PROJECT PROPOSAL

Project Name: **Understanding Government and Railroad Strategy for Crude Oil Transportation in North America**

Project ID: **NURail2012-MIT-R03 Transportation of Energy-Related Material** **Funding Year:** 2012

Is this the continuation of a prior year project? ☐ YES ☒ NO

Project Type: ☒ Research ☐ Education ☐ Tech Transfer ☐SDP ☐Other

Project Team:

Name	Role	Institution	Department
S. Joel Carlson	Author	MIT	CEE
Joseph M. Sussman	Supervisor	MIT	CEE

Project Summary: *(Include objectives, scope & method. 300 words maximum or 1/2 page)*

On July 6, 2013, an oil-laden unit train derailed and exploded in Lac-Mégantic, Quebec, Canada, killing 47 people, shocking and saddening many, and leading to significantly increased public scrutiny of crude oil transported by rail. Simultaneously, there has been intense scrutiny of proposed pipelines from the oil/tar sands in Alberta, most notably the TransCanada Keystone XL. Not only is there concern about the potential environmental impacts of the pipelines themselves, such as a potential spill of diluted bitumen, but there is also concern about the consequences of greenhouse gas emissions caused by the energy-intensiveness of bitumen production and refining.

- Address railway safety of crude oil transport assuming the railroads are going to continue to transport crude oil. Using the Lac-Mégantic accident and the Canadian railway regulatory environment as context, use the accident investigation tool CAST (Causal Analysis based on STAMP) to describe the hierarchical safety control system for transporting crude oil by rail.

- Evaluate the tradeoffs of railroads versus pipelines using the Keystone XL (i.e. Alberta to the US Gulf Coast) as its case study. Specifically, consider not only the direct impacts of the transportation system itself along economic, environmental, and safety dimensions, but also how it interacts with the oil sands production system to impact economic development, energy security, and climate change. Rely heavily on the information researched in the US Department of State Final Environmental Impact Statement (2014), but also critique the findings in this document using

PROJECT PROPOSAL (continued)

Strategic Goals / Research or Educational Areas Addressed:
(Check at least one under both USDOT Strategic Goals and NURail Center Topic Areas)

U.S. DOT Strategic Goals	NURail Center Topic Areas	
☒ Safety	☒ Infrastructure	☐ Passenger/Public Transport
☐State of Good Repair	☐Rolling Stock / Equipment	☐Freight
☐Economic Competitiveness	☒ Safety & Risk	☐Multimodal
☐Livable Communities	☐Operations	☐Institutional
☒ Environmental Sustainability	☐Capacity	☐Education
	☐Reliability	☐Workforce Development
	☐Planning	☐Technology Transfer
☐ Economics	☐Other	

PROJECT PROPOSAL (continued)

Detailed Scope of Work: *(Include a description of the project, a list of tasks and associated deliverables and how students will be involved. 600 words maximum or 1 page)*

Use information from government (notably the Alberta Government, National Energy Board of Canada [NEB], the US Energy Information Administration [EIA], and US Department of State), industry sources (notably the Canadian Association of Petroleum Producers [CAPP]), other researchers and consultants (notably the Canadian Energy Research Institute [CERI], as well as, Cairns, Dunbar, Forrest, Gordon, Choquette-Levy, Chen et al.), and media reports to describe the existing oil sands production system, its transportation system, and the trends motivating the desire for greater transportation capacity. Then identify information regarding the strategic alternatives using information from the US Department of State as well as pipeline and railroad industry sources. Use information from government agency websites, relevant statutes, the Congressional Research Service (CRS), and trade reports, and identify and describe the role of governmental actors in overseeing the implementation of both rail and pipeline strategic alternatives in both Canada and the US.

Evaluate the tradeoffs of railroads versus pipelines using the Keystone XL (i.e. Alberta to the US Gulf Coast) as its case study. Specifically, consider not only the direct impacts of the transportation system itself along economic, environmental, and safety dimensions, but also how it interacts with the oil sands production system to impact economic development, energy security, and climate change. Rely heavily on the information researched in the US Department of State Final Environmental Impact Statement (2014), but also critique the findings in this document using information from academic, government, industry, environmental and other researchers (such as CERI, CRS, the Manhattan Institute, The Pembina Institute, Council on Foreign Relations, Cairns, Knittel, Tarnoczi, Shelton-Davis, etc.). Incorporate other information from media and trade publication reports as appropriate. Consider the impact of regulatory uncertainty – the uncertainty created by governments as they contemplate whether to approve pipeline permits or not – on railroad industry investment in bitumen transportation capacity. Provide the results of a dynamic program – a modeling technique used to consider situations in which a decision-maker can take action at multiple periods in the future – to suggest how railroads would invest in transportation capacity (infrastructure and rolling stock) before and after they know the results of the pipeline permitting decisions.

Address railway safety of crude oil transport assuming the railroads are going to continue to transport crude oil. Using the Lac-Mégantic accident and the Canadian railway regulatory environment as context, use the accident investigation tool CAST (Causal Analysis based on STAMP) to describe the hierarchical safety control system for transporting crude oil by rail. Consider the results from CAST to help refocus the debate on the safety issues that may need to be addressed, rather than focusing on whether railroads are more or less safe than pipelines.

Use the CAST analysis in government reports and hearings prior to the Lac-Mégantic accident, governmental responses to the accident, statutes and regulations (notably the Railway Safety Act, the Transportation of Dangerous Goods Act, and the Canada Transportation Act), and railroad industry documentation, to construct the safety control structure of the industry and comment on possible inadequate control that may have existed. Suggest a contribution to improving railway safety by positing the causal relationship between the adequate control actions at the physical system level to the regulatory level. Contribute to the discussion by adding some underpinings using system theory.

Deliverable and student involvement will be the completed student Masters thesis.

PROJECT PROPOSAL (continued)

How Project Relates to U.S. DOT Strategic and NURail Center Goals: *(Provide an explanation of how the stated goals will be addressed in the project. 300 words maximum or 1/2 page)*

This project aligns very well with the goals of USDOT as well as NURail. It is directly concerned with safety and the differential impacts on public safety of transporting crude by rail versus by pipeline - - both have risks, and the question is what is the better choice from a safety perspective.

Second, the research is directly linked to environmental goals proffered by both USDOT and NURail as key components of developing sustainable transportation systems. The crude in northern Alberta is especially "dirty" with respect to resources needed to extract it as well as implications on the environment in case of either a pipeline or a railroad accident. This explains the strong sense in the environmental community that those tar sands should remain in the ground as an environmental play.

Economic development is also on the agenda. We know the linkage of energy use and economic growth. The efficient transport of crude plays directly into that economic development agenda. The challenge is creating that economic growth while being environmentally responsible as well as achieving a high level of safety on our nation's infrastructure.

This research contributes to the dialogue and debate on all of these dimensions.

Index Terms / Keywords:

Safety, Pipelines, "Crude By Rail", Environment

Estimated Number of Students Involved: *(by academic level)*

Primary	Secondary	Bachelors	Masters	Doctoral	Post-Doc	Total
			1			1

Type of Student Involvement: *(e.g. Research Assistant, Teaching Assistant, Other, etc.)*

Research assistant

PROJECT PROPOSAL (continued)

Proposed Project Schedule:

Proposed Project Start	Proposed Project Completion	Duration (months)

Estimated Project Budget: *(Note: Verify Cost Share requirements for Funding Year at Institutional Level)*

Source	Status	Amount	% Total Cost
NURail Funds			
Cost Share:			
Source 1			
Source 2			
Source 3			
Subtotal Cost Share:			
Total Estimated Project Cost:			

Submitted by: Dr. Joseph M. Sussman **Date Submitted:** 12/01/2015

Please submit completed Project Proposal form by email to LB Frye at lbfrye@illinois.edu