

# How University Transportation Work Can Contribute to State Greenhouse Gas Goals

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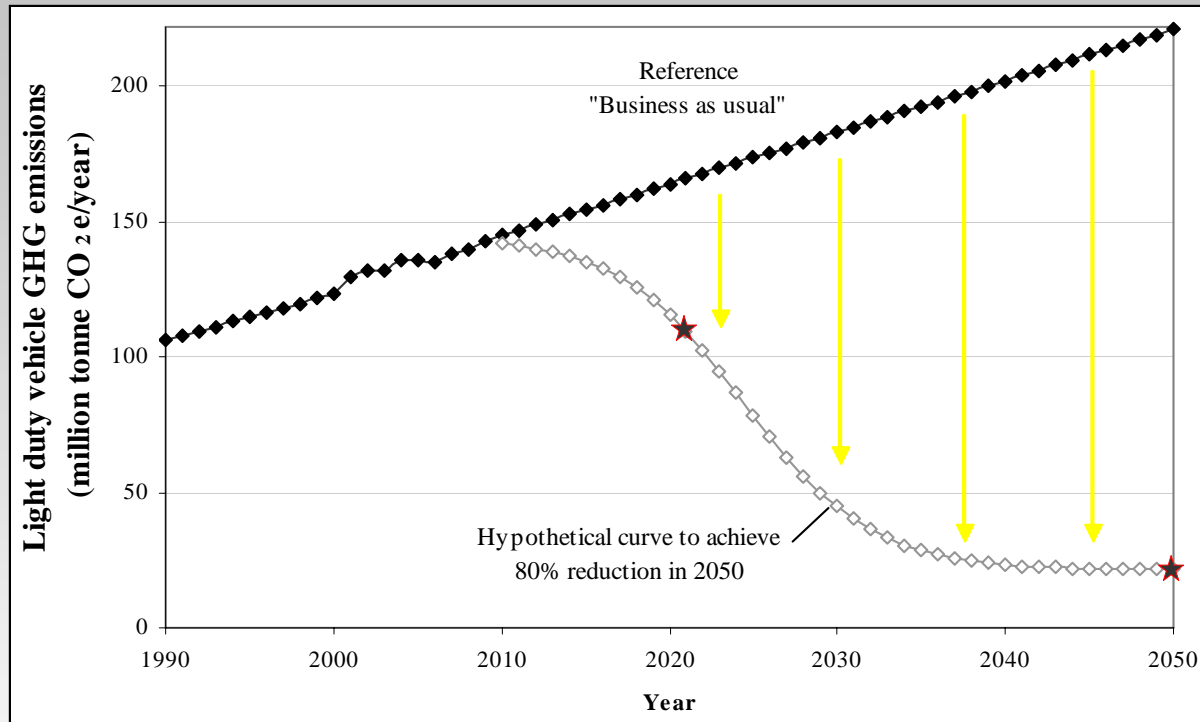
UC/CSU/CC Sustainability Conference  
Transportation Track  
August 2, 2008

# Outline

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- Background
  - Greenhouse (GHG) emission goals
  - Transportation and GHG emissions
  - California GHG mitigation policies
- GHG mitigation tools
  - Vehicles technology
  - Alternative fuel technology
  - Travel (VMT) reduction strategies
- Role of universities and colleges
  - Complying with GHG regulations
  - Demonstrate, quantify next steps for GHG goals

# Background: Transportation GHG emissions



Vehicle technology

Fuel GHG intensity

Travel behavior

$$\left( \begin{array}{c} GHG \\ emissions \end{array} \right) = \left( \frac{\text{gallon fuel}}{\text{mile}} \right) \times \left( \frac{CO_2 \text{ equiv.}}{\text{gallon fuel}} \right) \times \left( \frac{\text{miles traveled}}{\text{year}} \right)$$

# Background: GHG Mitigation Policy

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- Vehicle policy
  - GHG regulation for vehicles (Pavley, AB 1493 in 2002)
    - 30% CO<sub>2</sub> reduction in average passenger vehicles by 2016
    - Second stage ("Pavley II") being developed now
  - Zero-Emission Vehicle (ZEV) Mandate
    - Plug-in hybrid electric vehicles (PHEV): 58,000 by 2014
    - Zero-emission vehicles (full electric, hydrogen): 7,500 by 2014
- Alternative fuels policy
  - Low Carbon Fuel Standard (LCFS)
    - 10% reduction in average fuel carbon intensity for all transportation fuels by 2020
  - ZEV Mandate
    - Promote the transportation energy sources with much lower GHG emissions
- Travel (VMT) reduction policy
  - Best practices for local plans, developments, etc.
  - Guidelines from office of the Attorney General

# Vehicle Technology Options

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- Conventional vehicle technologies
  - Engines (gasoline direct injection, variable displacement)
  - Transmissions (5 and 6-speed auto, continuously variable)
  - Body, road load reduction (light-weighting, aero, rolling)
  - Other areas: accessories, air conditioning HFC
- Advanced drivetrain technology
  - Electrified drivetrain
    - Hybrid gas-electric
    - Plug-in hybrid gas-electric
    - Full battery electric
  - Fuel cell electric (hydrogen or other fuel)

# Alternative Fuel Options

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- Fuel mixing for conventional engines
  - Ethanol (up to 10% in gasoline, or 85% in “flex fuel”)
  - Biodiesel (up to 15% in diesel, or greater with minor vehicle modifications)
- Alternative fuels for modified engines
  - Compressed natural gas (CNG)
  - Liquefied petroleum gas (LPG)
- Lower-GHG alternative fuels
  - Biofuels from agricultural residue, waste, dedicated energy crops
  - Electricity, hydrogen – from various primary energy sources

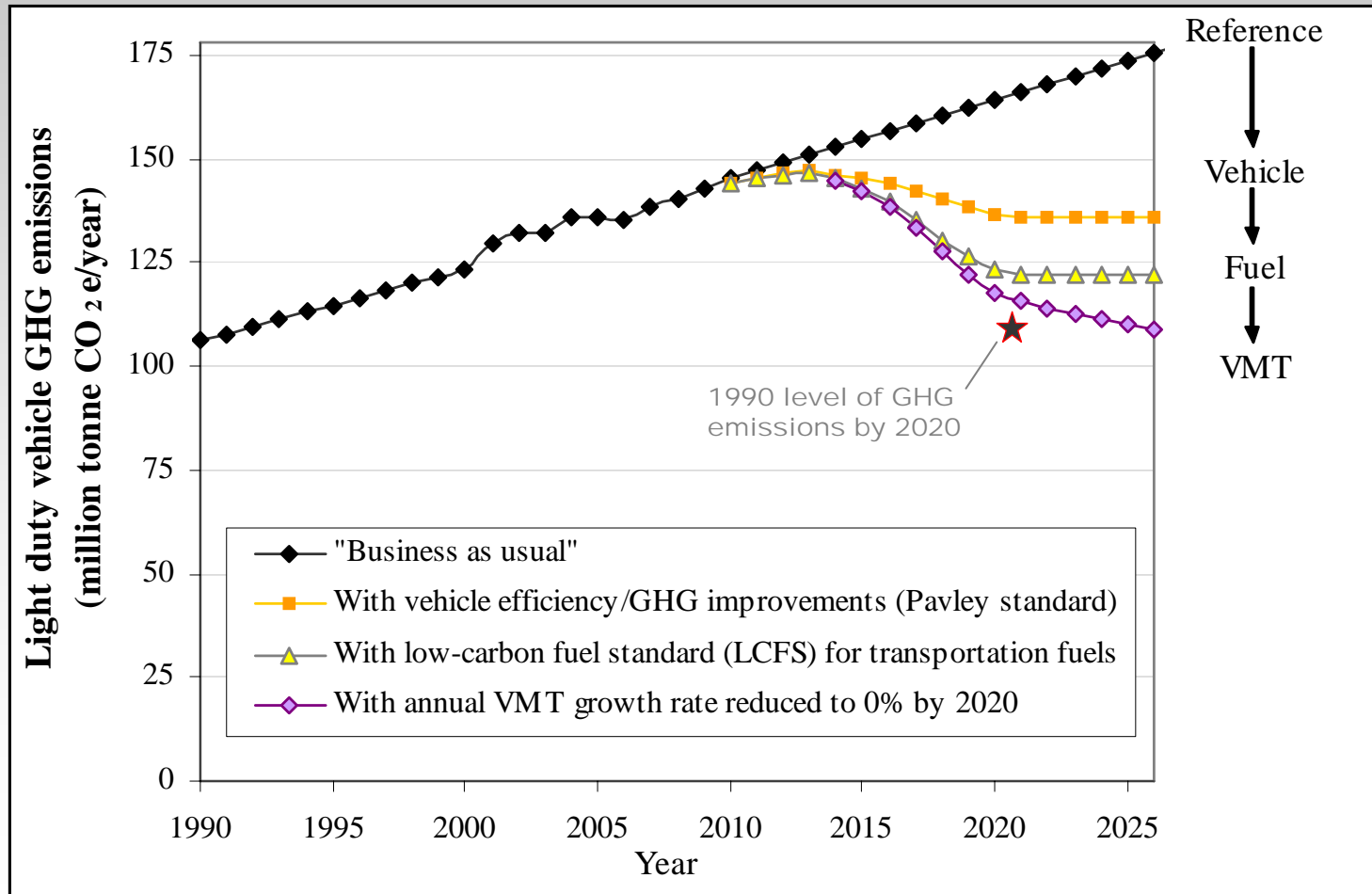
# Travel Behavior Options

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- Intelligent transportation systems (ITS)
  - Traffic signal control
  - Electronic toll collection
  - Bus rapid transit
  - Traveler information
- Mobility management strategies
  - Park-and-ride facilities
  - Employee parking “cash out”
  - Smart growth
  - Telecommuting
  - Carpooling
  - Integrated regional smart cards
  - Low-speed modes

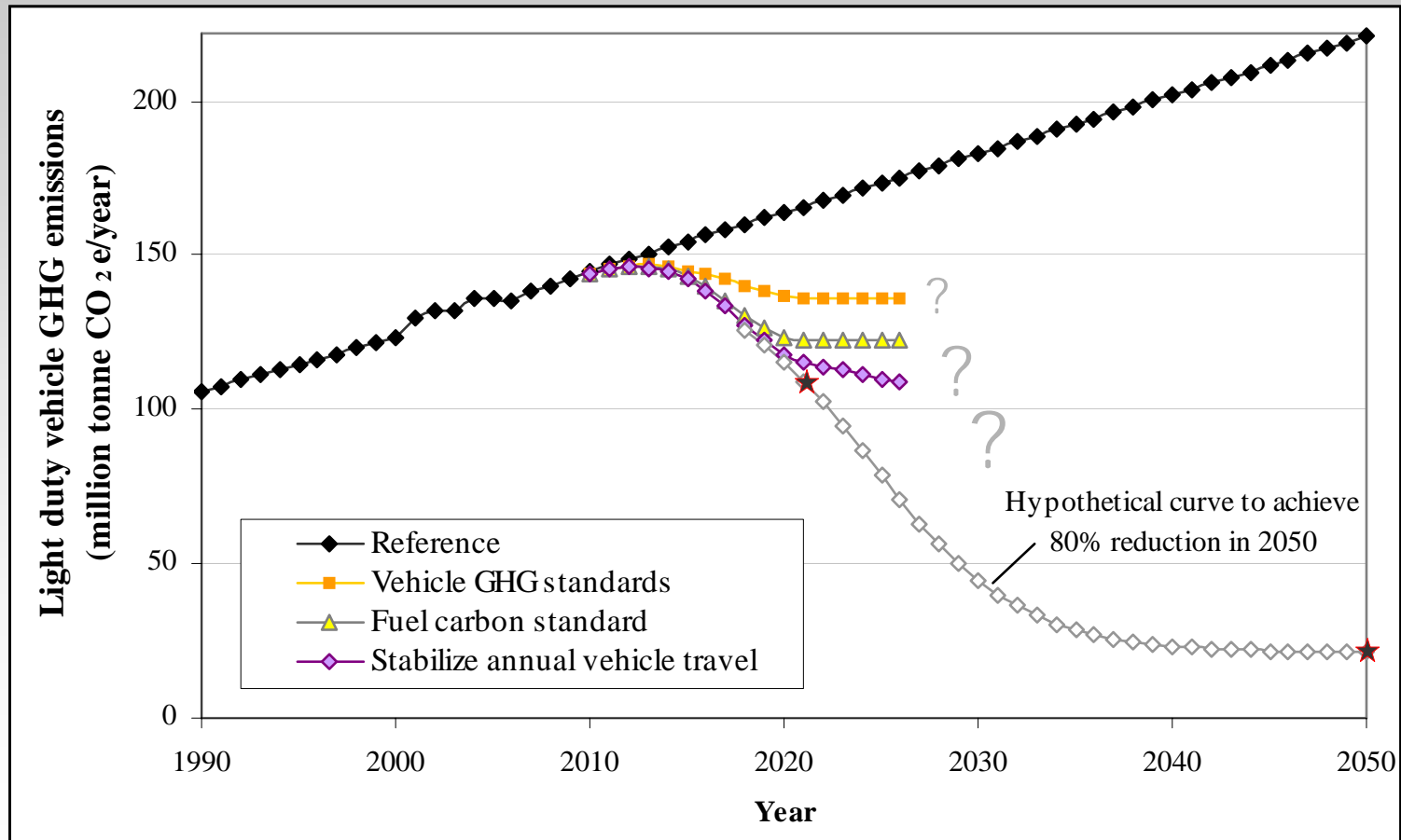
# Transportation GHG Reduction

How can we achieve our 2020 GHG emission goal?



# Transportation GHG Reduction

How can we achieve an 80% reduction by 2050?



# Role of Colleges and Universities?

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- Current issues in California climate change mitigation planning
  - Vehicles and fuels
    - How far can technologies get us toward 2020 goals? 2050 goals?
    - How can the ZEV mandate for vehicles work toward longer term goals?
    - Can California grow low-GHG biofuels?
    - Which near-zero GHG technologies are most feasible? Cost-effective? Most popular?
  - Travel demand measures
    - How much can VMT measures contribute to city-wide goals? And state-wide GHG goals?
    - Which VMT measures are most cost-effective? Most popular?
    - Can we develop reliable metrics for planners and policy makers to evaluate these policies?
- These are all questions that higher education can help answer

# Role of Colleges and Universities?

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- Strengths of California colleges and universities related to climate change mitigation planning
  - Local planning context
  - Expertise – engineering, behavioral, economics
  - Creative problem-solving (undergraduate projects, graduate research)
  - Experimental test-bed and showcase for technologies and practices
  - Non-partisan bridge between stakeholders (industry, government, and envir. groups)



# Role of Colleges and Universities?

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- Examples for contributions
  - Vehicle research (vehicle competitions, partnerships with industry)
    - Example: Pioneering research, demonstration of plug-in hybrid electric vehicles, hydrogen fuel cell technology at UC-Davis
  - Alternative fuels vehicle testing
    - Examples: campus, city fleets of hydrogen, electric cars, buses
  - Study travel-related behavioral change on and off campus
    - Example: survey campus employees, students on travel decisions
  - Work with under-staffed and cities and counties
    - Example: UC-Davis team works with Yolo County on "Cool County" commitment to bridge gap between technology research and practice
  - Routinely place students as interns with governments, organizations, and innovative companies in public policy-related positions
    - Example: work with CARB, CEC, utilities on current issues

# Role of Colleges and Universities?

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- Shorter term GHG goals (through 2020)
  - Meet and exceed existing California policy
  - Aid ongoing local and state efforts to reduce GHG emissions
- Long-term GHG goals (2020-2050)
  - Identify deeper-reduction GHG mitigation actions
  - Demonstrate
    - Near-zero GHG transportation technologies
    - Best practices in transportation planning
  - Quantify and validate impacts
    - Costs, GHG reductions
    - Establish metrics that can be used by planners, policy-makers

# Conclusions

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- California has established ambitious targets for GHG reductions in future years
  - Many issues lie ahead for policy makers, industry, and local planners in implementing state GHG regulations through 2020
  - The challenges of achieving 2050 GHG reduction targets are daunting, requiring prolonged efforts and better understanding of VMT reduction measures and near-zero GHG technologies.
- What is the role of California colleges and universities?
  - Demonstrate and validate cutting-edge GHG mitigation strategies
  - Utilize college/university strengths for work on the long-term climate mitigation issues
  - Make advances in break-through technologies and strategies to effect much larger changes
  - Continue to seek out answers to the critical research questions
  - Support current efforts in rule-making and implementation of near-term GHG reduction strategies for cities, regions, state

# Conclusions

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- Questions?
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