



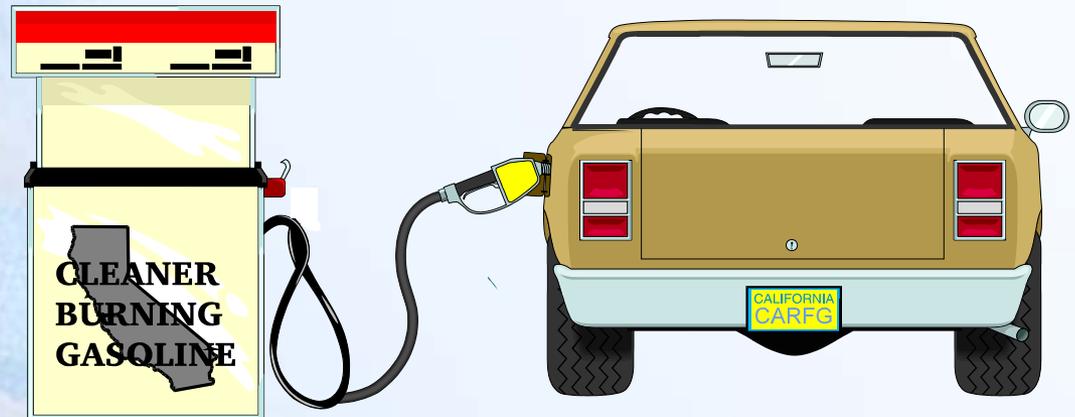
2004 SIP Summit

Gasoline and Vapor Recovery

January 13-14, 2004

Motor Vehicle Fuels Control Strategy

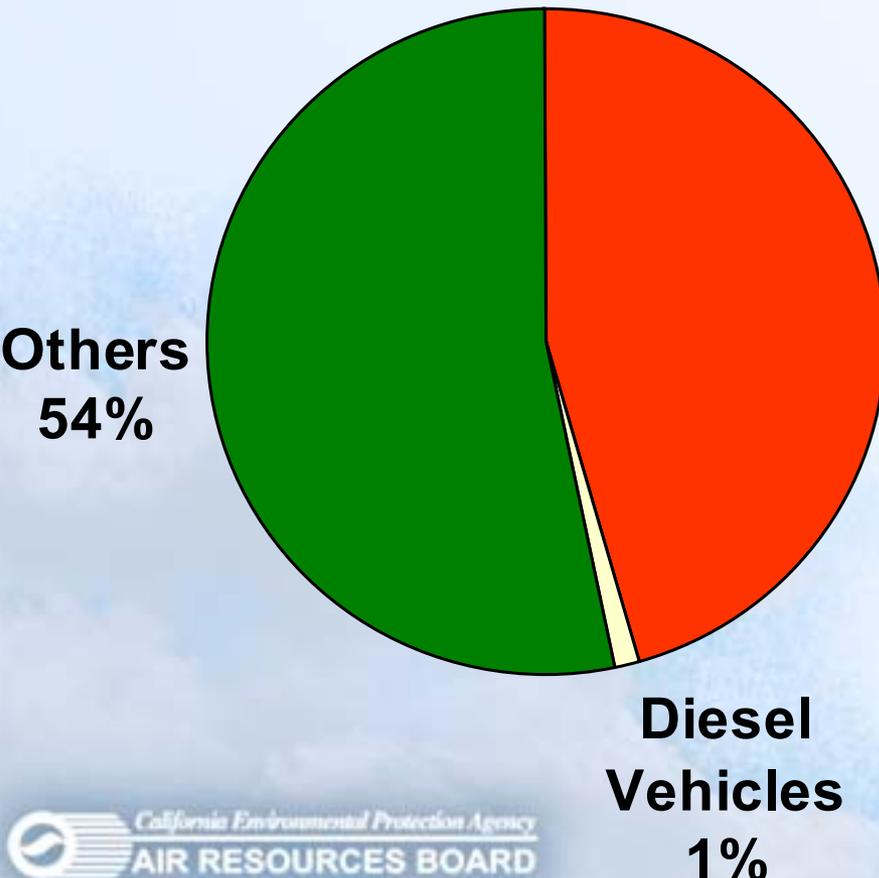
- Treat vehicles and fuels as a system
 - Vehicle emission standards
 - Fuel standards
 - Transport and marketing emissions
- Flexible



Statewide ROG Emissions Trend

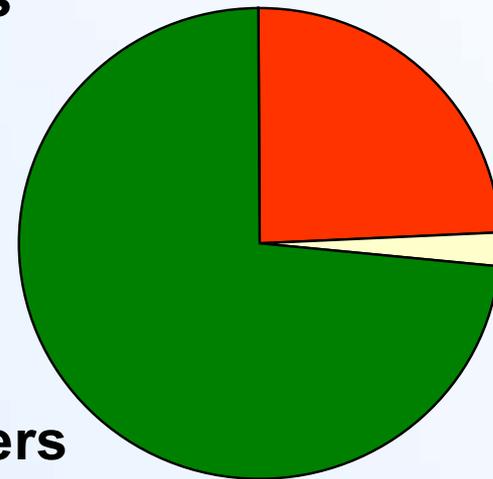
**CY 1995
(3500 tpd)**

**CY 2010
(2000 tpd)**



**Gasoline
Vehicles
45%**

**Gasoline
Vehicles
24%**



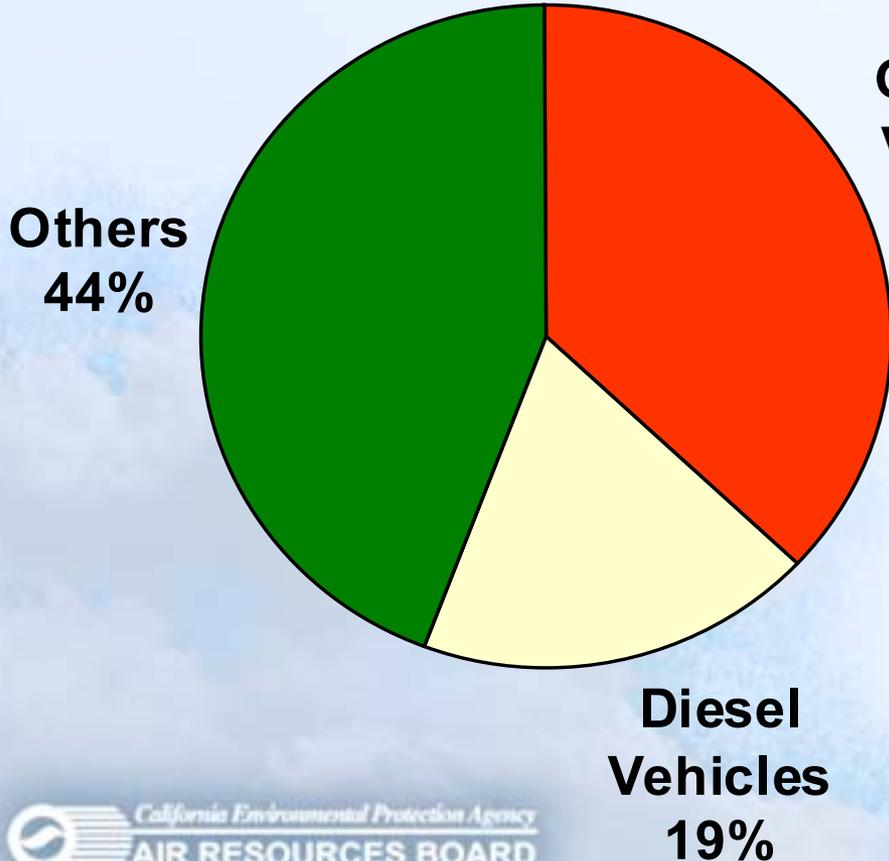
**Diesel
Vehicles
2%**

**Others
74%**

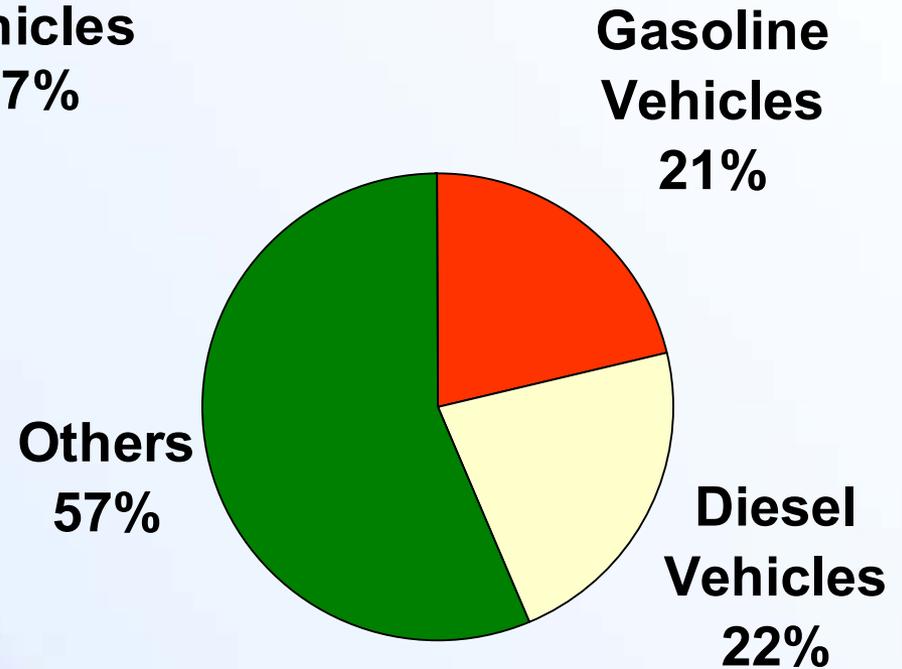
**Diesel
Vehicles
1%**

Statewide NOx Emissions Trend

**CY 1995
(4200 tpd)**



**CY 2010
(2500 tpd)**





2004 SIP Summit Gasoline

January 13-14, 2004

Fuels Program Benefits

Fuels Program	Emissions Reduction				
	HC	NOx	PM	SOx	Toxics
			<u>percent</u>		
Diesel	28	7	25	99	25
RFG	30	12	--	95	45
			<u>tons/day</u>		
Diesel + RFG	410	200	20	120	na

California Phase 2 Gasoline (CaRFG2) Program

- Adopted in 1991
- Implemented March 1996
- Phase 2 RFG Predictive Model
- Limits on the following parameters:

Sulfur

T50

T90

Olefins

RVP (Summertime)

Benzene

Aromatic Hydrocarbons

Oxygen Content



CaRFG2 Benefits

- Emission reductions equivalent to removing 3.5 million vehicles from region's roads
- Reduces smog forming emissions from motor vehicles by 15%
- Reduces benzene emissions by half
- Reduces potential cancer risk from vehicle emissions by 40%
- 1/4 of SIP reductions in 1996

CaRFG3 Regulations

- Approved December 9, 1999
- Amended July 2002
- Implement the Governor's Executive Orders
- Removed MTBE from California gasoline 12/31/03
- Provide additional flexibility to remove MTBE and use ethanol
 - Ethanol is currently the only oxygenate approved for use in California gasoline
- Gain additional emissions benefits over the California Phase 2 RFG program

Suggested Measures for Further Evaluation

- SIP commitment includes examination of feasibility and scope of further gasoline specifications

Suggested Measures for Further Evaluation (cont.)

- Sulfur 5 ppm
- Oxygen 0 %wt.^a
- Aromatics 25 %vol.
- Olefins 6 %vol.
- T50 200°
- T90 300°
- RVP 6.4^b - 6.5 psi
- Benzene 0.1% vol.

^a Federal CAA RFG areas must have at least 2% oxygen

^b U.S. EPA minimum

Comparison of Flat Limits

	Phase 2	Phase 3	Suggested Measure
Sulfur ppm	40	20	5
Oxygen %wt.	2^a	2^a	0
Aromatics	25	25	25
Olefins %vol.	6	6	6
T50 °F	210	213	200
T90 °F	300	305	300
RVP psi	7.0	7.0^b	6.5^c
Benzene %vol.	1.0	0.8	0.1

^a Federal CAA RFG areas to have at least 2% oxygen

^b RVP flat limit is 6.9 if CaRFG3 Predictive Model is used

^c U.S. EPA minimum 6.4

Estimated Potential Benefits

- The estimated potential benefits associated with suggested measure in 2010:

	<u>tons per day</u>
NOx	15
Hydrocarbons	35

Significant Issues

- Costs
- Supply

Significant Issues (cont.)

Capital	cents per gallon	\$/lb. controlled
Suggested Measure: 4 to 6 Billion dollars	10 - 20 ^a	45 - 90 ^b
CaRFG2: 4 Billion	10	6.3 ^b
CaRFG3: 1 Billion	3	NA ^c

a. Depends on costs of imports

b. Only HC and NO_x emissions reductions used to calculate cost effectiveness

c. Intended to eliminate MTBE

Significant Issues (cont.)

- Production and Imports
 - Could further reduce in-state production by about 15%
 - Require more imports

Significant Issues (cont.)

- Availability of Imports
 - Limited due to specifications that are radically different from federal RFG for rest of the nation
 - Sulfur - 5 ppm cap vs 30 ppm average for federal RFG
 - Benzene - 0.1% by volume vs 1% by volume for federal RFG

Other Significant Issues (cont.)

- Proposed 6.5 psi RFG limit makes production of complying fuel difficult if not impossible
 - Federal RVP minimum limit for fuel 6.4 psi
 - Leaves only 0.1 psi of flexibility
 - Reproducibility of test method is 0.2 psi

Other Significant Issues

- Proposed 0% Oxygen Content
 - Federal CAA requires 2% oxygen content
 - Federal CAA oxygen requirement applies to 80% of all fuel sold in California
 - Would require a waiver of the federal oxygen requirement
 - Wintertime oxygen content requirement still in effect for the South Coast and parts of Imperial County

Conclusions

- Significant supply and production issues to be addressed
- Feasibility assessments require additional investigation
- Potential for emissions benefits for gasoline



2004 SIP Summit

Vapor Recovery

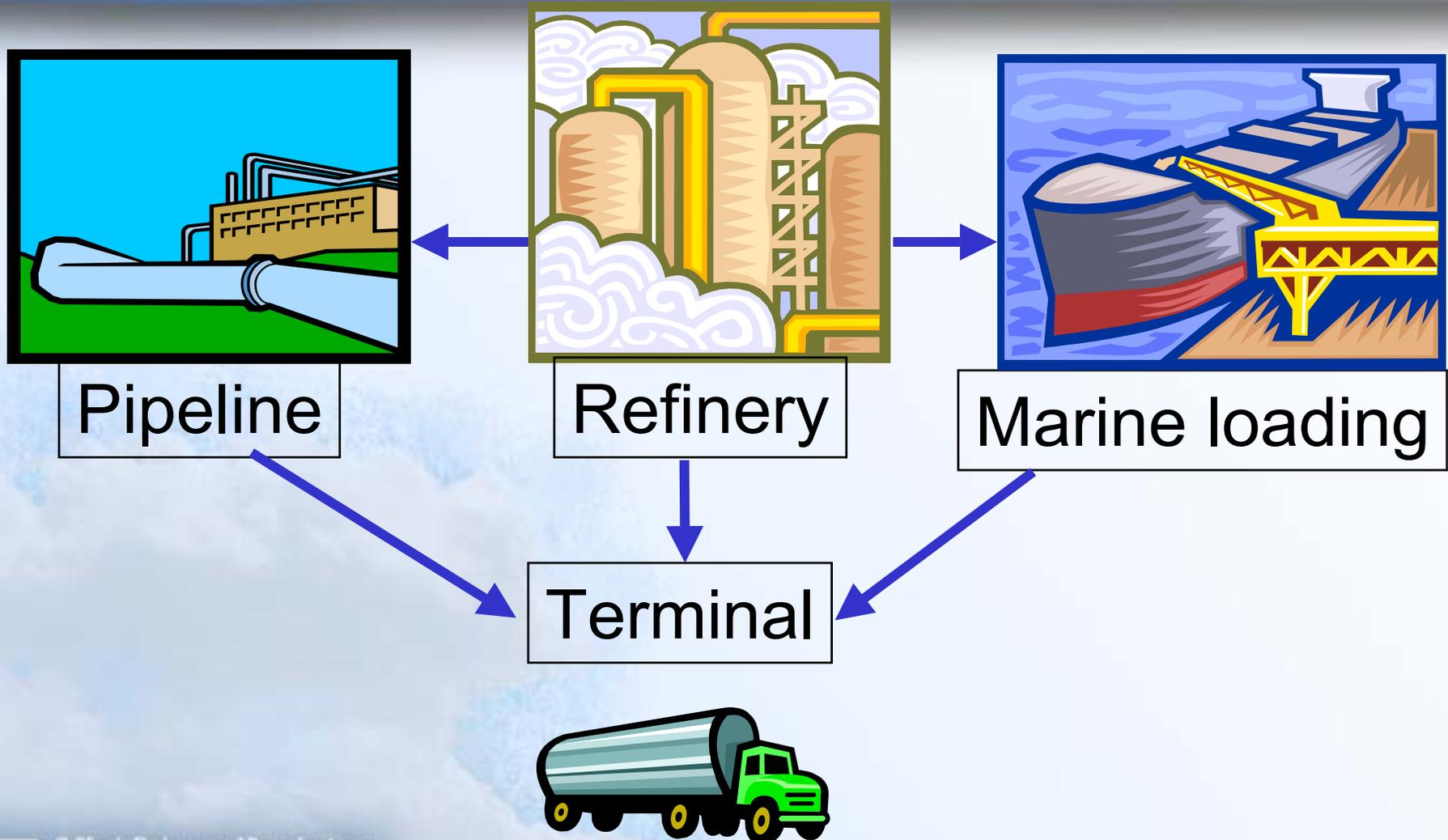
January 13, 2004

Working to Solve a Mystery

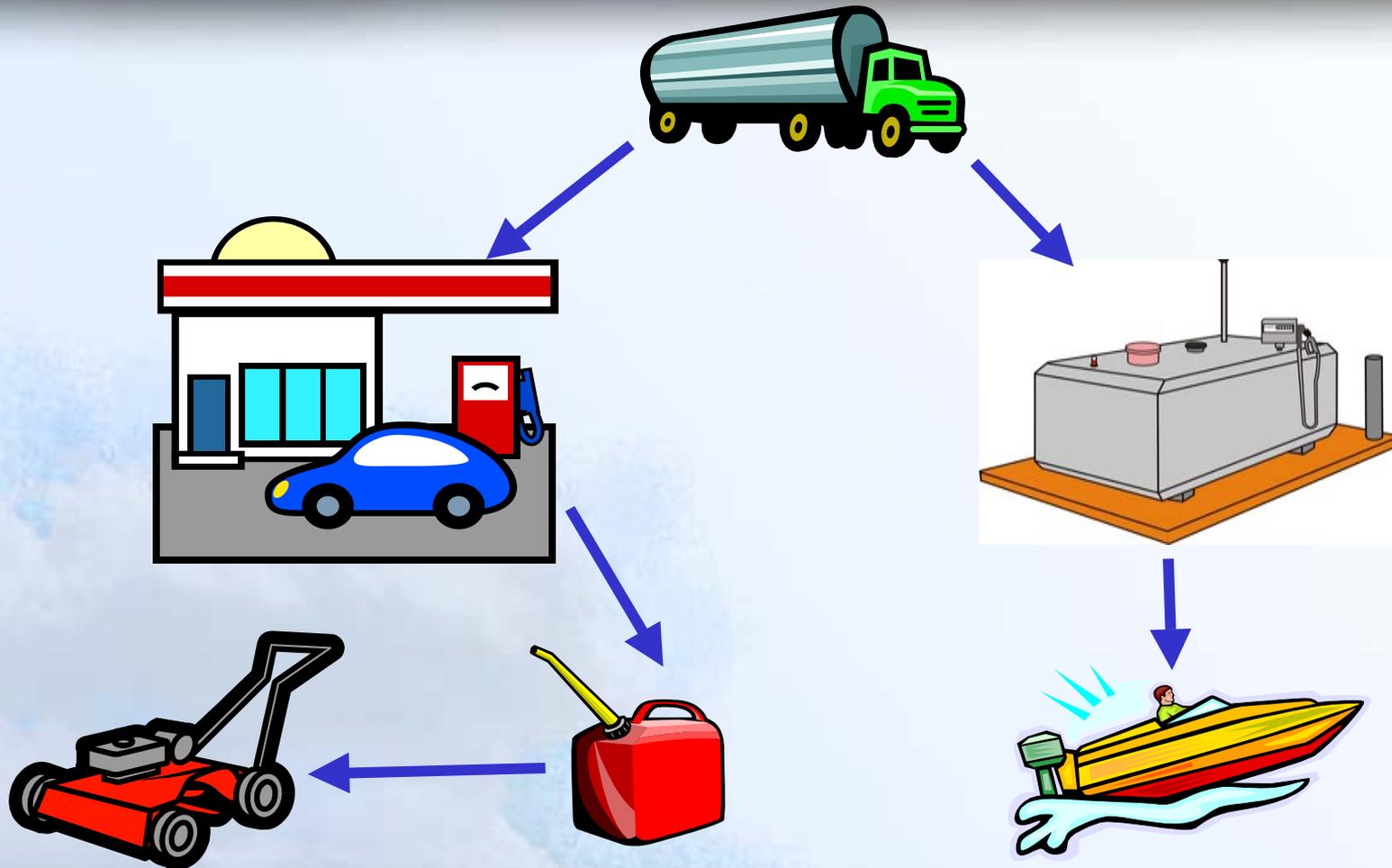
“there is much more unburned gasoline in the atmosphere than is indicated in the emission inventory.”

Harley, Hannigan and Cass
Environ. Sci. Tech. Vol.26, No. 12, 1992

Gasoline Pathways

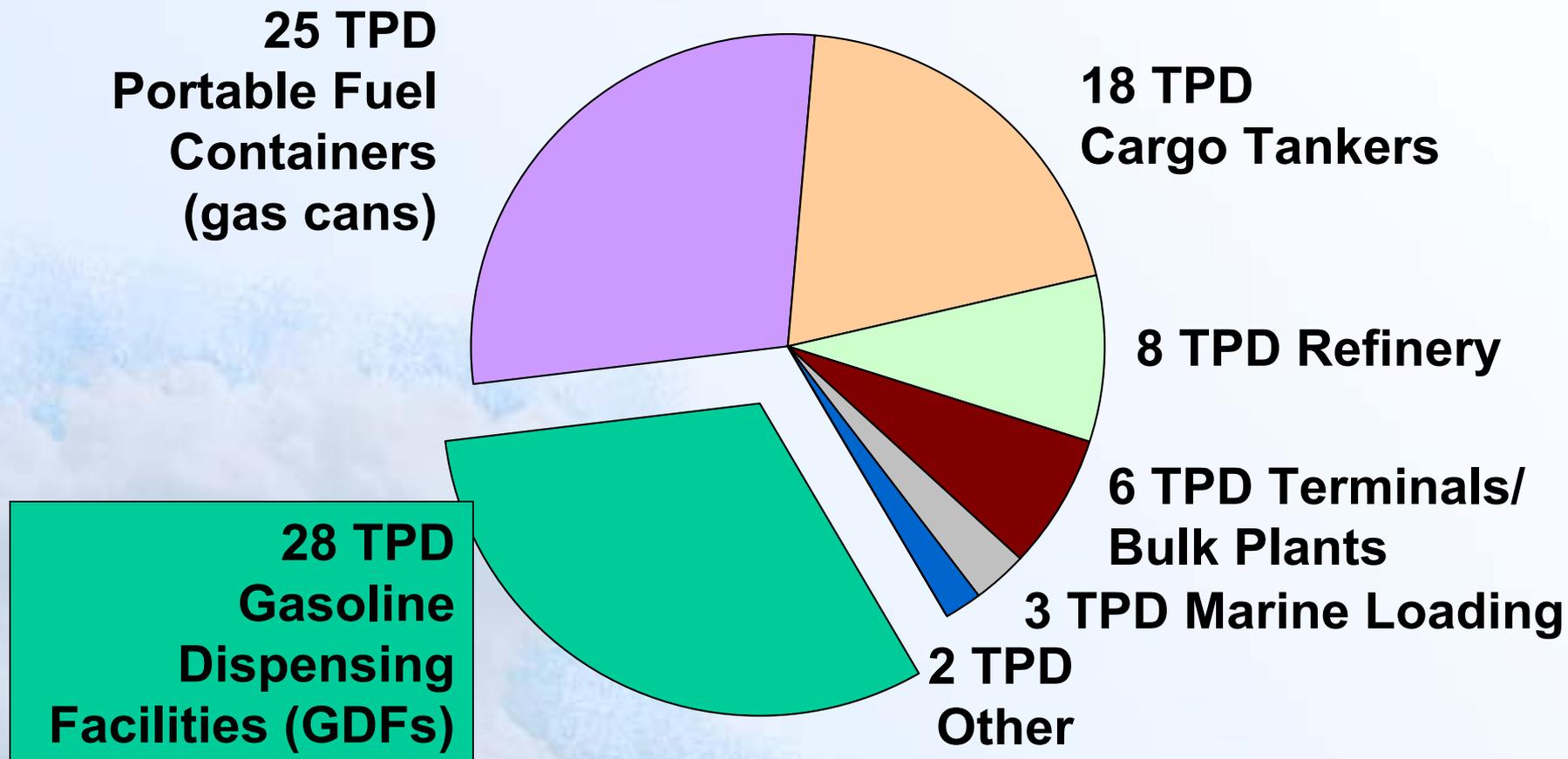


Gasoline Pathways

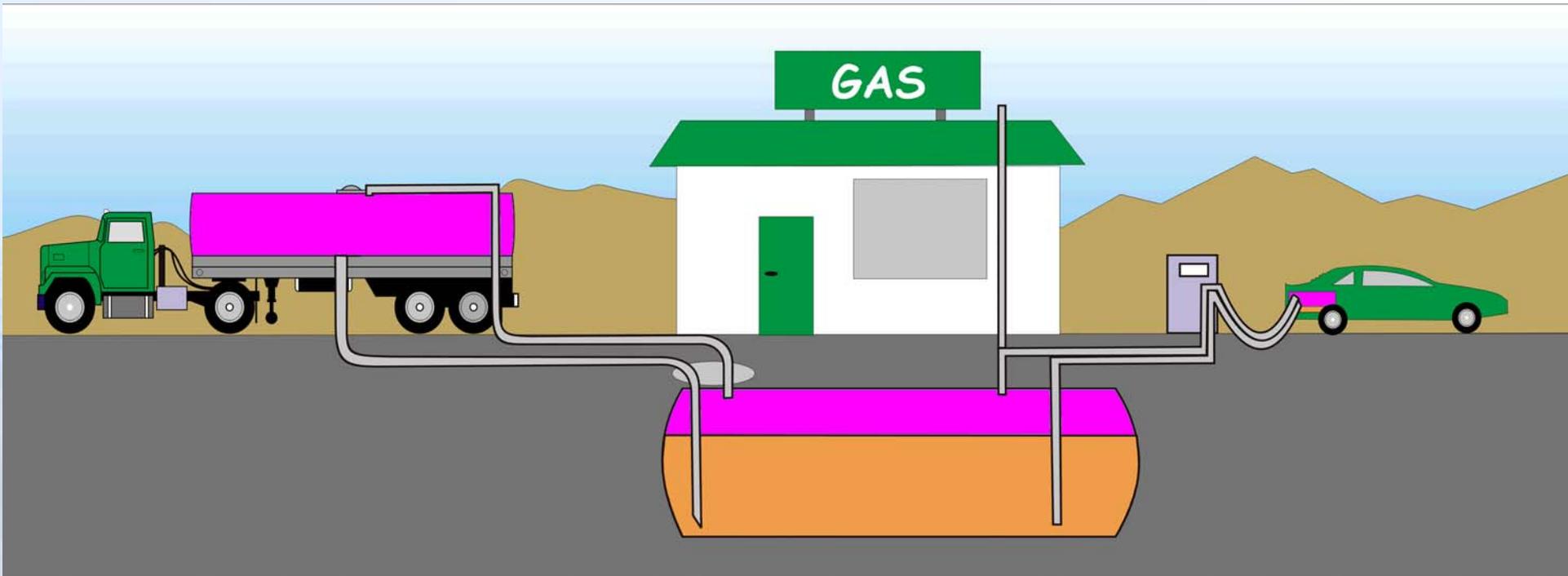


Petroleum Marketing & Fuel Storage Statewide 2010 ROG Emissions

89 tons per day



Vapor Recovery at GDFs



Phase I

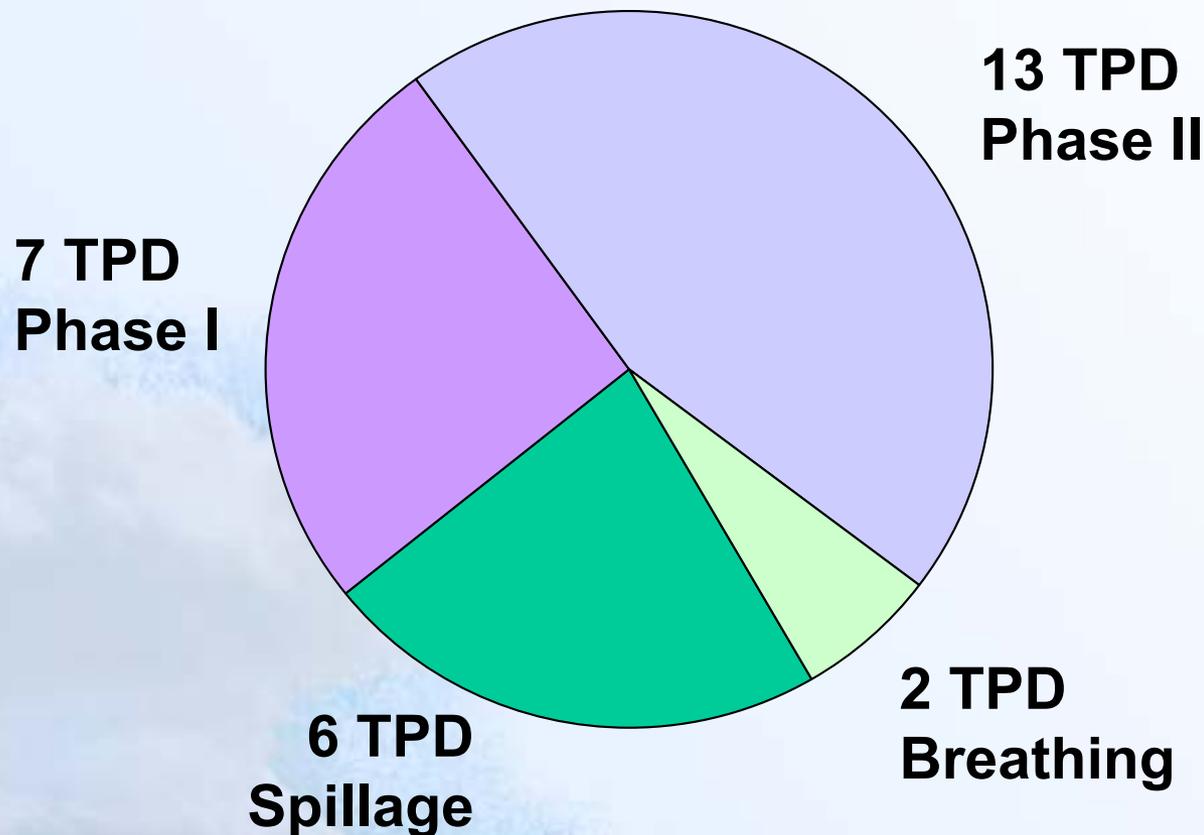
Phase II

GDF Vapor Recovery Benefits

- **347 TPD** from vapor recovery
- **25 TPD** from Enhanced Vapor Recovery (EVR)
- **Total: 372 TPD**

Gasoline Dispensing Facilities 2010 ROG Emissions

28 tons per day



EVR for Aboveground Storage Tanks (ASTs)

- EVR Phase I and Phase II emission reductions modest due to low throughput - less than 0.2 TPD
- Breathing emissions - up to 7.4 TPD



Gasoline Dispensing at Marinas

- Less than 0.2 TPD emission reductions as only about 0.10% of total state gasoline throughput dispensed at marinas



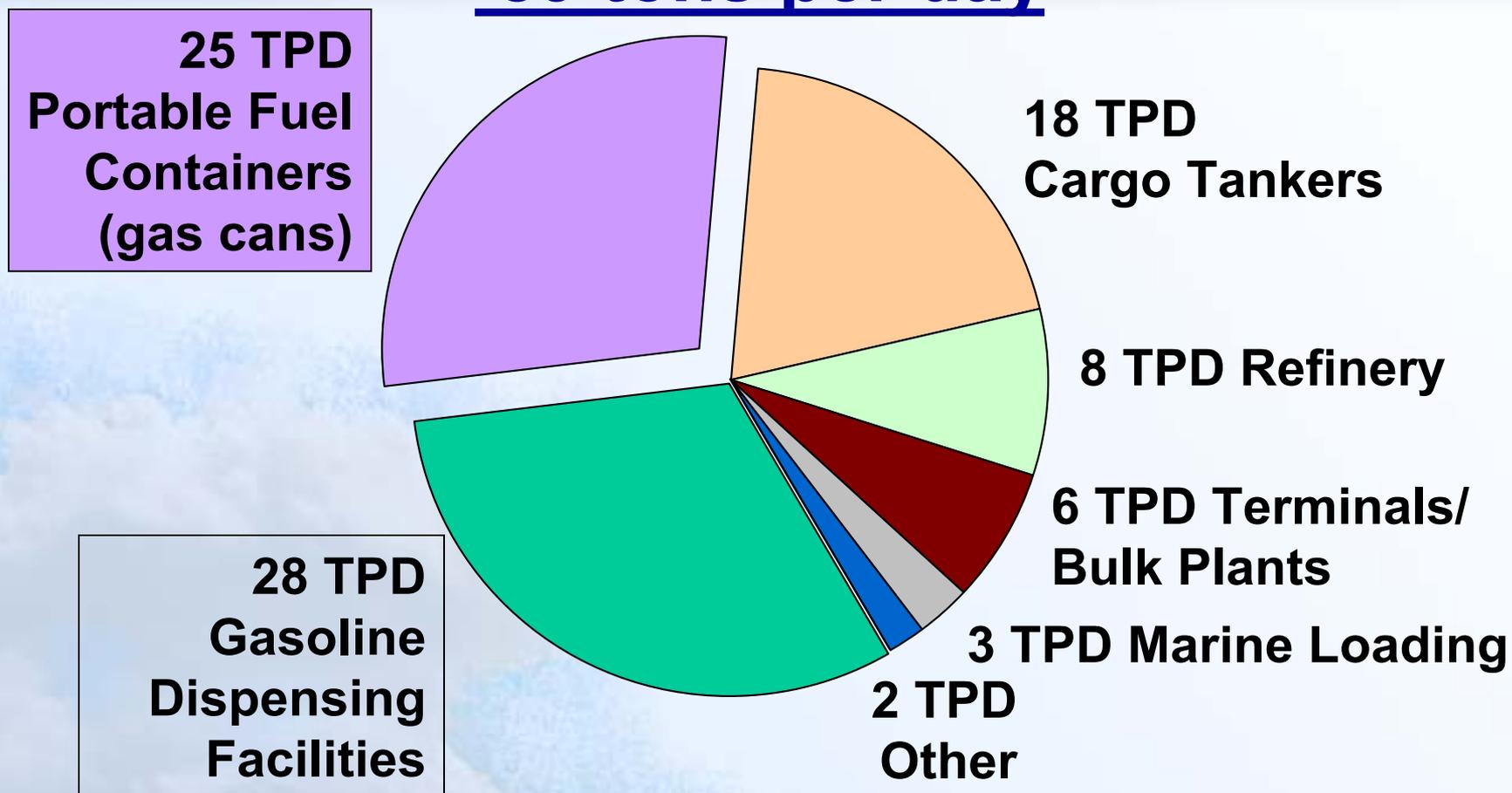
Gasoline Hose Permeation

- Estimated baseline emissions: 3.0 TPD
- Possible emission reductions: 1.7 TPD

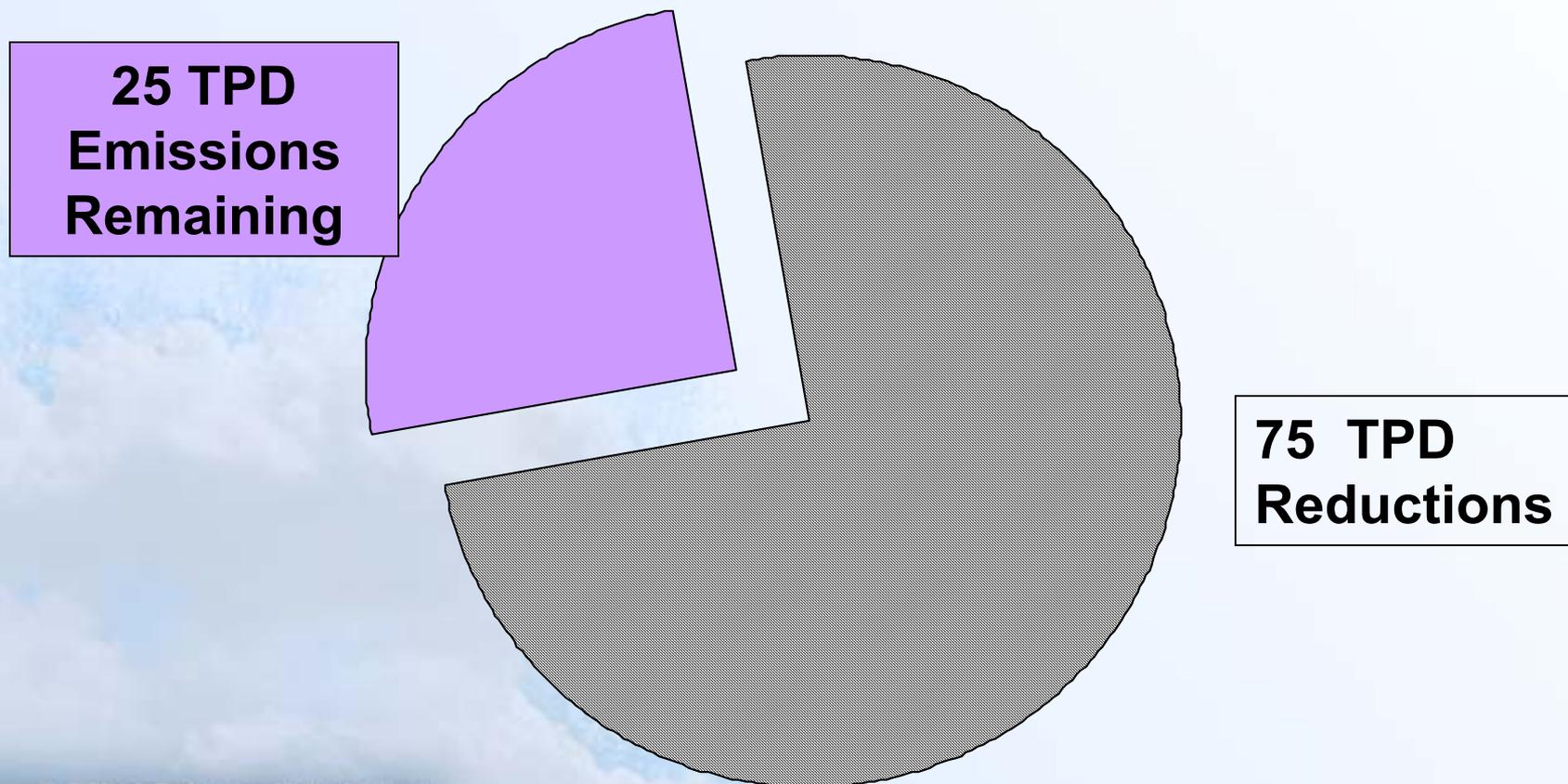


Petroleum Marketing & Fuel Storage Statewide 2010 ROG Emissions

89 tons per day



Portable Fuel Container (Gas Can) Regulation Emission Reductions

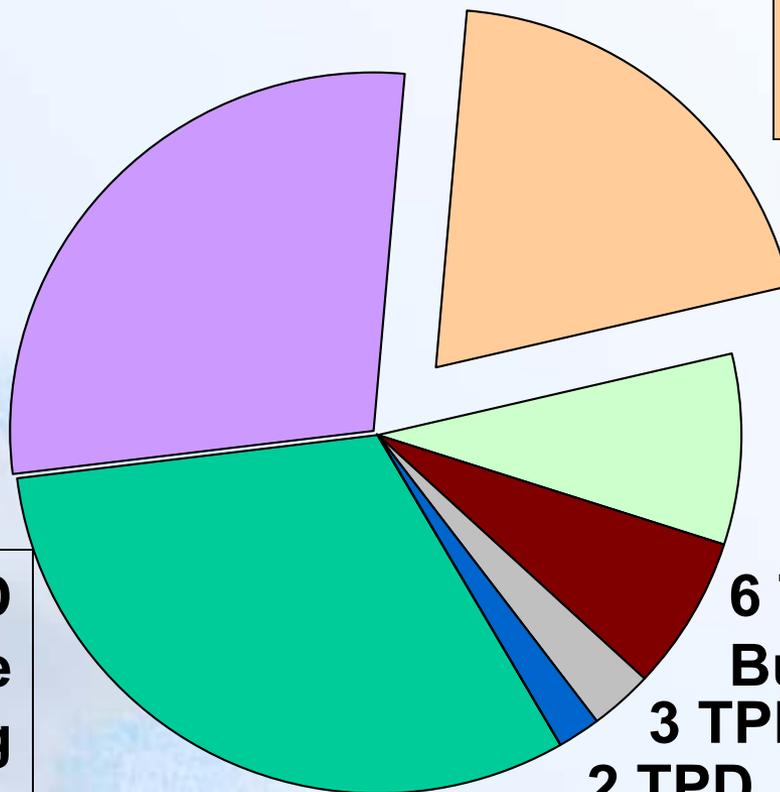


Petroleum Marketing & Fuel Storage Statewide 2010 ROG Emissions

89 tons per day

**25 TPD
Portable Fuel
Containers
(gas cans)**

**18 TPD
Cargo Tankers**



8 TPD Refinery

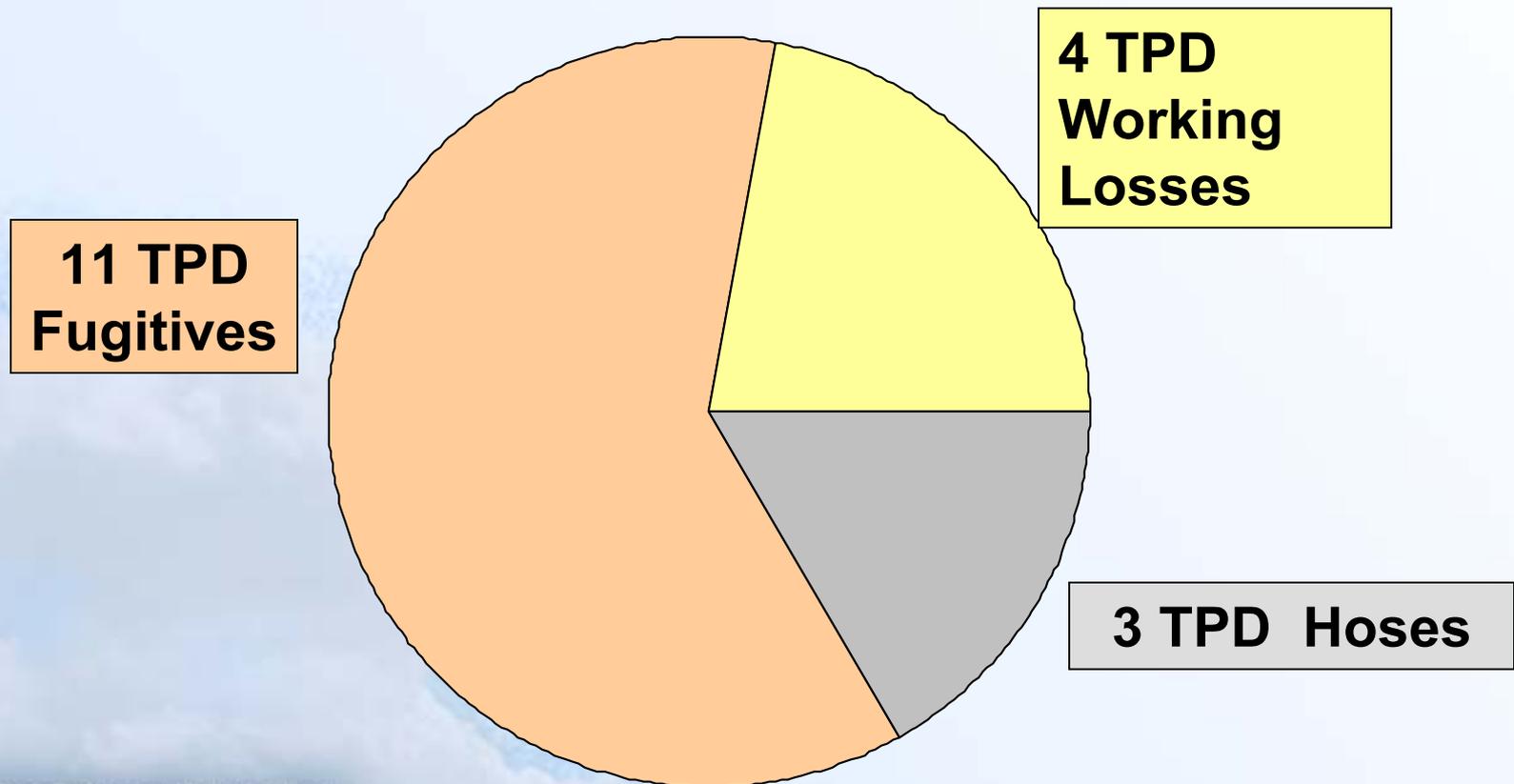
**28 TPD
Gasoline
Dispensing
Facilities**

**6 TPD Terminals/
Bulk Plants**

3 TPD Marine Loading

**2 TPD
Other**

Gasoline Cargo Tankers 2010 ROG Emissions 18 TPD



Cargo Tanker Emission Points

Vapor Vent Valve



Vapor and Product Hoses

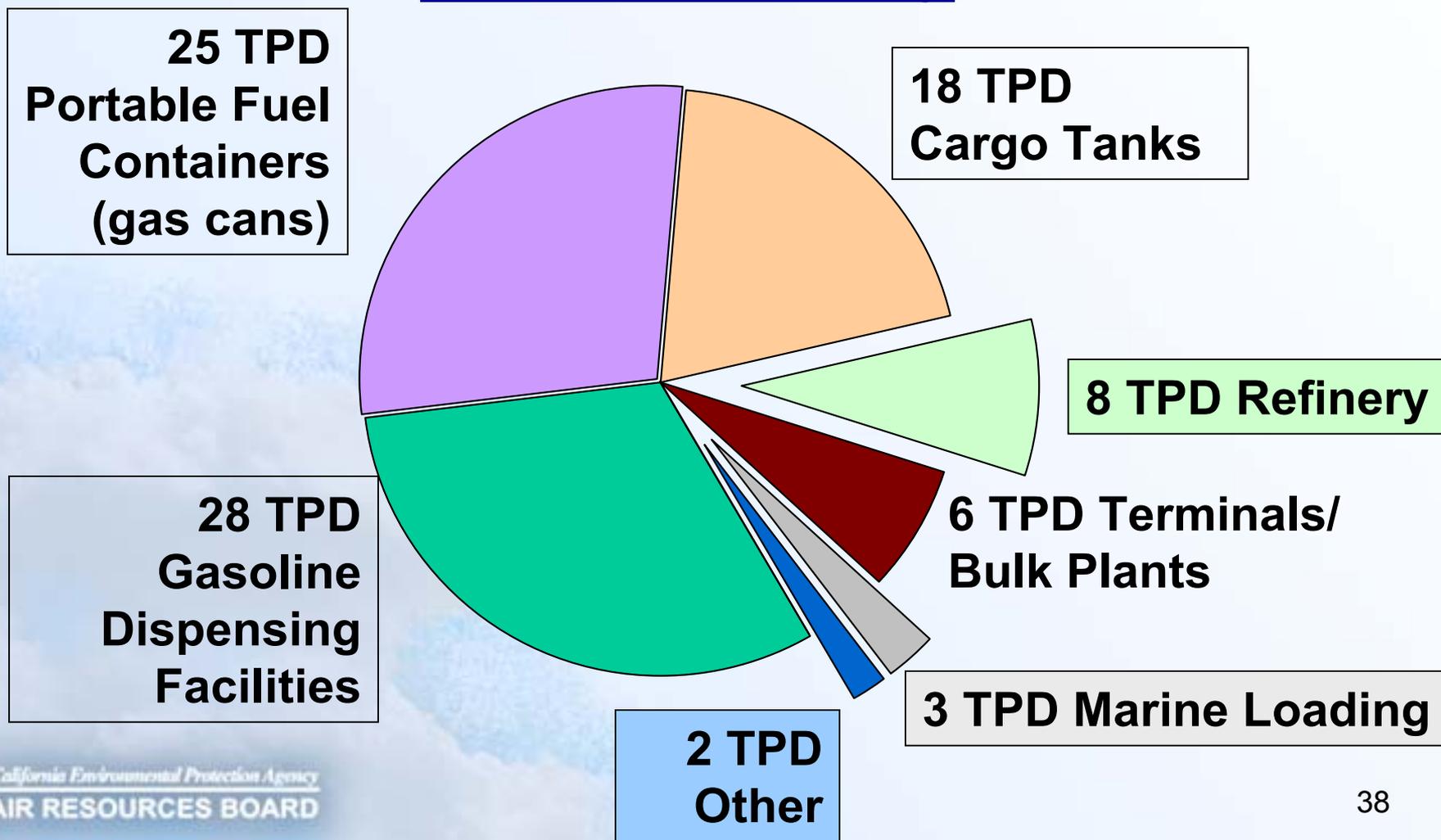
Gasoline Cargo Tankers

- Estimated baseline emissions: 14 tons/day
- Possible emission reductions: 11 tons/day



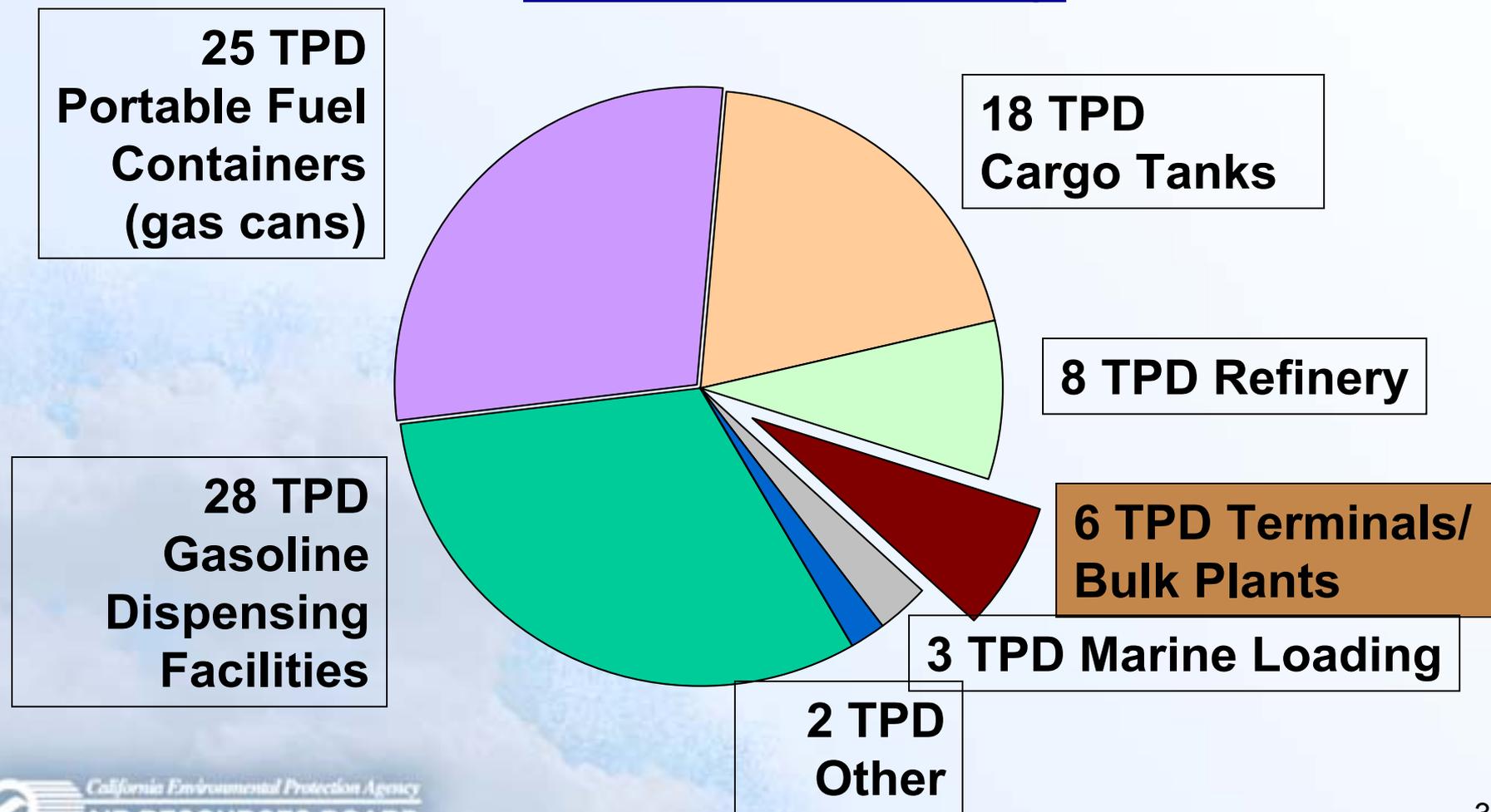
Petroleum Marketing & Fuel Storage Statewide 2010 ROG Emissions

89 tons per day



Petroleum Marketing & Fuel Storage Statewide 2010 ROG Emissions

89 tons per day



Other Possible Measures

- Increase certification efficiency for gasoline transfer operations at terminals, bulk plants and GDFs
- Increased electronic monitoring
- Eliminate breathing losses by keeping gasoline vapor space at negative pressure
- Reassess spillage standard based on EVR nozzles and new vehicles
- Propane and LPG distribution