

CLIMATE AND SUSTAINABILITY GRAND CHALLENGE

NET-ZERO EMISSIONS

Create a transportation system that supports an economy with net-zero greenhouse gas emissions.



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CRITICAL RESEARCH TOPICS:

- Electric vehicle and infrastructure development
- Electric aircraft design and operation
- Battery safety, performance, production, recycling, and disposal
- Rapid charging infrastructure and electrification of road systems
- Smart power grids
- Sustainable and recyclable infrastructure
- Alternative fuel production, storage, and transport

VISION: The transportation sector is responsible for more greenhouse gas emissions than any other sector of the U.S. economy. Dramatically reducing transportation sector greenhouse gas emissions is possible and necessary. Advances in clean energy technology include the development of safe and inexpensive batteries with high storage capacities, efficient and long-lasting hydrogen fuel cells, and advanced technologies for producing low-cost sustainable biofuels. These innovations are ushering in a new age in transportation in which our cars, trucks, trains, planes, and ships will no longer be major sources of air pollution and climate-warming emissions. These advances make it possible to envision a future where the U.S. transportation sector contributes significantly to a net-zero economy.

DESIRED OUTCOMES:

- The vast majority of passenger vehicles and buses are hybrid or fully electric and the efficiency of internal combustion engines is greatly improved. Advances in battery and charging technology make long-range, fast-charging, safe, and affordable electric vehicles the default options for consumers, motor carriers, and transit agencies.
- Charging infrastructure is efficient, affordable, and readily available in all communities.
- Commercial vehicles have become significantly more energy-efficient and the majority rely on electric power or alternative fuels such as hydrogen or biomass fuel.
- Expansion of transit and micromobility services and bicycle and pedestrian infrastructure, combined with integrated transportation and land-use planning, mean that people are less dependent on personal vehicles and more likely to walk, bike, or use transit.
- Expansion of broadband access and advances in virtual technologies mean that more work can be done remotely and people spend less time commuting.
- Fewer personal vehicle trips combined with advances in connected roadway and vehicle technology and operations result in less congestion, improved travel times, less wasted fuel and fewer emissions.
- New aircraft are energy-efficient and use alternative fuels or electric power, reducing the carbon footprint of air travel.
- More frequent and higher-speed intercity rail services mean that travelers are more likely to choose to travel by train for vacations and business travel.
- Thousands of miles of public right-of-way along roadways are repurposed to generate wind and solar energy, or to grow vegetation that stores carbon.
- Transportation infrastructure is increasingly composed of recyclable, recoverable, and durable materials that take less energy to produce, have longer lifecycles, and require less maintenance.
- Marine vessels moving freight or passengers are more energy efficient and/or use alternative fuels and technologies as a method of supporting a carbon-neutral supply chain.