

CJ is a leading expert in emerging energy technologies and energy system transitions. With Shell, he was the Emerging Technology Theme Leader in China/Beijing (2011 to 2015), worked extensively with the Chinese energy communities on the country's future energy landscape, and the Senior Technology Advisor in alternative transportation fuels in the US / Houston (2006-2010), and served during 2010 as Chairman of the Fuel Operations Group for the US DOE FreedomCar Partnership. Prior to joining Shell, CJ has held technology development, commercialization and management positions with Air Liquide (2002-2006) and The BOC Group (1995-2001) after working as a research scientist in oil-sands upgrading with CANMET in Canada (1992-1994).

CJ earned his Ph.D., Chemical Engineering, at CSU, Ohio, his M.S. and B.S., Chemical Engineering at TYUT, China. He has earned various awards from Shell, Air Liquide, BOC, Shanxi Province (China). He holds many patents and has sat on the board of Shenzhen Sanmu Battery Technology Company as an independent board member during 2009-2010.

A Novel Systems Analysis Platform to Navigate Industrial Decarbonization  
Emre Gençer

Principal Research Scientist, [MIT Energy Initiative](#),  
Co-founder and CEO, [Sesame Sustainability](#)



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Principal Research Scientist, [MIT Energy Initiative](#),  
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Emre Gençer is a principal research scientist at the MIT Energy Initiative, and a co-founder and CEO at Sesame Sustainability.

The central theme of his research is to identify optimal utilization of resources for the evolving energy system facing the dual challenge of increasing demand while profoundly reducing its environmental footprint. His research focuses on integration of emerging and conventional energy technologies, their policy implications, multiscale modeling, and optimization. He is the principal investigator of various ongoing projects at MIT including *Understanding Carbon Mitigation Technologies*, *Analysis of Options towards Fully Decarbonized EU by 2050*, and *Exploring Power and Transport Sector Decarbonization Pathways via Direct and Indirect use of Electricity*. He is the lead developer and chief architect of a novel software platform called [Sustainable Energy Systems Analysis Modeling Environment \(SESAME\)](#), which provides comprehensive cost and sustainability assessment for the converging electric power, transportation, and industrial sectors to decision makers and technology analysts with high technological, temporal, and geospatial resolution. He was lead on the chemical storage chapter of [The Future of Energy Storage](#) report and co-lead on the thermal storage chapter.

Decarbonizing hard-to-abate sectors is critical to achieve climate change goals given the unique and often fossil fuel-based manufacturing processes. For developed and emerging economies, evaluating power and heavy industry sectors are pertinent given the immense growth expected in the upcoming decades. This presentation will focus on cost and emission models that have been developed and evaluated using the Sesame platform. Specifically, case studies for Hydrogen, Iron and Steel, and Power will be presented demonstrating the impact of technology options, supply chain choices and regional differences. In addition to the plant-level analysis, a system view will be taken to estimate emissions and energy consumption for the entire fleet. By comparing the various technology routes on a cost and emission basis, potential decarbonization strategies, marginal abatement cost, and sensitivities to fuel and other operational costs will be analyzed. The sectoral analysis indicates the immense increase in energy consumption and corresponding infrastructure support for industrial decarbonization. A combination of resource efficiency and technology improvements will be important for reducing emissions from a business-as-usual operation. Overall, the analysis indicates the role of system analysis in evaluating plant-level and system level changes in legacy sectors that are expanding and will be transitioning from traditional production methods. This study is timely as the global community sets climate goals and must consider hard-to-abate sectors, during the energy transition. Using system analysis provides insight to future plant-level and sectoral-level emission and cost challenges.

11:48 AM

## Mutual Reinforcement of Land-based Carbon Dioxide Removal and International Emissions Trading in Deep Decarbonization Scenarios

Jennifer Morris

Achieving long-term climate stabilization targets that limit warming to 1.5°C or 2°C requires deep decarbonization, with total greenhouse gas (GHG) emissions eventually falling to net zero. Because some emissions in the economy are difficult to eliminate, most 1.5°C or 2°C pathways rely on negative emissions strategies to offset residual positive GHG emissions in hard-to-abate sectors. Among carbon dioxide removal (CDR) technologies, bioenergy with carbon capture and storage (BECCS) and natural-climate solutions such as afforestation and reforestation (A/R) are among the most widely considered options. The deployment of these options will depend on their availability as well as the climate policy regime, particularly the availability of international emissions trading. In fact, CDR and international trade in GHG permits mutually reinforce each other. This relationship and its implications for the scale of CDR and emissions trading, regional deployment, carbon prices, and GDP will be discussed in this talk.

12:35 PM

MIT Startup Exchange  
Catarina Madeira  
Director, [MIT Startup Exchange](#)



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Director  
[MIT Startup Exchange](#)

Catarina has been working with the Cambridge/Boston startup ecosystem for over 10 years and joined Corporate Relations with a solid network in the innovation and entrepreneurial community. Prior to MIT, she was part of the team that designed and launched the startup accelerator IUL MIT Portugal, which was later rebranded as Building Global Innovators. She was based in Lisbon and worked in direct relation with the Cambridge team. She held positions including Operations Coordinator, Program Manager, and Business Developer. The accelerator soon achieved steady growth in large part due to the partnerships that Catarina led with regional and global startup ecosystems. After that, she worked at NECEC, leading a program that connects cleantech startups and industry. In this role, she developed and built a pipeline of startups and forged strong relationships with both domestic and European companies. She has also held positions in Portugal and France, including at Saboaria e Perfumaria Confiança and L'Oréal as Technical Director and Pharmacist. Catarina earned her bachelor's in chemistry and pharmaceutical sciences in Portugal. She went on to earn her Master of Engineering for Health and Medicines in France.

Prabhu Rao  
Chief Executive Officer and Chairman  
[Ivys Adsorption Inc.](#)

Art Shirley

1:08 PM

Closing  
CJ (Changjie) Guo  
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1:15 PM

Adjournment