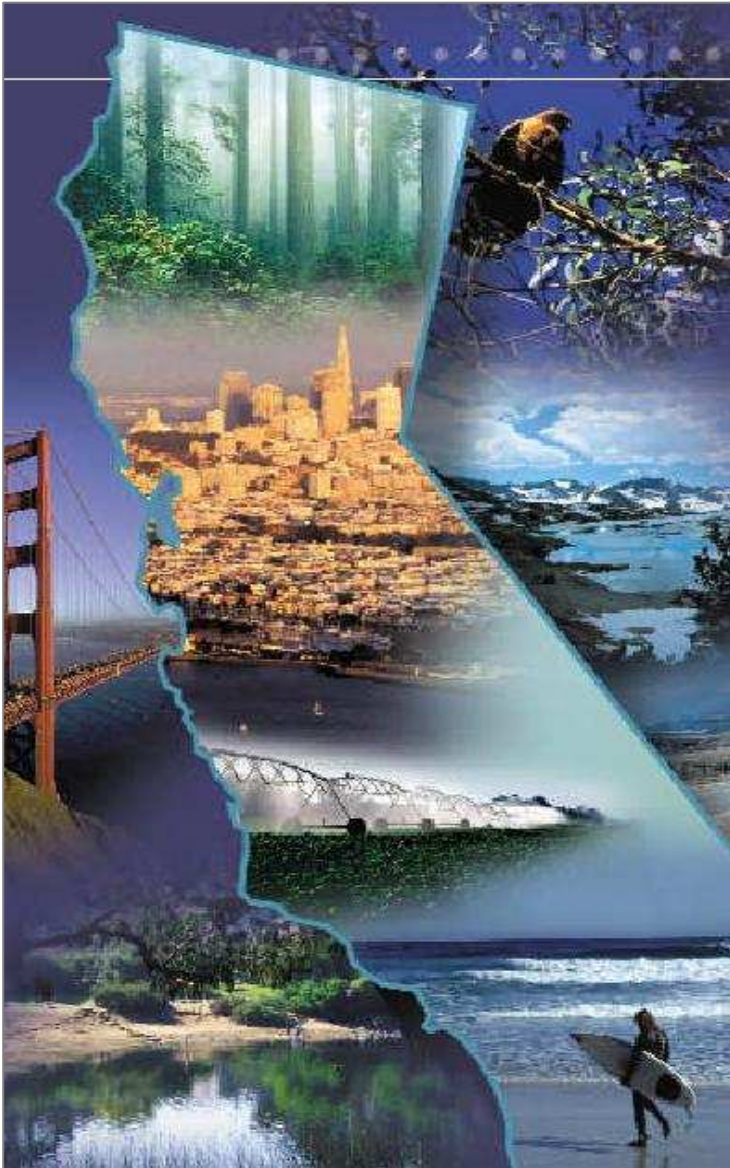


**SAE Alternate Refrigerant Symposium 2007**  
**July 17-19, Phoenix, AZ**



# ***Status Update - Proposed HFC Reduction Measures for California***

*Alberto Ayala, Winston Potts, Tao Huai, and  
Richard Corey*

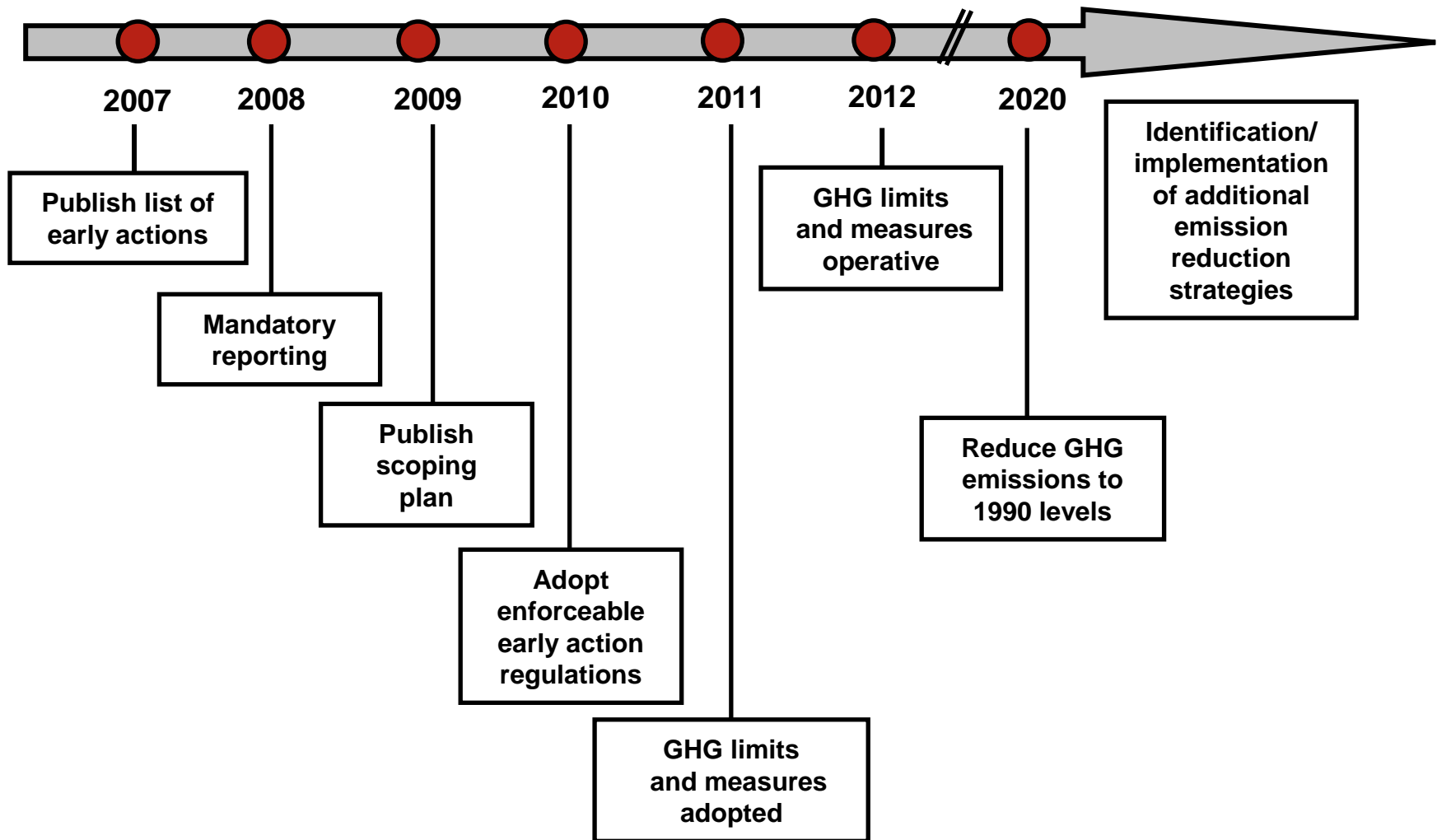
***California Air Resources Board***



# *Where are we now?*

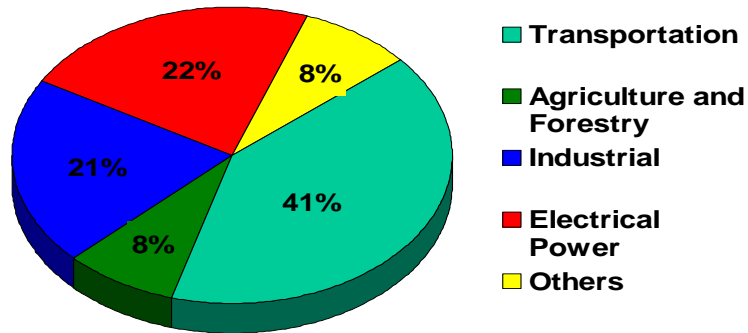
- California's GHG Motor Vehicle Regulation (AB 1493)
  - Awaiting US EPA's decision on waiver request
  - MY 2009 is first year of implementation
  - Credits available for improved MVACSs
- California Global Warming Solutions Act (AB32)
  - Mandates GHG reductions to 1990 levels by 2020
  - Dictates the use of command-and-control strategies as well as market-based mechanisms
  - CARB adopted "discrete early actions" last month
    - Included GHG reductions from DIY practices
- CARB's mission remains the same:
  - Protect public health through achievement of clean air
  - To lead the world with a landmark program for the protection of the global climate

# California Global Warming Solutions Act of 2006 (AB 32)

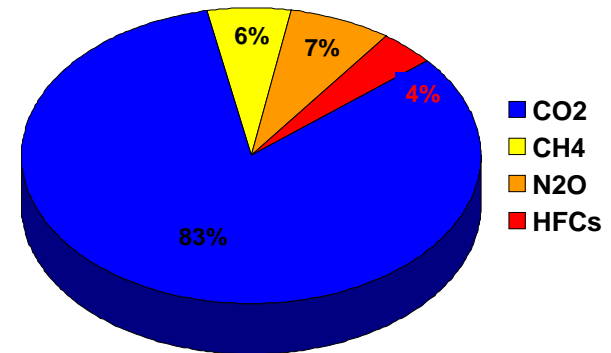


# California GHG Emissions

GHG EMISSION SOURCES  
[MMT CO<sub>2</sub> eq]



GHG EMISSIONS  
BY TYPE



CO<sub>2</sub>, N<sub>2</sub>O



CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O



CO<sub>2</sub>

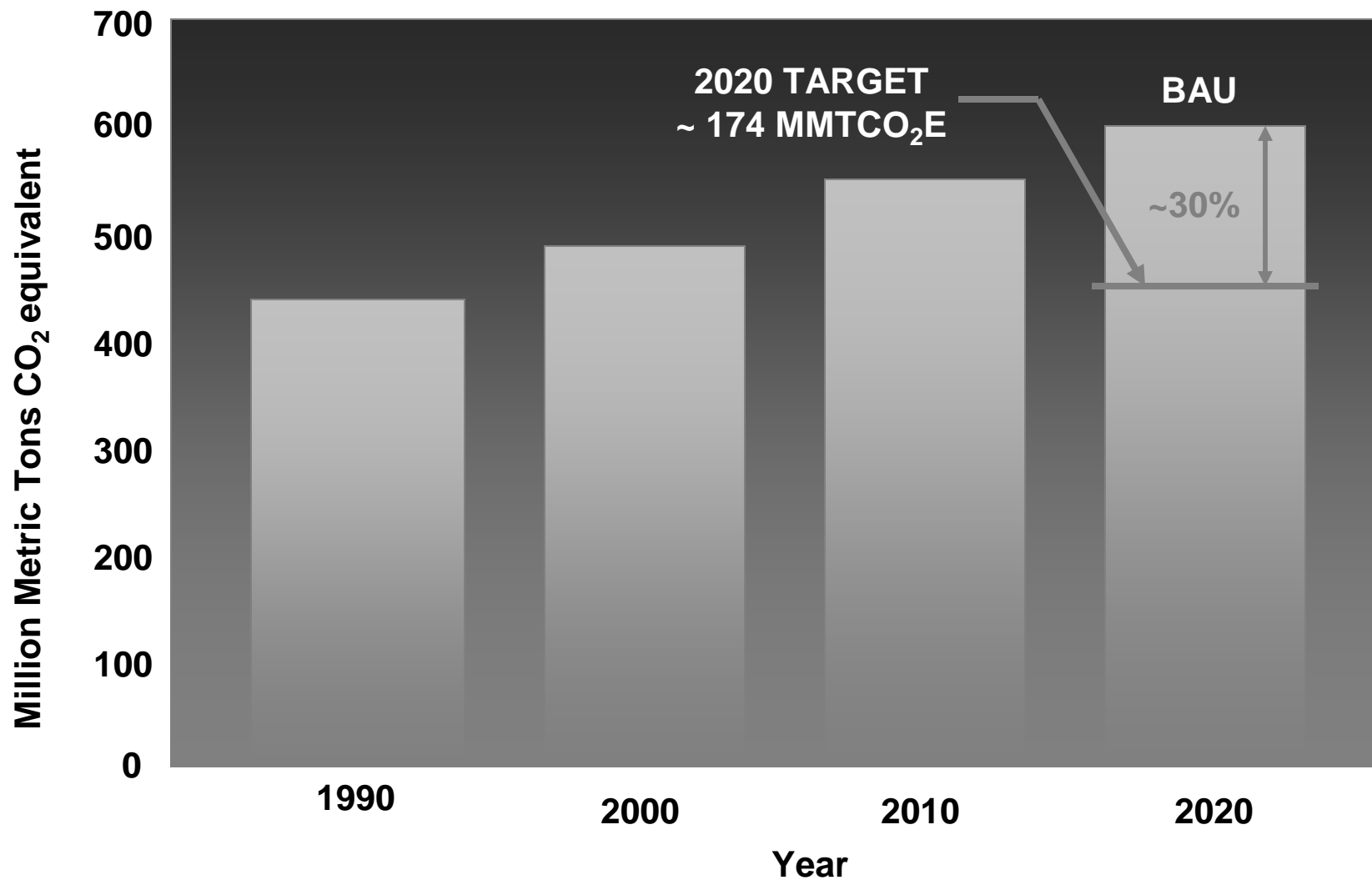


CO<sub>2</sub>



HFCs

# 2020 Emissions Reduction Target established by AB 32 (relative to 'business-as-usual' emissions)



## “Discrete Early Actions” are:

- Regulations to be adopted by CARB
- Must be listed by June 30, 2007
- Must be enforceable by January 1, 2010
- *Our interpretation: Considered by Board by early 2009, processed thru Office of Administrative Law, and legally on the books by January 1, 2010*

# First Early Action related to HFCs: Restriction of High GWP Refrigerant Use by DIYs

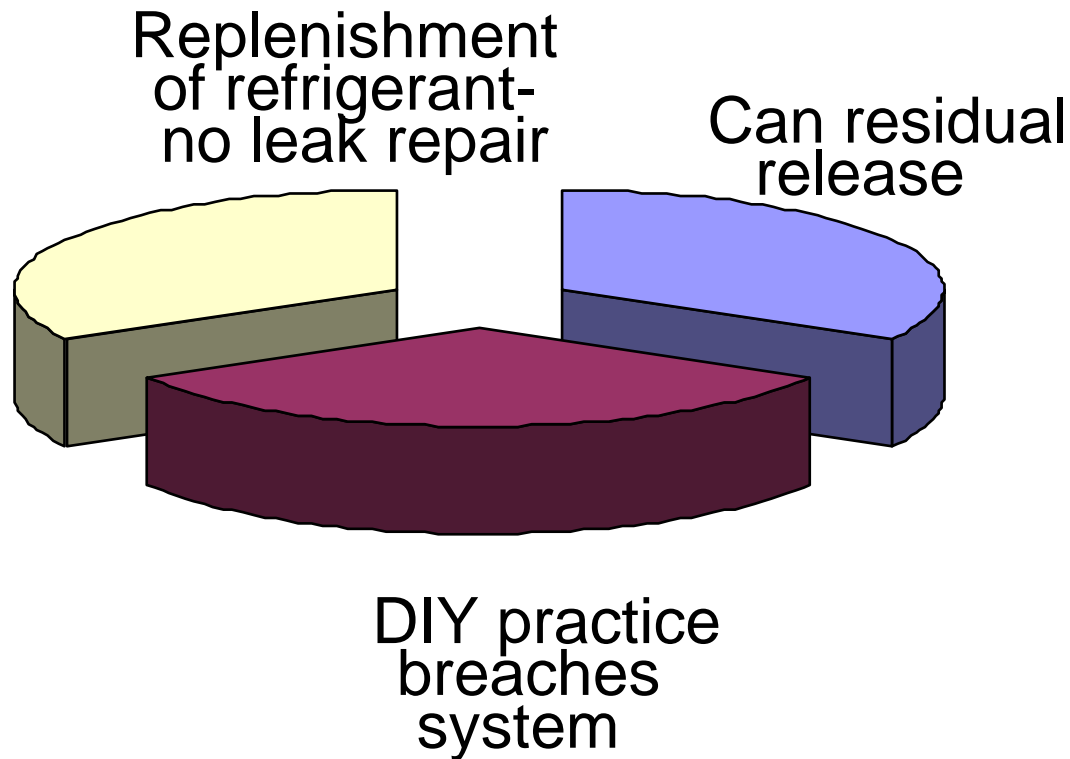
- Prohibit recharging of leaky automotive air conditioning systems by non-professional DIYs
- Potential benefit: 1-2 MMTCO<sub>2</sub>E reductions by 2020



# Sources of Refrigerant Emissions

**Mechanisms for  
refrigerant loss to the air  
due to DIY practice and  
use of small cans**

**Two Key Concerns**

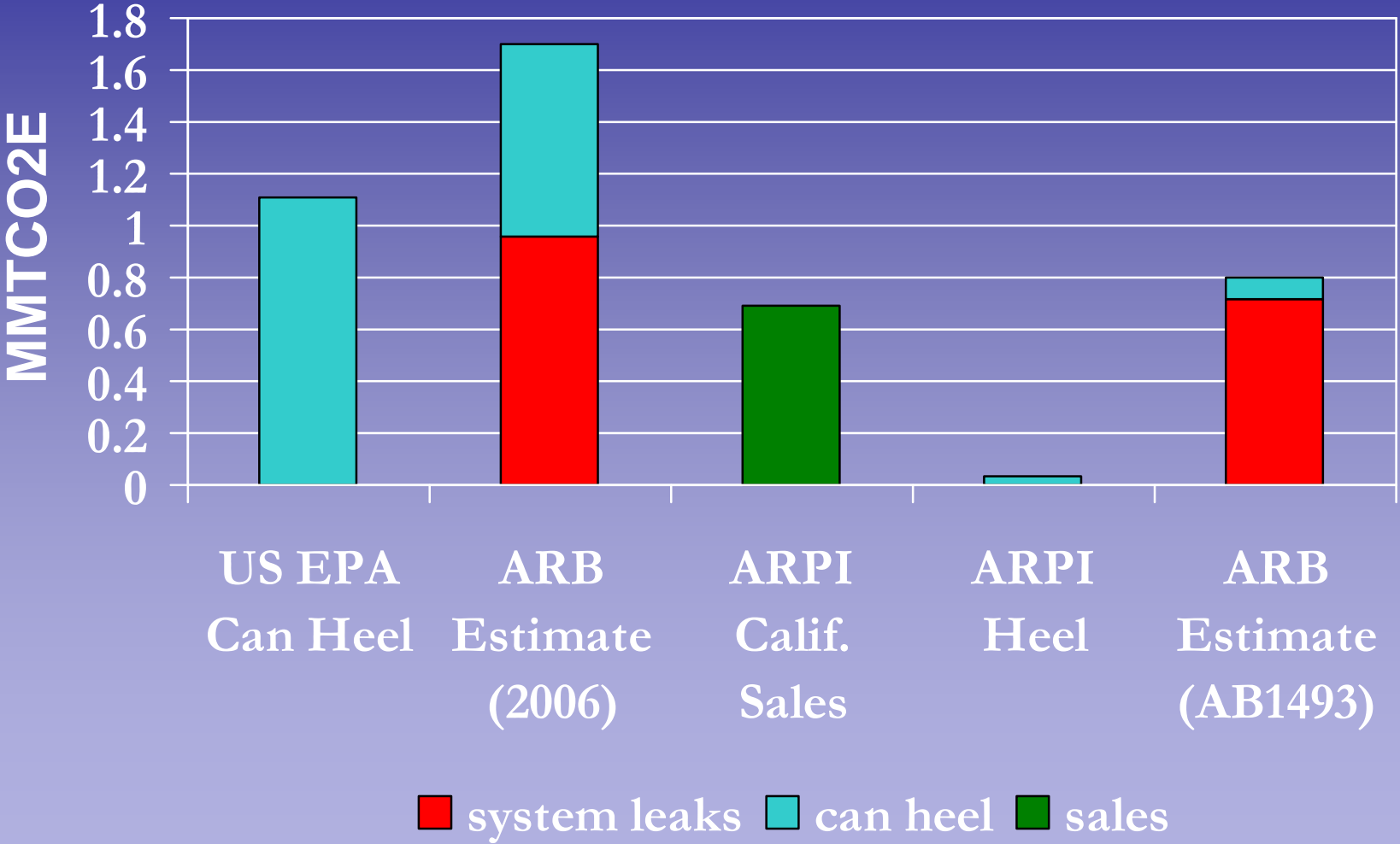


- Excess leakage
- Can heel

**(NOT TO SCALE)**



# GHG Emission Burden due to Cans used by DIYers



# Alternative Proposals Under Consideration

- Industry-led can deposit & recycling program
- Self-sealing valves in cans to prevent leakage
- Expansion of Smog Check program to include leak check and fix
- Next steps:
  - develop regulation as “discrete early action” by early 2009
  - leave final form of rule open pending further evaluation
  - engage industry and other stakeholders

# Other Early Actions Related to HFCs used in MVACs

<b>Strategy</b>	<b>Board Hearing</b>
Cool automobile paints	March 2009
Enforce federal ban on HFC releases during service/dismantling of MVACs	2010
Require low GWP refrigerants for new MVACs (HDV and non-LDV applications)	2010
Strengthen light-duty vehicle standards (phase out high-GWP HFCs in MVACs in next phase of AB-1493-Pavley regulation)	2010
Add AC leak tightness test and repair to Smog Check	TBD

# Other Early Actions Related to HFCs in non-vehicle applications

<b>Strategy</b>	<b>Board Hearing</b>
Specifications for commercial refrigeration	Dec 2010
Reduction of hydrofluorocarbons (HFCs) from foam production/installation including block foam (California foam banks ~ 650 MMTCO <sub>2</sub> E)	Dec 2011
Replacement of high global warming potential (GWP) gases used in fire protection systems with alternate chemical(s)	2011

# Early Actions to Reduce Greenhouse Gas Emissions

## EARLY ACTIONS CONSIDERED BY BOARD IN 2007-2011 TIMEFRAME

### ARB MEASURES

#### GROUP 1

Discrete Early Action Measures

#### GROUP 2

Additional Greenhouse Gas Reduction Strategies

#### GROUP 3

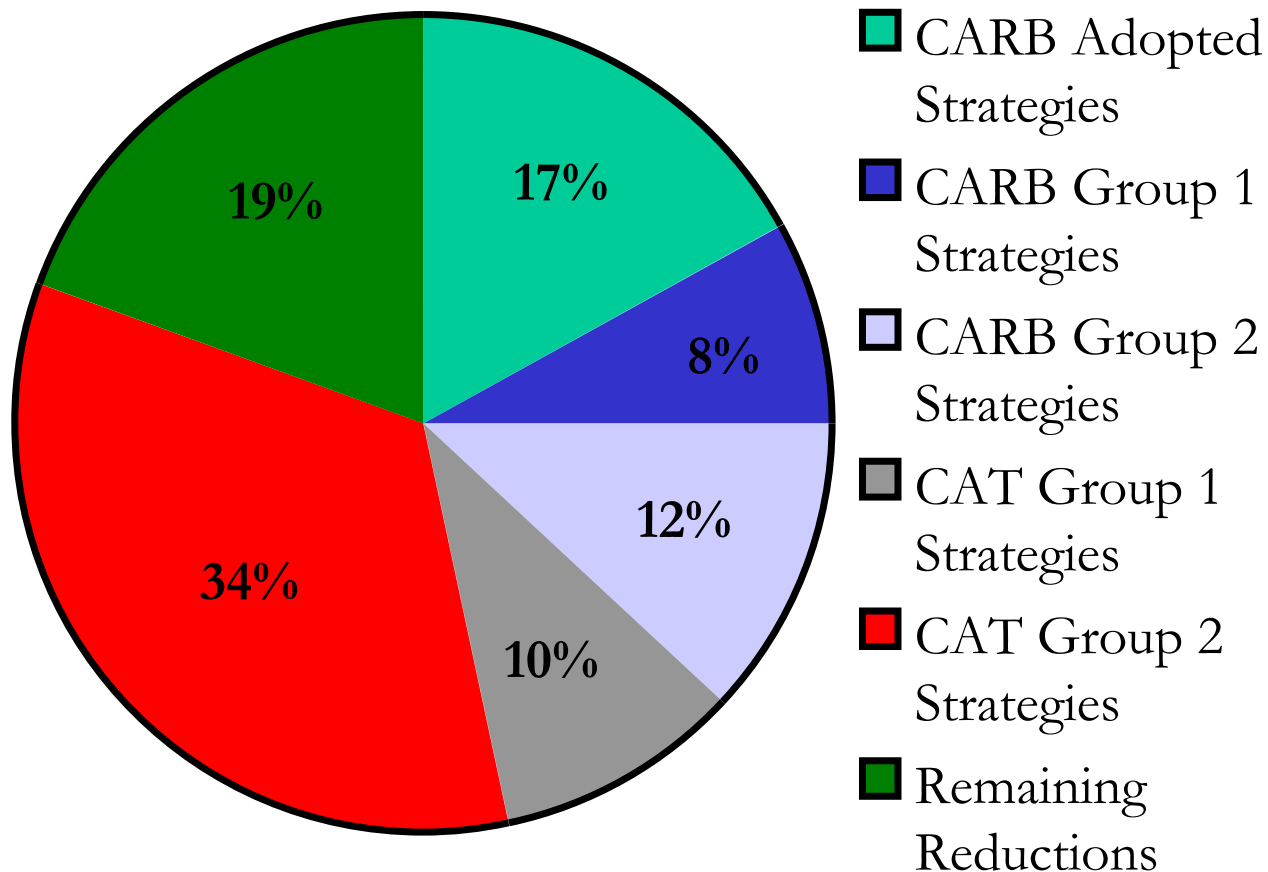
Criteria and Air Toxic Control Measures

### CLIMATE ACTION TEAM MEASURES

- 37 distinct reduction measures
- At least 33 MMTCO<sub>2</sub>E reductions
- ~20% of 2020 reduction target
- A key focus is mitigation of MVACSs

# 2020 Emission Reductions by CARB and other Climate Action Team Members

LOWER ESTIMATE (140 of 174 MMTCO<sub>2</sub>E)



ARB and CAT GROUP 3 STRATEGY REDUCTIONS ARE TBD

# CARB-sponsored Research for Science-based Rule Making (Early Actions)

- In-use indirect MVACS emissions
  - PI = Tim Fox/Cal.State Univ. Northridge and
  - Co-PI = Pega Hrnjack & Clark Bullard/Univ. of Illinois, UC
- Determination of direct emissions from MACSs used in HDV and other non-LDV applications
  - PI = Rick Baker/Eastern Research Group
- Quantification of end-of-life refrigerant MVACS emissions in California
  - PI = Cindy Stover/Foundation for California Community Colleges
- Emissions of HFC-134a from servicing of MVACSs by DIYers and professionals in California
  - PI = Denis Clodic/ARMINE
- California inventory of refrigerant emissions from commercial refrigeration, with emphasis on retail food
  - PI=Denis Clodic/ARMINE

# CARB's In-house Research on MVACS and RAC

- Exploration of advanced system design and existing rules for commercial refrigeration:
  - Low-charge multiplex systems, distributed systems, secondary loop systems, and advanced, self-contained systems
  - South Coast Air Quality Management District Rule 1415 is template for Inspection and Repair Program
- Running SHED measurement of HFC-134a leaks from 30 California in-use vehicles (testing at CARB's Haagen-Smit Laboratory)
- Consider modifications to existing Smog Check Program for refrigerant leak test and repair
- Enhance understanding of benefits from cool paints and other technology-based approaches including window glass, cabin ventilation, seat cooling, etc.
- Investigation of abatement options for non-Kyoto GHGs such as ODSs



# ***Final Remarks and Next Steps***

- Abatement of impacts from HFC refrigerant and other high-GWP GHGs is expected for helping meet California's GHG emission reductions targets
- Many technically feasible and cost-effective options are expected for all applications (LDV, HDV, off-road vehicles, commercial RAC, etc)
- Deployment of superior MVACS technology will be encouraged in California's actions for protecting the global climate pursuant to AB 32
- In parallel to rule development, continue to explore emerging opportunities for GHG emission reductions (i.e., mitigation of ODS impacts)
- Next, we will begin regulatory development process for the recently adopted discrete early actions
- Continue progress on voluntary actions, scoping plan, and other tasks