Northwestern | BUFFETT INSTITUTE FOR GLOBAL AFFAIRS

Buffett Undergraduate Research Fellowship Opportunity

International Aspects of the Hydrogen Economy

Faculty Mentor: Jennifer Dunn, Professor, McCormick School of Engineering

Project Synopsis: Hydrogen is a promising alternative fuel that can reduce pollution from many sectors, including the shipping sector. Sweden is a unique case study for the use of hydrogen in shipping and in waterborne transport (e.g., ferries) and is situated in the heart of the discussion of the hydrogen economy in Europe. Our collaborators at Chalmers University develop and apply the Global Energy Transition model to understanding the role of hydrogen in the broad context of energy systems that also include conventional fuels like diesel and bunker fuel for vessels and electricity, among many others. Their expertise and interests intersect with those of Northwestern, who is a partner in a regional hydrogen hub, but also focus on an area that is less well-studied in the U.S., the role of hydrogen in goods movement by boat and heavy- and medium-duty on road transport. We are interested in collaborating with Chalmers university on the development of energy systems models that can provide insights into when hydrogen makes sense, in terms of costs and emissions reductions, as a fuel and how Europe and the U.S. can work together in creating a hydrogen economy.

Project Term: Summer and Academic Year

Project Location: In-person, off-campus, with travel to Gothenburg, Sweden

Job Description: The student will travel to Chalmers University for four weeks in the summer to work directly with the research team there and become acclimated to working with the GET model. This requires skills in programming and math as well as, ideally, background in the general understanding of energy systems. The student will work with the Chalmers team to characterize the medium-duty trucking fleet and expand the GET model to address this mode of goods movement that is not currently addressed in the model. The student will attend regular meetings with the team at Chalmers during their time at the university. The student will also work at an office on-campus where they will regularly interact with team members. Prior to traveling to Chalmers, the student will meet with researchers in the Dunn group at Northwestern to gain the background they will need to contribute to the research during the short time they are in Sweden. Following the visit, the student will be encouraged to continue working collaboratively with the Dunn and Chalmers group to build data sets and analyses of the role of reducing energy consumption and pollution in goods movement via an expanded role for hydrogen.

Time Commitment: Prior to Sweden: 3-5 hours per week of background reading on hydrogen and energy systems modeling in consultation with the Dunn group at Northwestern. Hours flexible. One in-person meeting/week for ~30 min.

While in Sweden: 40 hours per week of working with the GET model, building data sets for medium-duty goods movement in Sweden, and applying these data sets and the modeling framework to expanding the model. Hours are not flexible. Students expected to interact in-person and directly with Chalmers research group including faculty, students, research staff.

Returning from Sweden: Ideally the student may engage in research for credit with the Dunn group to continue the research and expanding the model to address medium-duty goods movement. Hours flexible. One in person meeting/week for ~30 min.

Number of available positions: One