

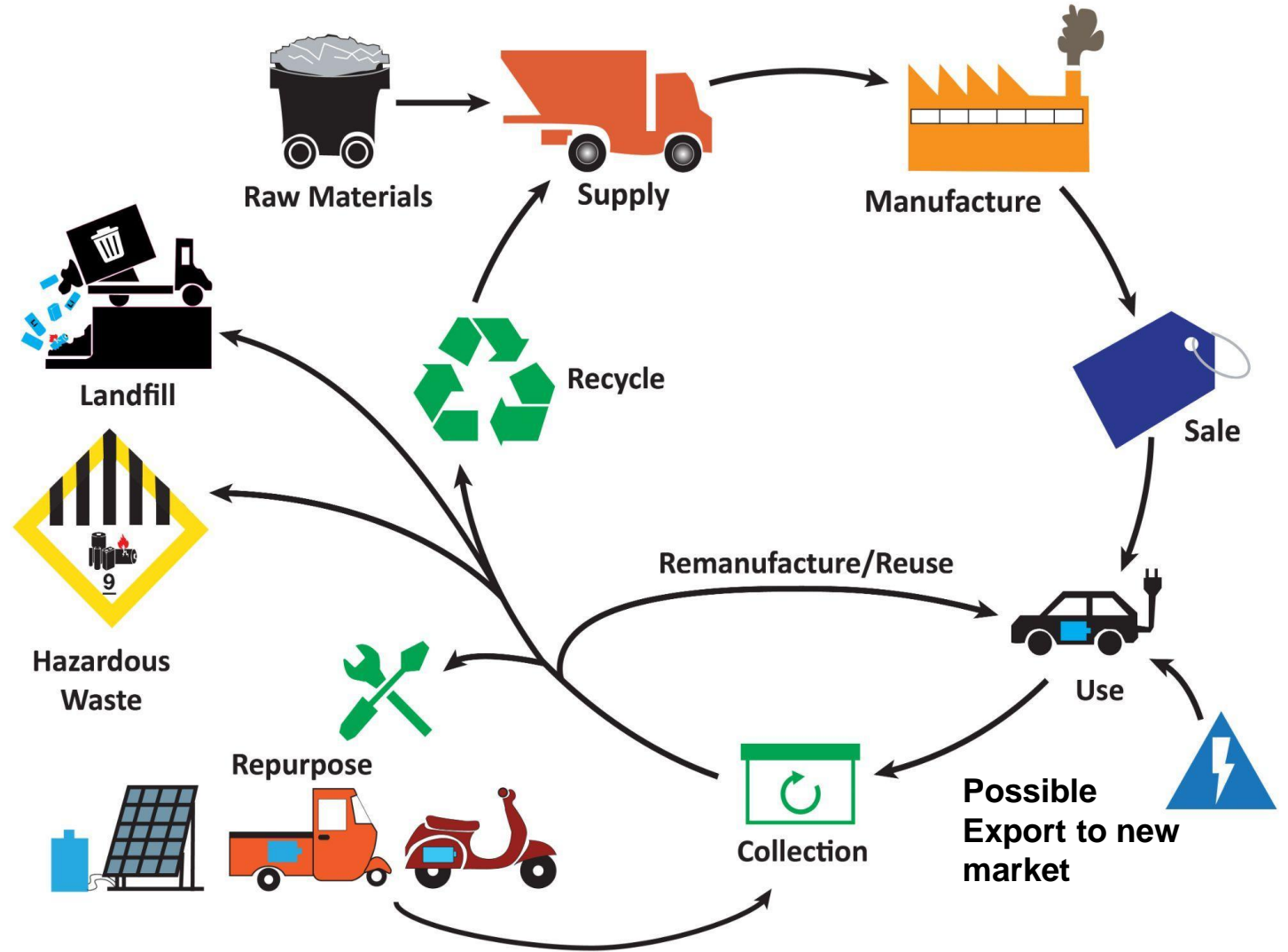
US-Mexico Second-hand Vehicle Trade: Implications for Responsible EV End-of- Life Management and Material Circularity in North America

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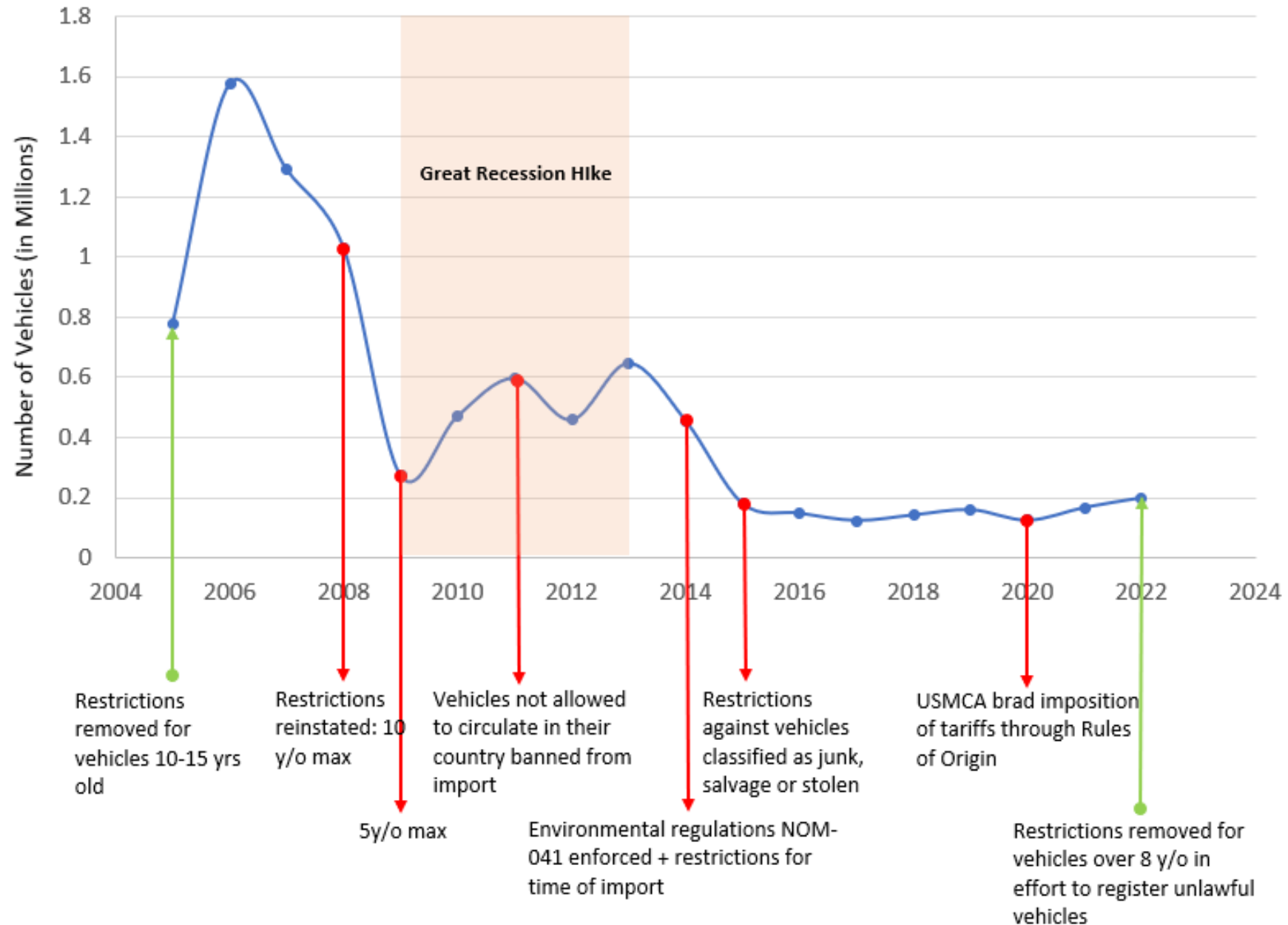
The EV Life Cycle:
Few studies have considered the life cycle impacts of EVs exported from first markets to second-hand (SH) markets, but early evidence shows disproportionate end-of-life (EOL) burdens on importing countries





Second-hand (SH) vehicle imports to Mexico

- SH vehicles from the US make up 20% of Mexico's on-road fleet
- SH vehicle imports soared in 2005 when restrictions were first removed.
- SH flows stabilize starting around 2015.

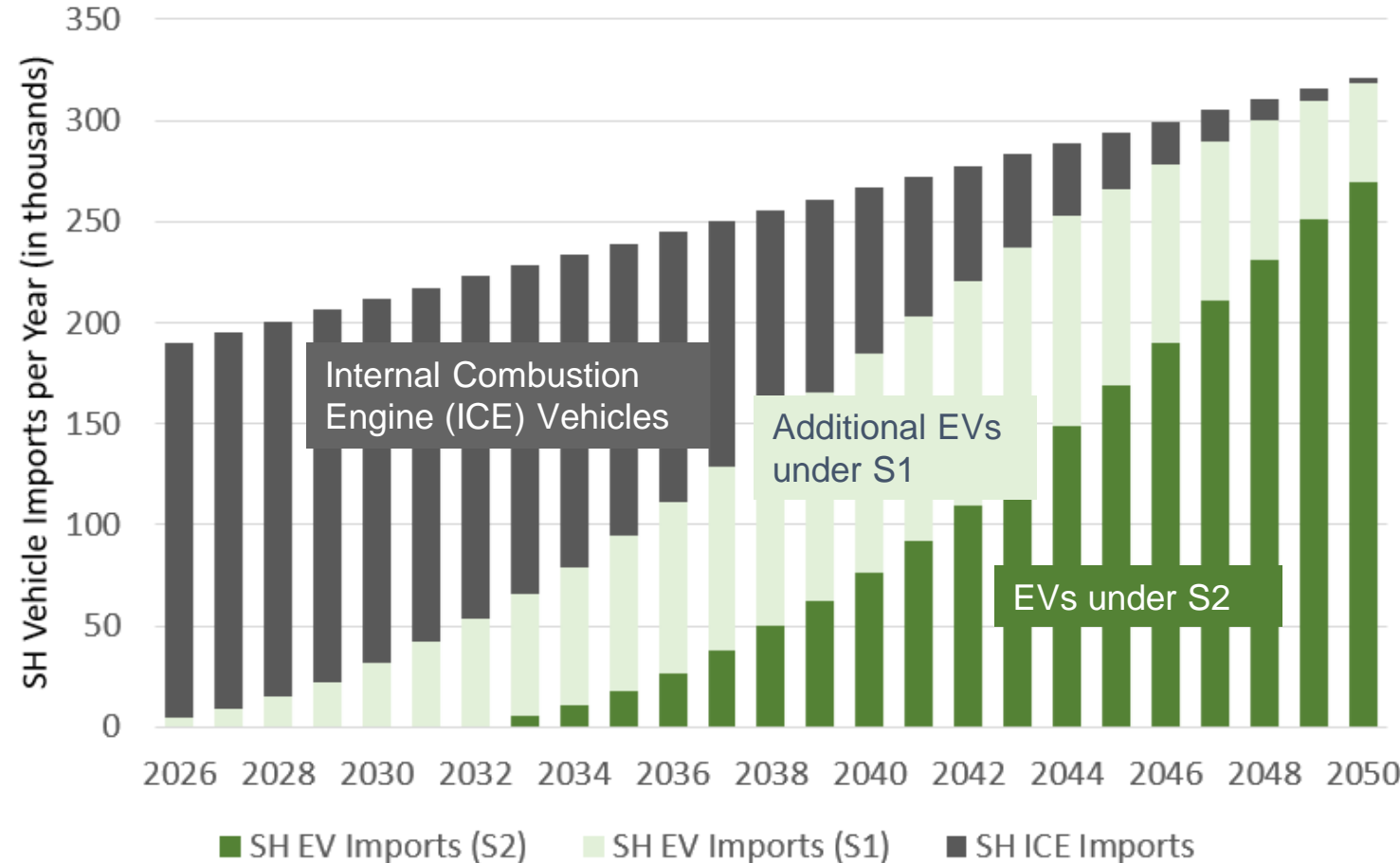




Projections of SH Vehicles imported from US to Mexico

Second-hand EV imports to Mexico under 2 scenarios,

- one where SH EVs are assumed to be imported in proportion to their representation in the US Fleet (S1),
- and a second whereby SH EVs do not get imported until a sufficient number of new EVs are on the road in Mexico (S2)



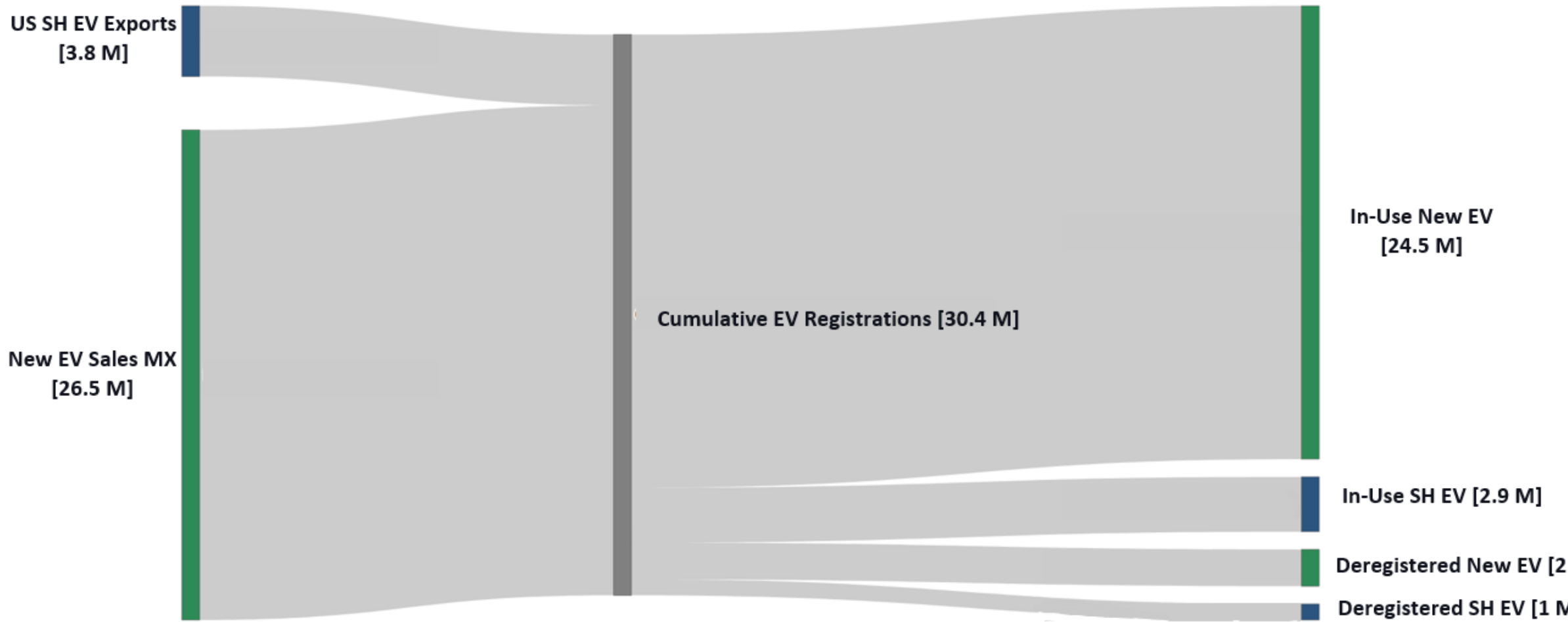


Why does this matter?

- SH EVs are likely to have older batteries.
 - Unlike engines, batteries are hard or impossible to repair.
 - SH EVs will generate waste batteries more quickly than new EVs, and depending on the cost and availability of replacement batteries, could mean the whole vehicle is retired sooner.
- Does this contribute to disproportionately high disposal/EOL burdens? Yes.



Cumulative EV Registrations and Retirements

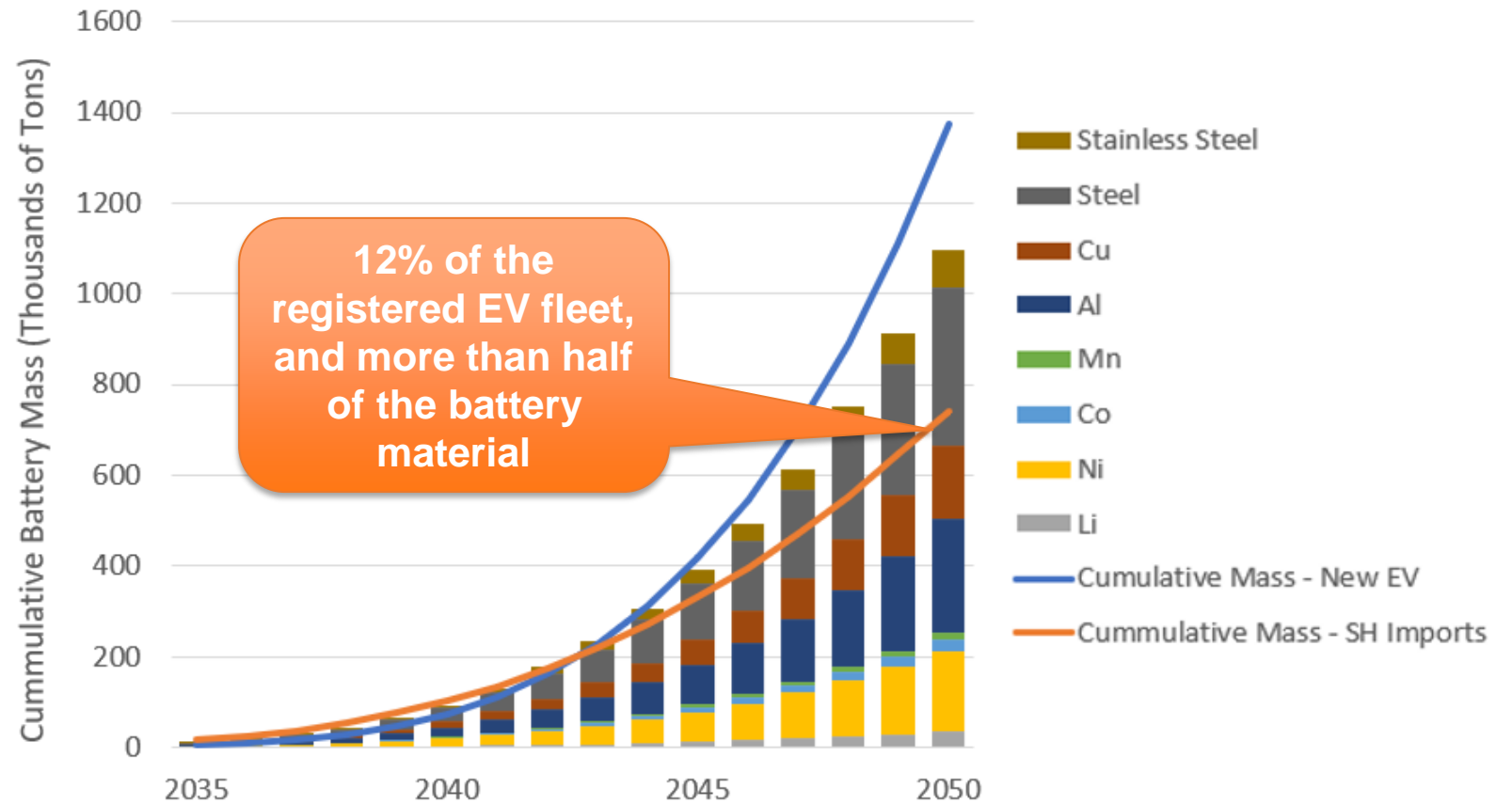


SH EVs disproportionately contribution to retired EVs



Cumulative Battery Mass Deregistered (Retired) EVs in Mexico

- This remarkably large contribution of SH EVs to retired battery mass is particularly evident.
- What can we do to ensure SH vehicles are providing more benefit than burden?





What might be the role for policy for ensuring SH EVs are a benefit?

- Guarantee that SH EVs have sufficient remaining battery life to be useful for Mexican consumers (like a minimum State of Health measure).
 - This also prevents waste battery dumping in the guise of SH EV exports
 - Damaged and aged EV batteries are at higher risk of safety problems.
- Coordination of battery recycling policy and infrastructure across North America.
 - We already have a highly coordinated and interdependent automotive manufacturing industry. There could be benefits for a coordinated recycling system (both from industrial and policy perspectives)
 - Domestic recycling in Mexico could bring value-add to the country and support a North American circular battery economy