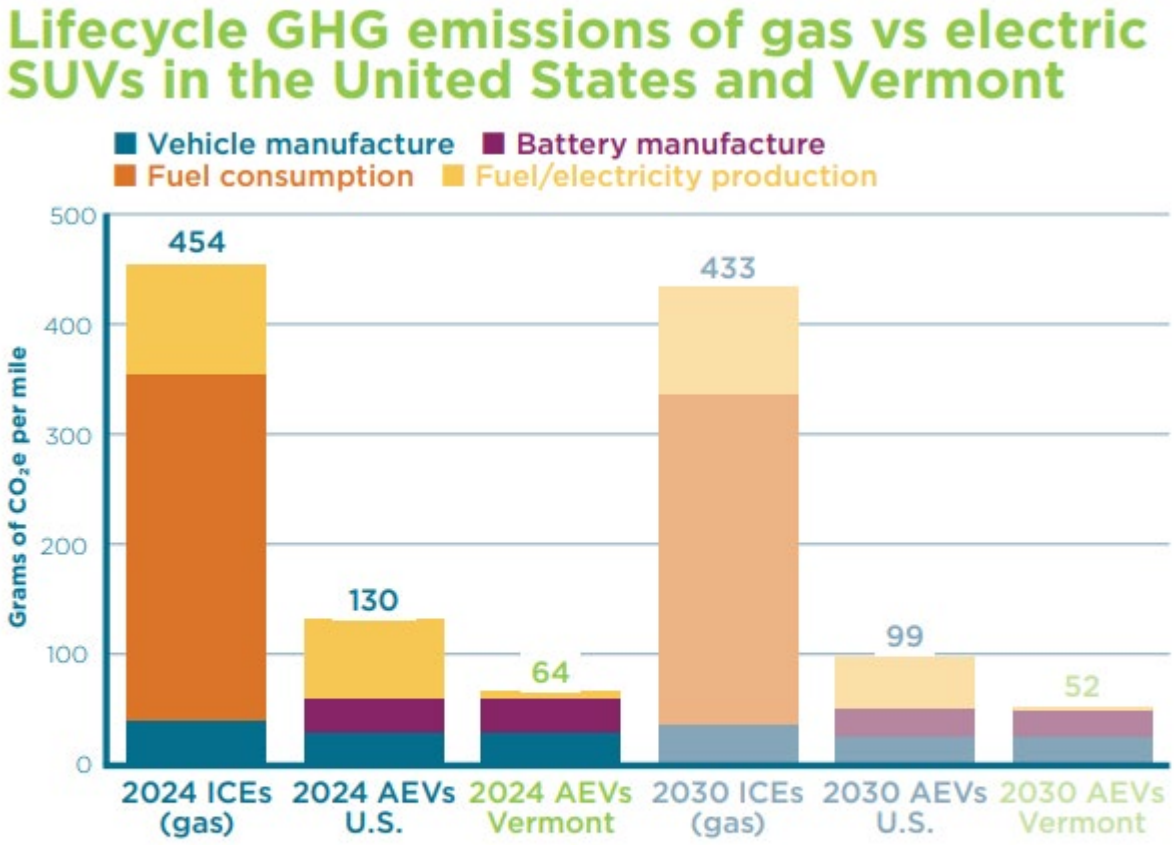
Responses from Agency of Natural Resources to questions posed by members of the House Transportation Committee on Wednesday, February 12, 2025

How does the overall environmental impact of a battery electric vehicle compare to an internal combustion engine (ICE) vehicle?

- In 2022, ANR conducted a life-cycle analysis to compare the overall environmental impacts of an electric vehicle (EV) to an ICE vehicle, which showed that the lifecycle emissions of an EV are lower than an ICE vehicle. An ICE vehicle has a more significant environmental impact because of the continued fossil fuel extraction and refining needed to produce gasoline, and the combustion of gasoline in the internal combustion engine. Battery electric vehicles have no tailpipe emissions from the use of fossil fuels. EVs produce significantly less pollution than ICE vehicles, even though their initial production, particularly battery manufacturing, results in higher greenhouse gas emissions. A detailed discussion of this analysis can be found in the Technical Support document handout pg. 28.
- The Energy Action Network Annual Progress Report for Vermont, 2024, provides the following look at lifecycle greenhouse gas emissions.



Sources: ICCT, "Life-cycle greenhouse gas emissions of U.S. sedans and SUVs with different powertrains and fuel sources," 2024. Vermont electricity emissions based on 2020 life cycle emissions from Vermont Agency of Natural Resources/ERG, "Vermont Energy Sector Life Cycle Assessment," 2024. **Notes:** AEV = all-electric vehicle, ICE = internal combustion engine vehicle. Emissions from AEVs are presented separately for the US and Vermont because Vermont's electricity portfolio is much lower-emitting than the national average. Emissions from AEVs in 2030 are expected to be lower than in 2024 because of reduced production-related emissions and continued decarbonization of the electricity sector.

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What are the impacts from manufacturing vehicle batteries? Does battery manufacturing involve child labor?

- ANR provided a detailed response to this question in the Responsiveness Summary handout pgs. 18-19. In summary, electrification of the on-road vehicle fleet will likely result in increased demand for lithium and other semi-precious metals, which may result in potential adverse environmental effects. Battery recycling and reuse is reducing these impacts.
- Unlike ICE vehicles that require ongoing fossil fuel extraction and combustion, many materials in EV batteries can be reused and recycled. Some battery modules removed from EVs can be refurbished and reused as a replacement battery pack for the same model EV.
- Auto companies are increasingly making EVs with lithium-iron phosphate batteries, which use no cobalt.
- According to the U.S. Department of Labor, some cobalt supply chains in the Democratic Republic of Congo have been linked to unethical child labor practices, though international efforts have been made to improve conditions in this supply chain and manufacturers are shifting away from using cobalt altogether.
- It is also important to note that ICE vehicles require aluminum alloys, magnesium, iron, and steel, which are all metals that already require extensive mining with similar physical impacts to the environment, including loss of habitat, agricultural resources, and forests; water, air, and noise pollution; and erosion.
- New studies estimate that the need for virgin materials will greatly diminish as battery recycling capacity increases. Advanced Clean Cars II (ACCII) includes durability requirements for batteries that lead to reduced battery degradation and therefore less battery replacements, and includes battery labeling requirements to ensure that used batteries can be sustainably and properly managed at their end of life and critical battery materials are efficiently recovered.
- The Northeast States for Coordinated Air Use Management (NESCAUM) is releasing a paper in the coming weeks about how states can help to facilitate the growing circular EV battery economy via policies like extended producer responsibility.

Are trucks that ship hazardous materials exempt from the rules? Will they be forced to be electric?

- The following vehicles are exempt from the rules:
    - Emergency vehicles
    - Transit buses

  - A right-hand configuration vehicle used by a rural route postal carrier, if a CA-certified vehicle is not available
  - Vehicles designed exclusively for off-highway use
  - Rental vehicles with a final destination outside of Vermont
- While not exempt, a hazardous material hauler will not be forced to buy an electric truck by the Advanced Clean Trucks (ACT) rule, and there is no ban on producing combustion-powered vehicle types like hazardous material haulers, motor homes or tow trucks under the ACT rule. The rule offers manufacturers significant options on how to meet their sales requirements and no specific type of vehicle needs to be sold as a Zero Emission Vehicle (ZEV). The ACT rule allows manufacturers to produce and sell new ZEVs, which includes battery electric vehicles and plug-in hybrids, into the market segments they deem to be most suitable for the products they manufacture, with the goal that manufacturers develop competitive ZEV products at price points that will meet fleet needs. For example, a manufacturer can focus sales on vehicle types that are already well suited for electrification today such as zero-emission school buses or delivery vans.

Comment that these electric trucks are unsuitable and too heavy.

- Regarding increased weight of battery electric vehicles (BEVs), the federal maximum gross vehicle weight limit is 80,000 lbs., however natural gas vehicles and EVs may exceed the federal maximum gross vehicle weight limit for comparable conventional fuel vehicles by up to 2,000 lbs. See: https://afdc.energy.gov/laws/11682. It has been reported that at least 20 states have adopted the additional 2,000 lb. allowance to EVs. At this time, Vermont has not. Vermont's weight limit provisions are at 23 V.S.A. § 1392, and currently has the 80,000 lb. standard. However, Vermont allows weights in excess of 80,000 lbs. on a permitted basis. In any event, 2,000 lbs. is generally enough to accommodate the additional weight for any application.

- Key Findings from the North American Council for Freight Efficiency (NACFE) Guidance Reports on Electric Trucks provides that: *1) For class 3-6 vehicles, the heavier weight of electric trucks is not a significant issue because most applications "cube out" (i.e., parcels fill up cargo area) before reaching maximum weight capacity. For those applications with more densely packed loads that operate near weight limits (e.g., linen services, paper supply, beverage delivery), fleets may opt for a vehicle with a higher gross vehicle weight or vehicle designs that focus on lightweighting. 2) For class 7 and 8 vehicles, weight is not an issue for many, but not all, applications. Over 70% of freight trucks operate at levels below 80,000 pounds. Also, the weight differential between diesel and electric trucks should take into account the diesel powertrain components and fluids that are not needed in electric*

trucks. NACFE found that diesel-related hardware and fluids add up to over 7,800 pounds on some Class 8 on-highway tractors. In terms of weight issues, the biggest challenge will be long haul trucks that operate at weight capacity. The more exact the understanding of freight weights that can be provided by the fleet operator to the manufacturer or dealer, the better the electricity needs for BEVs can be estimated. This will help fleets better match BEVs to duty cycles. In the meantime, manufacturers need to continue to refine batteries with weight reduction as a key goal.

Question about whether there is a centralized place to know if chargers are having downtime.

- All EV charger vendors have apps that provide real-time up and down time information for chargers. There are also a few crowd sourced apps to inform availability and functionality of chargers.