

# **In-Station Diagnostics Update**

February 16, 2006

California Air Resources Board

Cal-EPA

# Agenda

- Introductions
- ISD Implementation Schedule
- Status of ISD Installations
- ISD System Evaluation Program
- Plan to Update ISD  
Cost-Effectiveness
- ISD Enforcement Policy

# ISD Implementation

> 1.8 million  
gallons/yr

600,000 – 1.8 million  
gallons/yr

≤ 600,000  
gallons/yr

New and Major  
Mod Sites:  
**Sept. 2005**

Existing Sites:  
**April 2009**

New and Major  
Mod Sites:  
**April 2006**

Existing Sites:  
**April 2010**

Exempt  
From  
ISD



# ISD Installations

16 Sites installed  
& operating

54 A/Cs issued,  
not yet operating

Several  
applications in  
process

# **In-Station Diagnostic System Evaluation Program**

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**Update on In-Station Diagnostics  
February 16, 2006**



**Alex Santos  
California Air Resources Board**

# Evaluation to Determine if Installed ISD Systems Operate as Expected

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- **ISD systems certified by ARB**
  - Monitor emission-related parameters and components
  - Alert station operator so corrective action can be taken
- **Overall objective of ISD Evaluation Program is to determine whether performance of installed systems is similar to performance of systems tested in certification**
- **Protocol focuses on how well the installed ISD system performs the following functions:**
  - Vapor to Liquid (V/L) Testing
  - Identification of Onboard Refueling Vapor Recovery (ORVR) equipped Vehicles
  - Underground Storage Tank (UST) Pressure Monitoring
- **Protocol also verifies that the ISD vapor pressure sensor and vapor flow meters are operating properly**

# Minimum of Six ISD Sites to be Evaluated

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- **ISD Stations included in Evaluation will be located in South Coast, San Joaquin, San Luis Obispo, San Diego, Glenn County, Sacramento, and Bay Area**
- **Evaluation is collaborative effort between the ARB and CAPCOA**
- **Districts will designate the six evaluation sites**
- **Evaluation will last 18 months**

# Current Status of ISD System Installations

District	ISD A/Cs Issued	ISD Sites Operational	Minimum Needed
Bay Area	0	3	1
Glenn	0	0	0
Sacramento	4	1	1
San Diego	6	6	1
San Joaquin	7	3	1
San Luis Obispo	0	0	0
South Coast	33	2	1

# Draft ISD In-Use Evaluation Protocol

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- Updated Draft Protocol will be posted on February 16<sup>th</sup>
- ARB Staff will run Draft Protocol in the next two weeks at Sacramento site
- Each District to identify evaluation site(s) and run Draft Protocol once
- ARB Staff will make final changes to Draft Protocol, as necessary, based on ARB Staff run and initial District runs
- After Protocol is finalized, ARB will conduct field demonstration of Final Protocol for Districts

# Summary of Comments Received on Latest Draft of ISD In-Use Evaluation Protocol

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- **Add Exhibit 5 (V/L) as Attachment (completed)**
- **Establish Interim ISD Enforcement Policy (working with CAPCOA)**
- **Amend Protocol to evaluate ISD leak rate system (comment noted)**
- **Certification data does not support tightening of the V/L criteria for the ISD's recording of failures (comment noted)**

# Progress of Evaluation

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- **ARB Staff will compile testing data from Districts and forward the compiled data to all participants every three months**

# ISD In-Use Evaluation Contacts

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**[www.arb.ca.gov/vapor/vapor.htm](http://www.arb.ca.gov/vapor/vapor.htm)**

# Questions?





# Plan to Update ISD Cost- Effectiveness

# Resolution 02-35

December 12, 2002 EVR Technology Review

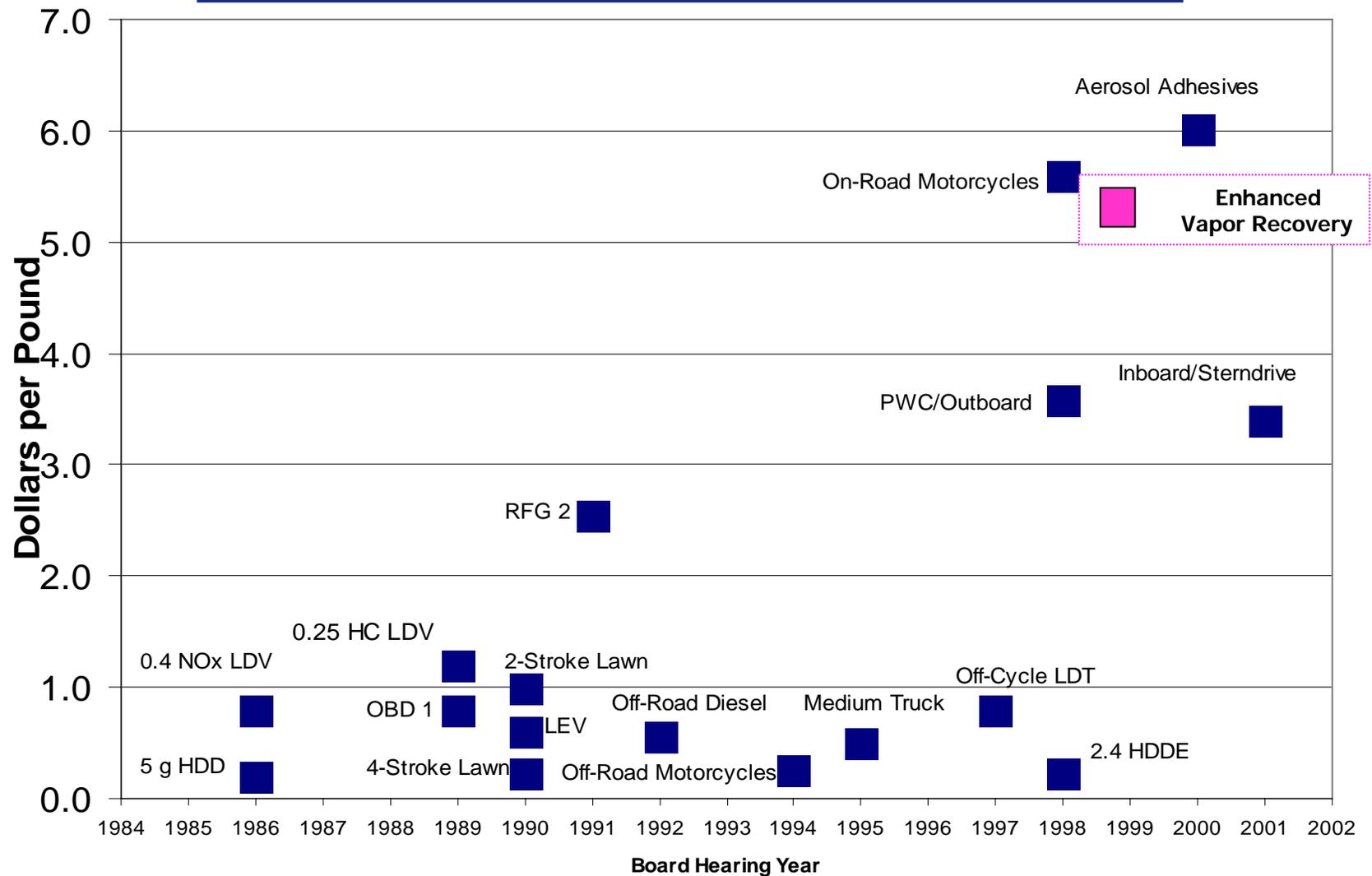
*BE IT FURTHER RESOLVED that the Board directs the Executive Officer and Board staff to assess, following the initial certification of the first EVR Phase II system with in-station diagnostics (ISD), the capital cost impacts of ISD on smaller through-put GDFs. The Executive Officer and Board staff are directed to complete the assessment within 18 months after the initial certification of an ISD equipped system.*

# ISD Cost-Effectiveness

$$C-E = \frac{\text{annual cost to comply}}{\text{annual emission reductions}}$$

C-E expressed in dollars per pound of  
emission reductions

# Cost Effectiveness of Major Regulations Mobile Sources and Fuel



# GDF Distribution

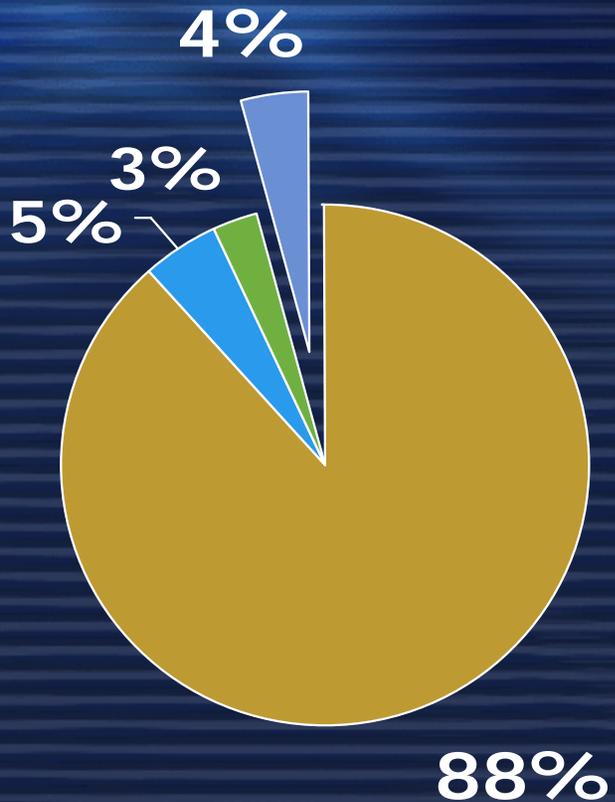
Gallons/Month	1991 National GDF %	1998 California GDF %
0 - 5,999	3.8	0.76
6,000 - 9,999	4.8	0.96
10,000 - 24,999	15.0	3.0
25,000 - 49,999	23.5	14.1
50,000 - 99,999	32.3	45.7
100,000 - 199,000	18.2	31.3
> 200,000	2.4	4.2

1991: 70,661 gal/month  1998: 99,779 gal/month 

# Gasoline Stations (GDF) Categories

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
<b>Annual Throughput (gal/yr)</b>	Up to 300,000	300,000 to 600,000	600,000 to 1.2 mil	1.2 mil to 2.4 mil	2.4 mil and up
<b>% throughput</b>	0.6	5.3	34.3	47.1	12.7
<b>% stations</b>	4.7	14.1	45.7	31.3	4.2
<b>Number of stations</b>	531	1,586	5,136	3,522	475
<b>Fueling Points</b>	2	3	6	9	12

# ISD Cost Inputs



- Equipment, Installation & Maintenance
- R&D
- Certification
- Gas credit

# ISD Equipment Costs

ISD Component	2000	2002	2006**
Pressure sensor	\$192	\$595	\$900
A/L sensor	\$245	\$885	\$900
Datalogger & CPU (TLS 350)	\$1,197	\$4,665	\$6,705
Inventory sensor	Not Included	\$1,095	\$1,145

**\*\* Assumes customer does not have a TLS and that a TLS is not required for SWRCB regulation compliance**

# 2006 Example Calculation Equipment Cost for GDF1

GDF1 has two fueling points, one dispenser and “2.5” USTs:

One Pressure sensor:	\$ 900
One A/L sensor:	\$ 900
2.5 Inventory sensors:	\$2863
One TLS-350:	<u>\$6705</u>
<b>TOTAL:</b>	<b>\$11,368</b>

# ISD Equipment Costs per Model GDF

	<b>GDF 1</b>	<b>GDF 2</b>	<b>GDF 3</b>	<b>GDF 4</b>	<b>GDF 5</b>
<b>2000</b>	\$2,167	\$2,412	\$3,147	\$3,882	\$4,617
<b>2002</b>	\$8,883	\$9,625	\$10,656	\$11,980	\$13,308
<b>2006</b>	<b>\$11,368</b>	<b>\$11,818</b>	<b>\$13,168</b>	<b>\$14,518</b>	<b>\$15,868</b>

# Installation Costs

- 2002 EVR Tech Review
- Based on data from ISD pilot site installs
- Assumed labor costs of \$55 per hour

	Base Cost	Additional cost per Dispenser
New	\$250	\$125
Retrofit	\$300	\$200

# ISD Installation Costs per Model GDF

- 2006 Info from 2 sources (preliminary estimates)
- ISD retrofit: 4.7 hrs per dispenser
- Labor costs \$72 to \$135 per hour

	<b>GDF 1</b>	<b>GDF 2</b>	<b>GDF 3</b>	<b>GDF 4</b>	<b>GDF 5</b>
2000	\$1,280	\$1,280	\$1,280	\$1,280	\$1,280
2002	\$500	\$600	\$900	\$1,200	\$1,500
Preliminary 2006 Estimates	\$340 - \$630	\$510 - \$960	\$1,020 - \$1,900	\$1,520 - \$2,860	\$2,030 - \$3,810
	NA	\$936 - \$1,755	\$1,224 - 2,295	\$1,440 - 2,700	\$1,584 - 2,970

# Cost Recovery Factors (CFR)

	Discount	Life	CFR
<b>CFR1</b>	<b>10%</b>	<b>10 yrs</b>	<b>0.1627</b>
CFR2	10%	7 yrs	0.2054
CFR3	10%	3 yrs	0.4021

# ISD Maintenance Costs (2002)

ISD Component	Annual maintenance, calibration and repair cost
A/L sensor	\$300
Pressure sensor	\$200
Datalogger	\$50

# Annual ISD Maintenance Costs per GDF Category

	<b>GDF 1</b>	<b>GDF 2</b>	<b>GDF 3</b>	<b>GDF 4</b>	<b>GDF 5</b>
<b>2000</b>	Not incl				
<b>2002</b>	\$550	\$700	\$1,150	\$1,600	\$2,050
<b>2006</b>	?	?	?	?	?

# R&D Cost Assumptions

1999 – 64 Phase II and 14 Phase I certs

2000 – Assumed all would be recertified  
plus 16 ISD systems

2002 – Reduced projected certifications to:

7 Phase I systems

32 Phase II systems

8 ISD systems

**2006?**

# R&D Costs Include:

- engineer and support staff salaries for 5 yrs
  - Each Phase I : 1 engineer & 0.5 support staff
  - Each Phase II+ISD: 2 engr & 1 support staff
- Prototype equipment and bench testing
- Marketing costs

Module	R&D
1	5 %
2	50 %
3	10 %
4	5 %
5	5 %
<b>6</b>	<b>25 %</b>

# Certification costs – ARB Fees

	Pre-EVR	EVR (2000 assumed)	EVR (2006)
Phase I	\$2,000	\$10,000	\$45,000
Phase II	\$10,000	\$50,000	\$104,000
ISD	N/A	\$50,000	Pending

# Manufacturer Certification Cost Assumptions

	Pre-EVR	EVR (2000 assumed)	EVR (2006)
Phase I	\$34,000	\$68,000	???
Phase II	\$170,000	\$340,000	???
ISD	N/A	\$340,000	???

# Gasoline Recovery Credit

	2000	2002	2006
ISD Statewide 2010 Emission Reductions (tons/day)	6.6	8.5	???
Gallons Fuel Saved by ISD (gal/day)	2,100	2,700	???
Retail Price per Gallon	\$1.50	\$1.50	\$2.50?
Gasoline Credit (\$ per day)	\$3,150	\$4,050	???

# Annualized ISD Costs Per Station (2002)

Group	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
<b>Annual Throughput (gal/yr)</b>	Up to 300,000	300,000 to 600,000	600,000 to 1.2 mil	1.2 mil to 2.4 mil	2.4 mil and up
<b>Equipment &amp; Installation</b>	\$1,527	\$1,615	\$1,881	\$2,145	\$2,410
<b>Maintenance</b>	\$ 820	\$1,020	\$1,470	\$1,920	\$2,370
<b>R&amp;D</b>	\$ 147	\$147	\$147	\$147	\$147
<b>Certification</b>	\$ 98	\$ 98	\$ 98	\$ 98	\$ 98
<b>Gas Credit</b>	(\$ 16)	(\$ 49)	(\$ 99)	(\$197)	(\$475)
<b>TOTAL</b>	<b>\$2,576</b>	<b>\$2,831</b>	<b>\$3,497</b>	<b>\$4,113</b>	<b>\$4,550</b>

# Comments on ISD Costs

ARB should also consider:

- “affordability”
- Increased VR system maintenance
- Increased station downtime
- Increased NOVs possible depending on district enforcement policy
- TLS-350 capacity for additional sensors
- ORVR vehicle penetration
- Permit fees
- Annual operability tests

## ISD Cost-Effectiveness

$$C-E = \frac{\text{annual cost to comply}}{\text{annual emission reductions}}$$

C-E expressed in dollars per pound of  
emission reductions



# ISD Emission Reductions

# Vapor Recovery Emission Inventory

- Uncontrolled emission factor:
  - 8.4 lbs/1000 gallons vapor
- Four emission inventory categories:
  - Phase I 98% efficiency (cert & in-use)
  - Phase 2 Transfer Efficiency
    - 95% efficiency (cert)
    - **90% efficiency (in-use)**
  - Spillage (0.24 lbs/1000 gallons dispensed)
  - “Breathing” losses

# 2000 ISD Emission Reductions

- Calculated as ROG for 2010
- Only claimed for assist systems
- Based on 1999 ARB-district field tests
- 6.6 tons/day statewide “excess emissions”
- Assumption that ISD would achieve emission reductions of 6.6 tons/day to bring Phase II in-use efficiency back to 90% as assumed in inventory

# 2002 ISD Emission Reductions for EVR Tech Review

- Lowered A/L emission reductions claimed for assist systems
- Added emission reductions for balance
- Added emission reductions for Phase I
- Adjusted emission reductions to reflect ORVR penetration

# 2002 Assist System Emissions Adjustments

- 6.6 TPD reduced to 3.9 TPD recognizing that ISD only detects A/L reading that is under 75% or over 125% the allowable A/L range
- 3.9 TPD reduced to 1.6 TPD assuming 60% ORVR vehicle penetration in 2010 and zero emissions from ORVR vehicles

# ISD Balance System Emission Reductions

Failure	Reduction In Efficiency (%) from field study	Assume ISD Detects (%)	Emission Reduction (TPD)
Total Vapor Path Blockage	11.1	100	7.4
Partial Vapor Path Blockage	4.2	0	0
Losses at Vehicle-Nozzle Gaps	14.4	50	4.2
		Total	11.6

ORVR Correction: Lowered 11.6 down to 4.6 TPD

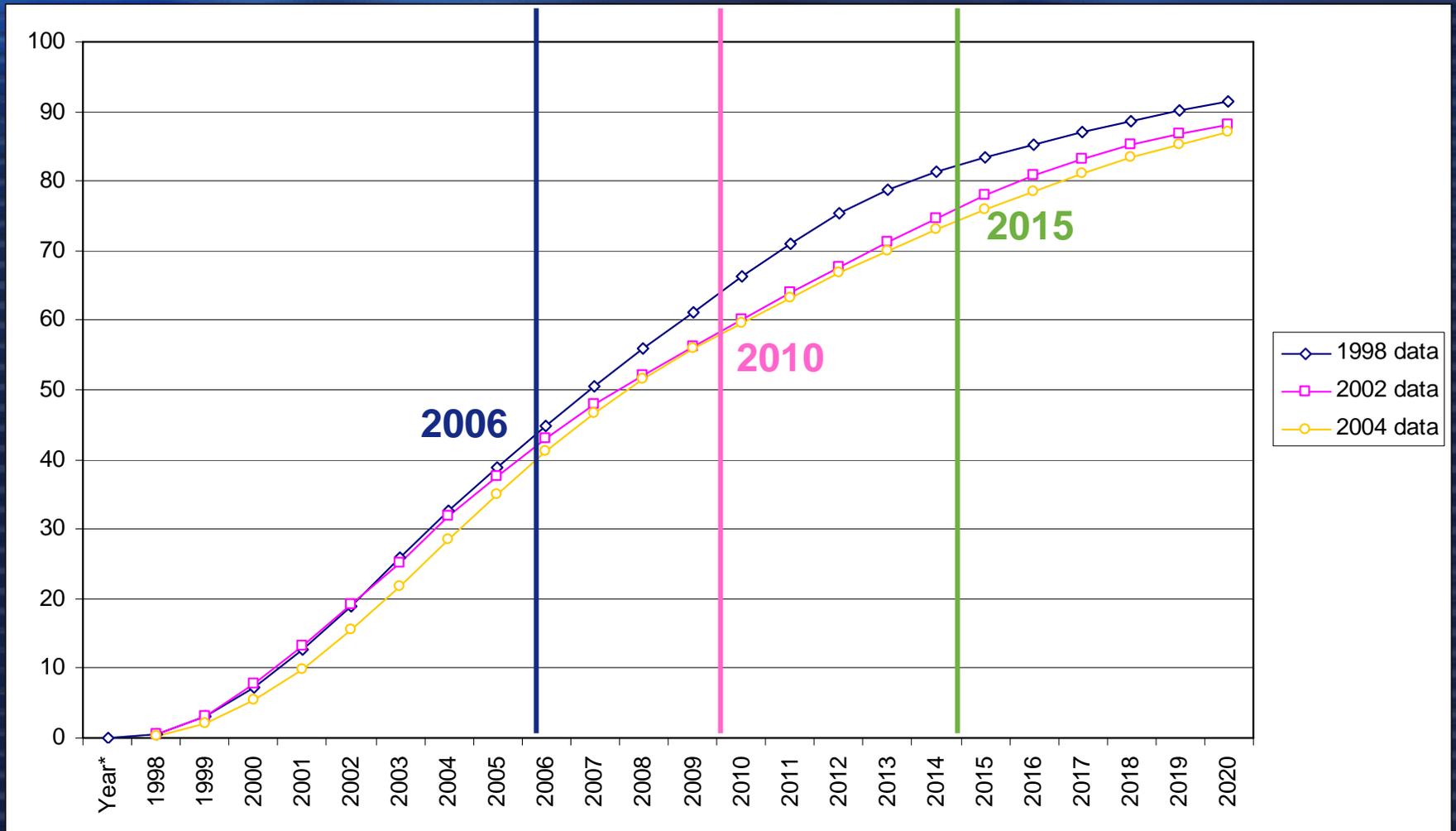
# 2002 ISD Emission Reduction Summary

	2010 TPD
A/L for Assist	1.6
Flow performance for Balance	4.6
Leak integrity for balance	0.8
Phase I	<del>XX</del> 0
TOTAL:	<del>8.5</del> 7.0

# Comments on ISD Emission Reductions

- Revisit emission reductions even though Board requested capital cost update only
- Use EVR emission reductions
- Use info from ISD in-use evaluation study
- Limit C-E update to assist systems
- Separate C-E for balance system when EVR balance Phase II certified
- Update for ORVR penetration at least through 2015

# ORVR Penetration



# Other Comments

- ISD exemption for ORVR fleet facilities?
- Re-evaluate C-E for all GDF categories, not just lower throughput GDFs
- Lengthen schedule to allow collection of in-use data
- Include “retrofits” as well as new installations
- Station personnel not qualified to interpret alarms
- Form working group

# ARB ISD Enforcement Policy

- ISD output not currently appropriate for enforcement
- No response by GDF operator to ISD failure signal is enforceable

# Industry – CAPCOA Enforcement Policy Agreement

- Draft proposals under review
- Meeting planned for February 23rd

# Questions?

