

"SOLVENT MASS BALANCE" APPROACH FOR ESTIMATING VOC EMISSIONS FROM ELEVEN NONPOINT SOLVENT SOURCE CATEGORIES

By:

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SOLVENT MASS BALANCE

Material Balance Technique

Project Goal:

Estimate nonpoint solvent emissions for 11 solvent source categories for inclusion in the National Emission Inventory (NEI)

11 SOLVENT NONPOINT SOURCE CATEGORIES

1. Architectural Surface Coating
2. Automobile Refinishing
3. Consumer and Commercial Products
4. Dry Cleaning
5. Graphic Arts
6. Industrial Adhesive and Sealants
7. Industrial Coating Operations
8. Pesticide Application
9. Process Solvents (and other operations)
10. Surface Cleaning (degreasing)
11. Traffic Paints

SOLVENT MASS BALANCE APPROACH

Today's Presentation

- Describe the 10 steps in the Solvent Mass Balance procedure
- Compare Solvent Mass Balance estimates for 1999 and 2002 vs. Existing 1999 NEI and State-submitted Estimates for 2002

SOLVENT MASS BALANCE APPROACH

Basic Methodology

- Start with solvent purchases on the national level from solvent market reports.
- Assign solvent to source categories.
- Distribute national solvent to the states/counties.

SOLVENT MASS BALANCE APPROACH

10 Steps

1. Obtain national solvent utilization data from available marketing reports (The Freedonia Group) for the most recent and/or target year.
2. Distribute solvent into source categories using market descriptors provided with the market data.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

3. "Grow" the solvent data to target years (1999 and 2002), if needed, using other market data, e.g., solvent market projections by broad industry group and/or source category.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

4. Assign solvent data to nonpoint source classification codes (SCCs), and identify nonpoint-to-point SCC correlation.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

5. Identify spatial surrogates for each source category: e.g., employment (by NAICS) and/or population.

6. Use spatial surrogates to distribute the solvent consumption by SCC to the state/county level.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

7. Apply national regulatory program controls that result in the destruction of solvent at nonpoint sources.
8. Obtain uncontrolled point source emissions on the county and/or facility level.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

9. Back-out uncontrolled point source emissions from controlled emissions and control device efficiency, if necessary.

SOLVENT MASS BALANCE APPROACH

10 steps (continued)

10. Subtract uncontrolled point source emissions (by point SCC) from total solvent consumption (by nonpoint SCC) at the state/county level to obtain nonpoint solvent emissions.

SOLVENT MASS BALANCE APPROACH

Step 1 – Detail

1. National solvent utilization data

- Detailed chemical-specific solvent use available for all but four (4) “paint and coating” source categories:
 - *Architectural Surface Coating*
 - *Automobile Refinishing*
 - *Industrial Coating*
 - *Traffic Paints*

SOLVENT MASS BALANCE APPROACH

Step 1 – Detail (cont.)

1. National solvent utilization data (continued)

- Only total “paint and coating” solvent use is available in Freedonia.
- The fraction of solvent used in each “paint and coating” source category is available from National Paint and Coating Association reports.

SOLVENT MASS BALANCE APPROACH

Step 2- Detail

2. Distribute solvent into source categories using market descriptors provided with the market data.

- Identify by North American Industrial Classification System (NAICS) codes.

SOLVENT MASS BALANCE APPROACH

Step 3 - Detail

3. "Grow" the solvent data to target years (1999 and 2002)

- Growth rates were small for most source categories and ranged from -2.2 to 1.2%.
- Exception is Dry Cleaning, with a -12.5% growth rate to 1999 and -0.61% rate from 1999 to 2002.

SOLVENT MASS BALANCE APPROACH

Step 4 - Detail

4. Assign solvent data to nonpoint SCCs

- Solvent consumption is divided equally among the nonpoint SCCs identified for each solvent source category.

SOLVENT MASS BALANCE APPROACH

Step 4 - Detail (cont.)

4. ...and identify nonpoint-to-point SCC correlation.

- Five solvent source categories had no point source components:
 - *Architectural Surface Coating*
 - *Automobile Refinishing*
 - *Consumer and Commercial*
 - *Pesticides*
 - *Traffic Paints*

SOLVENT MASS BALANCE APPROACH

Step 5 - Detail

5. Identify spatial surrogates for each source category: e.g., employment (by NAICS) and/or population.

- Spatial surrogates determined for each source category, as follows:

SPATIAL SURROGATES USED

Solvent Mass Balance

- Architectural Surface Coating
 - Painting and Wall Covering Contractors 23521 (60%)^b
 - Population (40%)^b
- Automobile Refinishing
 - Couriers and Messengers 492; Auto Equipment Rental and Leasing 5321; Auto Repair and Maintenance 8111

SPATIAL SURROGATES USED

Solvent Mass Balance

- Consumer and Commercial Products
 - Population (100%)
- Dry Cleaning
 - Coin-op 81231; Dry Clean Services 81232; Linen and Uniform 81233

SPATIAL SURROGATES USED

Solvent Mass Balance

- Graphic Arts
 - Paperboard Container 3222; Printing 32311
- Pesticide Application
 - Crop Production 111 (50%)
 - Population (50%)

SPATIAL SURROGATES USED

Solvent Mass Balance

- Industrial Adhesive and Sealants
 - Wood Products 3212; Paperboard 32221; Paper Bag, Treated Paper 32222; Sanitary Paper 322291; Printing 32311; Plastics and Rubber 326; Motor Vehicle Body 336211; Building Materials/Supplies 4441; Auto Repair and Maintenance 8111

SPATIAL SURROGATES USED

Solvent Mass Balance

- Industrial Coating Operations
 - Logging 1133; Wood Mfg 321xx; Pulp&Paper 322x; Chemical Mfg 325; Plastics and Rubber 326; Pottery, Plumbing Mfg 32711; Glass 327212; Concrete 32739; Metal 332xx; Computer&Electron. Mfg 334xx; Electr. Equip Mfg 335xx; Transp. Equip. Mfg 336xx; Furniture Mfg 337xx, Misc Mfg 339xx; Couriers 492; Cables 5132; Telecomm. 5133; Auto Rental 5321; Auto Repair 8111; Electronic Repair 811x

SPATIAL SURROGATES USED

Solvent Mass Balance

- Surface Cleaning
 - Metal 331,332; Machinery 333;
Computers 334; Electrical 335;
Transport Equip Mfg 336; Furniture
337; Misc Mfg 339; Auto Parts 441;
Transportation 483, 484, 485, 488;
Auto Repair 8111; Electronic Repair
8112

SPATIAL SURROGATES USED

Solvent Mass Balance

- Process Solvents
 - Chem Mfg 325; Computer & Electron. Mfg 334
- Traffic Paints
 - Highway and Street Construction 23411

SOLVENT MASS BALANCE APPROACH

Step 7- Detail

7. National destructive solvent controls?

- No potentially-applicable regulations require destructive controls and/or apply to nonpoint emission sources:
 - CAA 183(e) VOC Rules: Architectural, Automobile Refinishing, and Consumer Products;
 - NESHAP: Degreasing and Dry Cleaning

SOLVENT MASS BALANCE APPROACH

Step 8 - Detail

8. Obtain uncontrolled point source emissions on the county/facility level

- 1999 and 2002 NEI Point Source data.

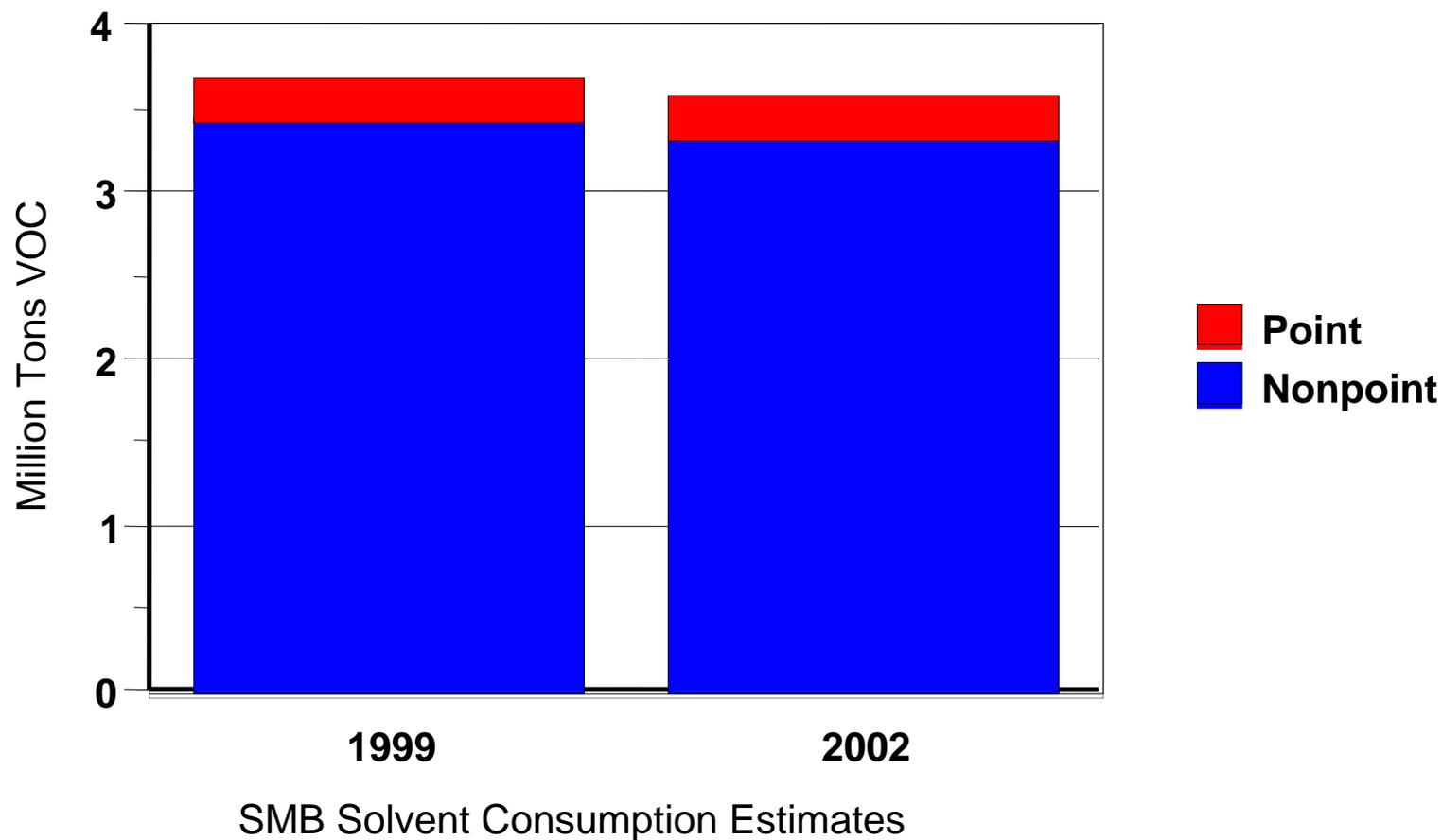
SOLVENT MASS BALANCE APPROACH

Step 9 - Detail

9. Back-out uncontrolled point source emissions from controlled emissions and control device efficiency, if necessary.

- Use reported control efficiency (CE), default CE from EPA for specific control devices, or overall default CE of 70 percent.

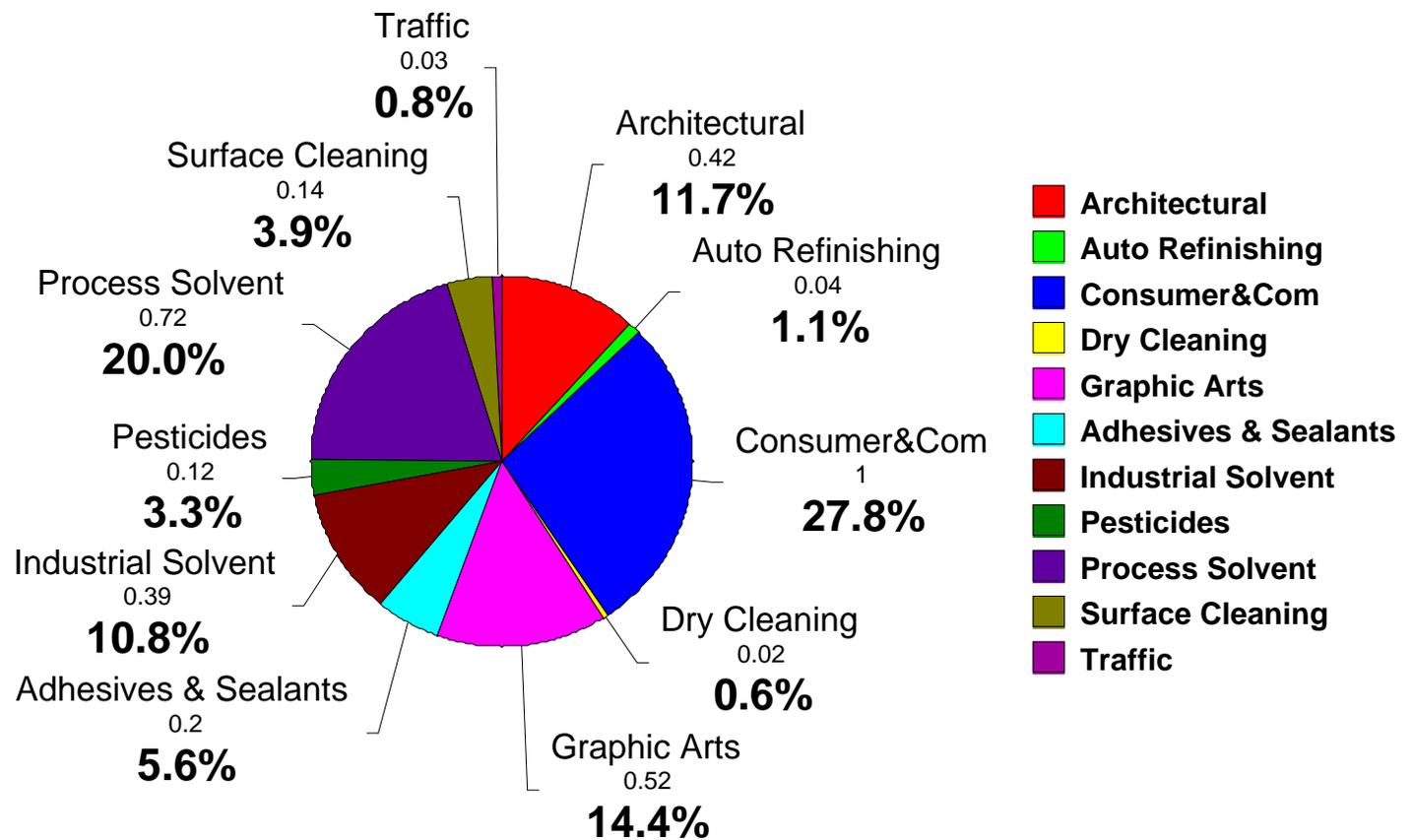
SOLVENT MASS BALANCE (SMB) ESTIMATES



Total 1999 = 3.7
Total 2002 = 3.6

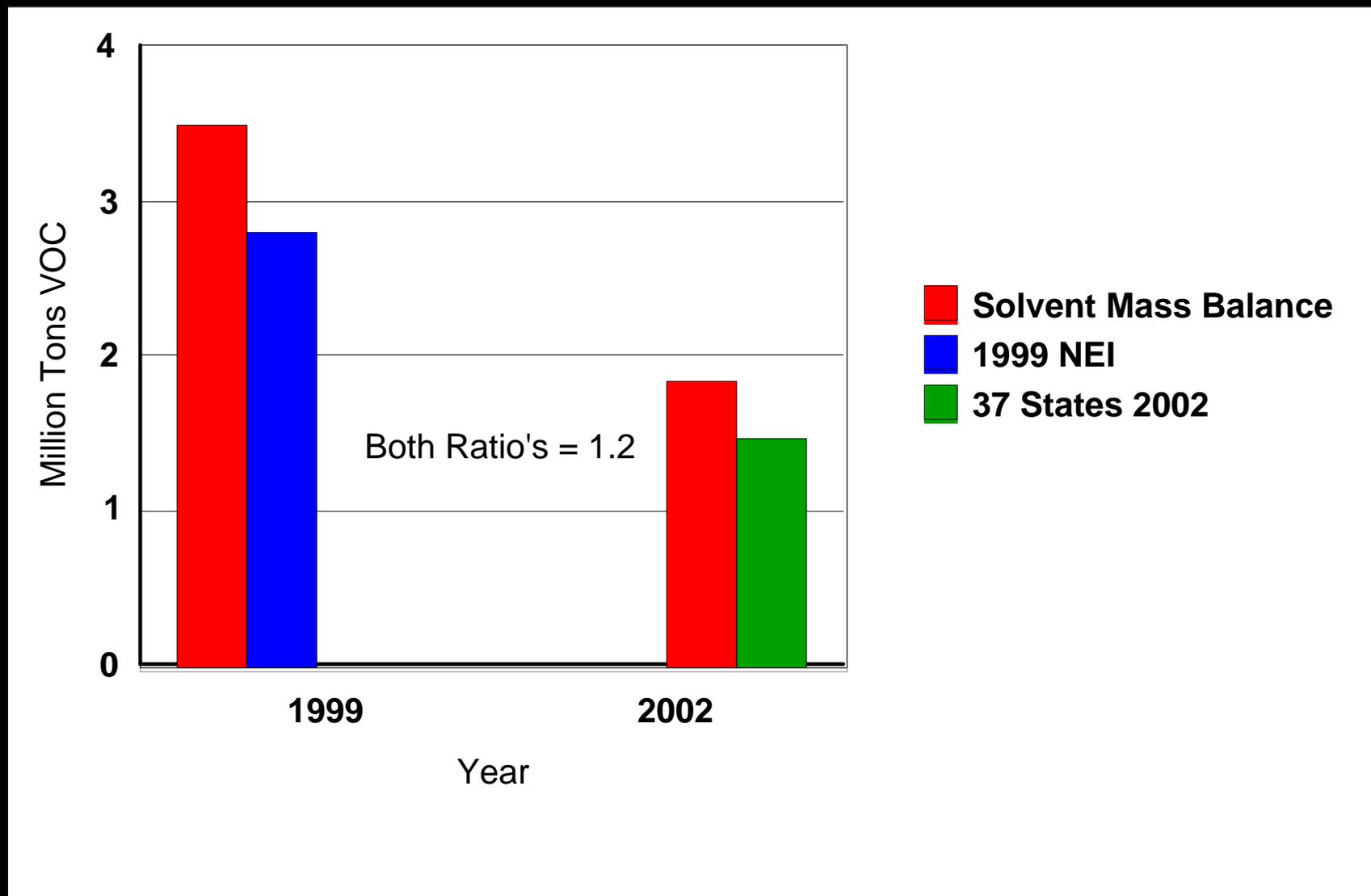
SOLVENT MASS BALANCE APPROACH

U.S. Solvent Consumption 2002

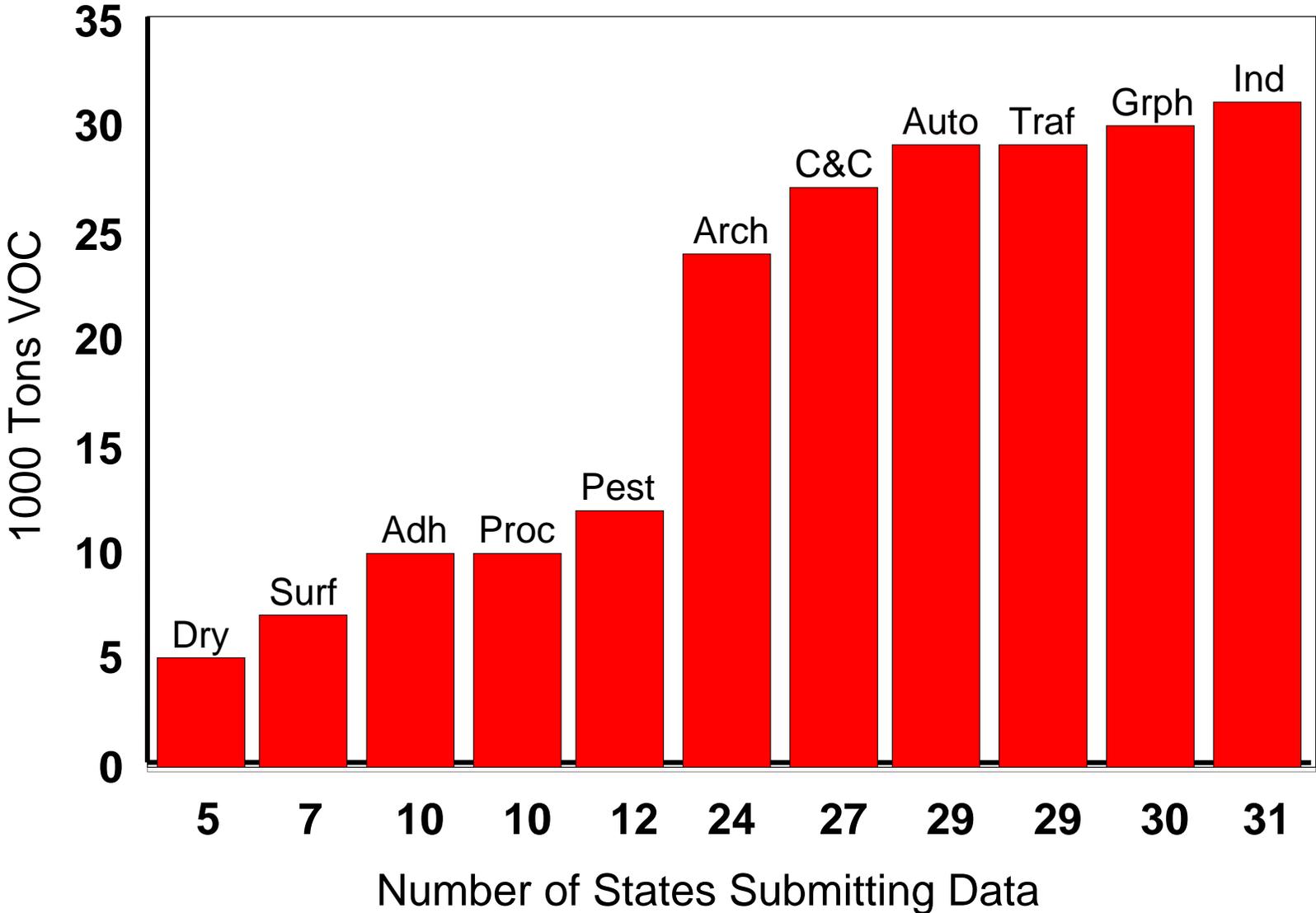


Circle = 3.6 million tons

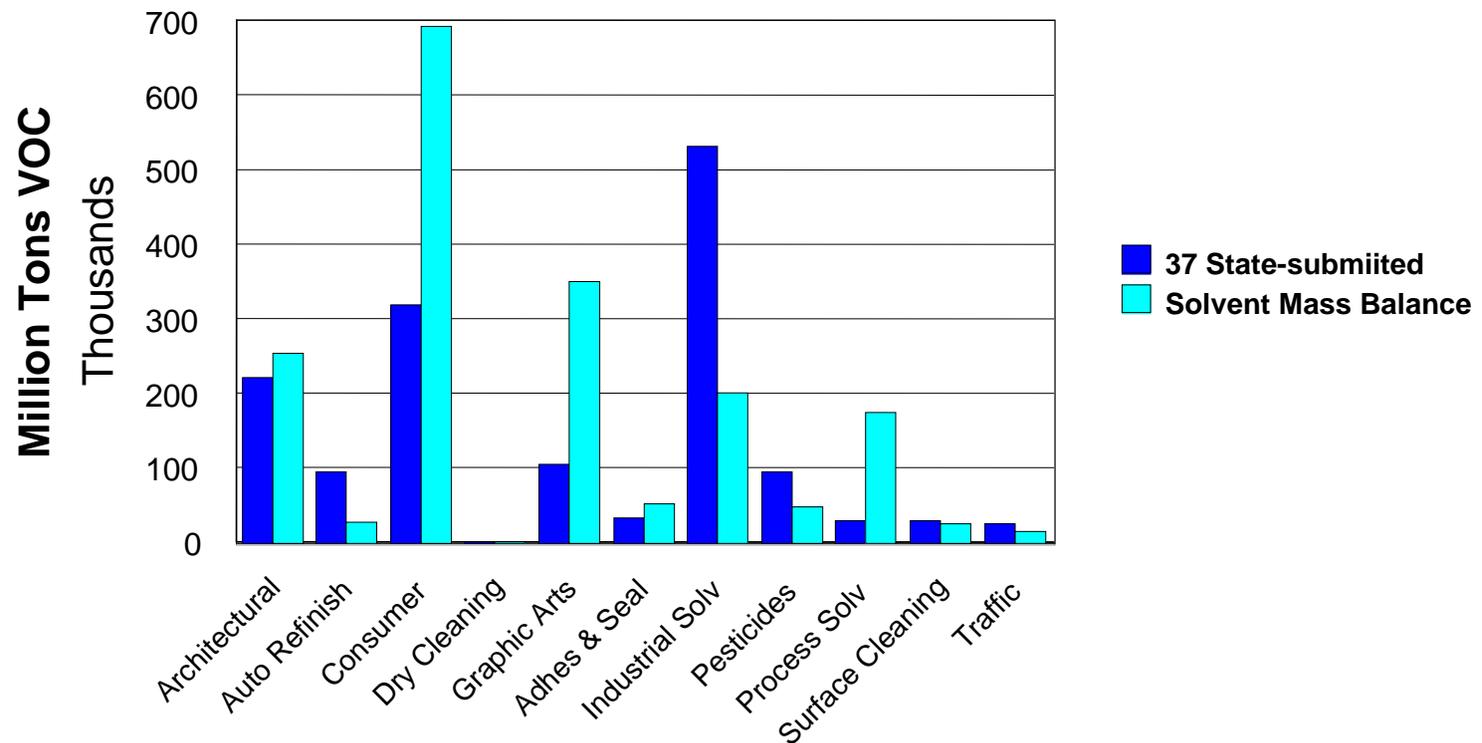
COMPARISON TO 1999 NEI AND 2002 STATE DATA



STATE-SUBMITTALS FOR 2002



COMPARED TO 37 STATE-SUBMITTED ESTIMATES FOR 2002



Solvent Nonpoint Source Categories

Total VOC Emissions Estimates for 2002 for 37 States

"Solvent Mass Balance" = 1.84 million tons

37 State-submitted Estimates = 1.48 million tons

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER ESTIMATE: SOLVENT MASS BALANCE

- Consumer and Commercial Products
- Graphic Arts
- Process Solvents

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER ESTIMATE:
STATE-SUBMITTED

- Industrial Coating Operations
- Pesticide Application
- Automobile Refinishing

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

SIMILAR ESTIMATES

- Architectural Surface Coatings
- Dry Cleaning
- Industrial Adhesives and Sealants
- Surface Cleaning
- Traffic Paints

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER SOLVENT MASS BALANCE ESTIMATE

- California
- Tennessee
- Texas

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

SOLVENT MASS BALANCE
HIGHER ESTIMATE--For California

- Architectural Surface Coatings (9X)
- Consumer and Commercial Products (9X)
- Graphic Arts (12X)

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

SOLVENT MASS BALANCE
HIGHER ESTIMATE--For Texas

- Consumer and Commercial Products (7x)
- Graphic Arts (19x)
- Industrial Coating (11)

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER STATE-SUBMITTED ESTIMATE

- Florida
- Georgia

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER STATE-SUBMITTED ESTIMATE:
Florida

- Industrial Coating (x5)

2002 SMB ESTIMATES VS. 37 STATE-SUBMITTED

HIGHER STATE-SUBMITTED ESTIMATE:
Georgia

- Automobile Refinishing (x7)
- Industrial Coating (x5)

SOLVENT MASS BALANCE-- *POTENTIAL IMPROVEMENTS*

- Develop a methodology to allocate solvent use to the individual SCCs within each solvent nonpoint source category that reflects true solvent use.
- Develop a methodology to account for regional programs that reduce solvent use in local areas.