U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

National Blueprint for Lithium Batteries and Executive Order High-Capacity Battery Supply Chain Report

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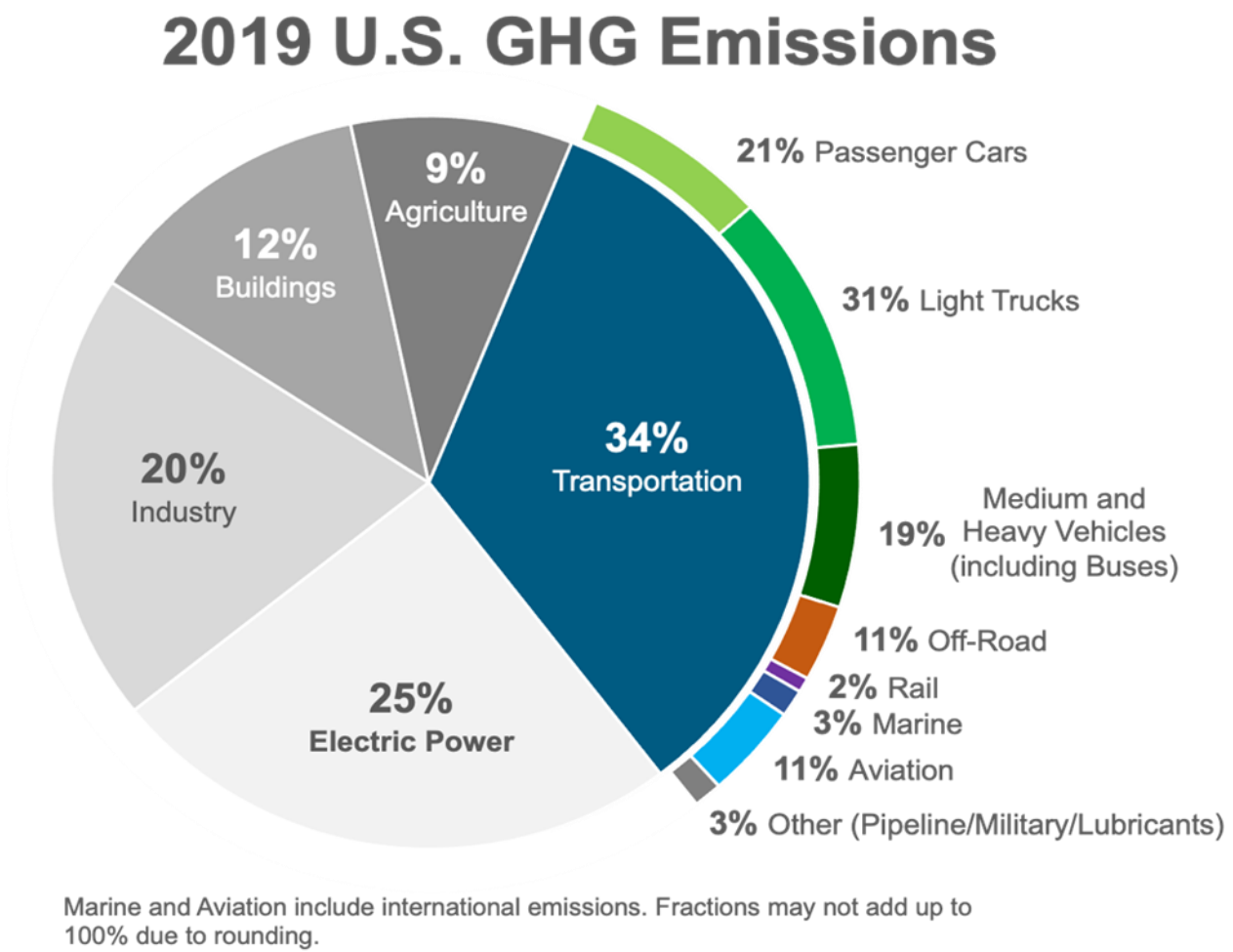
Vehicle Technologies Office (VTO)

Mission: Decarbonize transportation across all modes

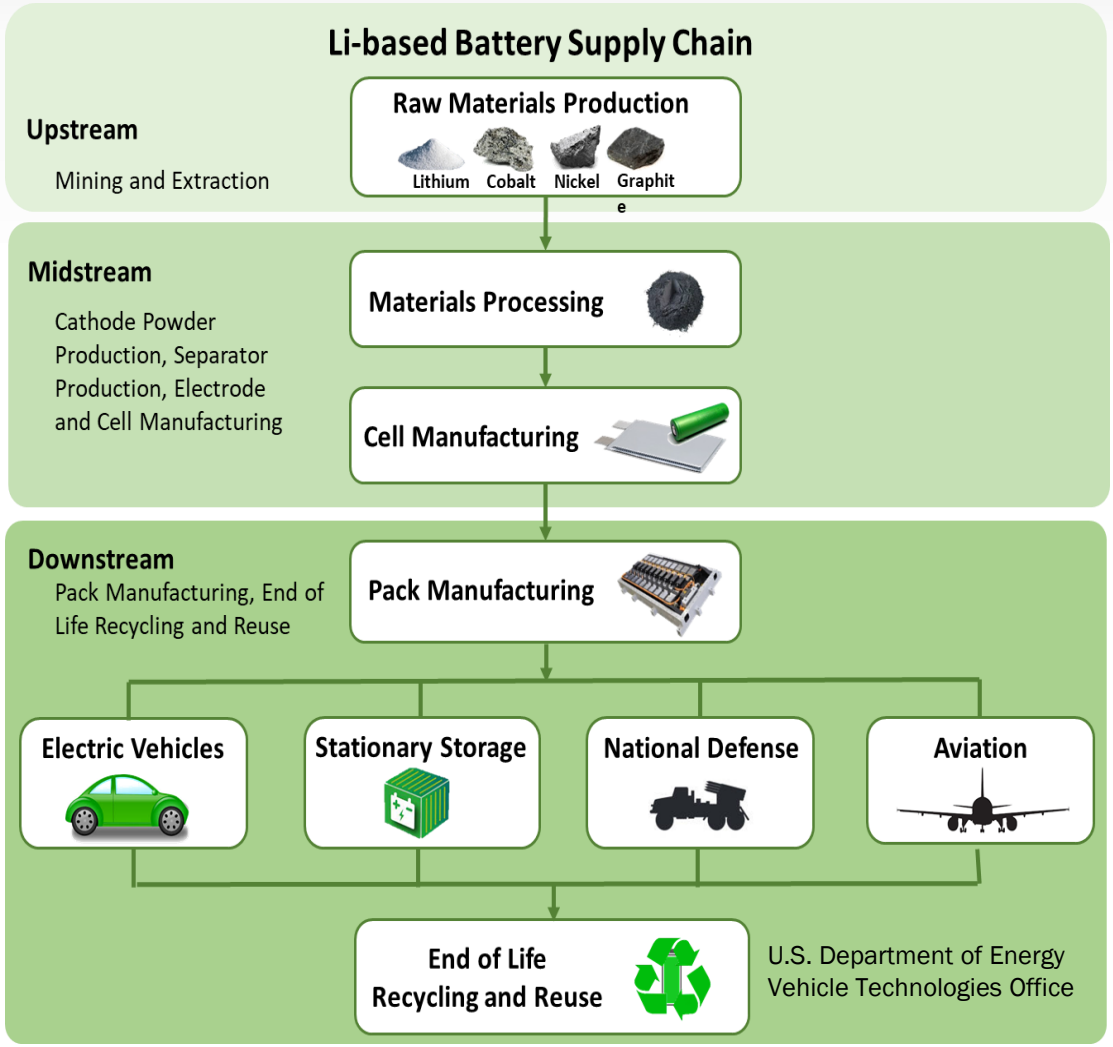


Marine and Aviation include international emissions. Fractions may not add up to 100% due to rounding.

- Net-zero by 2050 requires dramatic energy efficiency and emissions improvements in vehicle and the overall transportation system
- On-Road Vehicles (Light, Medium, Heavy) account for 71% of GHG emissions,
  - Deep Electrification, advanced mobility systems, and Clean Grid provide pathway
- Long Haul freight movement, Off-Road, Air, Marine, Rail (25% of GHGs)
  - Likely require Hydrogen and Biofuels and advances in combustion efficiency

President's Executive Order 14017: America's Supply Chains: Supply Chain for High-Capacity Batteries

Released – 06/08/2021



Up Stream

- **Vulnerability:** Class I nickel, lithium, and cobalt are the primary supply chain vulnerabilities.
- **Vulnerability:** U.S. has a significant deficit in mineral refining and processing

Mid Stream

- **Vulnerability:** The U.S. has less than 10 percent of global market share for capacity across all major battery components and cell fabrication (with cathode and anode production capacity sorely lacking).

Down Stream

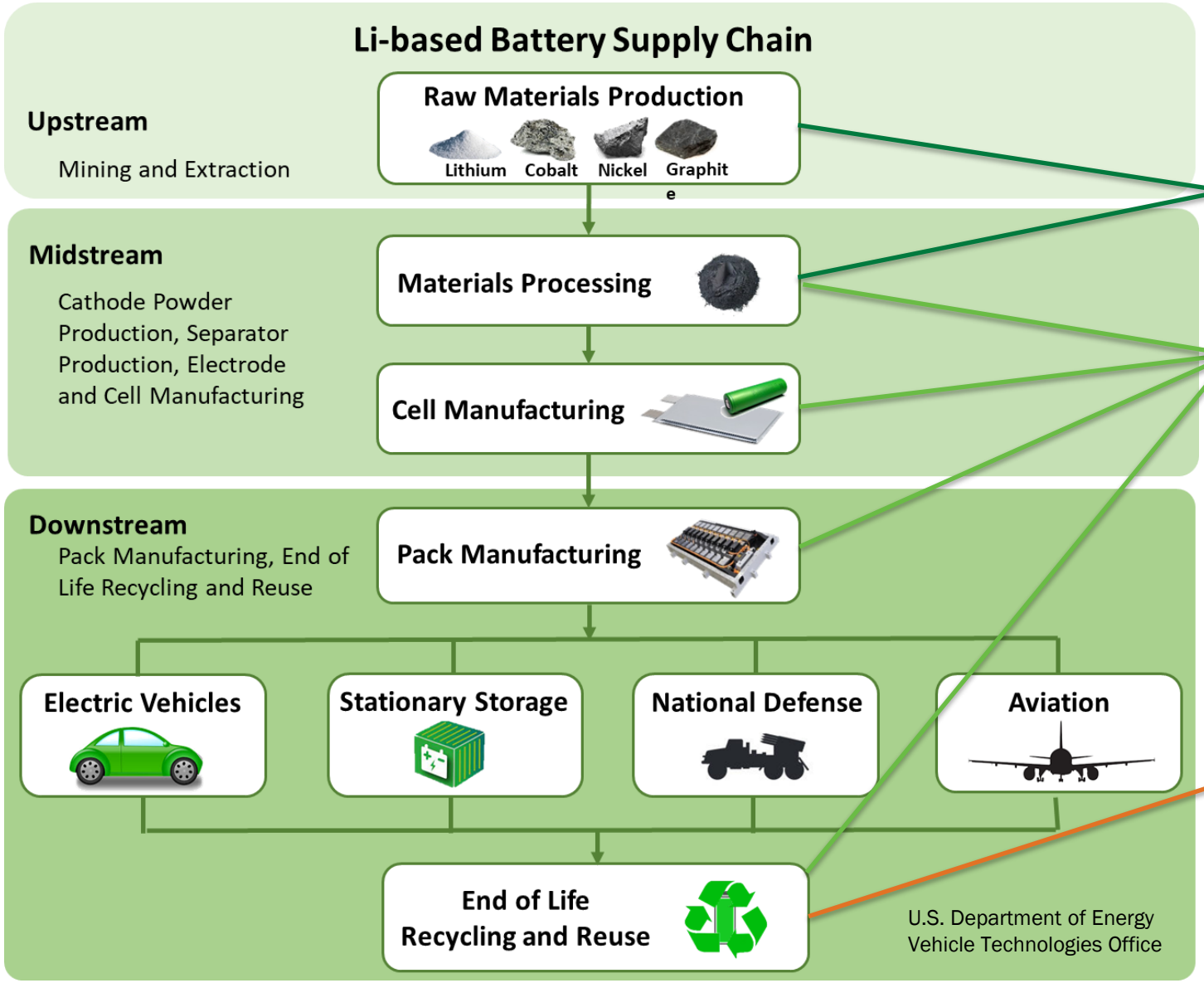
- **Vulnerability:** U.S. lags other markets for domestic demand of lithium batteries, primarily driven by EV demand.
- **Vulnerability:** U.S. lags other markets in lithium battery recycling, with less than 5% of lithium-ion batteries recycled each year.

Key Recommendations

100 Day High-Capacity Battery Supply Chain Report

Stimulate Demand	➢ Create battery demand by electrifying federal, state, and local purchases of vehicles and busses ➢ “Point of Sale” rebates for consumers and other tax incentives
Strengthen key battery minerals Supplies	➢ Invest in mineral specific strategies with improved environmental/labor standards ➢ Establish a comprehensive recycling policy to drastically increase battery capture and materials recovery
Promote domestic battery materials, cell, and pack production	➢ Incentivize private investment through federal grant processes, tax credits, Federal loans, and leverage existing programs
Invest in the people and innovations	➢ Increase R&D to meet cost goals and decrease critical material dependence ➢ Develop workforce

Infrastructure Investment and Jobs Act



Battery Material Processing Grants ($3 Billion Total over 5 years)

Battery Manufacturing and Recycling Grants ($3 Billion Total over 5 years)

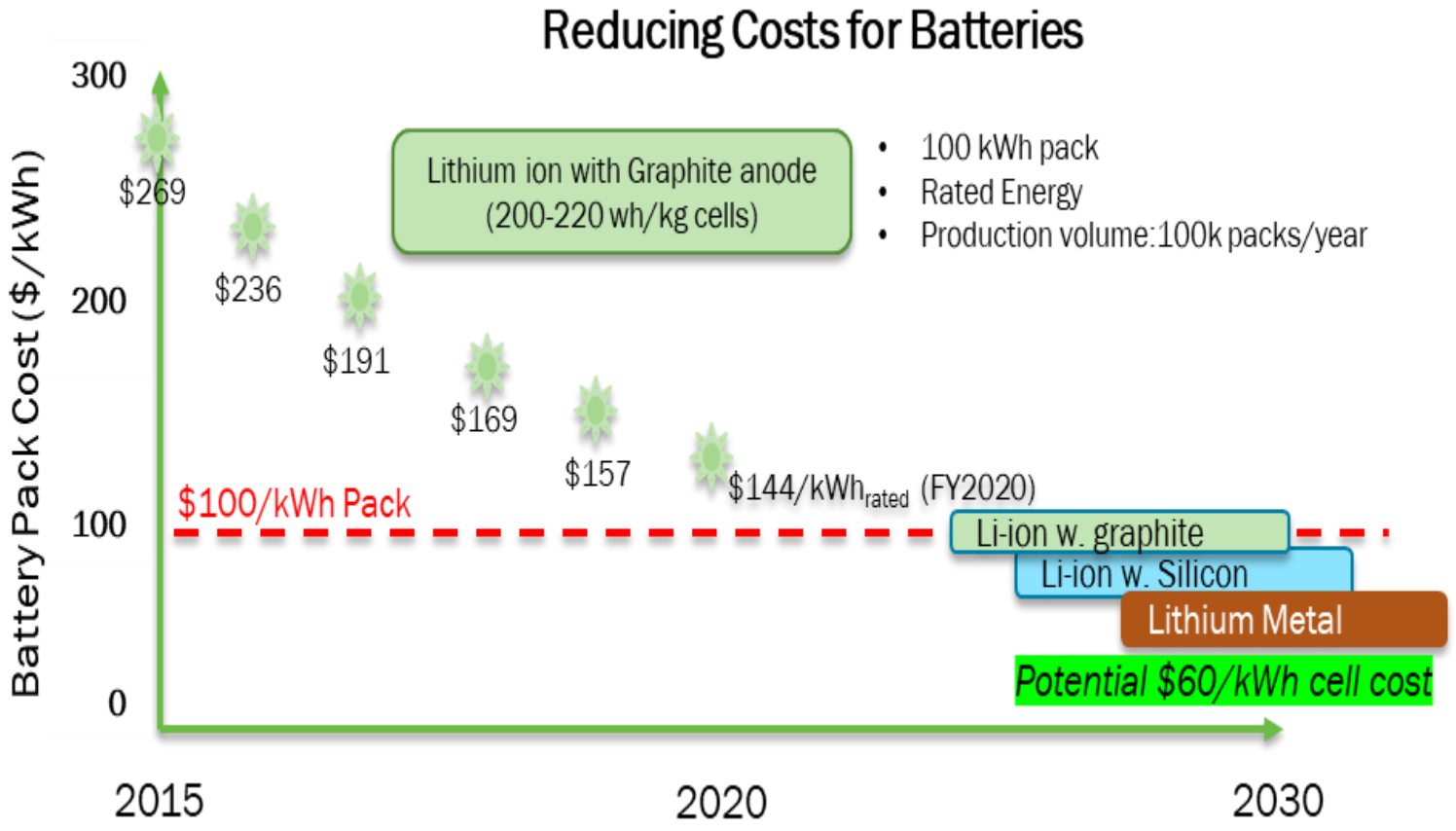
Lithium-Ion Battery Recycling Prize Competition ($10 Million total)

Battery and Critical Mineral Recycling: Battery Recycling Research, Development, and Demonstration Grants ($125 Million total)

Electric Drive Vehicle Battery Recycling and Second-Life Applications Program ($200 Million Total over 5 years)

Accelerate Innovation

BY 2030, reduce the cost of EV battery cells to less than $60/kWh, and decrease reliance on critical materials, and decrease charge time to 15 minutes or less.



Vehicle Technologies Office Key Focus

- Continue to Accelerate Battery Cost Reduction.
- Significantly Reduce or Eliminate Cobalt and Reduce Nickel content
- Accelerate Next Generation Lithium Battery Technology
  - Silicon-based Anodes
  - Lithium Metal Batteries
  - Solid State
- Accelerate Lithium Battery Reuse and Recycling

Thank You