LIFE CYCLE ASSESSMENT OF ENERGY SYSTEMS TRANSITIONS: THE CASE OF SOLAR ENERGY IN ALBERTA

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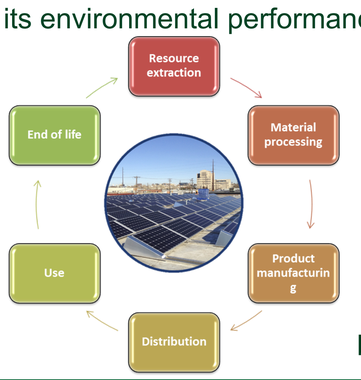
BACKGROUND

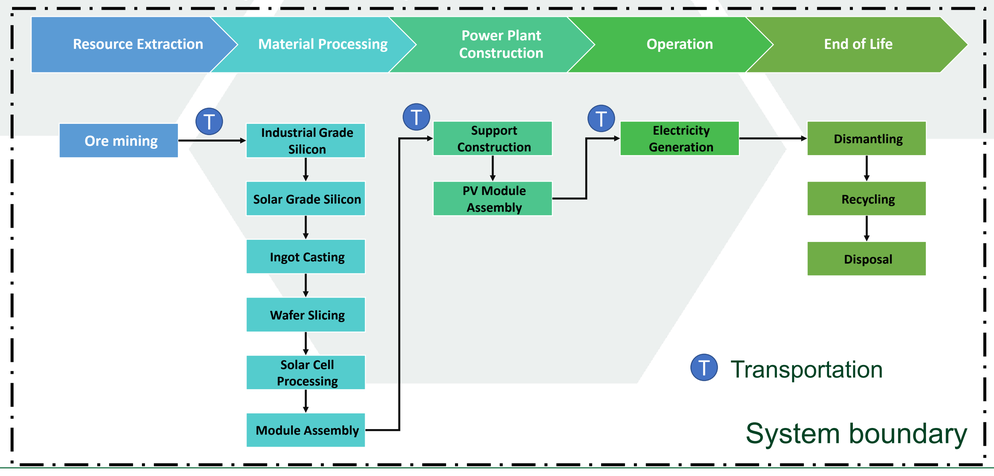
With the change in global energy market scenario, Canadian energy sector is going through a phase of dynamic diversification. Solar energy has been gaining interest among the stakeholders in Alberta as the province has the highest annual sunlight. Solar energy is usually considered as a safe and reliable source of electricity with minimal greenhouse gas (GHG) emissions when only the operational phase is considered. Assessment based on life cycle thinking that takes into the full life cycle provides a complete picture of its environmental performance.



Life Cycle of Solar Panel

AIMS AND OBJECTIVES

The main purpose of the project is to evaluate the direct and indirect environmental impacts of a solar power plant situated in Alberta. Through mapping the full supply chain the main hotspots will be identified. The project also aims at developing Canada specific life cycle inventory data for solar power generation.



ANTICIPATED OUTCOMES

Short–term

- Map the supply chain pathway of solar energy generated in Alberta.
- Develop a life cycle inventory data.
- Develop an excel-based bottom up attributional LCA model for solar plant .
- Identify the most energy intensive process in the life cycle of a solar energy pathway.
- Compare results with other alternative energy sources.
- Generate results that will help Albertan and Canadian policy makers understand the potential consequences of solar energy deployment.
- Inform the development of a robust Pan-Canadian and global energy strategy.

In the long–term the research will address the following problems:

- Is there enough market supply of solar panels to satisfy current and future energy demands?
- Any foreseeable supply disruption in the future?
- How policy decisions to promote solar energy technologies will affect other sectors?
- How may the gain in the market share of solar energy technologies affect the economy-wide and global environment?
- How to broaden the boundary to include the life cycle environmental impacts of technologies used outside the application area?

FUTURE DIRECTIONS

- Extend the environmental assessment to include economic and social aspects of sustainability.
- Identify the potential economy-wide and global consequences solar based energy generation in Alberta.
- Develop a framework that captures the economy-wide and global environmental consequences of solar energy pathway to help Albertan and Canadian policy authorities make informed decisions on investments, policy development, and negotiation in inter-provincial and international climate agreements.

PARTNERS

This project will be complementary to:
University of Alberta-Future Energy Systems
University of Calgary-Global Research Initiative in Sustainable Low Carbon Unconventional Resources

FES PROJECT OVERVIEW

Lifecycle Assessment of Transitions

The joint collaboration between the University of Alberta and the University of Calgary will assess the economy-wide and global environmental impacts associated with up to six different energy transition pathways. The project aims at addressing the issue of expanding the system boundaries for various renewable energy based power generation where the raw materials and equipment might not be acquired from Alberta which will have environmental impacts globally and the life cycle GHG footprints would be different than what would be considered if the boundary was drawn around Alberta. The project aims at answering these questions to equip the policy makers with better data to implement policies.

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FUTURE ENERGY SYSTEMS

CANADA FIRST RESEARCH EXCELLENCE FUND
This research has been undertaken thanks in part to funding from the Canada First Research Excellence Fund.