CTP 2040 SCENARIOS OF GHG EMISSIONS

AIR RESOURCES BOARD VISION PROGRAM

CALTRANS CTP PAC MEETING

FEBRUARY 3, 2015

OVERVIEW

- Background
  - GHG targets; CA 2012 GHG Inventory reference
  - Model structure; Scenario descriptions
- Scenario results

U.S. DOE Scenario Planning definition:

- "Identifying the range of possibilities of trends & policies"
- "Developing a shared understanding of a problem"

GHG EMISSION TARGETS

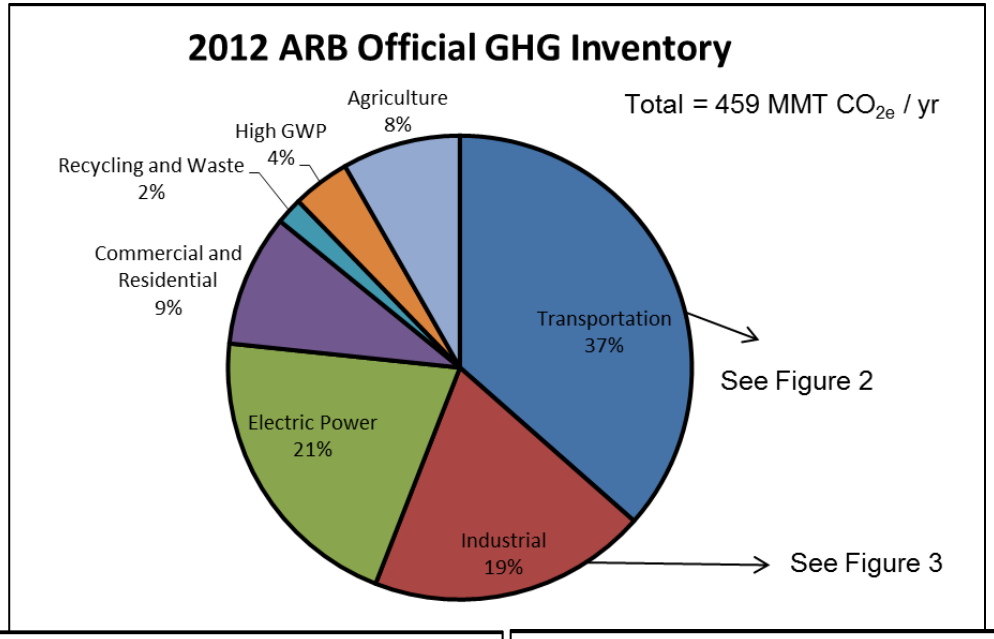
431 MMT CO2e

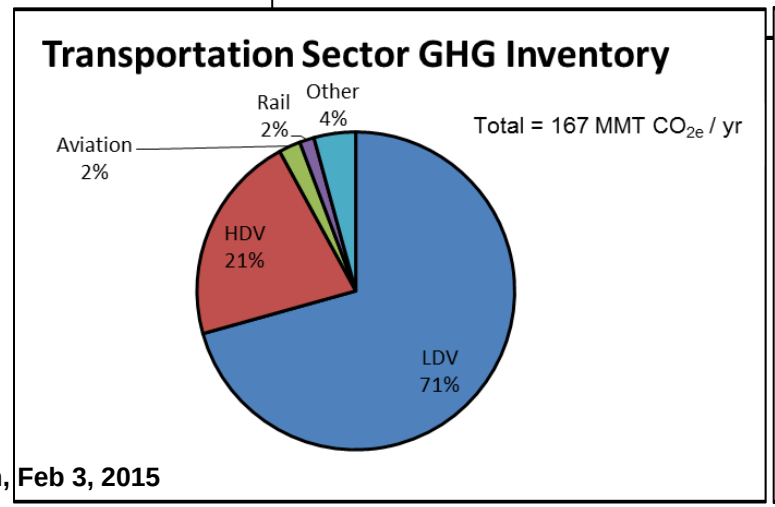
- AB 32 CA Global Warming Solutions Act
  - Requires statewide GHG emissions to return to 1990 levels by 2020. No "equal share" sector requirement
- Executive Order S-03-05

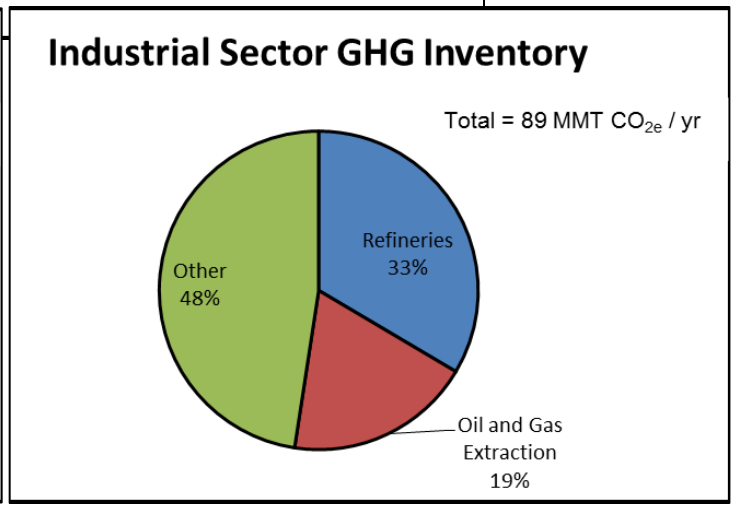
86 MMT CO2e

  - Sets target of 80% below 1990 levels by 2050
  - Same as 80% below 2020 levels with AB 32 success
- Executive Order B-16-12
  - Establishes the transportation sector shall meet it's "equal share" of the 2050 GHG target
- CTP 2040 Proposed Target
  - 2050 GHG emissions 80% below Alternative 1 2020

CA 2012 GHG INVENTORY







MODELS, DATA HANDOFFS, ETC

CSTDM → **EMFAC 2014** → **Vision 2.0**

- VMT aggregated into 4 veh bundles
- 2010, ‘20, ’40
- By county
- By speed bin

- Disaggregate VMT to all vehicle classes
- Extrapolate all years

- Adv veh selections
- Alt fuel selections
- Emission factors for fuel production and vehicle usage

Rail Plan & Sce

Aviation Inventory

Caltrans

ARB

THREE CTP 2040 SCENARIOS

- Vision results for all three alternatives
  - All transportation modes (sectors); well-to-wheel (WTW)
- Scenario (Alternative) 1 - Baseline
  - CTP 2040 baseline VMT for LDV & HDV
- Scenario (Alternative) 2 –VMT reductions
  - Aggressive statewide VMT reduction strategies
  - CTP 2040 passenger rail assumption
- Scenario (Alternative) 3 – Adv Veh & Fuels
  - To achieve remaining GHG reductions for 2050
  - One of many scenarios that reach same GHG Em.

CSTDM VMT ASSUMPTIONS

Total VMT from CSTDM for
Alternatives 1, 2 and 3 in billions of miles per year

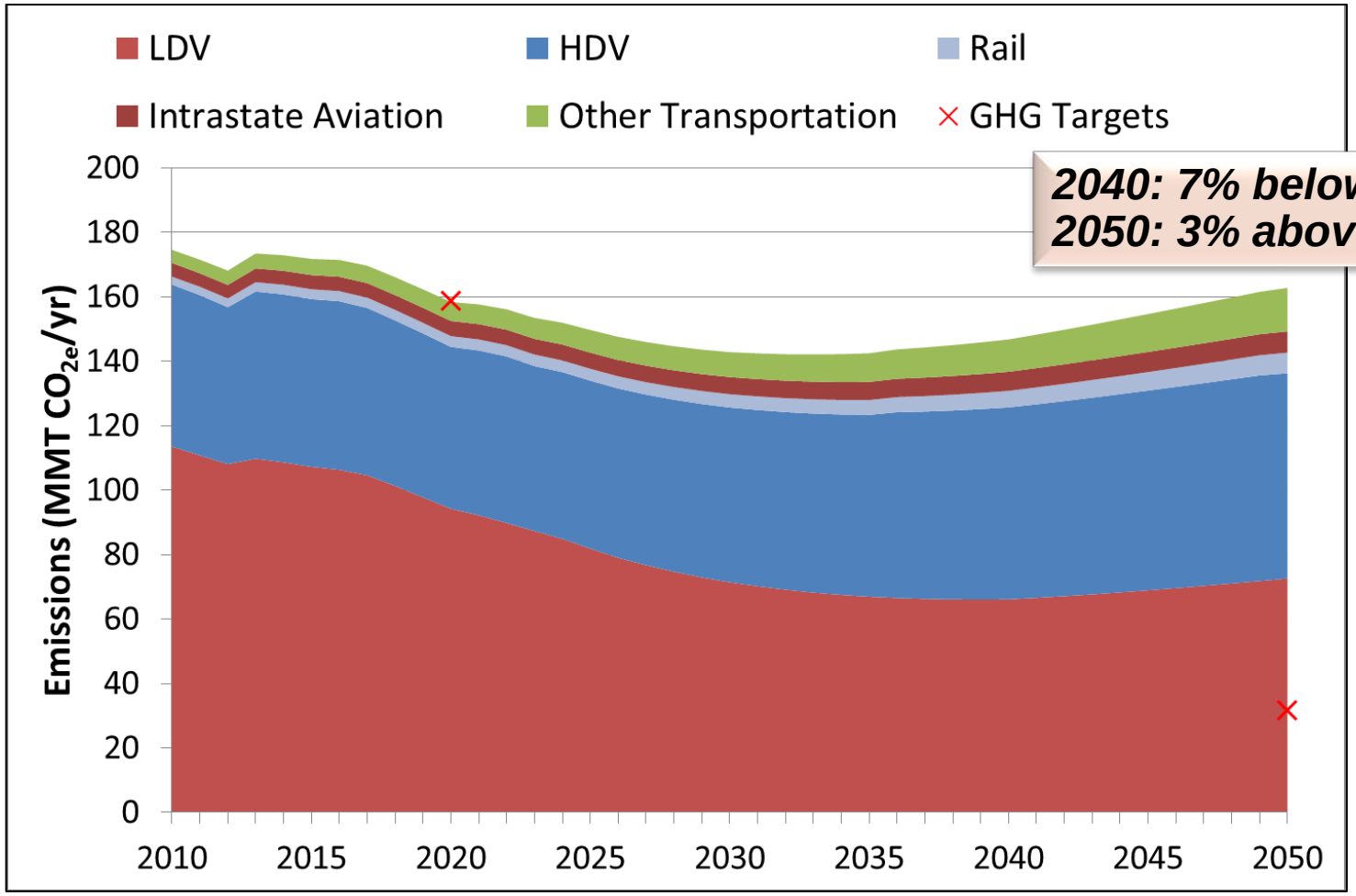
	2010	2020	2040
Alternative 1			
LDV	189.7	208	251
HDV	74	73.5	83
Total	264	282	334
Alternatives 2 and 3			
LDV	-	-	161.9
HDV	-	-	71.3
Total	-	-	**233**
% Reduction*			**30%**

** VMT reduction below 2040 in Alternative 1*

SCENARIO RESULTS FOR ALTERNATIVES 1, 2, 3

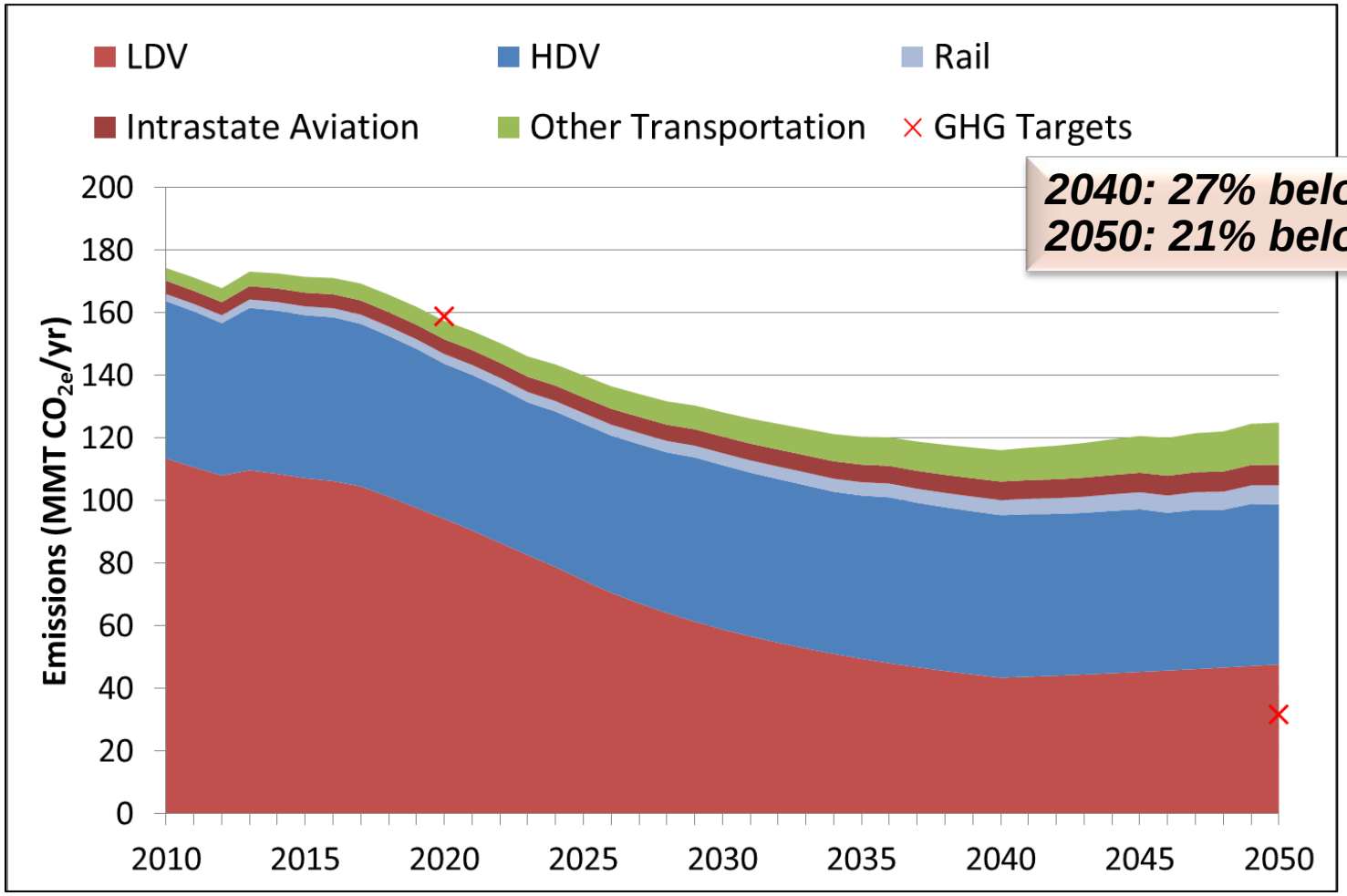
STATEWIDE GHG EMISSIONS: ALTERNATIVE 1

Well-to-Wheel (WTW) GHG Emissions by Sector



STATEWIDE GHG EMISSIONS: ALTERNATIVE 2

Well-to-Wheel (WTW) GHG Emissions by Sector



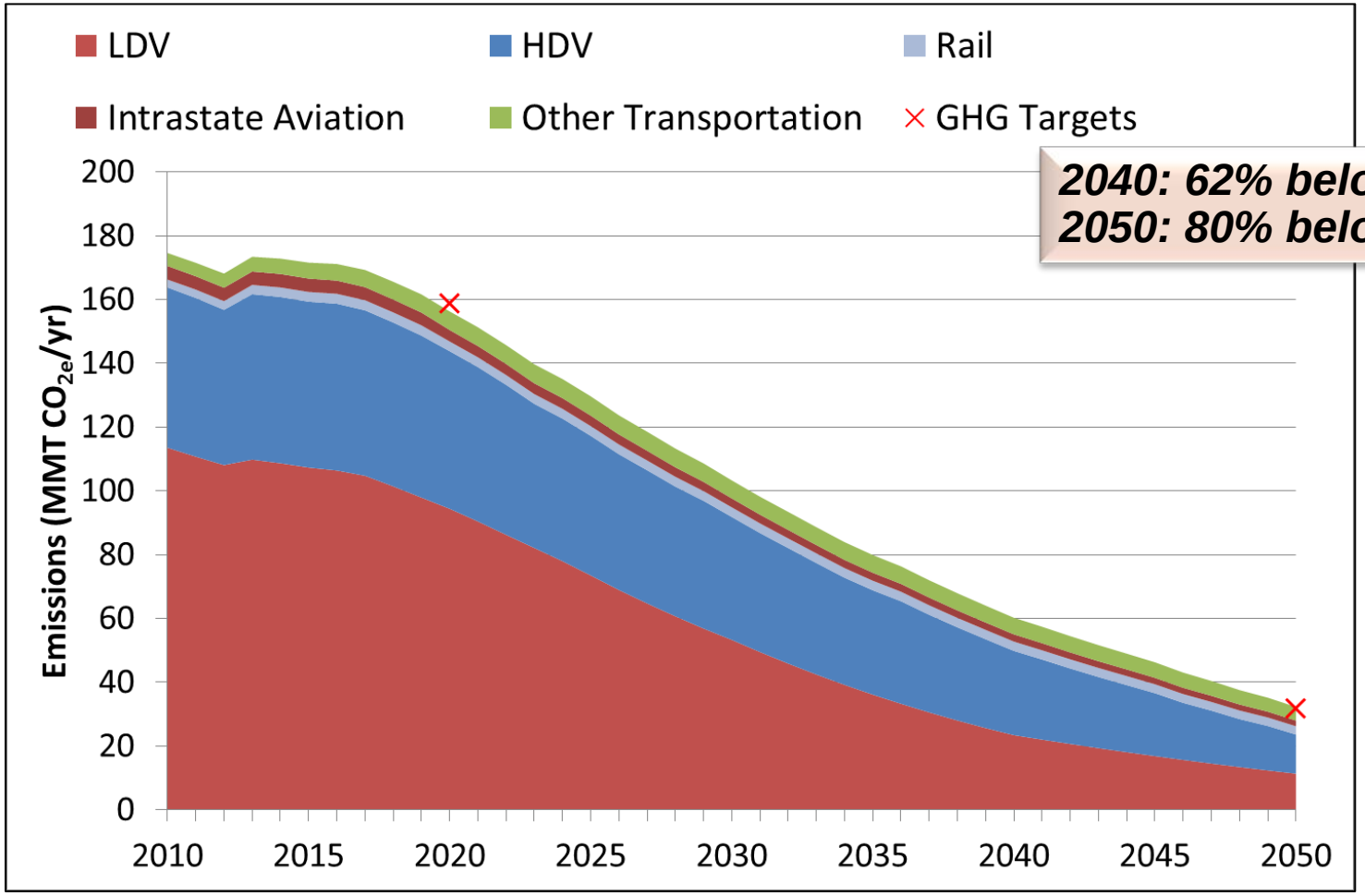
ALTERNATIVE 3 TECHNOLOGY AND FUELS STRATEGIES

One of many paths to 2050 (assumptions)

- Light duty vehicles by 2050
  - New vehicle fuel efficiency 4x today's levels
  - 20 million ZEVs on the road (1.5M 2025 target)
- Heavy duty vehicles by 2030
  - New vehicle efficiency 50% higher than today
  - 12% electric vehicle sales
- Freight rail and aviation: +2%/yr efficiency fleetwide
- 7 billion gallons of low-carbon biofuels (1.5B ethanol today)
- 75% renewable electricity and hydrogen by 2050

STATEWIDE GHG EMISSIONS: ALTERNATIVE 3

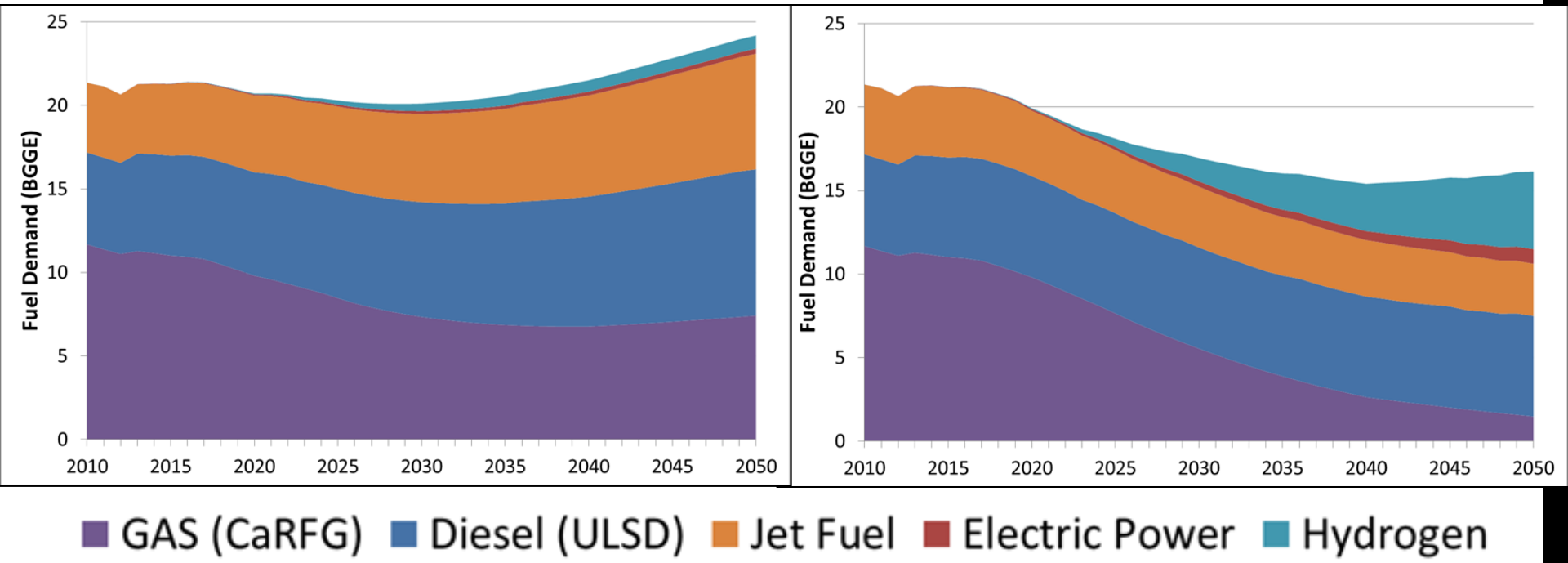
Well-to-Wheel (WTW) GHG Emissions by Sector



STATEWIDE FUEL DEMAND (INCLUDES BIOFUEL BLENDING)

Alternative 1 Baseline

Alternative 3



Note: "BGGE" = billion gallons gasoline equivalent (by energy content)

SUMMARY

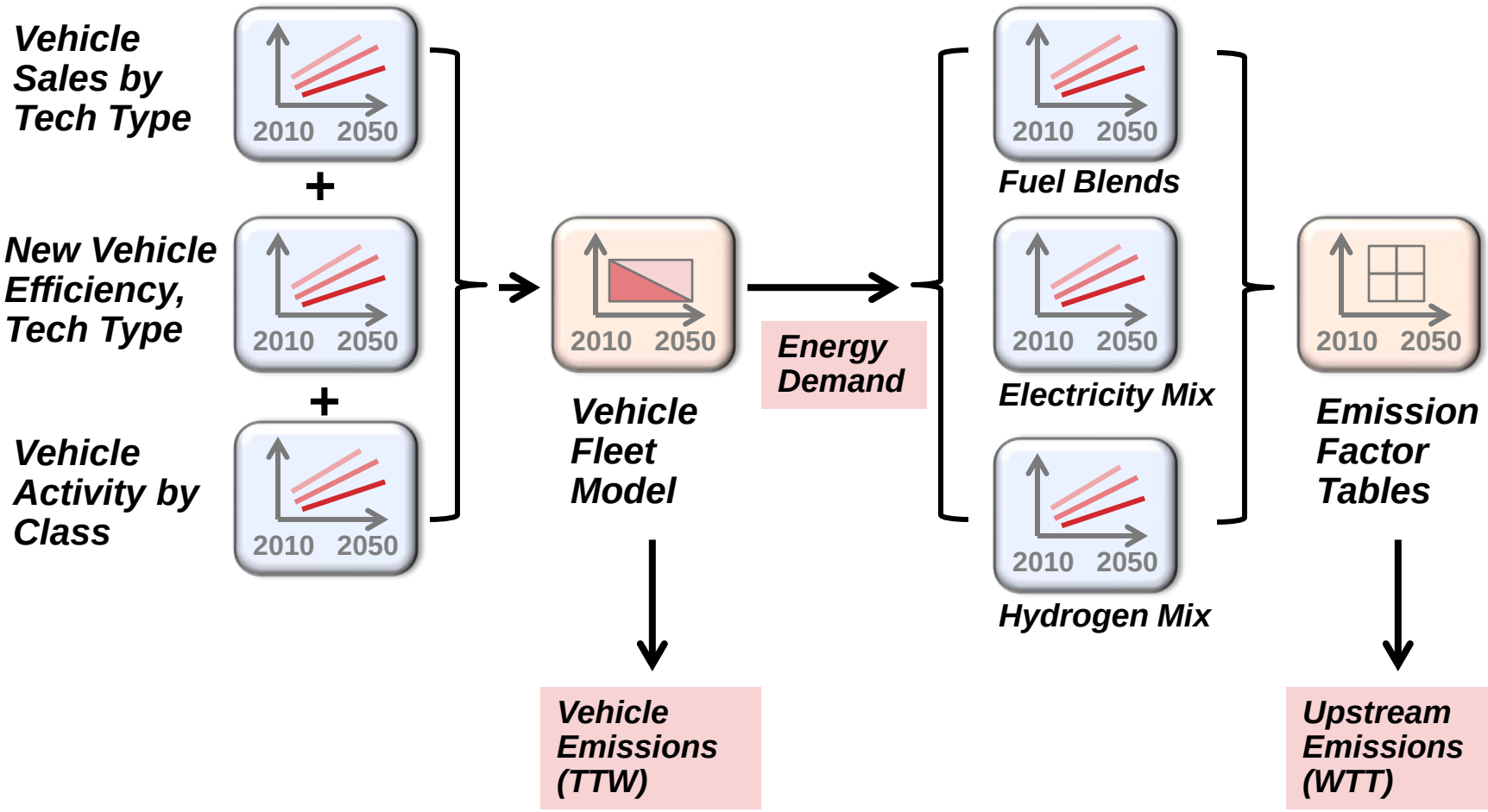
- 2050 Alternative 1 emissions are 3% above 2020
- Alternative 2 with VMT strategies achieves substantial GHG emission reductions
  - 21% below 2020 levels by 2050 (27% by 2040)
- To fully achieve 2050 target, Alternative 3 assumed aggressive assumptions in all areas:
  - Vehicle efficiency well beyond existing rules
  - Advanced technology powertrains for vehicles
  - Alternative fuels (biofuels, hydrogen, electricity, etc)

POTENTIAL IMPLICATIONS FOR ROAD NETWORK AND TRANS. FACILITIES

- State-level policy actions to reduce LDV and HDV VMT
- Leverage state road and facility network for alternative fuel depots, particularly considering service for multi-modes
- Evaluate how LDV VMT may change for alternative vehicles, considering how drivers access refueling
  - PEV drivers fuel predominantly at home, and access public charging at work and near shopping areas
  - FCV hydrogen network likely close to freeway interchanges
- State road network should support changing HDV trips for alternative fuel production and delivery:
  - Biofuel production requires more truck trips to collect biomass feedstocks, deliver to biorefineries (when produced in-state)
  - Hydrogen requires more frequent truck deliveries of finished fuel on freeways to local fueling stations (until pipelines installed)

BACKGROUND MATERIAL

SCENARIO TOOL FRAMEWORK



SECTORS / MODES IN VISION 2.0

Mobile Sector Modes Included

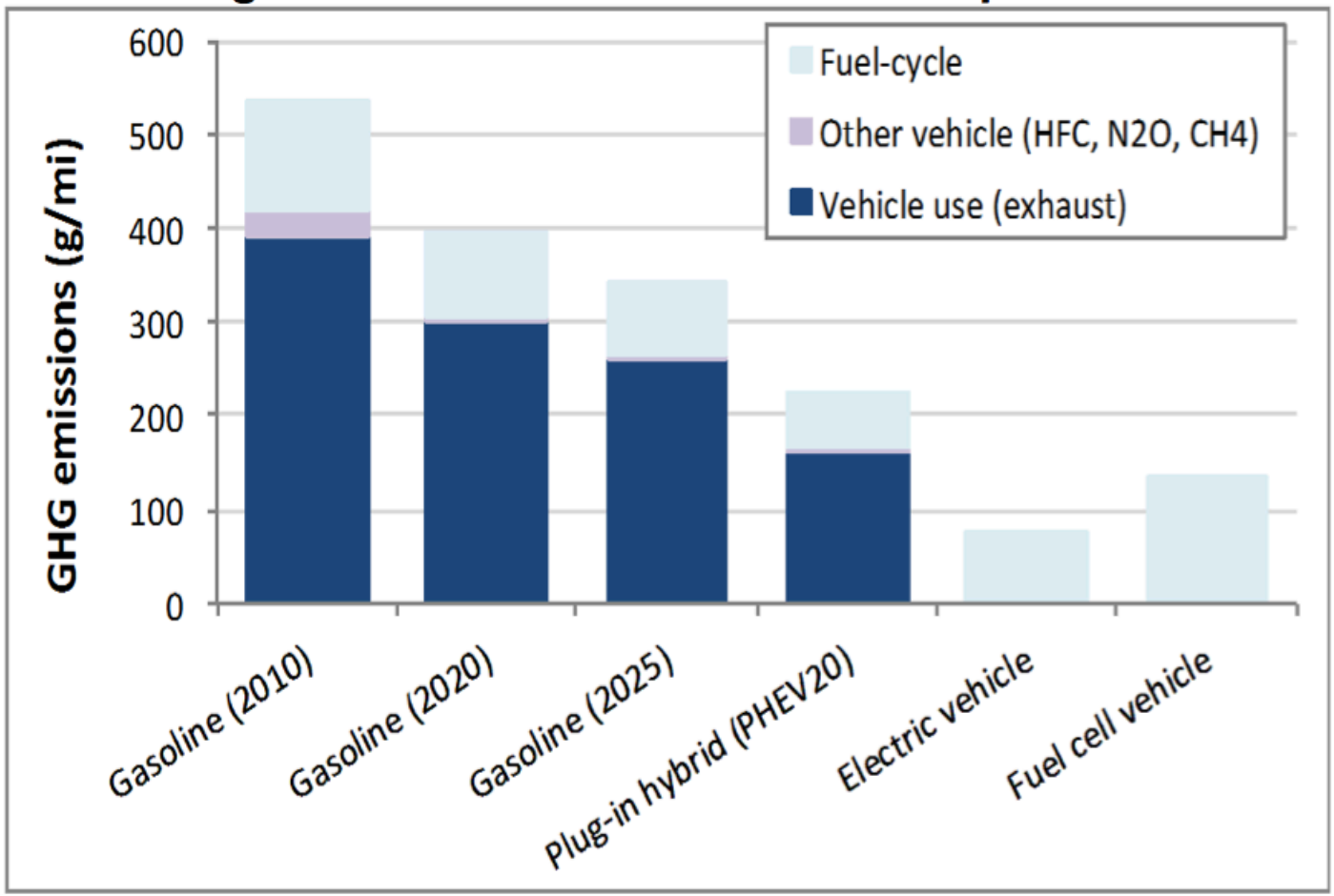
- Passenger vehicles
- Heavy-duty vehicles (on-road)
- Rail (freight, passenger)
- Aviation
- Ocean going vessels
- Cargo handling equipment
- Commercial harbor craft
- Construction equipment
- Other off-road vehicles

Industrial & Building Sector Modes Included

- Fuel production for transportation and buildings
- Residential and commercial buildings

WELL-TO-WHEEL EXAMPLE: WTT (FUEL CYCLE) + TTW (VEH)

Figure 19: WTW GHG emissions comparison



Source: ARB ZEV Regulation Staff Report, Dec 2011

SCENARIO PLANNING FOR CTP 2040 DEVELOPMENT

Long-term scenarios show multiple strategy combinations exist to achieve goals, and:

- Identify trends of most promising (and risky) strategies
- Inform near term public policy decisions
- Increases awareness of transportation system
  - Fuel network (multiple fuels across sectors)
  - Alternative technologies (some common across sectors)
  - Activity changes including mode shifts