CLEAN PRODUCTS MARKET ANALYSIS
PRESENTATION OF SURVEY FINDINGS

Presentation to MWAQC Technical Advisory Committee
May 9, 2017

RAMBOLL ENVIRON

PROJECT SCHEDULE

Key Activities	Date
Project kickoff	November 29, 2016
Present survey approach to COG Present survey approach to TAC	December 20, 2016 January 10, 2017
Submit draft Technical Memo (survey approach)	January 6, 2017
Beta test and revise surveys	January - February 2017
Distribute surveys	February - March 2017
Analyze survey results	April 2017
Submit draft Technical Report (results)	April 28, 2017
Present results to COG **Present results to TAC** Present results to MWAQC (in person)	May 2, 2017 **May 9, 2017** May 24, 2017
Finalize draft Technical Report	May 31, 2017
Prepare SIP documentation	TBD

BACKGROUND

- Differences in current product regulations in the member states (DC-MD-VA)

Jurisdiction	Automotive Refinishing Coatings	Residential Heating Oil
District of Columbia	2009 OTC rules	500 ppm (No. 2 fuel oil) (15 ppm in 2018)
Maryland	2009 OTC rules	500 ppm (No. 1 & 2)
Northern Virginia	2002 OTC rules	None

STUDY QUESTION

- Due to the regional nature of supplier and distribution networks, do manufacturers and distributors voluntarily sell cleaner products in Northern Virginia, even if not required by state regulations?
- If yes, could MWCOG and its member air agencies apply to the USEPA for State Implementation Plan (SIP) credit for voluntary emission reductions?

Image Source: MWCOG

STUDY DESIGN CRITERIA

- Meet USEPA criteria for seeking SIP credit
  - Quantifiable
  - Surplus
  - Enforceable
  - Permanent
  - Adequately Supported
- Consistent with prior emission inventories' calculation methodologies

IDENTIFICATION OF STUDY PARTICIPANTS: AUTOMOTIVE COATINGS

- **Industry structure**: Coatings are manufactured by a relatively small group of mostly multinational coating manufacturers who sell to distributors or end users (e.g., auto repair shops)
- **Target participants**: Manufacturers and distributors
- **Participant recruitment**: American Coatings Association Automotive Refinish Committee
  - Approximately 24 companies, including national and international automotive coating manufacturers and distributors
  - ACA requested that we not disclose the membership list publicly but we confirmed that the top U.S. manufacturers with the majority of the industry market share were included on the list
- **Target response rate**: Aim to reach at least 25-30% of participants and evaluate market share representation

IDENTIFICATION OF STUDY PARTICIPANTS: RESIDENTIAL HEATING OIL

- **Industry structure**: Fuel oil is delivered from refineries via pipeline to bulk terminals and sold to small, direct distributors and large bulk distributors who sell to other distributors or end users
- **Target participants**: Distributors and wholesalers
- **Participant recruitment**: Multiple methods
  - Interviews with the Virginia Petroleum Council and Petroleum Marketers Association of America
  - Fuel seller permits
  - Public vendor directories
  - Interviews with “last-mile” residential heating oil providers
- **Target response rate**: Aim to reach at least 25-30% of participants and evaluate market share representation.

SURVEY IMPLEMENTATION

- Beta-testing of questionnaire with a subset of industry participants
  - Main feedback: Reluctance to provide product sales and market share information
- Two-part questionnaires instead of one-part questionnaires
  - Part 1: Basic company information, geographic markets (DC, MD, and/or VA), and presence/absence of cleaner product offerings
  - Part 2: Product sales volume, percentage of products meeting lower emission limits, market share, future changes in sales
- Two-contact approach for each questionnaire part
  - Attempted to reach survey recipients at least 2 times
  - Part 2 survey was administered by email or phone and included partial responses
  - Follow up emails or phone calls to clarify responses to Part 1 and 2 surveys

OVERALL SURVEY RESPONSE RATES

Parameters	Automotive Refinishing Coating	Residential Heating Oil
Recipient type	Manufacturers and distributors	Distributors and wholesalers
Number of survey recipients	24	13
Response rate	17%	23%
Market share representation	> 60%	Not estimable based on information provided

AUTOMOTIVE REFINISHING COATINGS

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OVERVIEW OF FINDINGS: AUTOMOTIVE REFINISHING COATINGS

- **Hypothesis**: Coating manufacturers and distributors sell lower VOC products in Northern Virginia even if they are only required to do so in neighboring DC and MD.
- **Findings**:
  - There is partial adoption of lower VOC products in NoVA but it is not widespread and varies by product category and company.
  - Proportion of coatings sold in NoVA that meet DC and MD limits is relatively small.
  - Large coatings manufacturers and distributors segment the market by regulatory differences.
  - Adoption of lower VOC coatings is generally motivated by customer demand and product performance, not by convenience of selling the same product formulations to the region.

EMISSION REDUCTION SCENARIOS (VA): AUTOMOTIVE REFINISHING COATINGS

Baseline	Emissions based on employment numbers and per-employee emission factor
Low Estimate	% reduction accounts only for the market share of respondents
High Estimate	Extrapolates % reduction to non-responsive companies

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EMISSION REDUCTION ESTIMATES (VA): AUTOMOTIVE REFINISHING COATINGS

Estimate	Adjustment Factor	Annual VOC Emissions from Auto Refinishing Coatings in NoVA (tons)	VOC Reduction from Baseline (tons)	Percent Reduction from Baseline (%)
Baseline	0%	57.9	-	-
Low	8%	53.0	4.9	8
High	13%	50.4	7.5	13

RESIDENTIAL HEATING OIL

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OVERVIEW OF FINDINGS: RESIDENTIAL HEATING OIL

- **Hypothesis**: Distributors and wholesalers sell lower sulfur heating oil to Northern Virginia even if they are only required to do so in neighboring DC and MD.
- **Findings (from surveys)**:
  - All respondents reported that they distribute 15 ppm heating oil
    - Includes those that distribute only in Northern Virginia
  - Respondents appeared to represent a small share of the total market
  - Reported declining sales due to households switching to electric heat or natural gas
  - Dependent on available fuels at bulk terminals
- **Findings (from interviews of upstream suppliers)**:
  - Pipelines and terminals, which provide the vast majority of fuel oil to the MW region, supply exclusively 15 ppm fuel oil

EMISSION REDUCTION SCENARIOS: RESIDENTIAL HEATING OIL

Baseline	**Virginia**: 100% is 2000 ppm **Maryland**: 100% is 500 ppm
Low Estimate	**Virginia**: 70% is 15 ppm; 30% is 2000 ppm **Maryland**: 50% is 15 ppm; 50% is 500 ppm
High Estimate	**Virginia**: 100% is 15 ppm **Maryland**: 100% is 15 ppm

EMISSION REDUCTION ESTIMATES (SULFUR DIOXIDE, SO2): RESIDENTIAL HEATING OIL

Virginia Jurisdictions			
Estimate	Annual SO_2 Emissions from Residential Heating Oil Use (tons)	Reduction from Baseline (tons)	Percent Reduction from Baseline (%)
Baseline	129	-	-
Low	40	89.6	70
High	1	128.1	99

Maryland Jurisdictions			
Estimate	Annual SO_2 Emissions from Residential Heating Oil Use (tons)	Reduction from Baseline (tons)	Percent Reduction from Baseline (%)
Baseline	106.6	-	-
Low	54.9	51.7	49
High	3.2	103.4	97

EMISSION ESTIMATES (PARTICULATE MATTER, PM2.5): RESIDENTIAL HEATING OIL

Virginia Jurisdictions			
Estimate	Annual $PM_{2.5}$ Emissions from Residential Heating Oil Use (tons)	Reduction from Baseline (tons)	Percent Reduction from Baseline (%)
Baseline	4.1	-	-
Low	1.3	2.9	70
High	0.03	4.1	99

Maryland Jurisdictions			
Estimate	Annual $PM_{2.5}$ Emissions from Residential Heating Oil Use (tons)	Reduction from Baseline (tons)	Percent Reduction from Baseline (%)
Baseline	3.4	-	-
Low	1.8	1.7	49
High	0.1	3.3	97

CONCLUSIONS

- **Automotive refinishing coatings**
  - Limited VOC reductions
  - Significant adoption of low VOC coatings in NoVA is unlikely without regulation
  - Respondent concerns about releasing confidential data limits disclosure of supporting documentation
  - **Apply for SIP credit?**
    Not recommended

- **Residential heating oil**
  - Majority of fuel oil distributed through MWCOG region is 15 ppm
  - SO_2 and $PM_{2.5}$ emission reductions will be reduced in future years due to fuel switching and newer equipment (e.g., annual 5.5% decline in Virginia)
  - **Apply for SIP credit?**
    Maybe

UNCERTAINTIES

- Extrapolation of survey results to non-responsive respondents
- Reliance on state-wide data to represent MWCOG jurisdictions
- Selection of parameters used by states in emission inventory calculations
  - Automotive refinishing coatings
    - We used employment data for NAICS code 811121 (Automotive Body, Paint, and Interior Repair and Maintenance)
    - MDE uses an employment number for NAICS code 81112, which also includes glass repair shops
    - VDEQ uses an employment number based on SIC code 7532, which may not align perfectly with 811121.
    - Different emission factor: 94.69 lb VOC/employee (VA) vs. 592.68 lb VOC/employee (MD)
  - Residential heating oil
    - We used 2000 ppm as the benchmark for fuel sulfur content in Virginia in the absence of a standard

DISCUSSION

SUPPLEMENTAL SLIDES

EMISSION CALCULATIONS (VA): AUTOMOTIVE REFINISHING COATINGS

- Emissions calculations based on formulas and default values used by Virginia DEQ
  - $2015\ Annual\ Emissions\ (\frac{lbs}{year}) = (FIPs\ Activity\ Level)\ \times (EF) \times (Reactivity) \times (1 - (CE\ \times\ RP\ \times\ RE))$
    - Used employee count for NAICS code 811121
  - $2015\ Annual\ Emissions\ (\frac{lbs}{year}) = (1911\ employees)\ \times (94.69\ lb/employee) \times (1) \times (1 - (0.36\ \times 1\ \times 1))$
- Adjustment factor to the above equation developed based on survey responses
  - Estimated product sales volumes and relative proportion of product sales by product category
  - Relative proportion of higher vs. lower VOC products in each category
  - Estimated market share

EMISSION CALCULATIONS (VA, MD): RESIDENTIAL HEATING OIL

$$\text{Total residential fuel oil use in MWCOG jurisdictions} = \frac{\text{\% of households using heating oil (fuel oil, kerosene) in MWCOG jurisdictions} \times \text{Households in MWCOG jurisdictions}}{\text{\% of households using heating oil (fuel oil, kerosene) in entire state} \times \text{Households in entire state}} \times \text{Total residential fuel oil use in entire state}$$

Sources: American Community Survey 2011-2015, Energy Information Administration 2015

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EMISSION CALCULATIONS (VA, MD): RESIDENTIAL HEATING OIL

$$SO_2 \text{ emissions} = \text{Total residential fuel oil use in MWCOG jurisdictions} \times \left\{ \left(SO_2 \text{ emission factor for 15 ppm fuel oil} \times \text{\% share of 15 ppm fuel oil} \right) + \left(SO_2 \text{ emission factor for higher sulfur fuel oil} \times \text{\% share of higher sulfur fuel oil} \right) \right\}$$

$$PM_{2.5} \text{ emissions} = \text{Total residential fuel oil use in MWCOG jurisdictions} \times \left\{ \left(PM_{2.5} \text{ emission factor for 15 ppm fuel oil} \times \text{\% share of 15 ppm fuel oil} \right) + \left(PM_{2.5} \text{ emission factor for higher sulfur fuel oil} \times \text{\% share of higher sulfur fuel oil} \right) \right\}$$

Sources: American Community Survey 2011-2015, Energy Information Administration 2015, USEPA AP-42, Brookhaven National Laboratory

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HEATING OIL SPECIFICATIONS
NORTHEAST & CENTRAL ATLANTIC

Figure 7. Northeast heating oil sulfur specifications (2010-20)

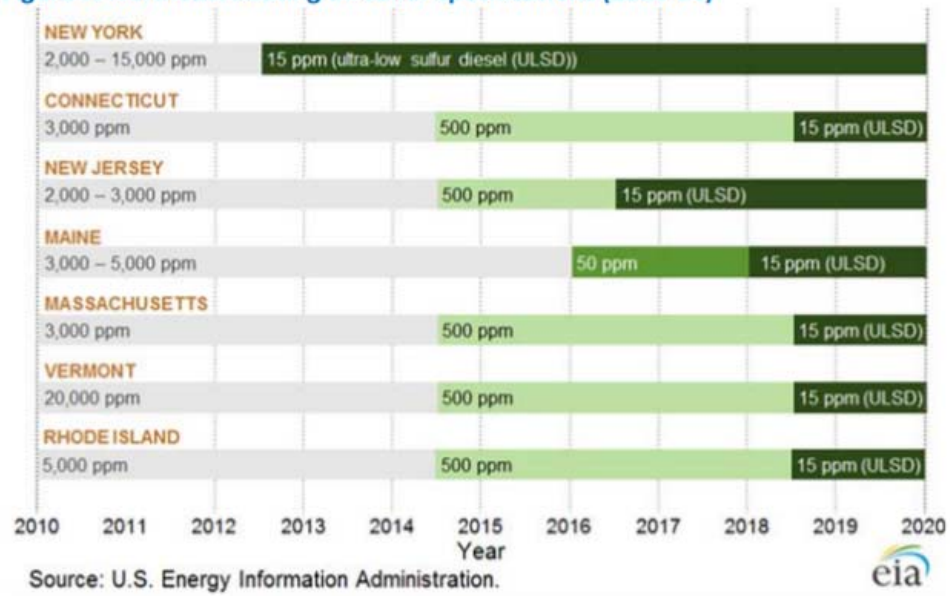

Figure 18. Central Atlantic heating oil specifications (2014-2020)

Source: 2016 EIA report

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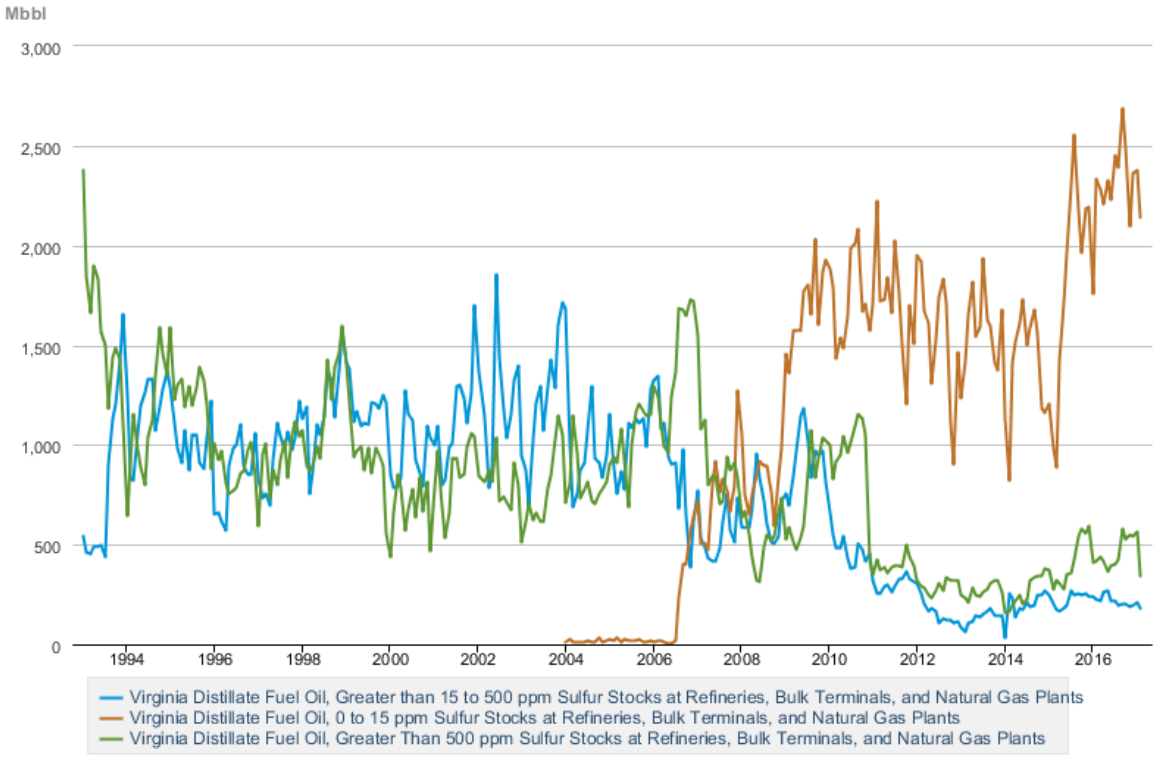
FUEL OIL DATA (VIRGINIA STATE-WIDE, ALL USES)

Prices, Sales Volumes & Stocks by State



Source: U.S. Energy Information Administration

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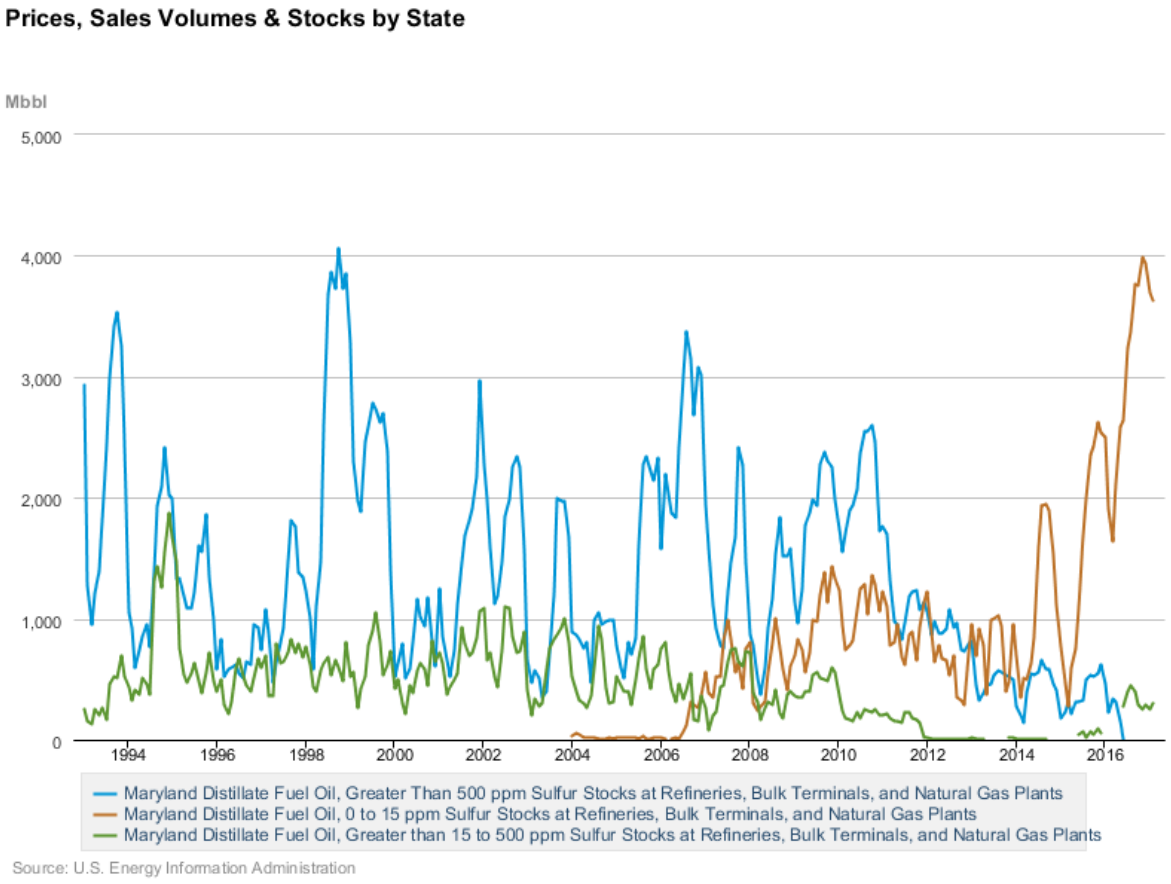
FUEL OIL DATA (MARYLAND STATE-WIDE, ALL USES)



Source: U.S. Energy Information Administration

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