



## Mechanical Engineering Seminar Series

### Life Cycle Assessment as a Lighthouse: Guidance Towards a Sustainable Harbor and Away From Peril

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**Room 1010 DOW**

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**4:00 p.m.**

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#### **Abstract**

Lighthouses guide ships toward a safe harbor and provide warnings of shallow water and rocky coasts. Life cycle assessment (LCA) and companion analysis tools like material flow analysis have a similar role to play in guiding technology and policy developers toward solutions that move society toward sustainability. But, most of these transitions have potential pitfalls that LCA can help us anticipate and possibly mitigate. This seminar will address three examples of LCA as a lighthouse. The first addresses the role of biofuels as complementary to electrification in the transportation sector. How can we use biofuels to a greater extent without incurring substantial land use change greenhouse gas emissions that might negate their benefit? Our work in this area encompasses a dynamic scenario analysis of biofuel deployment towards hard-to-decarbonize transportation modes and development of machine learning algorithms to detect land use change in high resolution imagery. The second addresses the role of critical minerals in electrification. What is life cycle assessment missing in addressing the social and environmental effects of these minerals, and how can it improve? The final example addresses the approach to reducing plastic waste. Pyrolysis is becoming a mainstream chemical recycling method but what can LCA tell us about whether it is better to use pyrolysis to produce fuels or new plastics? Taken together, these examples highlight the potential of life cycle assessment but also some of its weaknesses and needs for further development.

#### **Bio**

Jennifer studies emerging technologies, their energy and environmental impacts, and their potential to influence greenhouse gas and air pollutant emissions, water consumption, and energy consumption at the economy-wide level. Particular technologies of interest include biofuels and bioproducts, automotive lithium-ion batteries, waste plastics recycling and utilization, advanced manufacturing, and fuels and chemicals made from natural gas liquids. Techno-economic, life cycle, and material flow analyses are primary tools in her research. Furthermore, she applies machine learning techniques to gain insights into land use and land use change, which drive the sustainability debate surrounding biofuels.

Jennifer holds a Ph.D. in Chemical Engineering from the University of Michigan, where she was introduced to life cycle analysis through earning her Master's degree in Sustainable Chemical Engineering Systems. Her undergraduate degree in Chemical Engineering is from Purdue University. Prior to joining Northwestern, she led the Biofuels Analysis group at Argonne National Laboratory.

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