ZHIYUAN FAN

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Columbia University, SIPA, Center on Global Energy Policy

EDUCATION

Columbia University in the City of New York — New York, NY
M.S. in Mechanical Engineering, Energy Concentration (GPA: 3.9) — Aug. 2018 – Dec. 2019

The Hong Kong University of Science and Technology — Hong Kong, HK
B.Eng. (Hons.) in Aerospace Engineering [Minor in Mathematics] (GPA: 3.8) — Aug. 2014 – May 2018

Georgia Institution of Technology — Atlanta, GA
International Exchange Program (GPA: 4.0) — Aug. 2016 – Dec. 2016

SKILLS

Technical	Python, Matlab, R, SolidWorks, Excel, ASPEN
Languages	Chinese Mandarin (native)

WORK EXPERIENCE

Center on Global Energy Policy SIPA, Research Associate — New York, NY
Feb. 2020 – Now
Supervisor: Dr. Julio Friedmann

- Investigated decarbonization approaches for iron/steel industry based on current steelmaking processes combining low-carbon resources with cost analysis. Options including retrofitting existing facilities with carbon capture, hydrogen and solid biomass substitution, zero-carbon electricity and new facility potential with novel technology such as metal electrolysis.
- Investigated circular carbon economy development, focusing on low-carbon hydrogen (blue, green and bio-hydrogen) production and application. Research on technical pathways, key value propositions, and core challenges of adoptions.
- Analyzed levelized cost of carbon abatement as an improved methodology for cost comparison of technologies and policies. Investigated its application on industrial sectors, sustainable aviation fuels, and solar electricity carbon credits, including renewable electricity certificates trading.
- Analyzed the Shipping decarbonization using ammonia as alternative fuel, with ports in Asia-Pacific region to be the key infrastructure for this low-carbon fuel transition.

Center on Global Energy Policy SIPA, Research Assistant — New York, NY
Jan. 2019 – Dec. 2019
Supervisor: Dr. Julio Friedmann

- Investigate the options to decarbonize heavy industry by low-carbon heat approach, where industrial heat contributes to roughly 10% of global CO_2 emission. Initiated tech-economic analysis of low-carbon heat options and feasibility study of heat quality/requirement for specific heavy industry.

RESEARCH EXPERIENCE

Columbia University in the City of New York — New York, NY

Energy Storage System – Battery Aging and Optimization *[Python, Matlab]* — Jan. 2019 – Dec. 2019
Supervisor: Prof. Vijay Modi

- Time series analysis of Battery Aging Mechanism's effect on the energy storage system optimization: system cost optimization, battery energy flow and battery life optimization. Research focus on the energy storage system at high renewable penetration, deep decarbonization target and life cycle cost analysis, optimum energy storage composition (Battery + H_2), and optimum operation algorithm.

Electrification of Road Freight Transportation – Catenary Pathway

- Feasibility study of regional/national implementation of catenary wire for deep electrification of heavy road freight transportation. Cost and social benefit analysis of catenary pathway in compare with other competing technologies: battery powered vehicles, fuel cell vehicles, dynamic charging and bio-fuels.

The Hong Kong University of Science and Technology — Hong Kong, HK

Undergraduate Student-Initiated Experiential Learning Project *[Matlab]* — May. 2017 – May 2018
Supervisor: Prof. Larry Li

- Synchronization of a capillary jet for 3D printing optimization.
- Project initiation, apparatus design/setup/assemble, natural frequency testing, using Matlab for time series frequency analysis. Dimensionless data fitting for scaling analysis.

UAV Design with Detachable Cargo Container, *Team Leader [SolidWorks, Matlab]* — Hong Kong, HK
Apr. 2017 – May. 2018
Supervisor: Prof. Xin Zhang

- Design, construct and test of an Unmanned Aerial Vehicle with automatic detachable cargo container for local express delivery. Market research on express delivery industry using UAV for same day quick delivery. Top level requirement determination, configuration optimization, design, build and test flying.

VOLUNTEER WORK

G2A Volunteer in Ghana, *Team Leader [Rhino]* — Ghana, GA — Jun. 2015 – Jul. 2015

- Volunteered to construct a hygienic latrine for local elementary school and primary school level math/science teaching. Technical team leader, in charge of latrine design, budget, construction, technical communication and associated hygiene promotion.

PEER REVIEWED PUBLICATIONS

- **Zhiyuan Fan**, Emeka Ochu, Sarah Braverman, Yushan Lou, Griffin Smith, Amar Bhardwaj, Jack Brouwer, Colin Mccormick, Julio Friedmann. Green Hydrogen in a Circular Carbon Economy: Opportunities and Limits. *Center on Global Energy Policy, SIPA, Columbia University.* Aug. 2021. https://www.energypolicy.columbia.edu/research/report/green-hydrogen-circular-carbon-economy-opportunities-and-limits
- **Zhiyuan Fan**, S. Julio Friedmann. Low-carbon production of iron and steel: Technology options, economic assessment, and policy. *Joule, Volume 5, Issue 4, 2021, Pages 829-862, ISSN 2542-4351*. https://doi.org/10.1016/j.joule.2021.02.018
- S. Julio Friedmann, **Zhiyuan Fan**, Zachary Byrum, Emeka Ochu, Amar Bhardwaj, and Hadia Sheerazi. Levelized cost of carbon abatement: an important cost-assessment methodology for a net-zero emission world. *Center on Global Energy Policy, SIPA, Columbia University.* Oct. 2020. https://www.energypolicy.columbia.edu/research/report/levelized-cost-carbon-abatement-improved-cost-assessment-methodology-net-zero-emissions-world
- S. Julio Friedmann, Alex Zapantis, Brad Page, Chris Consoli, **Zhiyuan Fan**, Ian Havercroft, Harry Liu, Emeka Ochu, Nabeela Raji, Dominic Rassool, Hadia Sheerazi, and Alex Townsend. Net-zero and geospheric return: actions today for 2030 and beyond. *Center on Global Energy Policy, SIPA, Columbia University.* Sept. 2020. https://www.energypolicy.columbia.edu/research/report/net-zero-and-geospheric-return-actions-today-2030-and-beyond
- S. Julio Friedmann, **Zhiyuan Fan**, and Ke Tang. Low-carbon heat solutions for heavy industry: sources, options, and costs today. *Center on Global Energy Policy, SIPA, Columbia University.* Oct. 2019. https://energypolicy.columbia.edu/research/report/low-carbon-heat-solutions-heavy-industry-sources-options-and-costs-today