THE HILL TIMES

THIRTY-SECOND YEAR | CANADA'S POLITICS AND GOVERNMENT NEWSPAPER | WEDNESDAY, JUNE 16, 2021 $5.00

Policy Briefing
Natural Resources

A life-cycle view essential on EV battery opportunities and risks

Mining key battery components is inevitably a process that involves major environmental and social impacts, including major and permanent landscape disruptions, and the generation of high-volume legacy wastes.

Mark Winfield & Sumeet Sooch


Opinion

Over the past few months, the economic opportunities that the electrification of transportation, particularly the widespread adoption of electric vehicles (EVs), might offer Canada have drawn a lot of attention. The issue of Canada's potential contributions to EV supply chains, especially batteries, from the mining of primary components like lithium and other metals, through to design and manufacturing, has been at the centre of these discussions.

The opportunities are potentially large, given that global EV sales are expected to expand into the hundreds of millions over the next decade, as governments provide subsidies for purchasing EVs and develop charging infrastructure. Some governments are moving towards phasing out the sale of internal-combustion-engine-powered vehicles.

At the same time, these developments could entail some potentially significant environmental trade-offs. While EVs offer an important mechanism for decarbonizing transportation, careful attention needs to be given to the life-cycle dimensions of EV battery systems if these trade-offs are to be avoided. The primary extraction (e.g. mining) of key battery components, like lithium and other metals is inevitably a process that involves major environmental and social impacts, including major and permanent landscape disruptions and the generation of high-volume legacy wastes which will require very long-term, if not perpetual, management to safeguard the environment and human health and safety.

As part of an NSERC-funded research network on energy-storage technologies, we have been examining the emerging question of the other end of EV battery life cycles. What happens to EV batteries when they reach the end of their useful life in a vehicle? EV batteries are typically expected to have useful lives of about seven to 10 years. This means, among other things, that with the growth in EV sales, there is a downstream tsunami of waste EV batteries looming in the not-too-distant future.

End-of-life EV batteries contain hazardous chemical and metal components, and, depending on their condition, can pose fire and other physical risks as well. Their safe management requires specific levels of training and management at specialized facilities. Batteries in good condition may be able to be used in secondary applications, such as providing energy-storage services in support of intermittent renewable energy sources like wind or solar, and even as components of household level energy systems. But in all cases, they will ultimately reach a point where they are no longer useful.

Given the potential volume of end-of-life batteries that will eventually become available, they could pose significant long-term hazards and waste management problems. At the same time, they could also be important sources of components and materials for the manufacturing of new batteries, displacing or reducing the need for high-impact primary extraction to obtain these resources.

Unfortunately, current approaches to recycling EV batteries carry significant problems of their own. Dismantling to extract useful components and materials is generally regarded as the lowest impact and most desirable approach. Yet disassembly is becoming increasingly difficult, as battery manufacturers move in the direction of using welding and advanced adhesives in battery construction. The other two major options are placing batteries in high temperature furnaces to burn off non-metal components, and eventually recover useable metals (pyrometallurgy), or using acids to leach metal components out of the batteries (hydrometallurgy). Both processes are associated with substantial environmental impacts: air emissions and contaminated waste slags in the case of pyrometallurgy; or wastes that are liquid, acidic and hazardous with hydrometallurgy.

Within the European Union, there have been major initiatives to establish extended producer responsibility regimes for waste EV batteries. These make post-consumer management the responsibility of the manufacturer, providing strong incentives for design to facilitate reuse and recycling.

The situation in North America is far less advanced. As part of our research, we made inquiries about the status of EV batteries in relation to existing waste battery management regimes, and for the purpose of federal, provincial, and state rules regarding hazardous wastes or recyclable materials, dangerous goods. The answers throughout Canada and U.S. were that regulatory regimes for post-consumer management were essentially non-existent. The same basic answer applied to questions about publicly available data on the volume and fate of end-of-life EV batteries.

The electrification of transportation carries significant potential to reduce greenhouse gas emissions, and the potential for the development of new industries in Canada. However, appropriate regulatory frameworks are needed to avoid important environmental trade-offs around the process. The development of a national extended producer responsibility regime for end-of-life EV batteries, clarification of their status under waste management regulations, and the establishment of basic reporting requirements regarding their fate would be important places to start.

Mark Winfield is co-chair of the Sustainable Energy Initiative at York University. Sumeet Sooch completed his Master of Environmental Studies Degree at the Faculty of Environmental and Urban Change at York University and is a research associate with the Initiative.

The Hill Times