

U.S. DEPARTMENT OF
ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

U.S. Department of Energy Research Update

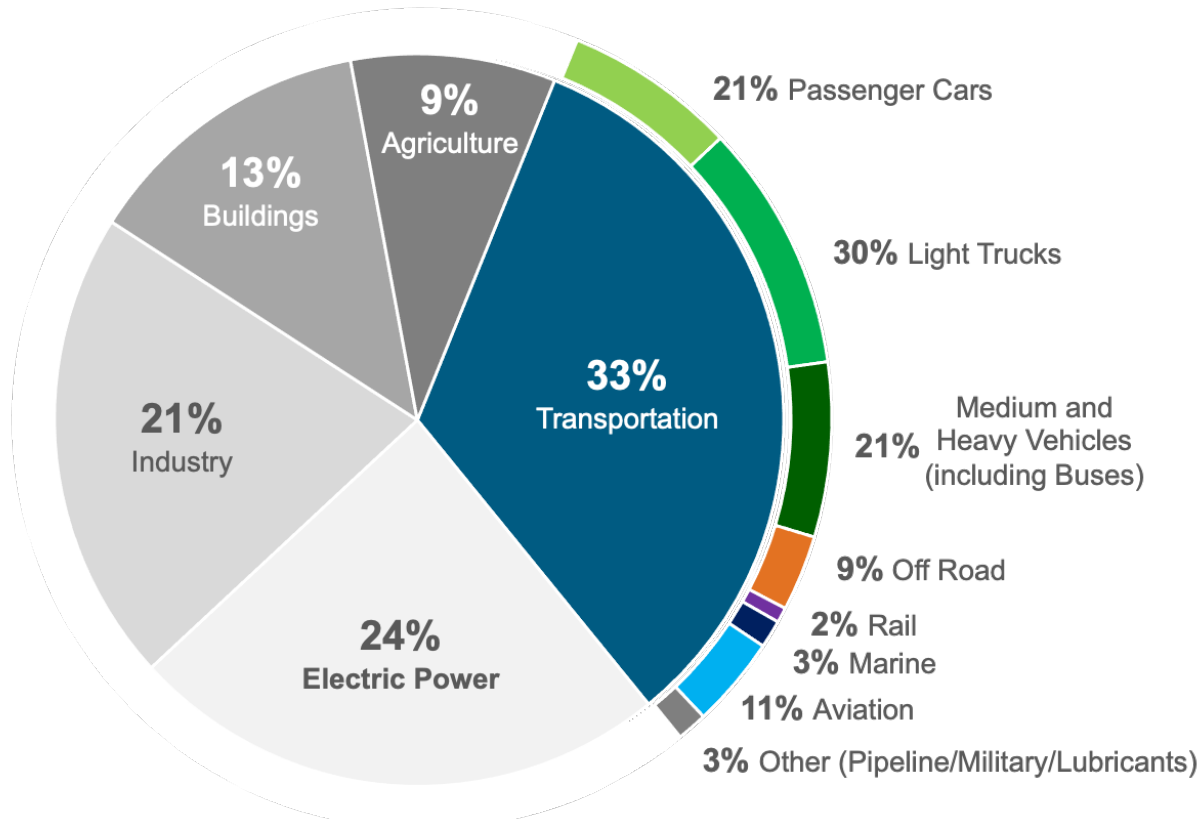
Mike Laughlin, U.S. Department of Energy, Vehicle Technologies Office

September 21, 2022



Multiple, Targeted Solutions are Needed

2019 U.S. GHG Emissions



Aviation and marine include emissions from international aviation and maritime transport. Fractions may not add up to 100% due to rounding.

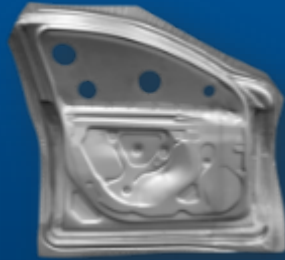
- Light Duty (cars/SUV/pickups) largest share (~52%), and can largely be electrified leveraging cheap and abundant clean electricity
- Strategy must also address **remaining 45+% of transportation including Rail** (projected to grow more rapidly)
 - Hydrogen and Biofuels will be critical to these other sectors
 - Electrification
 - Diversification of fuels improves resiliency
- Focus on solutions that can be **incrementally deployed**, delivering results by 2030
- Full **lifecycle emissions** must be addresses
- Effective **integration with the grid** and energy infrastructure

Vehicle Technologies Office (VTO) structure

Batteries & Electrification



Materials Technology



Mobility Systems



Technology Integration and Deployment



Some R&D for On/Off-Road MD/HD Vehicles



ON-ROAD
Light-, Medium-, Heavy
Duty Vehicles



Air, Marine, Rail



DOE VTO research covers many broad topics relevant to transit

Batteries/Energy Storage

- Improving current battery technology (lithium ion) for better performance and lower cost
- Exploring the next generation breakthroughs in battery technology (lithium metal, other ideas)

Electric Drive Systems

- Highly efficient and low-cost electric motor and power electronics technologies
- High power charging, smart charging, impacts and benefits of electric vehicle and grid integration

Materials

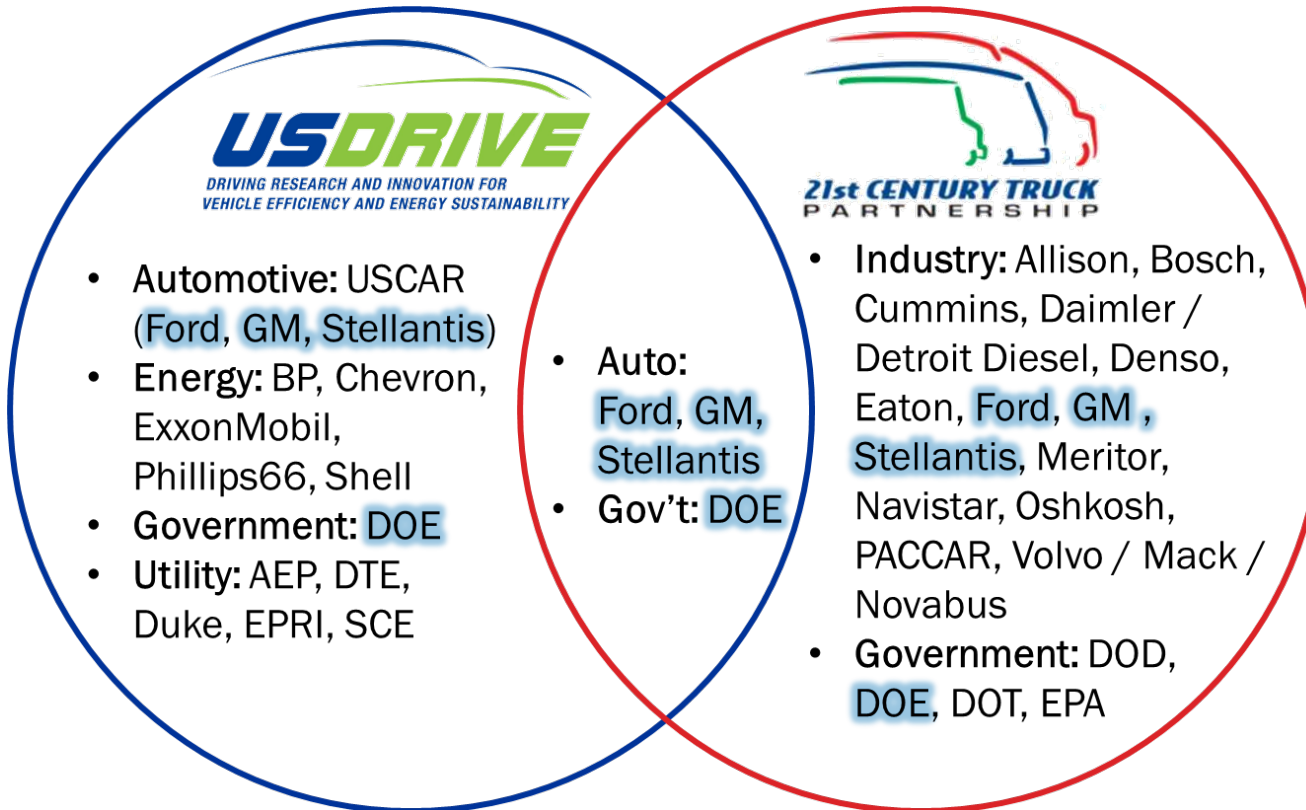
- Lightweight materials for vehicle mass reduction (lightweight metals, composites, joining technologies)
- Propulsion materials to improve powertrain efficiency (both internal combustion and electrified)

Energy Efficient Mobility

- How does transit contribute to a highly efficient regional mobility system?
- What impacts would new technologies have in the overall efficiency of the regional mobility system?

Public-Private Partnerships to Inform Research Opportunities

Public-Private Partnerships provide a framework for both strategic and deep technical engagement among industry and government experts



- Focuses DOE-funded R&D on high-risk barriers to technology commercialization, accelerates progress, and prevents duplication of effort.
- Includes development of technical targets and joint technical roadmaps.

Ongoing conversations between these Partnerships to explore research areas of common interest – opportunities for collaboration

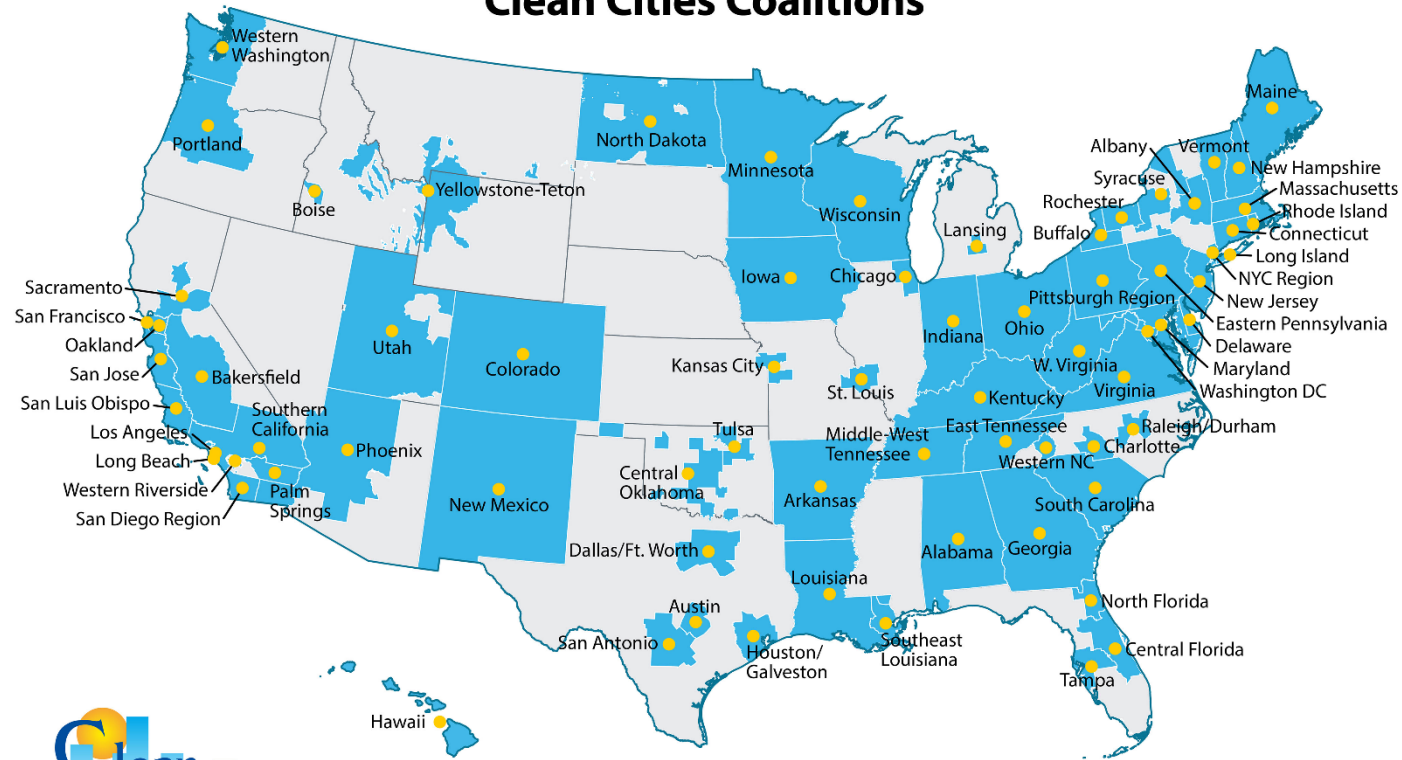
Clean Cities Coalition Network – getting technology in the hands of users

More than 75 Clean Cities coalitions with thousands of stakeholders, representing ~80% of U.S. population

Coalition projects have helped to put nearly **1 million alternative fuel vehicles** on the road.



Clean Cities Coalitions



96 million gasoline gallon equivalents of energy were saved through fuel economy improvement projects like telematics, driver training, and outfitting fleets with idle reduction equipment.



Map Date: 2/3/22

cleancities.energy.gov

Many options for technical assistance supported by DOE

Data and information on the AFDC

- Alternative fuel basics
- Transit ZEV technology evaluations and case studies
- Analysis of technology options with unbiased results

afdc.energy.gov

Questions to the Technical Response Service

- Email or phone
- Technical, policy, analysis questions
- Answers within 48 hours

afdc.energy.gov

Hands-on technical assistance from Tiger Teams

- National lab and subject matter expert help
- Challenging and complex technical problems

afdc.energy.gov

Assistance in your community through Clean Cities

- Local networking, events, outreach
- Technical connection to DOE resources
- Connection to federal, state, local funding opportunities

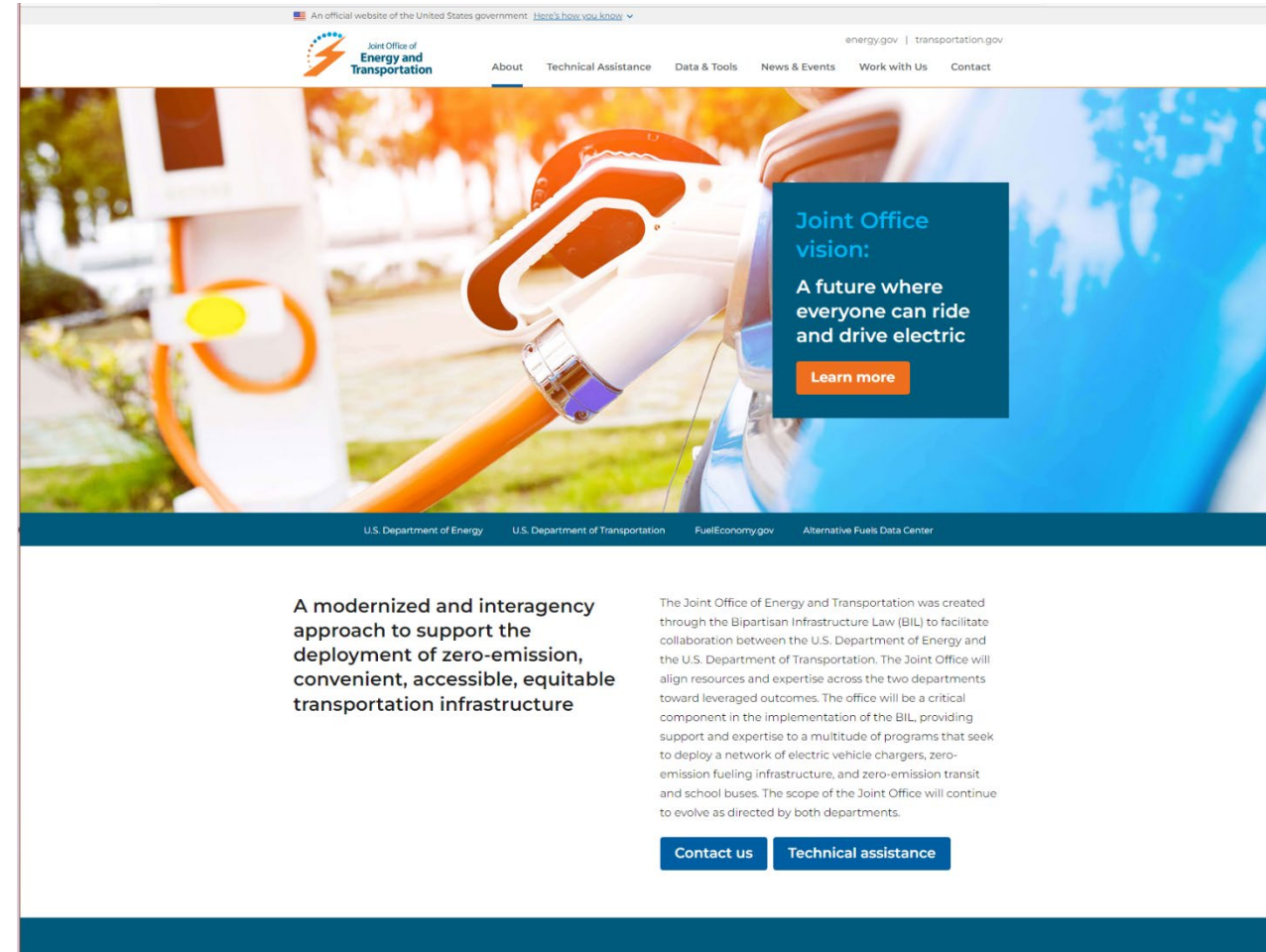
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Bipartisan Infrastructure Law

- **Broad-ranging investment in nation's infrastructure, opportunity for growing economy sustainably (law passed in November 2021)**
- **Transportation-related provisions**
 - Battery provisions – material processing, manufacturing and recycling, battery second life (DOE)
 - National network of electric vehicle chargers (DOT)
 - Clean school bus program (EPA) – electric, natural gas propane
 - Low or no emission transit buses (DOT)
- **And a lot more...**

Joint Office of Energy and Transportation

- **Collaboration between DOE and DOT**
 - Established by Bipartisan Infrastructure Law
 - Combine forces – draw on expertise from both agencies to facilitate successful implementation of BIL programs
- **Value to transit stakeholders**
 - Information resource and technical assistance partner



<https://driveelectric.gov/>

TI/Joint Office Collaboration on Bus Technical Assistance

- DOE TI team (HQ and national labs) collaborating with Joint Office to offer technical assistance
 - DOT/FTA Low/No Bus Program
 - EPA Clean School Bus Program
- Builds on existing AFDC and TRS structure and expertise

Joint Office of Energy and Transportation

Technical Assistance
for the FTA Low-No
Emission Transit
Vehicle Program

driveelectric.gov/transit-contact



Transition Transit Buses to
Low- or No-Emission Models

driveelectric.gov/transit



THANK YOU

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