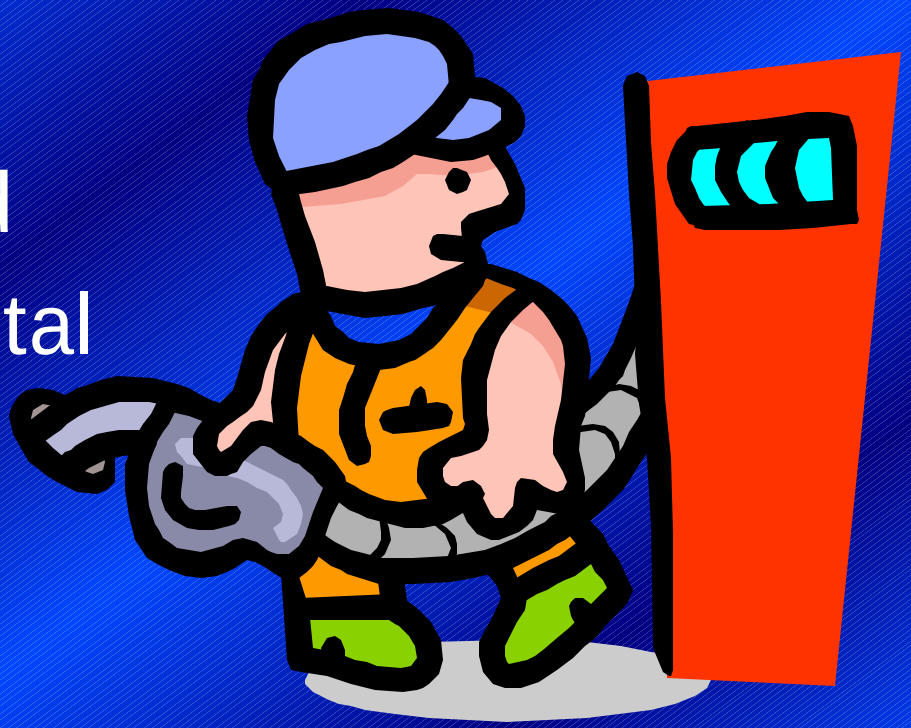
Enhanced Vapor Recovery Technology Review Workshop

February 5, 2002

Air Resources Board

California Environmental Protection Agency



Agenda

- Introduction
- Review of Tech Review Goals
- Summary of Oct 9 Workshop
- Discussion of Comments Received
- Changes to Feasibility Determinations for EVR Standards

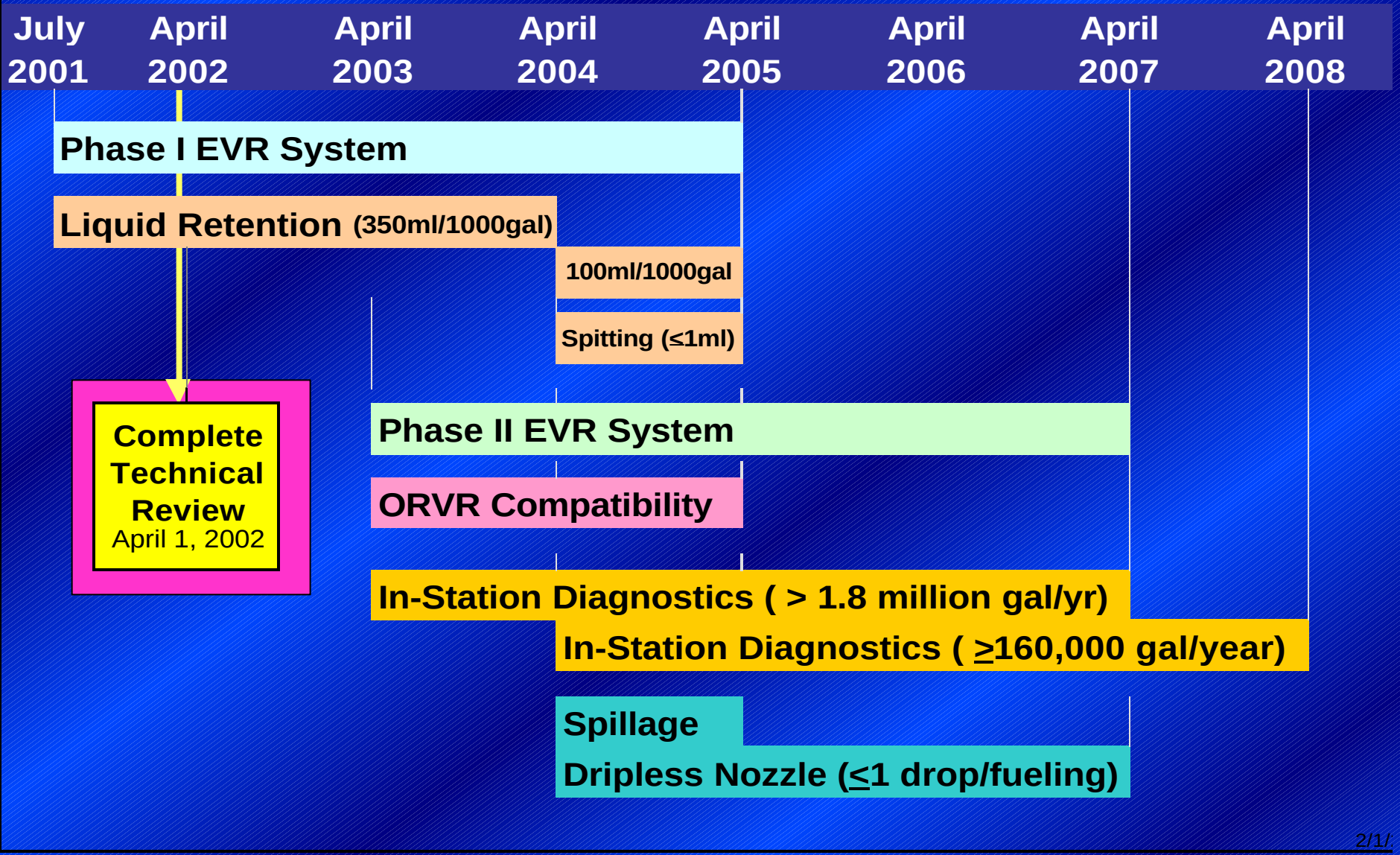
Agenda (cont.)

- Alternatives to EVR Standards
- In-Station Diagnostics
- Cost-Effectiveness Methodology Review
- Technology Review Schedule

Tech Review Direction from March 2000 Resolution

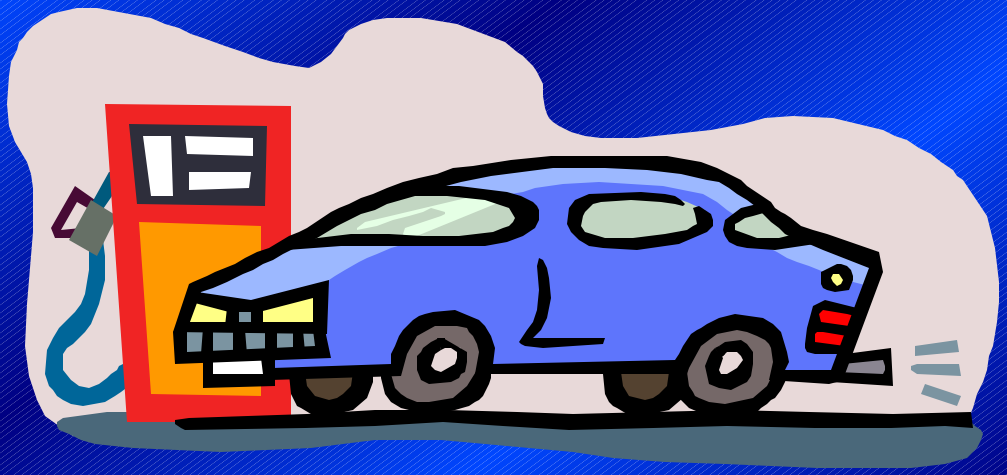
- Standards with future effective or operative dates, including ISD, nozzle performance standards & ORVR compatibility
- Comprehensive, thorough and rigorous
- Evaluate practical alternatives
- Hold workshops
- Complete tech review by April 1, 2002

The Enhanced Vapor Recovery Timeline



Scope of Tech Review

- ORVR Compatibility
- Phase II Standards
- “Nozzle” standards
- In-Station Diagnostics



Criteria for Technological Feasibility

Feasible?	Demonstration
Yes	Certified system OR ARB or manufacturer data shows meets standard
Likely	Information suggests standard can be met
Maybe	Development underway to meet standard
Not yet	Data indicates can’t meet standard now

Comments Received

- 10 stakeholders
- Topics
  - Feasibility criteria
  - ORVR
  - Phase II standards

Feasibility Criteria

- Comment: “Yes” determination should include being able to function 180 days “hands-off”.
- Response: If standard has been demonstrated, then durability can also be attained. Some maintenance allowed by CP-201.

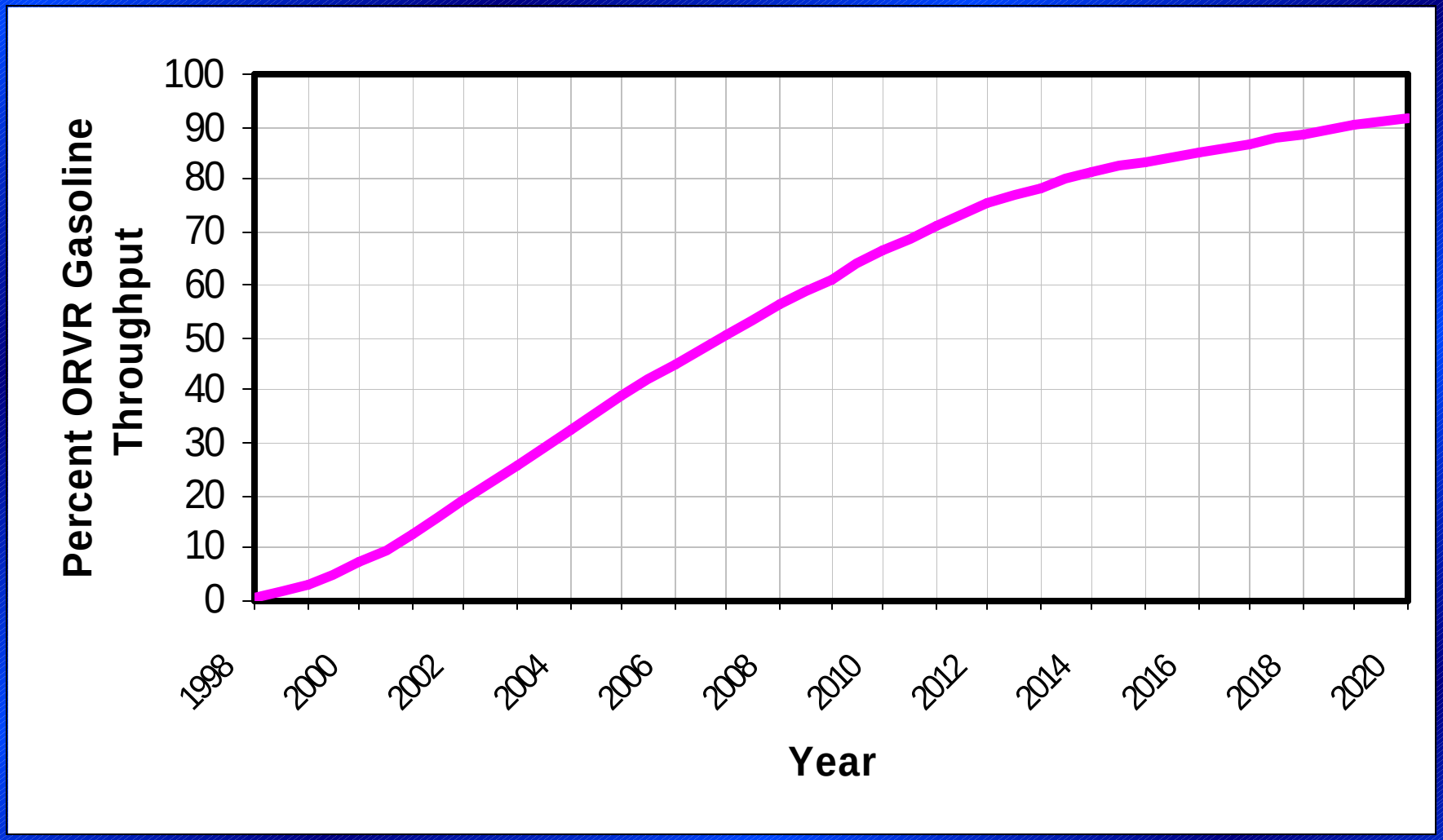
ORVR vs. Phase II

- Comment: There is no return on investment for EVR systems, as ORVR vehicles will replace Phase II
- Response: 90% ORVR penetration in 2020 is not high enough to remove Phase II. Penetration may be slower due to higher SUV sales.

ORVR Phase-in

Vehicle Class	40%	80%	100%
Passenger	1998	1999	2000
LD Trucks & MDV (<6000 lbs)	2001	2002	2003
MD Vehicles (6001-8500 lbs)	2004	2005	2006

ORVR Penetration Projection



2020 Calculation

- Assume uncontrolled Phase II emissions of 230 tons/day statewide
- Emissions with ORVR only

  (207 ORVR)(0.05) = 10 tons/day

  + 23 uncontrolled = 33 tons/day total
- Emissions with ORVR and Phase II

  (230) (0.05) = 12 tons/day total

  Difference is 22 tons/day!

Phase II Standard/Specification	Feasibility Status
Max. A/L of 1.00 for System Without Processor	Yes

Comment: Can't meet due to pressure drop variations in assist hanging hardware.

Suggestion: Change standard to 1.00 $\pm$ 0.10 or establish pressure drop budget for assist hanging hardware similar to that for EVR balance systems.

Response: Identify pressure drop requirements for certification or certify as innovative systems

Phase II Standard/Specification	Feasibility Status
Phase II Emission Factor (incl. pressure-related fugitives)	Likely

Comment: Changes to quantification of emissions, such as including fugitives, may affect ability to certify.

Response: Not all existing system types are expected to meet EVR standards. Systems operating at mostly negative pressures should meet new standards.

Phase II Standard/Specification	Feasibility Status
Balance System Component Pressure Drops	Likely

Update:

- CARB test apparatus complete
- Component testing underway
- Request components for testing

Phase II Standard/Specification	Feasibility Status
HAPs from Destructive Processors 1.2 lbs/yr 1,3-butadiene	Yes
84 lbs/yr acetaldehyde	Yes
36 lbs/yr formaldehyde	Likely

Comment: Manufacturer can't find testing labs that can meet HAP detection limits. 1,3-butadiene is present in gasoline vapor from refining process.

Response: We are surveying laboratories and will make a list available.

Phase II Standard/Specification	Feasibility Status
UST Pressure Criteria Daily avg $\leq$ +0.25 in water Daily high $\leq$ +1.5 in water Non-excluded hours = 0 $\pm$ 0.05 in	Yes

Comment: What are “non-excluded hours”?

Response: Related to language in former version of CP-201. Will remove in next amendment.

Phase II Standard/Specification	Feasibility Status
UST Pressure Criteria Daily avg $\leq$ +0.25 in water Daily high $\leq$ +1.5 in water	Yes

Comment: How are these values calculated?

Response: Proposed CP-201 amendment: Zero and negative pressure shall be computed as zero pressure and time at positive and zero pressures shall be included in the calculation.

Phase II Standard/Specification	Feasibility Status
UST Pressure Criteria Daily avg $\leq$ +0.25 in water Daily high $\leq$ +1.5 in water	Yes

Example:

6 hours at + 1.0 in water
18 hours at - 1.0 in water

$$= \frac{(6 \times 1) + (18 \times 0)}{24} = \frac{6}{24} = 0.25 \text{ in water}$$

Phase II Standard/Specification	Feasibility Status
UST Pressure Criteria Daily avg $\leq$ +0.25 in water Daily high $\leq$ +1.5 in water	Yes

Comment: Vacuum system cannot meet w/o processor (non-operational hours, winter fuel)

Response: Will collect additional data at stations with overnight closure and winter fuel.

Phase II Standard/Specification	Feasibility Status
Max. A/L Ratio of 1.30 for System with Processor	Maybe

Comment: Not feasible to modify processor systems certified today with higher A/L ranges.

Response: Not all existing certified systems will meet EVR standards. System with higher A/L ranges may apply as innovative.

Standard / Specification	Feasibility Status
Max. HC Rate to Processor (5.7 lbs/1000 gallons)	~~Maybe~~ Yes

Comment: Existing certified vapor processors cannot meet. Proposed membrane processors can meet.

Response: change feasibility status to “yes”.

Standard / Specification	Feasibility Status
Max. HC Rate to Processor (5.7 lbs/1000 gallons)	~~Maybe~~ Yes

Comment: Modify standard to limit maximum feedrate from processor under failure mode.

Response: Modification under consideration. Comments welcomed.

Nozzle Standard/Specification	Feasibility Status
Fuel Any Vehicle that can be Fueled with Conventional Nozzle	Yes

Comment: Vehicles must meet CA fillneck standards for nozzles to operate properly

Response: CP-201, Section 4.7.1 states "each vapor recovery nozzle shall be capable of refueling any vehicle that complies with the fillpipe specifications and can be fueled by a conventional nozzle"

Nozzle Standard / Specification	Feasibility Status
Nozzle Spitting < 1.0 ml/nozzle/test	~~Maybe~~ Likely

Comment: Nozzle manufacturer states standard already met by balance nozzles and can be added to assist nozzles

Response: Update feasibility status to “likely”.

Nozzle Standard/Specification	Feasibility Status
Spillage (incl. Spout Drips) $\leq$ 0.24 lbs/1000 gal	Maybe

Comment: no comments received

Response: request information from manufacturers. Collect field data.

Standard / Specification	Feasibility Status
Post-Refueling Drips ≤ 1 drop/refueling	Maybe

Comment: one nozzle manufacturer says need more than one drop.

Response: how many do you need?

Alternatives to EVR Standards

- The technology review shall include an evaluation of all practical alternatives to, and means of meeting, the requirements of Enhanced Vapor Recovery goals
- Need input from stakeholders

ISD Agenda

- Mission and Goals
- Pilot Program Test Results
- Comments (and Responses)
- Alternatives

ISD Mission

- Improve vapor recovery system monitoring to ensure systems operate as certified at all times.

ISD Goal

- Provide continuous monitoring of important emission-related vapor recovery system parameters and alert the station operator when a failure mode is detected so that corrective action can be taken. (EVR staff report, p. 40)

Summary of Pilot Program Testing

- Four ISD Test Sites
- Two Month Trial Run Completed
- Additional Data Collected

ISD Tests

- A/L Ratio or Flow Performance
- Challenge Mode Testing
- Leak Integrity
- New and Existing Dispensers and Hanging Hardware

ISD Test Results

ISD Requirement	ISD System Test Results
A/L Ratio or Flow Performance	Pass
Leak Integrity	Pass
Pressure Measurement	Pass
Data Storage	Pass

ISD Comment

Comment: ISD is Too Expensive.

Response: Cost-Effectiveness of ISD Systems Will Depend on the Cost of ISD Systems and the Hydrocarbon Emissions Prevented by ISD Systems.

ISD Comment

Comment: Only One ISD Vendor Participating in Pilot Program.

Response: Although Only One ISD Vendor is Currently Participating, Other ISD Developers are Developing ISD Systems; Staff Expects Additional ISD Systems to be evaluated.

ISD Comment

Comment: Improved EVR Phase II Systems Will Not Need ISD Systems.

Response: ISD Needed to Identify Normal Equipment Degradation, Improper Installation and Maintenance, and Customer Handling Issues.

ISD Comment

Comment: Exclude Non-Operational Hours From ISD Requirements.

Response: ISD System Must be Operational 24 Hours a Day to Identify Such Parameters as Excess Vapor Pressure, Leak Integrity, and Improper Deliveries.

ISD Comment

Comment: ISD Certification Test Should be Rigorous and Thorough

Response: ISD Systems Will be Tested for 180 Days (Minimum) Including Operational and Challenge Mode Conditions to Ensure ISD Systems Identify All Failures Specified in ISD Appendix.

ISD Alternative

- Alternative Must Give Equivalent or Better Results Than Required in ISD Appendix. Examples of Possible Alternatives Include:
  - Manual Monitoring
  - Partial ISD with Supplement
  - Better Monitoring of Some Parameters, Decreased Monitoring of Others

Cost Methodology

- Based on EVR approach
- Described in Feb. 4, 2000 EVR Staff Report (ISOR)
- Available on webpage:

  http://www.arb.ca.gov/regact/march2000evr/march2000evr.htm

GDF Classification

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
%	4.7	14.1	45.7	31.3	4.2

Gasoline Dispensing Facility (GDF) divided into five groups based on throughput

GDF Classification

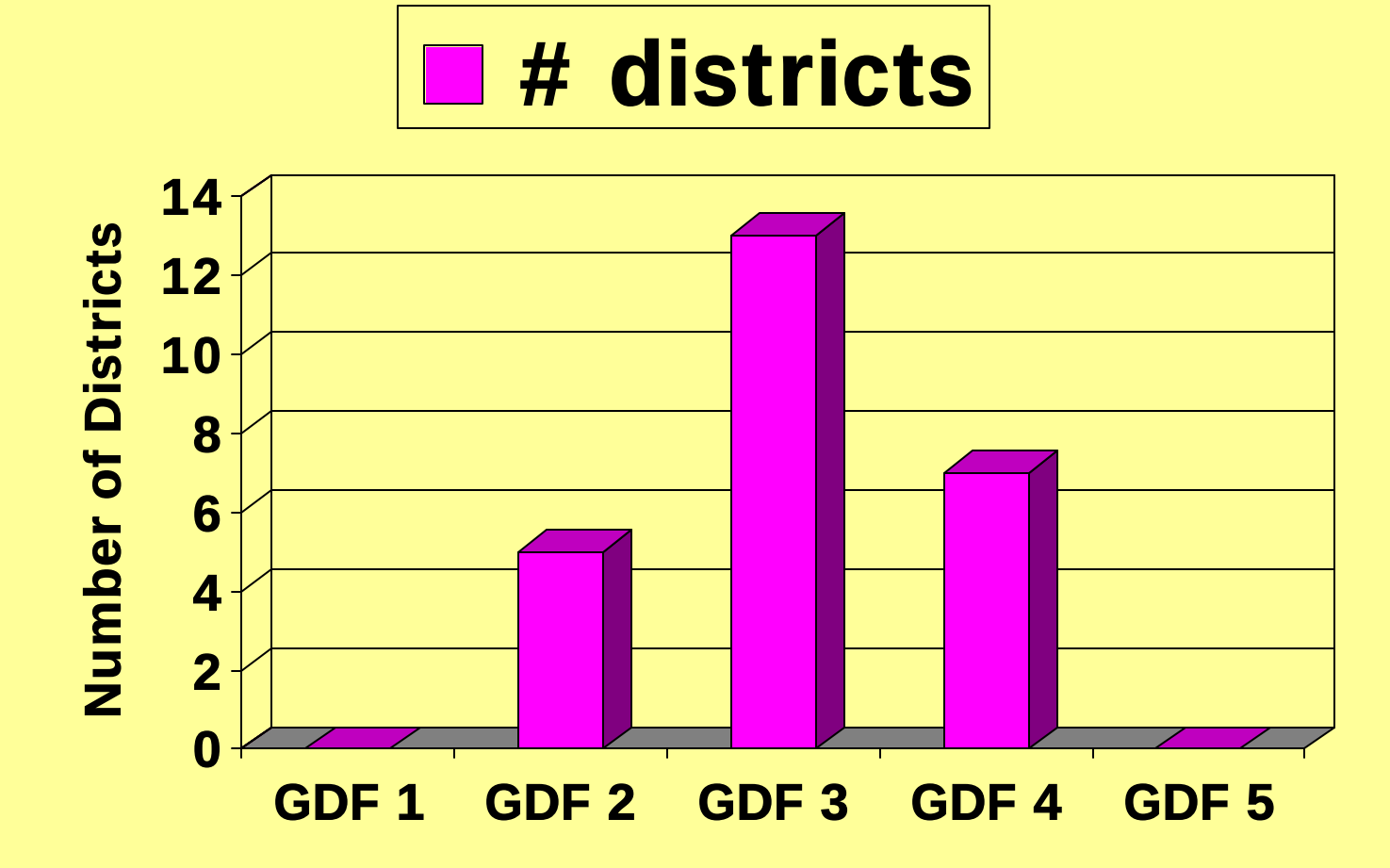
EVR staff report:

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
%	4.7	14.1	45.7	31.3	4.2

San Diego APCD:

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
%	5.3	9.7	22.4	46.6	16.0

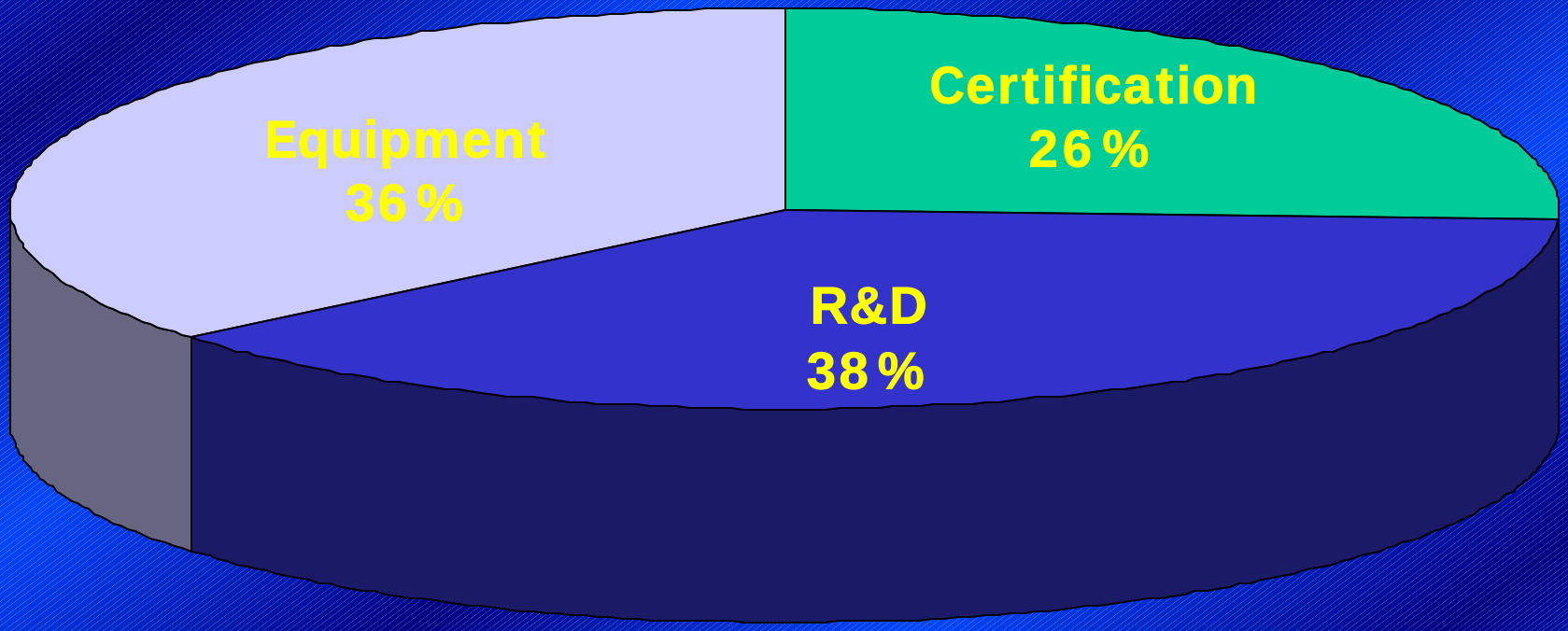
Typical Station for Selected Districts



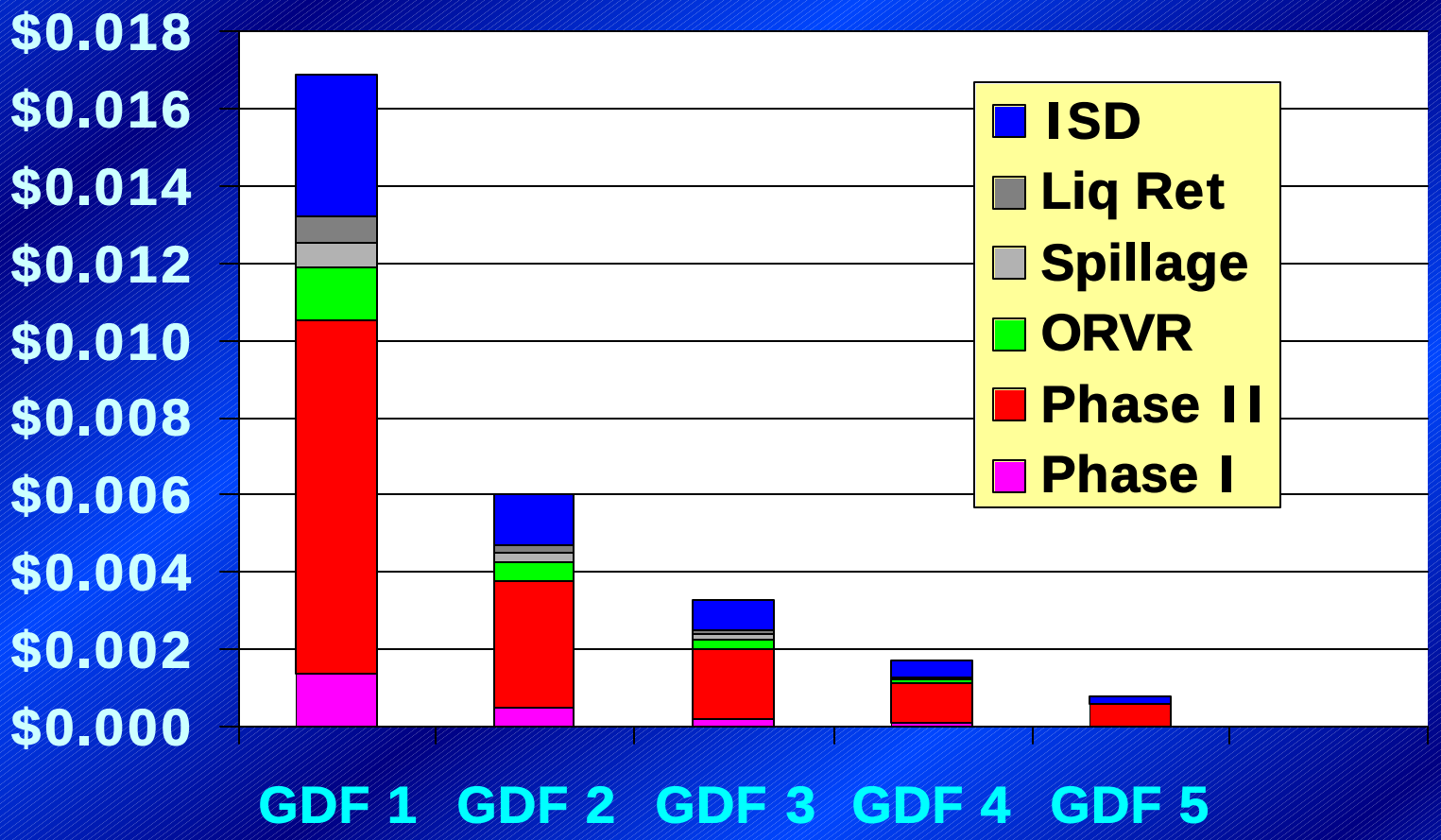
Conservative Assumptions

- All vapor recovery equipment components would be replaced
- “Retail list” prices
- EVR nozzles will cost 75% more
- 94 new EVR certifications
  - 14 Phase I, 64 Phase II, 16 ISD

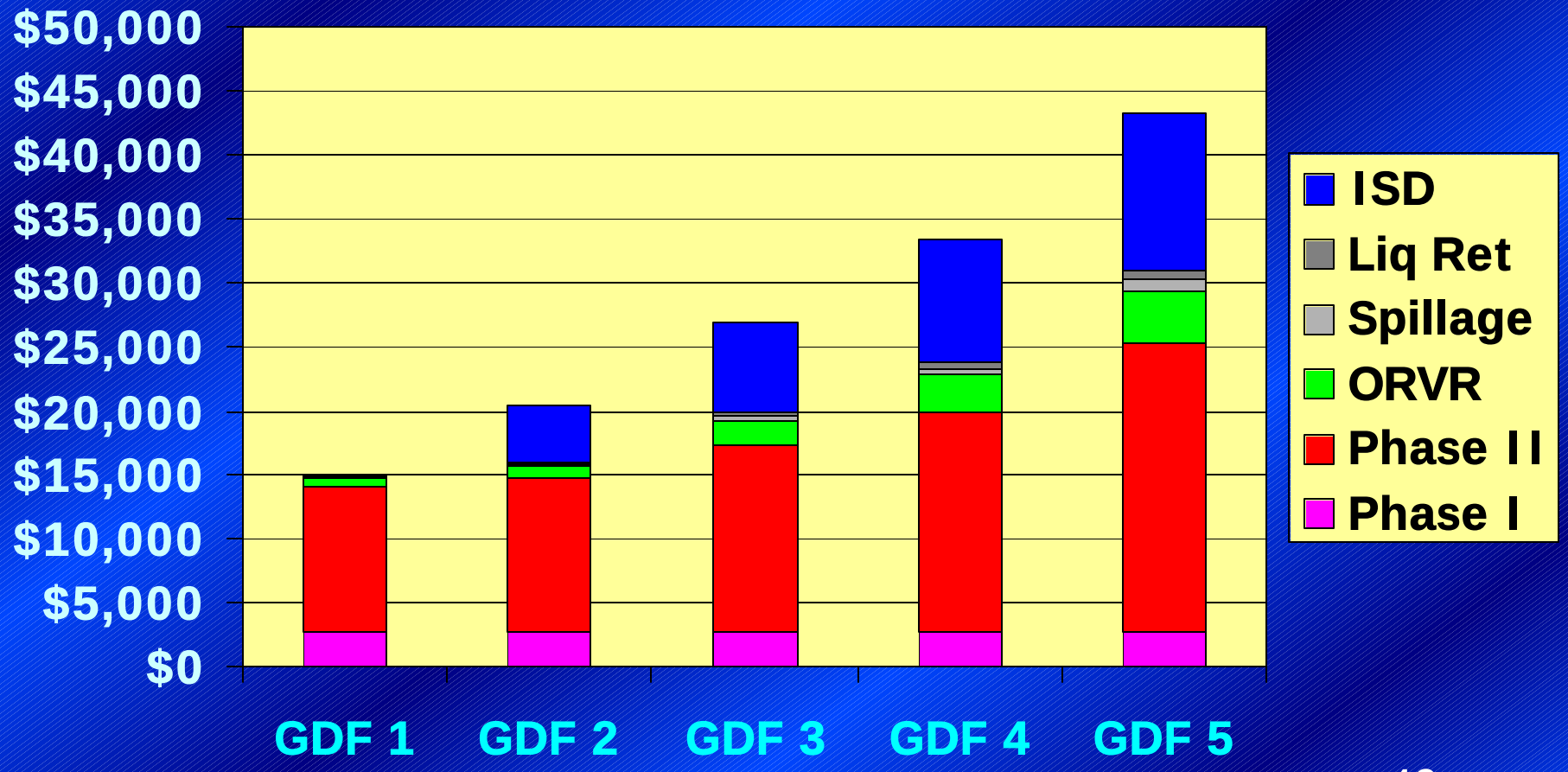
Total EVR Costs
33 million annually



Per-Gallon Cost Increase (Ave: 0.0025 $/gallon)



EVR Total Equipment and Installation Costs



Cost-Effectiveness

$$\left(\frac{\$33{,}000{,}000/\text{yr}}{25.1\ \text{tons/day}}\right)\left(\frac{1\ \text{ton}}{2000\ \text{lb}}\right)\left(\frac{1\ \text{yr}}{365\ \text{days}}\right)$$

$$= \boxed{\$1.80/\text{lb}}$$

Emission Reductions

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
%	4.7	14.1	45.7	31.3	4.2
EVR* em red (tpd)	0.16	1.33	8.61	11.81	3.19

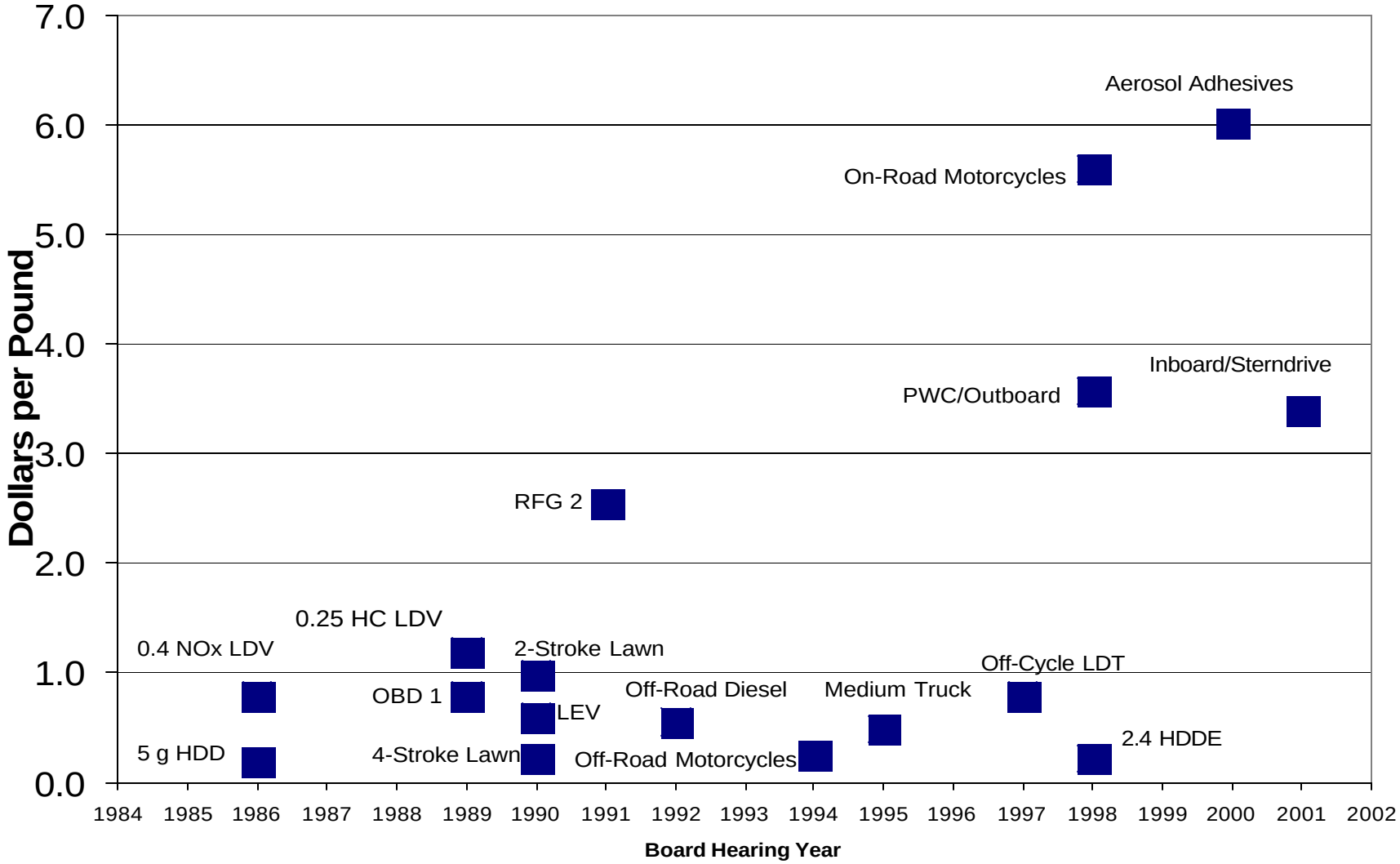
*Total EVR emission reductions = 25.1 tpd

Cost Effectiveness

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
%	4.7	14.1	45.7	31.3	4.2
EVR em red (tpd)	0.16	1.33	8.61	11.81	3.19
C.E.* ($/lb)	~~$12.49~~ $9.73	$4.42	$2.41	$1.24	$0.63

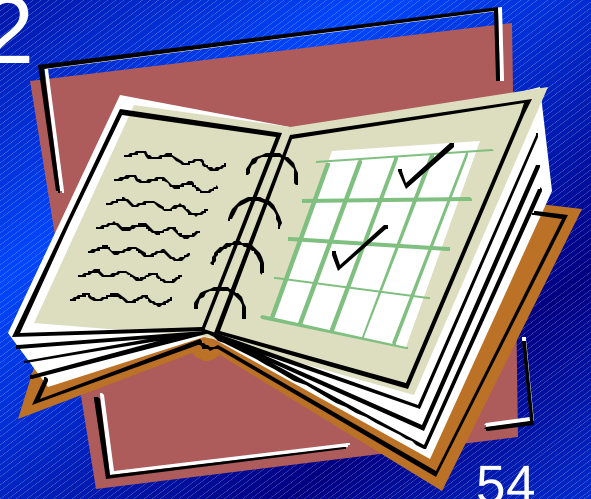
*Overall Cost-Effectiveness = $1.80/lb

Cost Effectiveness of Major Regulations
Mobile Sources and Fuel



Tech Review Schedule

- Workshop comments by Feb 15
- Draft report Feb 28, 2002
- Comments due March 12, 2002
- Completed April 1, 2002



2002 EVR Regulation Amendments

- Workshop in May 2002 (tentative)
- Finalize amendments in July 2002
- September 2002 Board meeting (tentative)

EVR Contacts

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