

Developing Guidance for Ethanol-Blended Fuel Releases

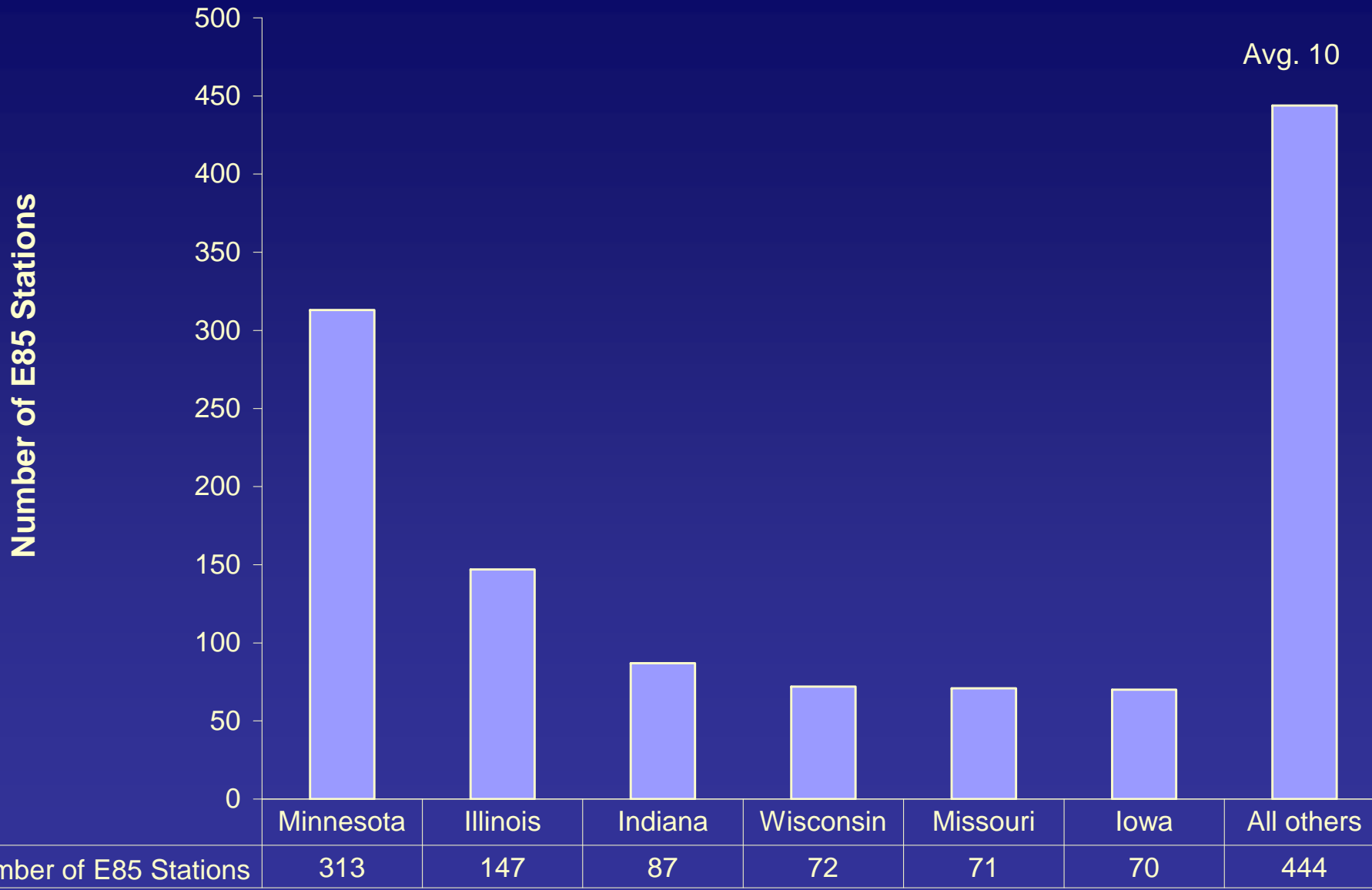
2008 Minnesota Air, Water, & Waste
Environmental Conference

**Minnesota Pollution Control Agency
Petroleum Remediation Program**

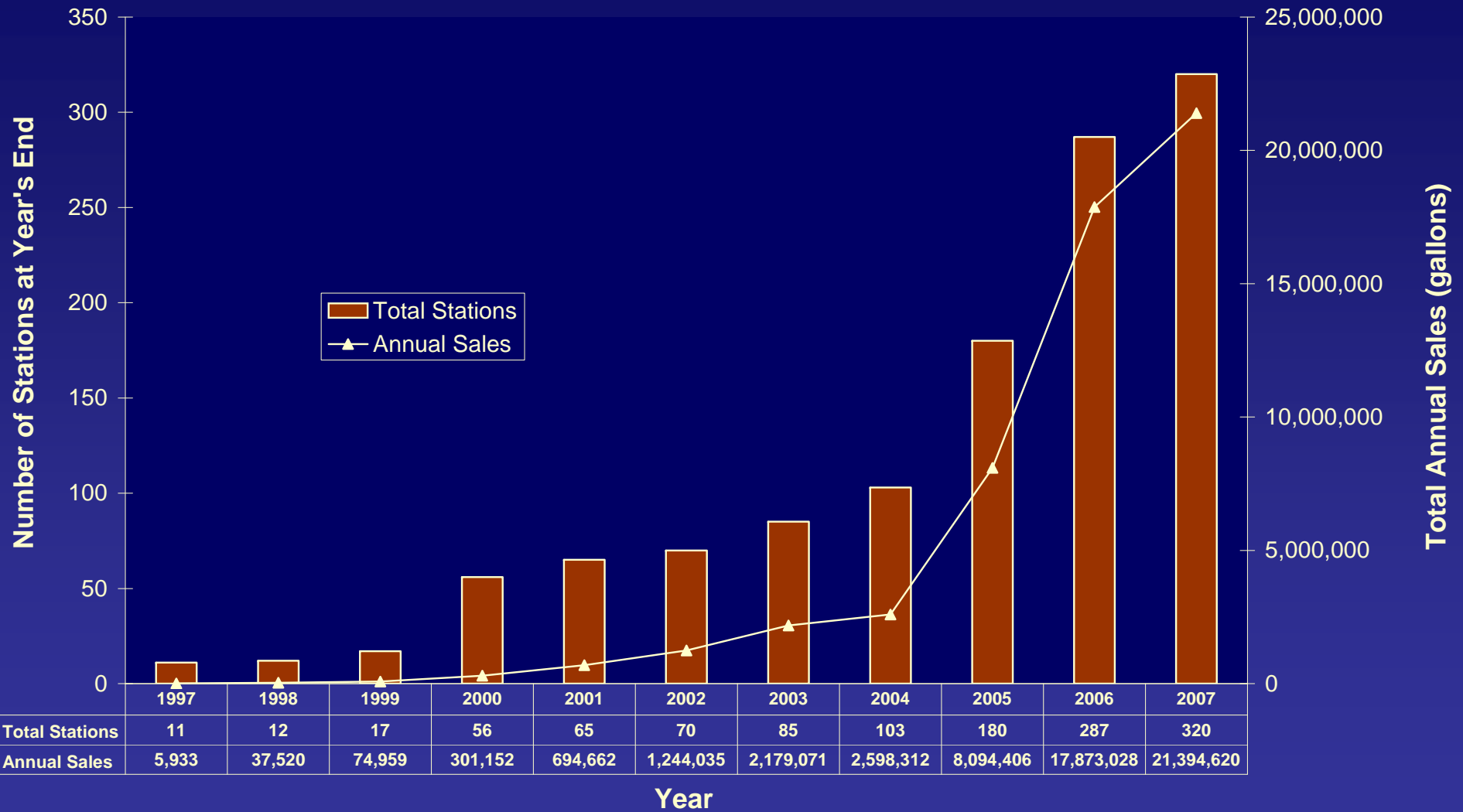
E85 Use in Minnesota

- Since 1997, MN gasoline blended with 10% ethanol
- 315/1206 E85 stations nationwide (26%)
- 315 of ~3500 public MN fuel stations sell E85 (8.9%)
- 600% increase in volume of E85 sold over the past two years
- 2006: 2.6 billion gallons gasoline sold, 0.69% sold as E85

Top E85 States by Stations



Minnesota E85 Stations and Sales

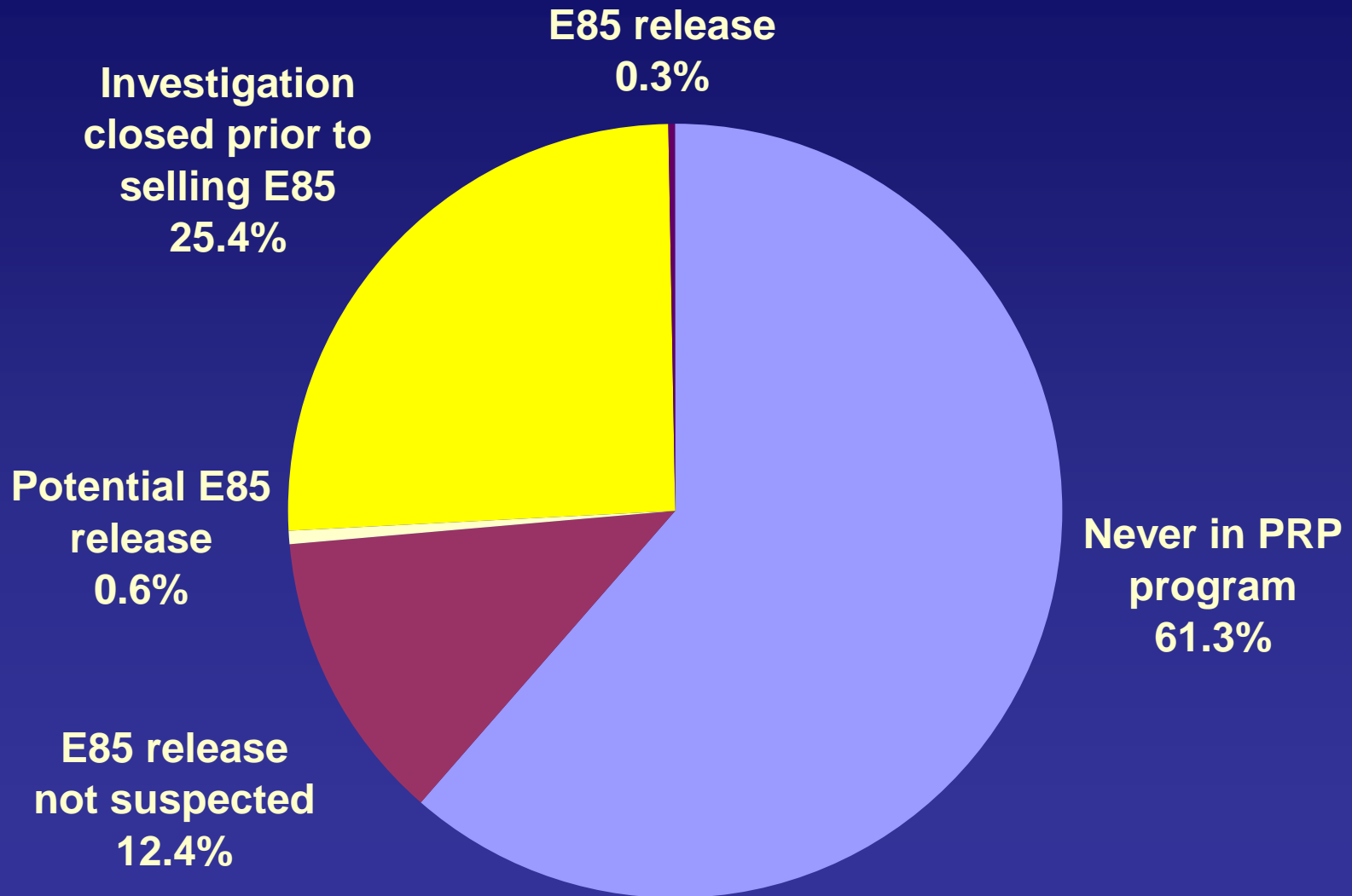


Ethanol Releases in MN

- 86 reported releases (2000 – 2006)
 - Petroleum terminal – 6
 - Ethanol plant – 58
 - Manufacturing – 9
 - ***Railroad - 3***
 - Truck cargo - 10
- 215,318 gallons (from 1 to 60,000 gal)
- PRP sites
 - 1 known E85 release from retail station (reported January 2007)

Minnesota E85 Stations

Total Number of Stations: 315



Why The Concern?

- Increasing use of E85 in MN
- UST compatibility issues
- Sampling procedures and analytical methods in development stages
- Lack of experience with E85 investigation and remediation

Why The Concern?

- Extends petroleum plume length
 - Co-solvency (higher BTEX concentrations)
 - Toxicity to microorganisms
 - Preferential biodegradation over BTEX
- Methane production
 - Potential to reach explosive levels
- E85 release over an existing petroleum release
 - Contaminant remobilization

Receptor Implications

- More water supply wells at risk
 - Elongated plumes
- Potential for methane accumulation
 - Utilities & utility corridors
 - Buildings (explosive risk)
- Vapor intrusion issues due to longer plumes

Current E85 Policy

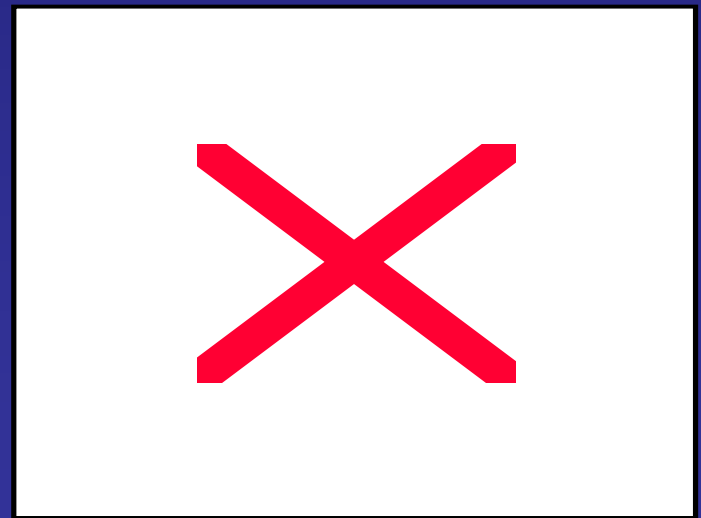
- MN State Duty Officer (DO)
 - Track initial report of E85 release
- MPCA PRP Release Reporting Coordinator
 - Database entry
 - Cross reference release site with known E85 stations
- Assigned to designated E85 project teams
- Potential pilot project study site

Current E85 Policy

- Site-specific requirements
 - Additional investigative procedures
- Costs split between RP and state
 - Ground water samples for ethanol and methane (state)
 - Soil gas sampling and methane field screening (RP)

Investigating E85 Releases

- Sampling parameters above and beyond unleaded gas releases
 - Ethanol and Methane in ground water
 - Ethanol & Methane in soil gas
 - Other parameters?
 - Acetate in ground water
 - Natural Attenuation



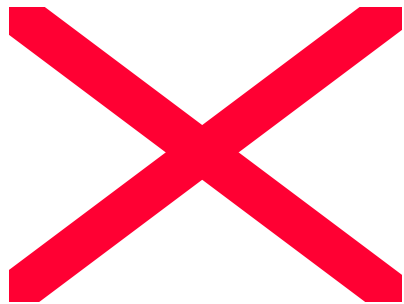
Policy Implications

- Limited Site Investigation may not be adequate for closure
- Additional investigative techniques may be required
- Long-term monitoring may be required for risk assessment
 - Ground water receptors
 - Soil vapor receptors

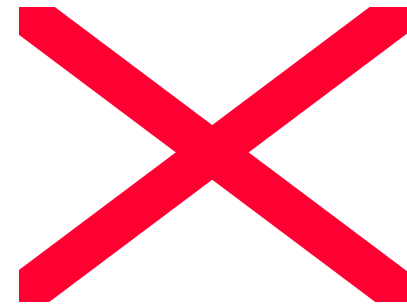
E85 Pilot Project

- Research on ethanol-blended fuel releases is lacking
- Field-based pilot studies at PRP and ER spill sites
 - Current work funded by MPCA
 - Coordination with EPA, MDH, API, UN, UM
- Lab based studies
 - Standards & method development

Minnesota Ethanol Pilot Project Sites



Balaton, MN



Cambria, MN

Preliminary Results

- Based on current investigation and risk-based policy both sites potential closure candidates
- Methane in soil gas has accumulated to explosive levels at both sites
 - Methane in soil gas three years after release (>50%)
- Ethanol 5.5% in ground water
- High benzene concentrations in ground water (7,000 ppb)

Project Next Steps

- Continued sampling of field project sites
- Ongoing site screening of PRP sites
- University of Minnesota bench scale studies
 - Examine fate & transport along with natural attenuation pathways for ETOH
 - Project underway (Spring 2008)

E85 Research Needs

- U of MN - MPCA Research Proposal
 - Bench-scale experiments to study relationship of co-solvency, phase separation, fate and transport of BTEX
 - Impacts of alcohol-enriched plumes on subsurface geochemistry, microbiology, denaturants and daughter products
 - Effects of other ethanol blends (E20, E50, etc)

Conclusions

- Research on high-percentage ethanol-blended fuel releases is lacking
- PRP investigation and sampling procedure changes likely required (E85 and E20?)
 - Methane generation a major concern
- Active remediation experience is lacking
- Private lab certification for new analytes

Acknowledgments

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