Technical Information for a Regional Fuels Strategy

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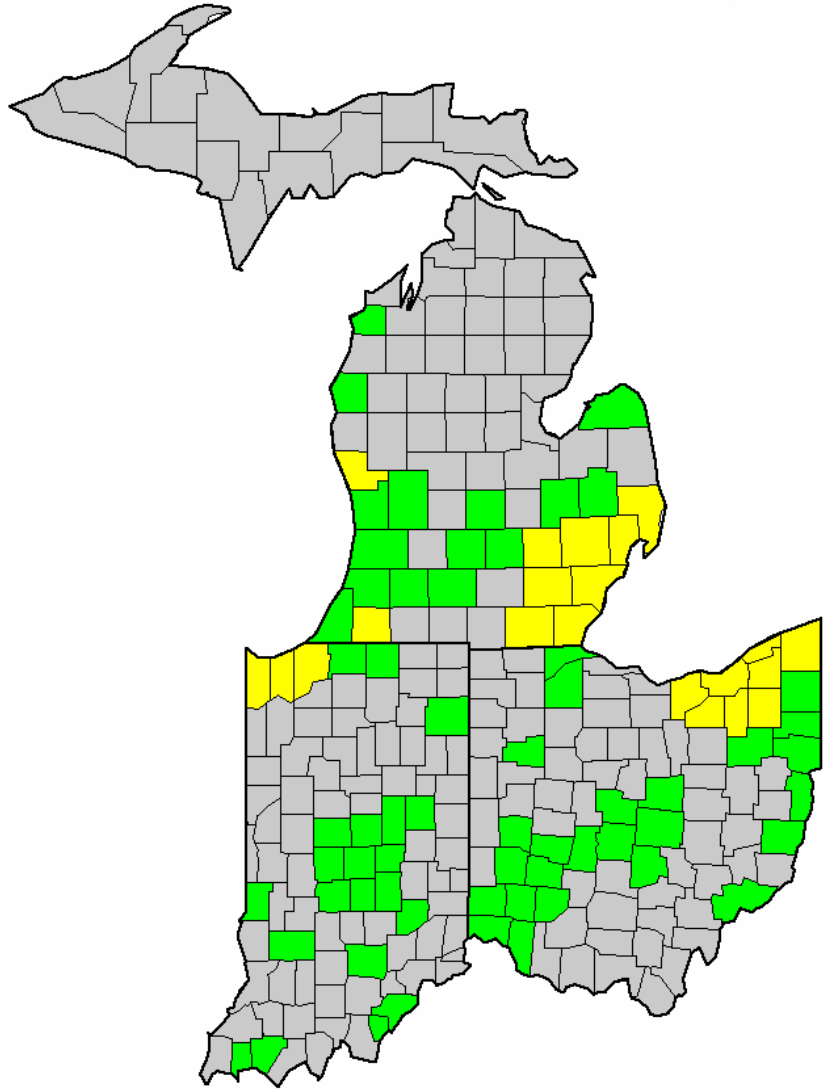
Goals

- LADCO states are studying the possibility of reducing gasoline volatility in the most nonattainment counties
- This, coupled with more regional NOx control, may assist in bringing many areas into attainment with 8-hour ozone standards
- Purpose of this study is to develop the technical information for a regional fuel strategy to reduce gasoline volatility

2004 8-Hour Ozone Standard Non-Attainment Areas, by Classification



Classification

- Moderate
- Basic
- Comply

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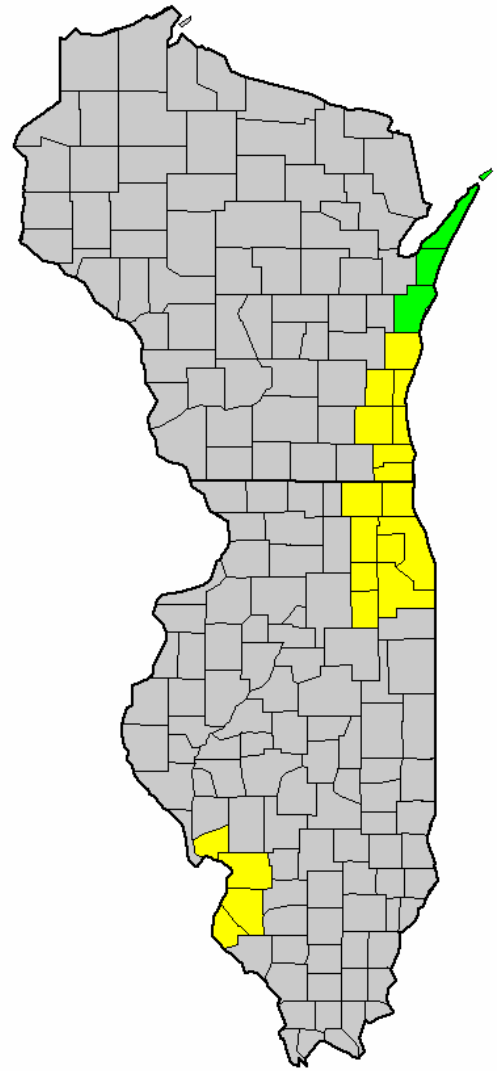

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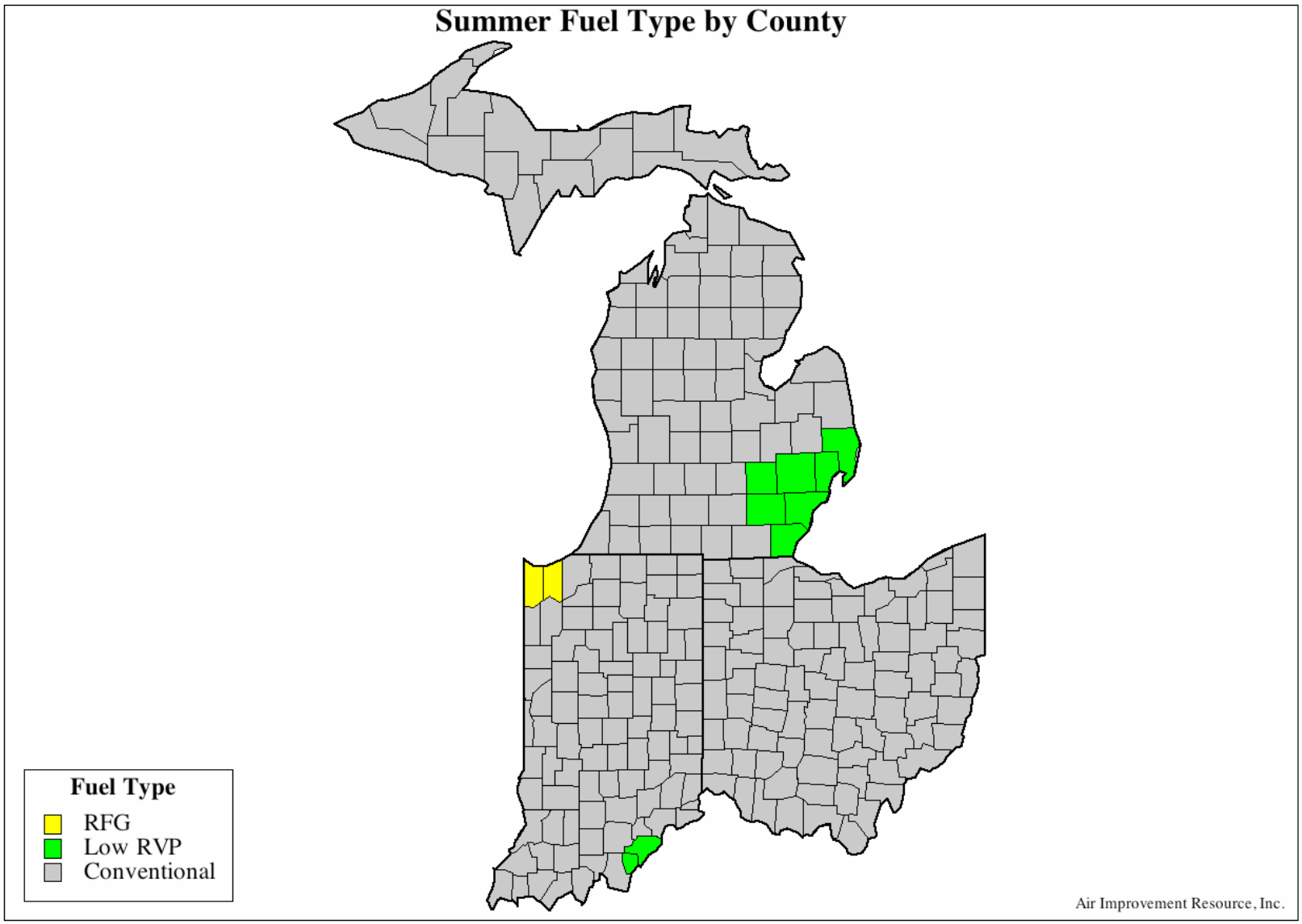
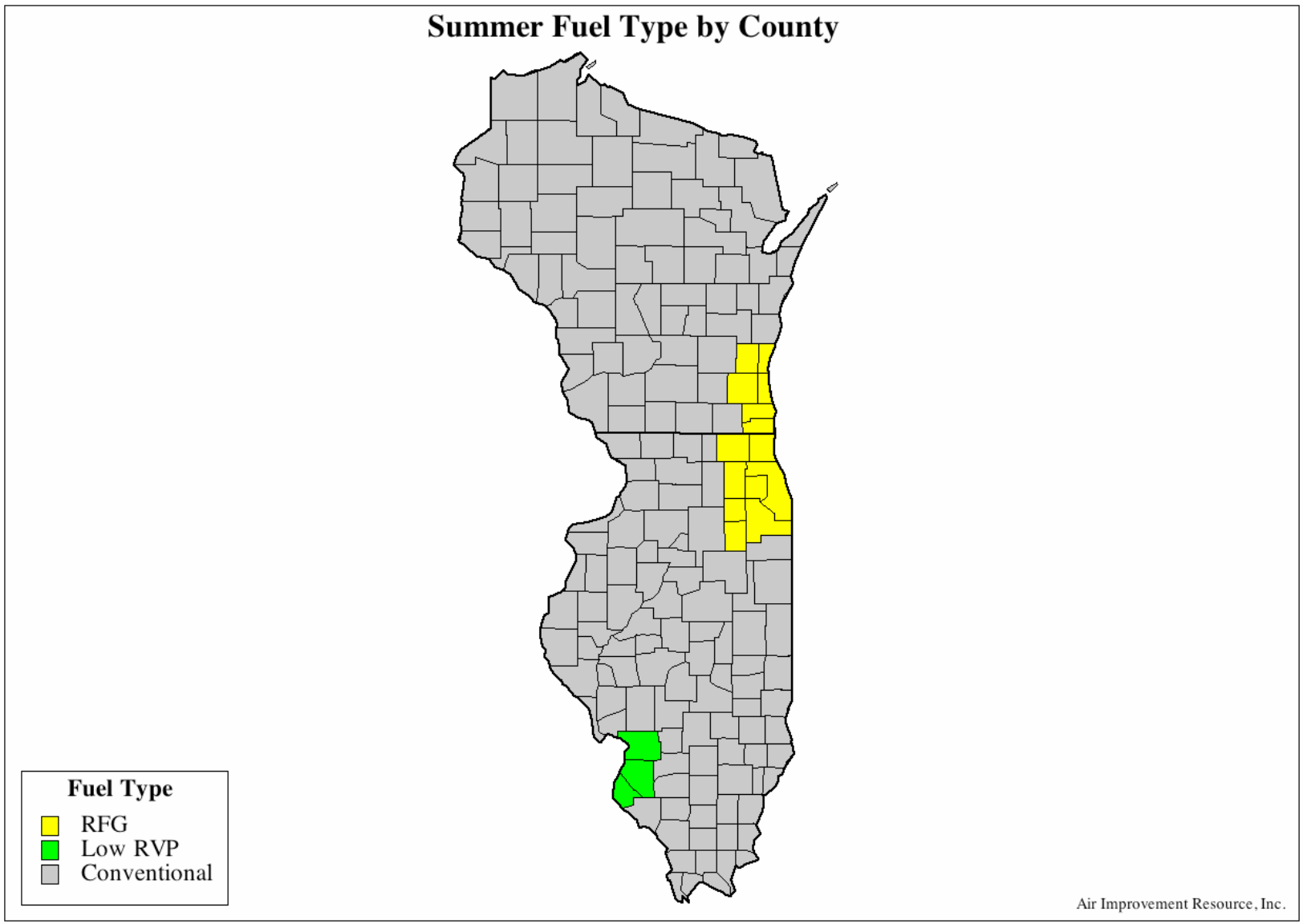

Summer Fuel Type by County
Fuel Type
RFG
Low RVP
Conventional
Air Improvement Resource, Inc.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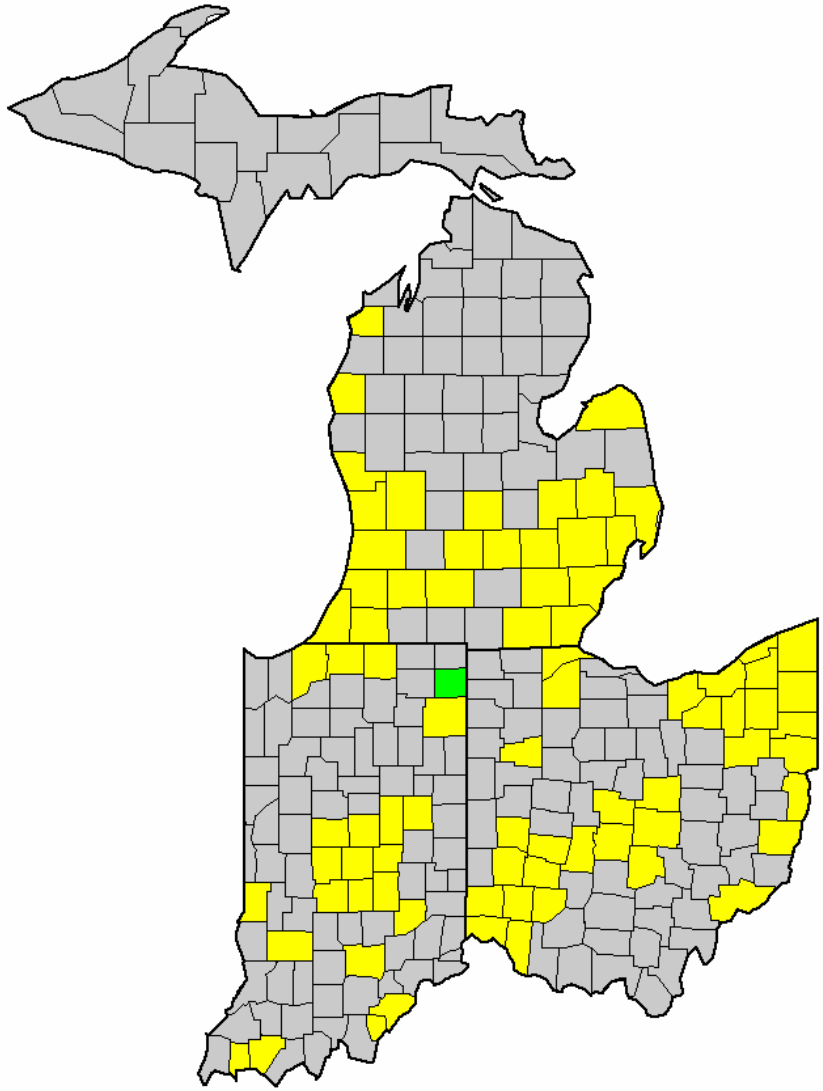
Nonattainment Counties that Could Have 7 RVP Fuel



Fuel Type

- 7 RVP
- Spillover
- No Change

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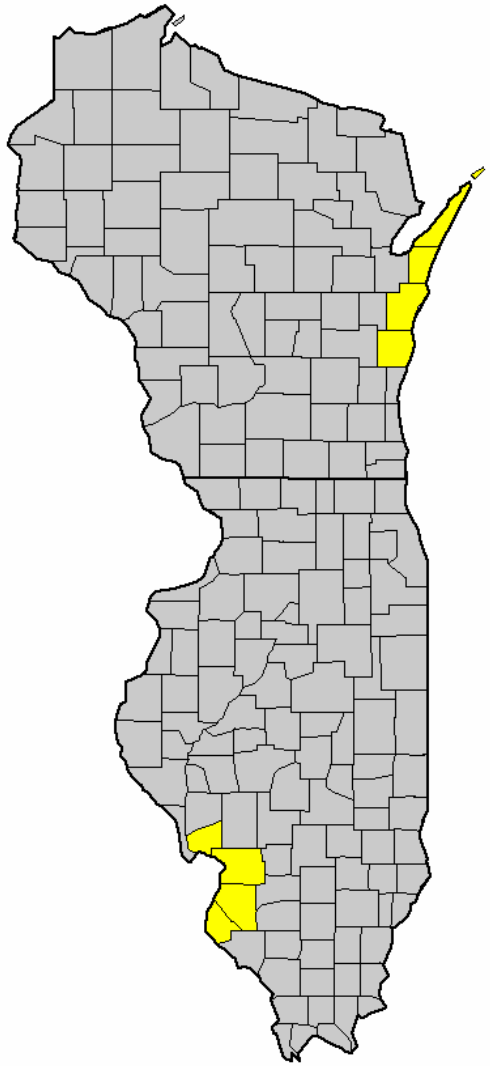

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Hurdles

- Each state must request and obtain a waiver from EPA to lower RVP in n/a counties
  - This request must meet certain criteria

- The modeling system must be capable of accurately modeling lower RVP
  - Should take into account the latest information affecting both baseline and control RVP

EPA Waiver

- Each state must request a waiver (called a “211 c demonstration”) to lower RVP from current levels
  - 1997 Guidance document
- Elements of the waiver request
  - #1: Identify the reductions needed for attainment
  - #2: Identify other measures that could be implemented in the reductions
  - #3: Explain which of these measures are impracticable
  - #4: Show that even with implementation of all reasonable and practicable measures, additional reductions are needed and that RVP controls would supply some or all of these reductions

How are the Elements Being Addressed?

- **#1: Identify reductions needed for attainment**
  - LADCO Urban Airshed sensitivity runs are identifying the reductions needed for attainment

- **#2: Identify possible other control measures**
  - These are being developed my MATCO and ENVIRON

How are the Elements Being Addressed?

- **#3: Explain which measures are impracticable**
  - A lot of information on this will be available from MATCO and ENVIRON. However, each state will have to develop its own rationale and customization

- **#4: Show that with all reasonable and practicable measures, additional reductions are needed and RVP controls would supply some reductions**
  - Developing accurate RVP reductions is a primary focus of this work effort

Other Areas That Have Submitted 211 c Demonstrations

- Birmingham, AL
- Atlanta, GA

Birmingham, AL

- Approved by EPA in 1999
- Applies to 2 counties
- Limited RVP to 7 from June 1st to September 15 (1 psi waiver for ethanol)
- Also included sulfur controls prior to Federal sulfur controls

Atlanta, GA

- Approved by EPA February, 2002
- 2 phases of controls
  - 7 RVP and 150 ppm sulfur apply in 13 counties in summer, 2002
  - 7 RVP and 30 ppm sulfur apply in 33 counties effective April 1, 2003

Modeling System Review

- Sources Affected
  - On-road mobile
  - Off-road mobile
  - Portable gasoline containers
  - Fuel distribution (tank farms, etc.)

- On-road and off-road mobile
  - Are input files ready?
  - Any model limitations that we can take care of?

MOBILE Model

- Asks for:
  - Gasoline RVP, without ethanol
  - Market share of ethanol (0-100%)
  - Concentration of ethanol (typically this is 10 volume %, or ~3.4 wt % oxygen)
  - Whether there is a 1psi RVP waiver for ethanol
- The model then computes the in-use RVP
  - Also accounts for “commingling”
  - This is where an ethanol and non-ethanol gasoline with the same RVP can become combined, resulting in a fuel tank with higher RVP than either fuel

MOBILE Example

- Base gasoline RVP is 9.0
- 50% ethanol market share
- 10% ethanol by volume
- 1 psi waiver for ethanol
- In use RVP = 50% * 9.0 + 50% * 10.0 = 9.5
- Also, adjust upward for commingling ~ 9.7 RVP or so

- Determining ethanol market fraction is very important!
- What if there is no RVP waiver for ethanol?
- Still important to develop ethanol market fraction, because on-road commingling effect will still raise RVP!

NONROAD

- This model much simpler
- Only input RVP, and wt % oxygen
- Model makes no internal adjustments to RVP like MOBILE does!
- Therefore, the inputted RVP must externally account for the oxygen content
- Thus, a state with a 1 psi waiver for ethanol, and significant ethanol market fraction, should have a higher RVP input for NONROAD than for MOBILE!
  - We are assuming no commingling of off-road gasolines, so states without a 1 psi ethanol RVP waiver should have the same RVP inputs for MOBILE and NONROAD

Model Input Review

- AIR checked the MOBILE6.2 and NONROAD2004 model inputs in NMIM
- AIR is working with the states to make some changes in the input files
- These changes should be completed this week

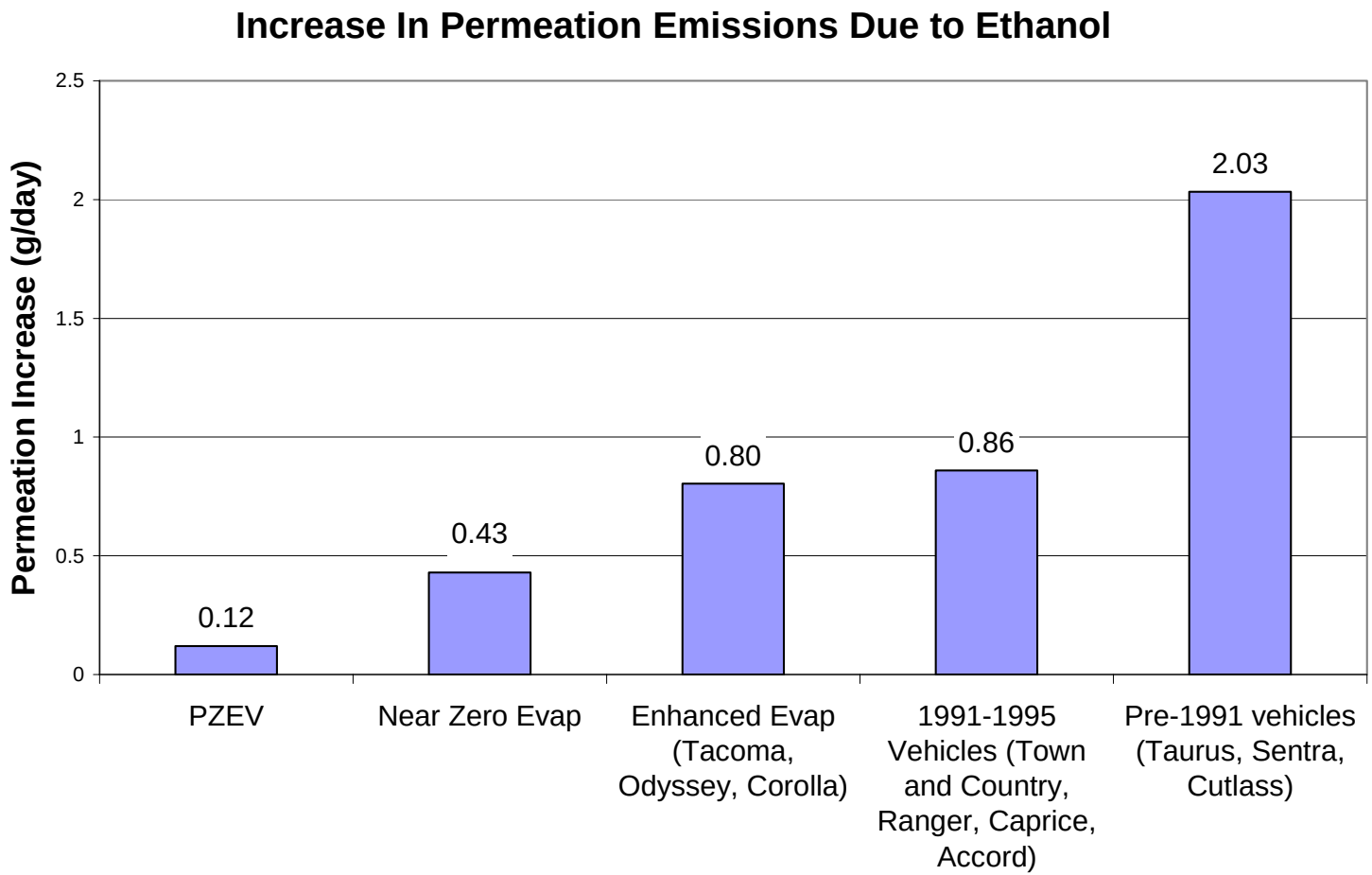
Model Review

- MOBILE6 models RVP changes very well
  - However, the model does not include increased VOC permeation due to ethanol
- NONROAD model evap VOC also changes with RVP
  - However, model does not include increased VOC due to ethanol permeation
  - Model also does not include resting losses, hot soak, and running loss emissions
  - Hot soak and running losses would change with RVP
- Need to change both models to account for these factors
  - Do it in such a way not to disturb NMIM, or any other input or output currently used in LADCO modeling system

Ethanol Permeation Impacts

- Source: AIR Studies for API and SEMCOG
- Ethanol permeation impacts conservative compared to recent California ARB estimates
- All permeation estimates corrected to local temperatures by county
- Permeation estimates based on tests on 2.0 wt %, assume same effect at 2.7% (RFG) and 3.5 wt % (could be higher)

On-Road Impacts
(based on very hot day, LADCO region would be lower)



Off-Road

(based on very hot day, LADCO region would be lower)

Source	Evap Controls	Ethanol Impact (g/day)
All off-road equipment	Without	0.4 g/day
Portable containers	Without	1.86 g/day
	With	0.56 g/day

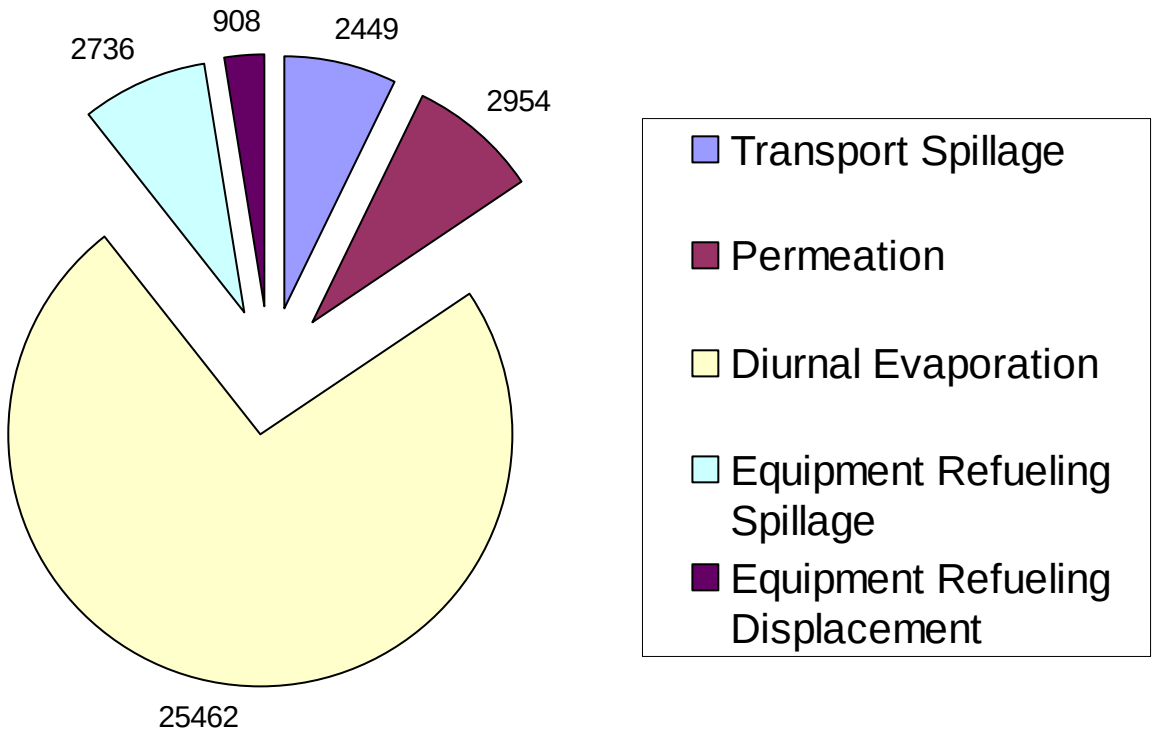
Improved Evap for NONROAD

- Model currently only contains diurnal emissions
  - Diurnal varies with RVP
- Need to add more VOC for permeation (not just ethanol permeation), hot soak, and running loss
- Developing adjustment factors that will bump-up VOC in NONROAD to account for other evap components
  - These estimates will be preliminary, as EPA plans to release NONROAD with updated gasoline evap once the small engine NPRM is released (Spring, 2006)
  - We are working with EPA (OTAQ)
- Improved evap adjustment factors will also be a function of input RVP

Portable Fuel Containers

- Interim White Paper (2/9/2005) describes inventory
- PFC inventory dominated by diurnal evaporative emissions, which are affected by RVP
- Inventories based on Illinois method, need to review method to develop RVP adjustment for diurnal evaporation (or use theoretical equations)
- Like on-road and off-road vehicles, size of diurnal reductions in nonattainment areas will depend on baseline RVP in those areas

PFC VOC Emissions in Nonattainment Areas
(inventories in tons per year)



Fuel Distribution

- Interim White Paper – 4/8/2005
- Sources: gasoline stations
  - Mechanisms: station refueling (stage I), vehicle refueling (stage II), tank breathing losses
- 97,300 tons per year in 2002 in n/a areas (8% of VOC!)
  - Drops to 74,000 in 2009 due to vehicle ORVR
- Lower RVP will reduce this - will utilize EPA equations for the effects of RVP on service station emisions

Low RVP Costs

- API Study of the “Potential Effects of the 8-Hour Ozone Standard on Gasoline Supply, Demand, and Production Costs”, April 15, 2005
- 7 RVP costs in the midwest (PADD2):
  - 0.6 – 3.0 cents per gallon
  - Range is a function of base RVP, other factors

Low RVP Cost Effectiveness

- Per gallon costs: API study
- Focus on a particular county or area like SEMCOG area
  - Similar cost-effectiveness elsewhere in the region
- Aggregate costs and emission reductions in that region
- Costs and emission reductions are concurrent, so no need to discount over time

Project Status

- Completed
  - Review of AL and GA 211 c waiver submissions
  - Spillover analysis
  - Costs (API report)
  - Review of current MOBILE and NONROAD inputs
  - Ethanol permeation in MOBILE and NONROAD
- In Process
  - PFC RVP control factors
  - Gasoline station RVP control factors
  - NONROAD evap adjustment factors (also RVP adjustment)
  - Cost effectiveness estimate
  - Draft report (1st week of December)