# Candidate Control Measures for Gasoline Dispensing Facilities


Regional Air Quality Workshop
June 29, 2005

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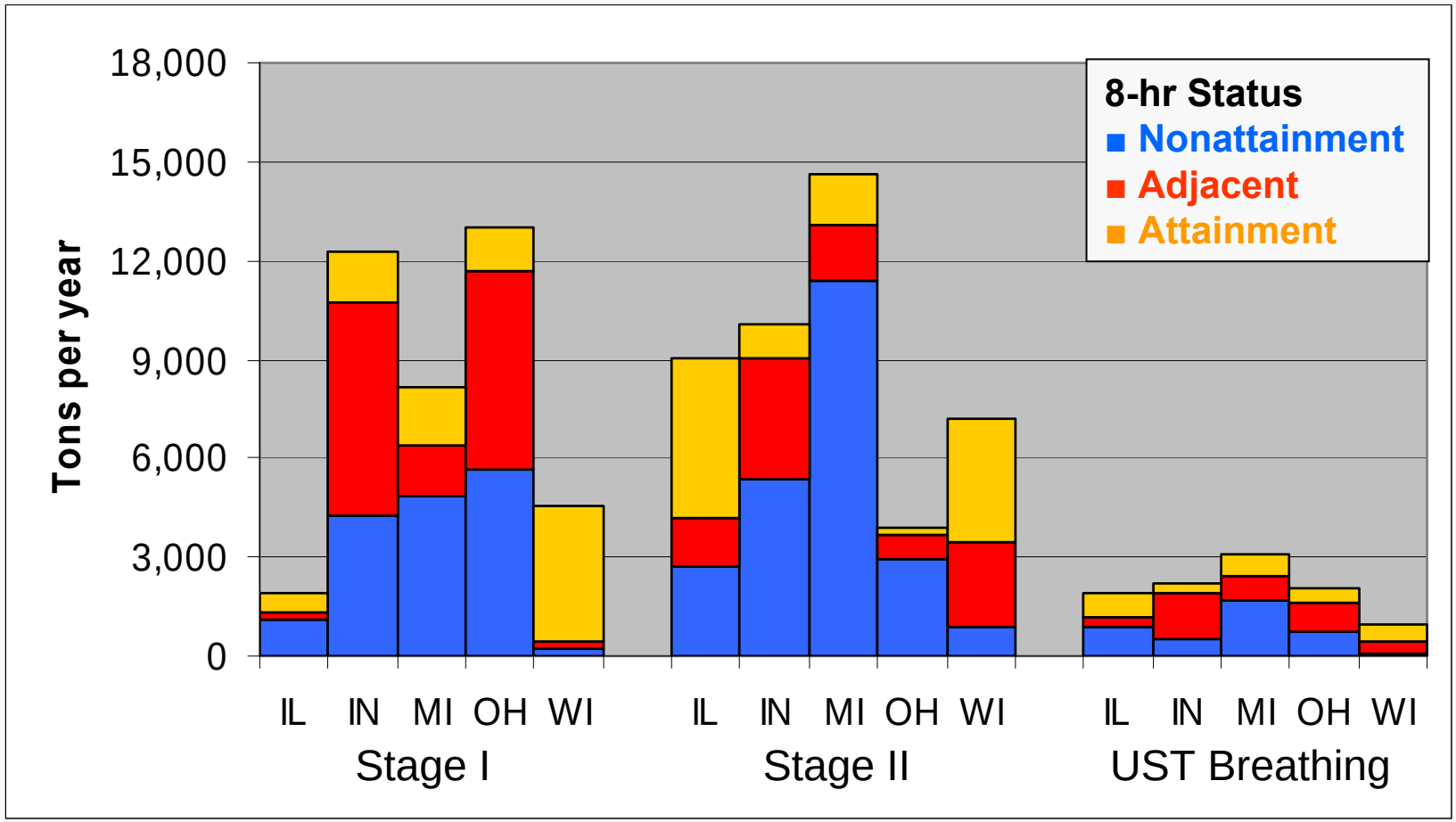
# Category Description: Gasoline Dispensing Facilities

- Stage I loading operations
  - Transfer from tank trucks to underground storage tanks (UST)
  - Emissions generated when gasoline vapors in the UST are displaced to the atmosphere by the gasoline being loaded into the tank
- Stage II vehicle refueling operations
  - Transfer from UST to the vehicle's fuel tank.
  - Emissions are generated when gasoline vapors in the vehicle's fuel tank are displaced by the gasoline being loaded into the tank.
  - Included in this category are emissions from spillage from pre-fill and post-fill nozzle drip and from spit-back and overflows from the vehicles' fuel tank filler pipe during filling
- Tank breathing losses through vent pipe occur daily and are attributable to gasoline evaporation and pressure changes
- Account for about 6.8% of the total anthropogenic VOC emissions in the MRPO region in 2002

# VOC Emissions from GDFs by Process and 8-hr Ozone Status



# Regulatory History: Stage I

- EPA established design criteria for Stage I vapor control systems in 1975
  - Submerged fill
  - Vapor return lines to transfer vapors from UST back to the delivery truck
  - No leaks in system & proper use of equipment
- All 5 MRPO States have Stage I regulations
  - Generally require submerged loading and vapor balancing or vapor control system to achieve a 90% reduction in VOC
  - Throughput or tank size exemptions
  - Not applicable in all counties – varies by State
- CARB's new Enhanced Vapor Recovery (EVR) program
  - Module 1 changes Stage I control efficiency requirement to 98%
  - Equipment design changes to reduce leaks and spills

# Regulatory History: Stage II

- 1990 Clean Air Act – 2 approaches
- Vapor recovery system (VRS) installed on dispensing nozzle
  - Capture vapors displaced from the vehicle fuel tank during filling and return them to the underground storage tank
  - Required in ozone nonattainment areas that were designated as moderate, serious, severe, and extreme
- On-board refueling vapor recovery (ORVR) canisters
  - Canisters to capture and adsorb vapors from the vehicle fuel tank and eventually release them to the vehicle's engine
  - Required to be installed on some new vehicles in 1998
  - Required on all new vehicles by 2006

# Regulatory History: Stage II Nozzle Vapor Recovery Systems

- MRPO states required Stage II vapor recovery systems in moderate and above ozone nonattainment areas
  - Most states require 95% control efficiency
  - In-use efficiency achieved affected by rule effectiveness and rule penetration
    - Exempted stations selling < 10,000 gallons/month
    - Effectiveness depends on proper operations/compliance
      - 85% in use effectiveness for semi-annual inspection
      - 77% in use effectiveness for annual inspection
      - 56% in use effectiveness for minimal inspections
- CARB EVR
  - Improving compliance certification process
  - Increase in-use effectiveness to 95 percent

# Regulatory History: Stage II On-Board Vapor Recovery Systems

- EPA issued ORVR standards in 1994
  - Expected to achieve from 95-98% reduction
  - ORVR began in 1998
  - 100% of new vehicles to be achieved by 2006
  - Fleet turnover is slow - 20-25 years to achieve full compliance
  - Effective everywhere, not just in nonattainment areas
- Compatibility of ORVR and Stage II VRS
  - Two systems will operate together for many years
  - Once ORVR control systems are in “widespread use” through the vehicle fleet, EPA may exempt areas from Stage II vapor recovery system requirements
  - Excess emission issues for some systems

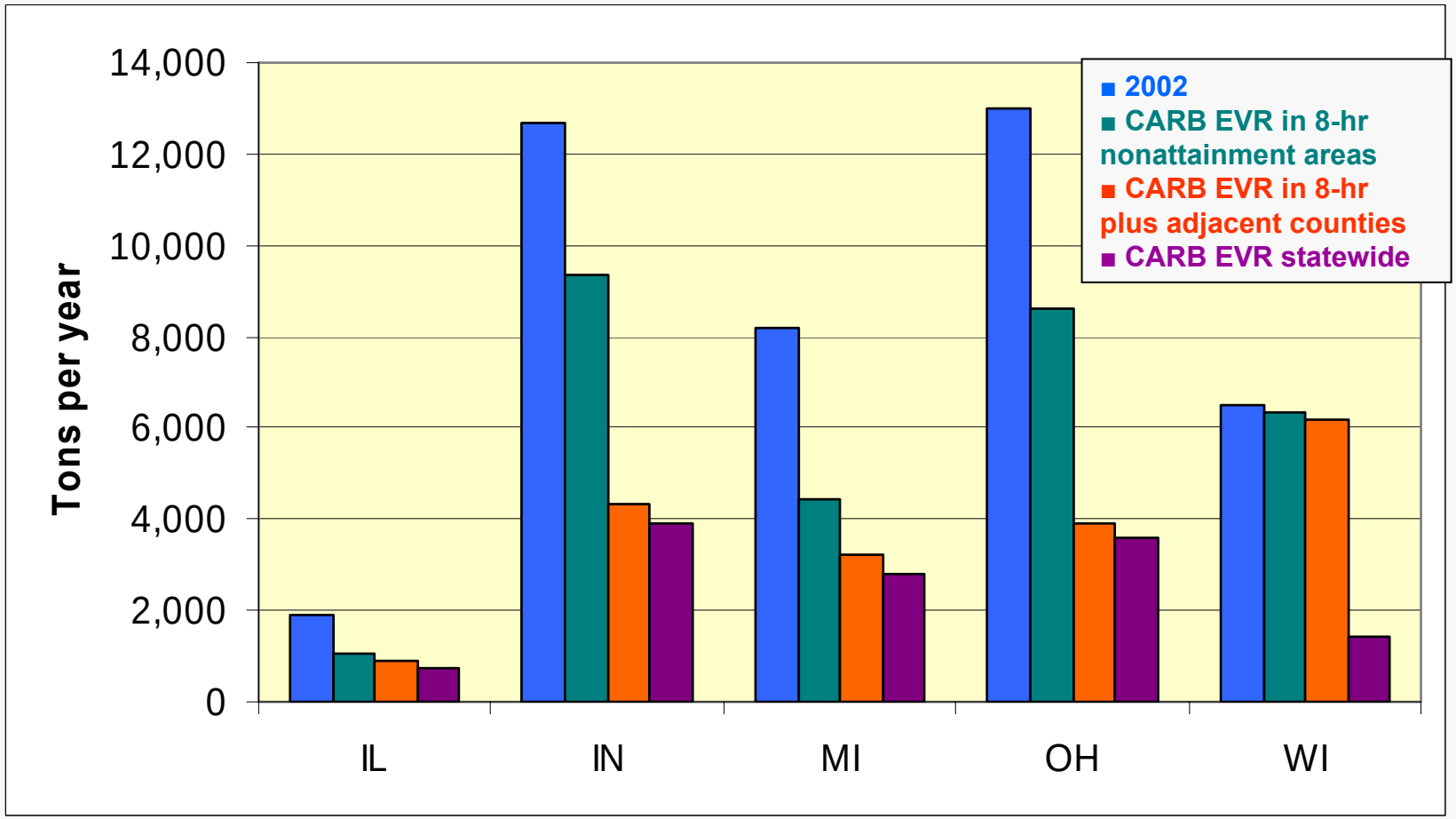
# Regulatory History: UST Vents

- Emissions result from changes in temperature and pressure
- Pressure-vacuum (P-V) vents to maintain pressure in tank and reduce emission by 95- 99%
- P-V relief valves required in Chicago and Metro East nonattainment areas of Illinois

# Candidate Control Measures: GDFs

- *Measure SOLV7A – Adopt CARB EVR Stage I requirements*
  - Increase required control efficiency of Stage I vapor recovery systems from 90 to 98 % in counties with existing Stage I requirements
  - Optionally, the control measures could be extended to counties that currently do not have Stage I requirements

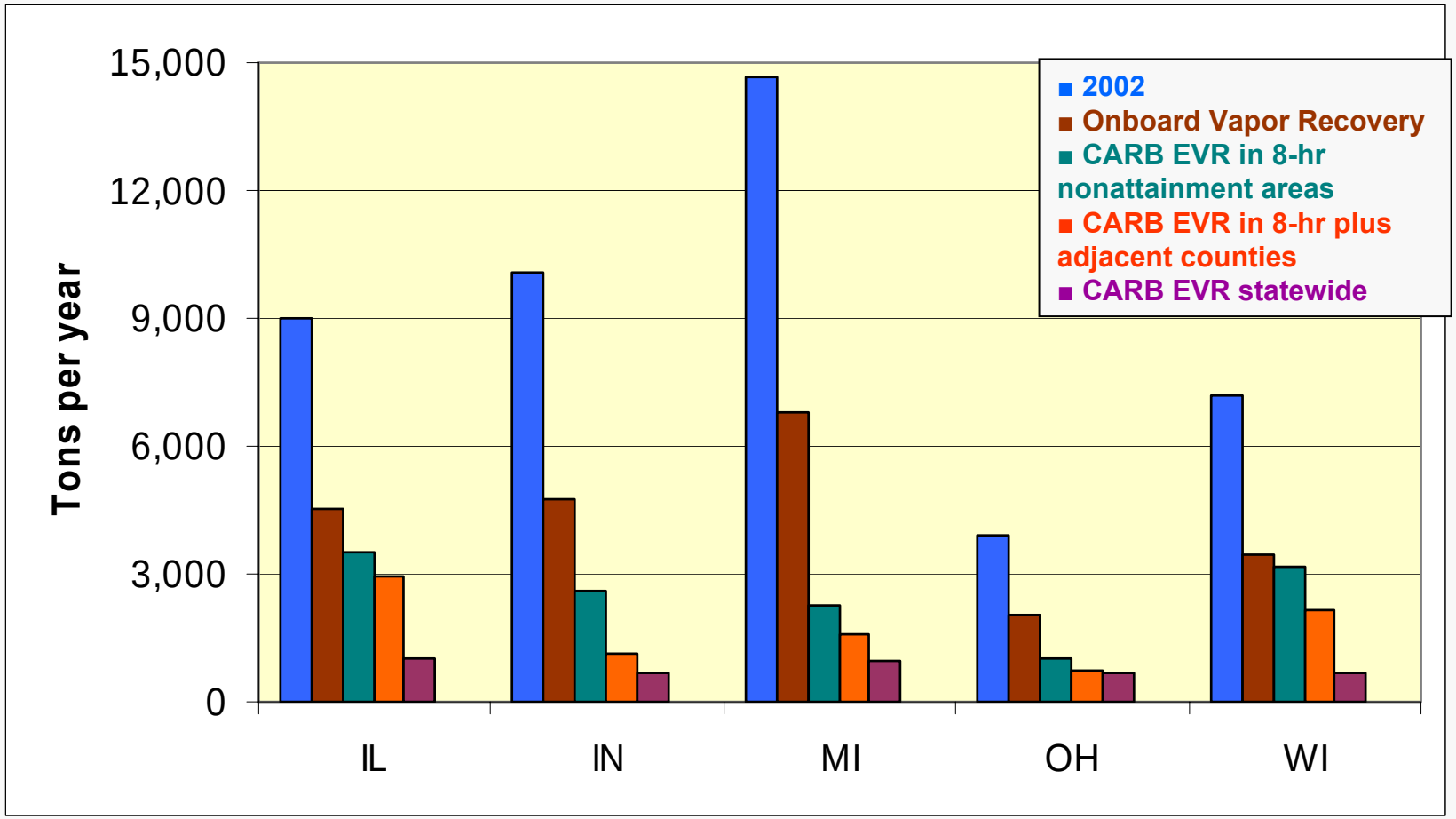
# VOC Emissions For Stage I Candidate Control Measure



# Candidate Control Measures: GDFs

- *Measure SOLV7B – Adopt CARB EVR Stage II requirements*
  - Based on the use of adoption of the CARB EVR Module 2 requirements
  - Increase the required control efficiency of Stage II vapor recovery systems to 95 percent in those counties with existing Stage II requirements
  - Optionally, the control measures could be extended to counties that currently do not have Stage II vapor recovery requirements

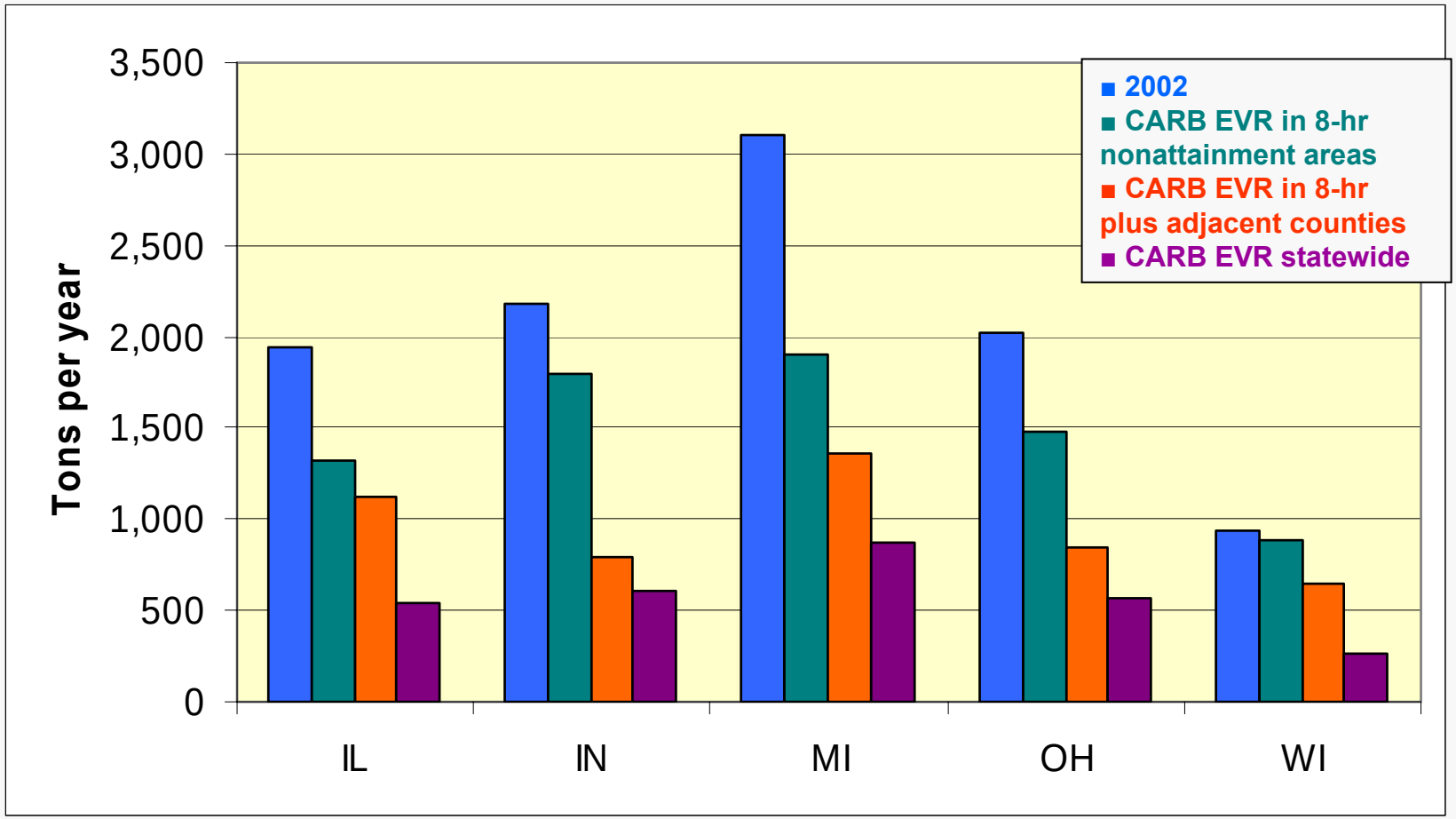
# VOC Emissions in 2009 For Stage II Candidate Control Measure



# Candidate Control Measures: GDFs

- *Measure SOLV7C – Require Add-on Control Devices on the UST Vent*
  - Based on the use of an add-on control device (such as a membrane system, refrigeration unit, or carbon bed) to reduce vapor growth emissions from the UST vent by 90 percent
  - Three geographic options considered:
    - All 8-hr nonattainment counties
    - All counties in or adjacent to an 8-hr nonattainment area
    - All counties in the MRPO region

# VOC Emissions For UST Vent Breathing Candidate Control Measure



# Cost Effectiveness: GDFs

- Upgrading existing Stage I systems to meet Module I of CARB EVR
  - For larger stations (monthly throughput greater than 300,000 gallons), CARB estimated enhancement would pay for itself with the value of the recovered gasoline
  - For smaller stations (monthly throughput less than 15,000 gallons), CARB estimated the cost effectiveness to be $2,120 per ton for the Phase I EVR program
- For stations without Stage I vapor recovery systems:
  - $100 to $4,742 depending on the size of the station
- Upgrading existing systems to meet Module II of CARB EVR
  - For larger stations (monthly throughput greater than 300,000 gallons), CARB estimated a cost effectiveness of $840 per ton
  - For smaller stations (monthly throughput less than 15,000 gallons), CARB estimated the cost effectiveness to be $13,420 per ton for the Phase I EVR program.
- For stations without Stage II vapor recovery systems
  - About $13,400 in 2009
  - Rises to $28,500 by 2015 as ORVR reduces emissions
- For UST breathing losses
  - Commercially available membrane vapor recovery systems are said to pay for itself with the value of the recovered gasoline

# Questions?
# Gasoline Dispensing Facilities