

Delaware Regulations for Vapor Emission Controls at Gasoline Dispensing Facilities (GDFs)

**Review Committee Meeting #1
August 29, 2013**

By: Frank Gao



Blue Skies Delaware; Clean Air for Life

Agenda

1. Introduction to Review Committee
2. Overview of Issues
3. Discussion
4. Plan for Next Meeting



Review Committee Members

- **Division of Air Quality-DNREC**
- **Tanks Management Section-DNREC**
- **GDF owner/operator**
- **Service contractors**
- **Industry organization**
- **Environmental group**



Committee Work Scope

- **Review and discuss relevant issues (background/history, current situation, problems, strategies)**
- **Identify and discuss control technologies**
- **Review and comment on draft revised regulations**



2. Overview of issues

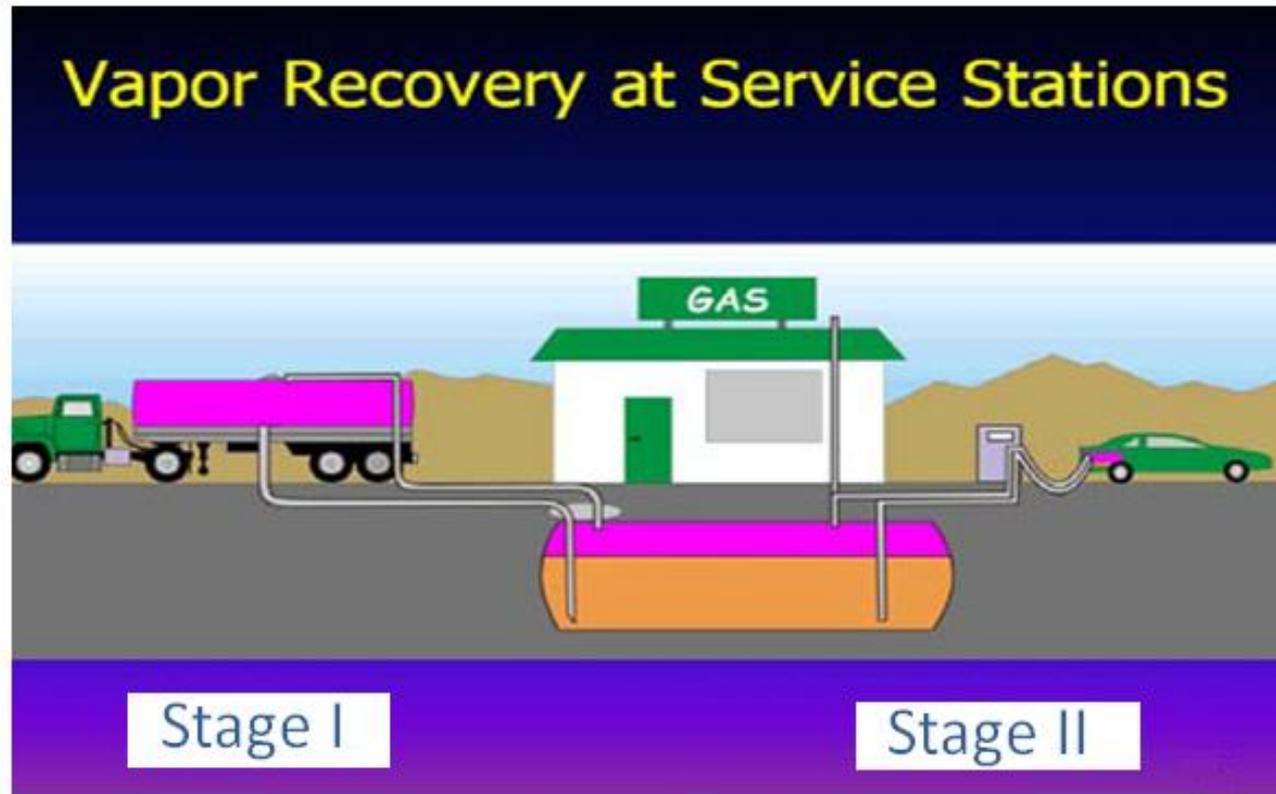
- **Vapor emissions at GDFs**
- **Air toxics background**
- **Ozone air quality background**
- **VOC controls**
- **Existing issues**
- **Control strategies**



Vapor emissions at GDF

Gasoline vapor: Toxics and VOC

Truck



Vapor emissions at GDF

- Delaware's current control strategy – collectively 7 DE Admin. Code 1124 (Reg. 1124):
 - Section 26 (Stage I)
 - Section 27 (Tank Trucks)
 - Section 36 (Stage II)
- This revision process will touch portions of each of these 1124 Sections, and will address both air **toxics** and volatile organic compound (**VOC**) emissions.



Vapor emissions at GDF (Cont'd)

- **Air toxic** requirements
 - At least as stringent as “Subpart 6C’s”
 - Jim Snead will cover this part
- **Volatile organic compound** requirements
 - Sources currently not “well controlled”
 - CAA requires new “RACT SIP” promulgation by July 20, 2014
 - Frank Gao will cover this part



Air toxics

- Switch to Jim Snead
- Then back to Frank Gao

Ozone air quality and VOC controls

- Ozone air quality background
- Control vapor emissions from GDFs
- Problems
- Control strategies



Ozone air quality and standards

- **What is ozone O₃?**
 - Ground-level, major part of summer smog
- **Ozone is harmful to human health**
 - Aggravates asthma
 - Damages respiratory system and lung
 - Worst effects on children and the elderly
- **Ozone is harmful to public welfare**
 - Damage to trees, crops, and buildings

Ozone is harmful!

- **Human health effects**
 - Irritates respiratory system
 - Reduces lung function
 - Inflames and damages cells that line the lung
 - Aggravates chronic lung diseases
 - Causes permanent lung damage

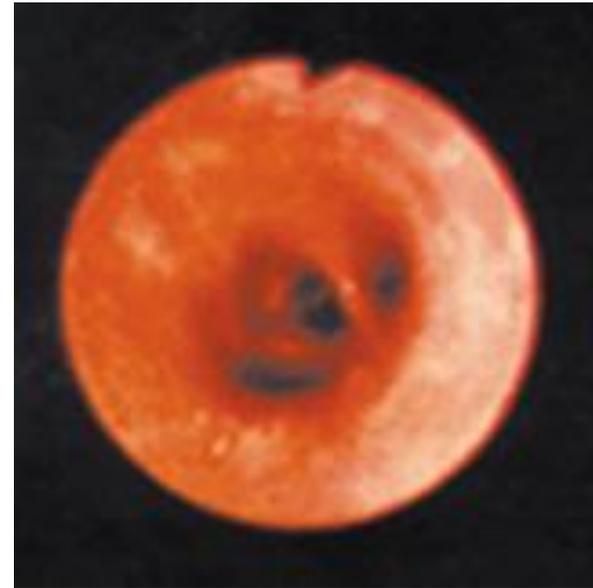
Ozone is harmful!

- **Damage to Human health**

Healthy Airway



Inflamed Airway



Ozone is harmful!

- **Damage to vegetation**
 - Interferes with ability to produce and store food, compromising overall plant health
 - Makes plants more susceptible to disease, pests & environmental stresses



Ozone air quality and standards

- **Clean Air Act (CAA) and ozone NAAQS**
 - 1970s-1990: 1-hour 0.12 ppm, DE non-attainment
 - 1990
 - 1-hour ozone standard 0.12 ppm →
Delaware non-attainment → attained in 2005
 - 1997
 - 8-hour standard 0.08 ppm →
Delaware non-attainment → attained in 2011
 - 2008
 - 8-hour standard 0.075 ppm →
Delaware non-attainment → 2015?
 - New standard in near future (~3 years)
Very likely ≤ 0.070 ppm → DE nonattainment

Delaware's SIP Control Measures

- Delaware's State Implementation Plan (SIP)
 - masterpiece for managing O₃ air quality
 - Targeting emissions of precursors VOC and NOx:
VOC + NOx → O₃
 - Developing strategies for controlling VOC and NOx emissions
 - Setting up control measures and rules
 - Committing to milestone emission targets and attainment
 - Ensuring no back-sliding
 - Seeking US EPA's approval

Delaware's SIP Control Measures

- **Delaware SIP covers every non-trivial VOC and NOx emitting source in the State**
 - Centralized Vehicle Inspections and Maintenance (I/M) requirements to include testing of older, high emitting vehicles, to significantly reduce on-road mobile emissions (7 DE Admin. Code 1126 and 1136)
 - Stringent Reasonable Available Control Technology (RACT) on all major nitrogen oxides (NOx) and volatile organic compound (VOC) stationary sources, which establishes a baseline level of control and achieves large, cost effective reductions (7 DE Admin. Code 1112 and 1125)
 - Best Available Control Technology (BACT) has been required on all existing coal and residual oil fired EGUs, and large industrial boilers, which ensure the largest emitters are well controlled (7 DE Admin. Code 1142 and 1146)

Delaware's SIP Control Measures (Cont'd)

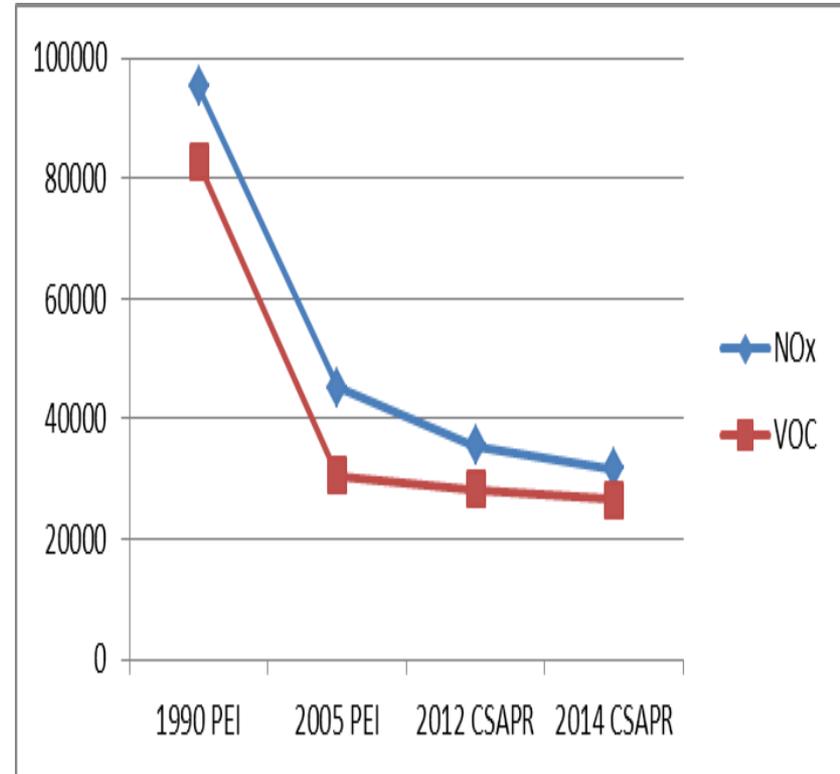
- BACT on all sources with high daily emissions, despite low annual emissions, which ensure all emissions on ozone days are controlled (7 DE Admin. Code 1144 and 1148).
- Adoption of regional measures to reduce emission from large non-point source categories that have been recommended by the Ozone Transport Commission (7 DE Admin. Code 1141, Sections 1, 2 and 4)
- Major and minor new source review, with minor source thresholds set at 5 tpy for ozone precursor emission, which ensures new units are well-controlled (7 DE Admin. Code 1125)

Ozone Formation: $\text{VOC} + \text{NO}_x \rightarrow \text{O}_3$

- **7 DE Admin. Code 1124: 50 sections, VOC RACT**
 - Various coating operations;
 - Petroleum refinery sources;
 - Solvent usage for cleaning operations;
 - Printing operations;
 - Consumer products;
 - Crude oil lightering operations;
 - Storage vessels of petroleum products;
 - Bulk gasoline plants and terminals;
 - Gasoline transport, storage and refueling at GDFs.
- <http://regulations.delaware.gov/AdminCode/title7/1000/1100/Split1124/1124.pdf>

Delaware's SIP Control Measures (Cont'd)

- Implementation of Delaware's SIP has been very effective.
- Both VOC and NOx emissions have been reduced by about 70% since 1990



Delaware's SIP Control Measures (Cont'd)

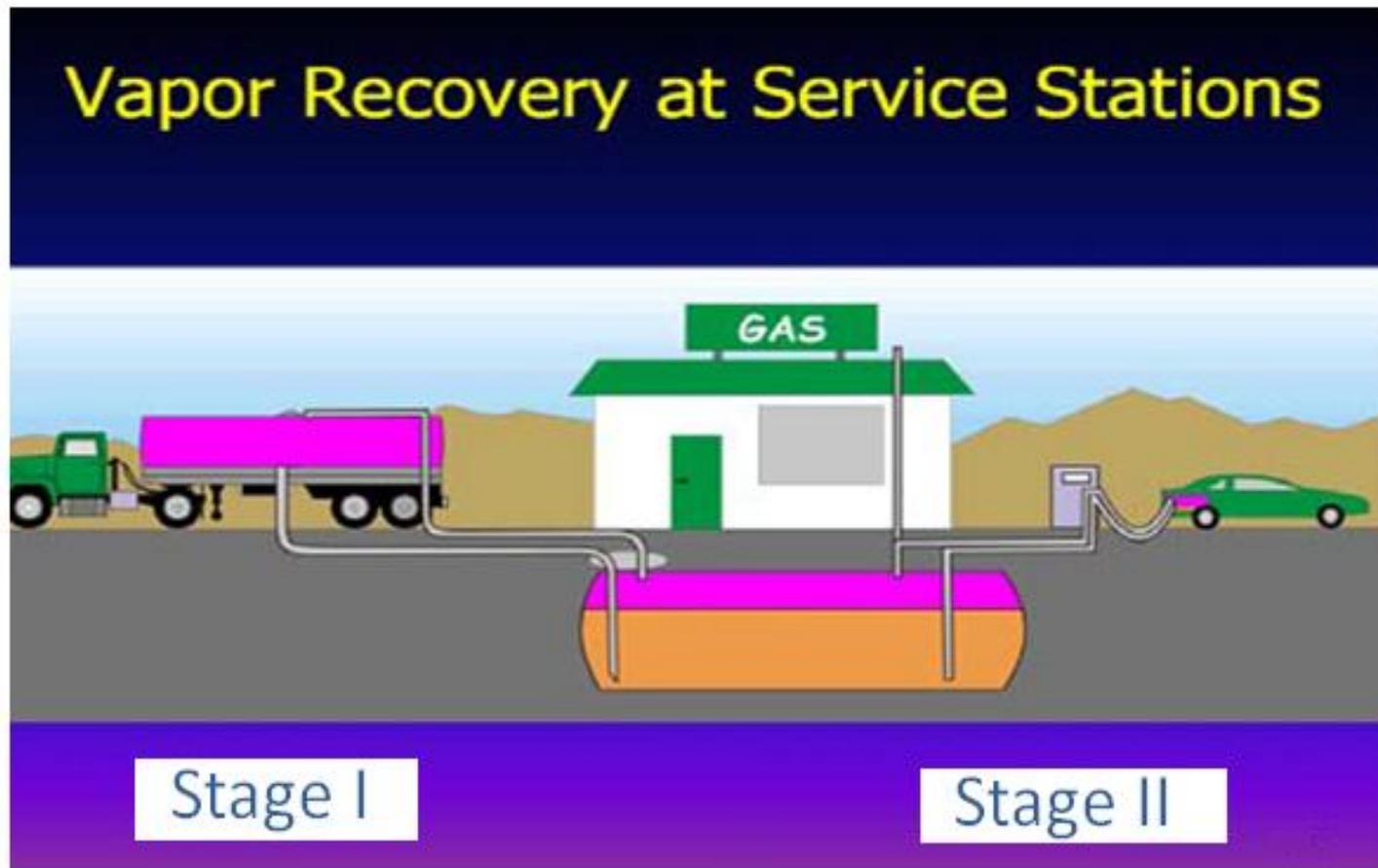
- Delaware sources are well controlled yet our air quality is still unhealthy.
- The primary reason is interstate transport of O₃ and precursors – **sources in upwind states contributing to DE's problems are not well controlled**
- Delaware approach
 - (1) ensure all its sources remain well controlled
 - (2) do all we can to get upwind emissions mitigated

VOC controls at GDFs

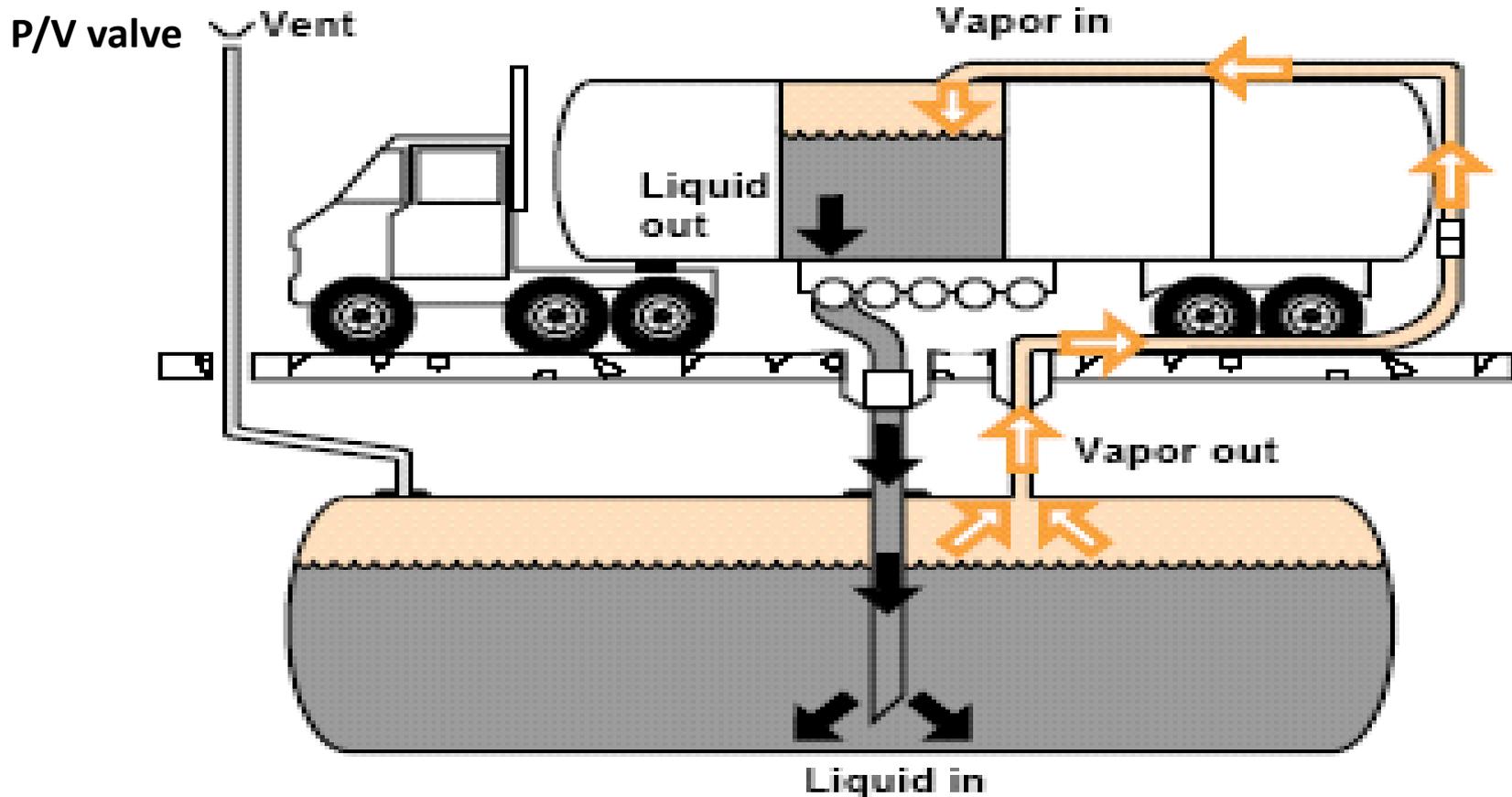
- **Vapor emissions at GDFs contain VOC**
- **Currently controlled by**
 - Stage I, Reg. 1124 Sec. 26
 - Gasoline tank trucks, Reg. 1124 Sec. 27
 - Stage II, Reg. 1124 Sec. 36
 - Onboard Refueling Vapor Recovery (ORVR), required by federal rule
- **Action is needed to ensure vapor emissions at GDFs remain well-controlled**

Vapor emissions at GDF

Gasoline vapor: Toxics and VOC

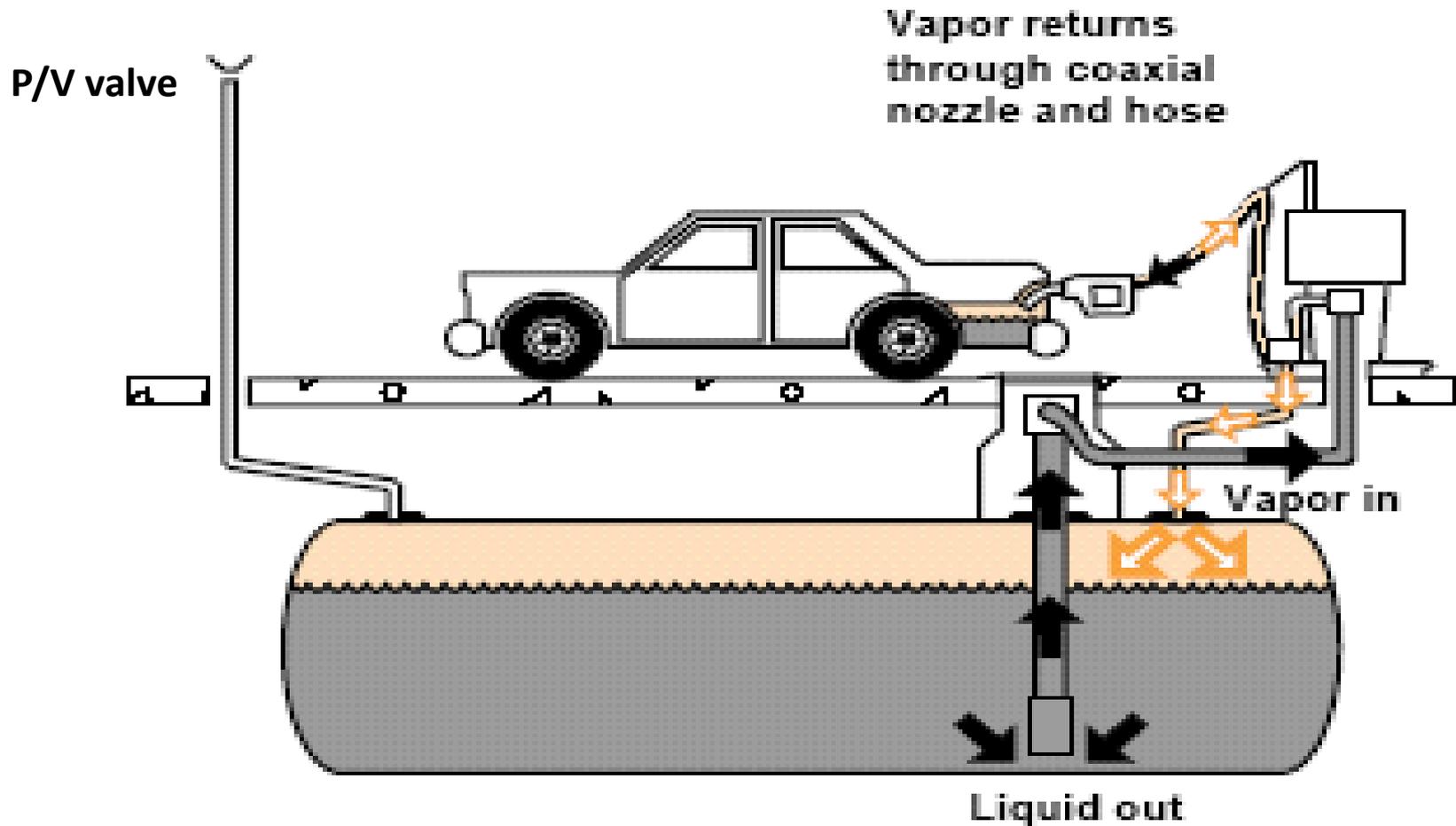


Stage I Gasoline Delivery and Tank Truck



- Sec. 26 Stage I – Deliveries: As fuel enters the GDF's tank, saturated vapor is returned to the tanker via a separate vapor connection.
- Sec. 27 Tank Truck: Must be vapor-tight.

Stage II – Vehicle Fueling



- Sec. 36 Stage II – Vehicle Fueling: As fuel enters the vehicle tank, saturated vapor is collected at the vehicle fill neck and returned to UST tank.

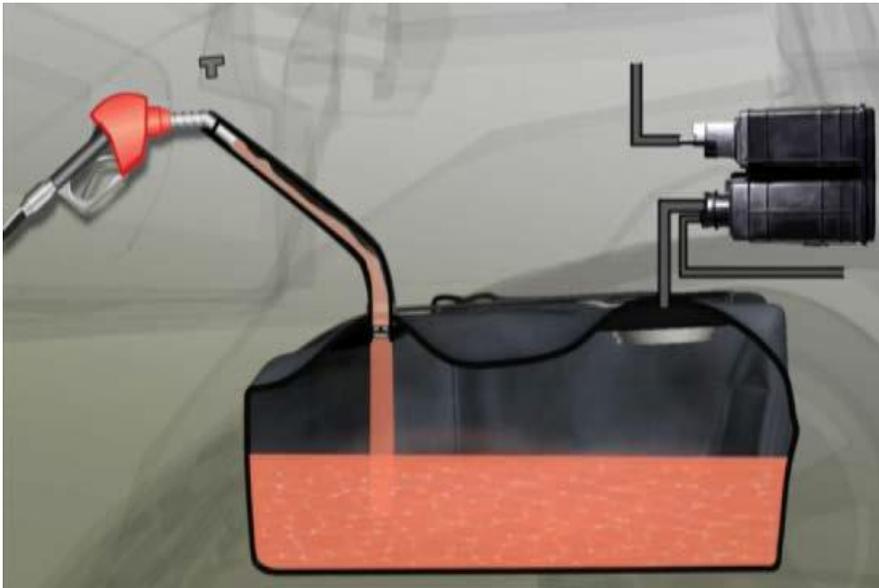
Control Features

- **When functioning as designed:**
 - Tank truck is vapor tight,
 - Stage I system ensures that the headspaces of the tank truck and the UST are comprised of saturated vapor,
 - Stage II system ensures that the headspaces of vehicle fuel tank and the UST are comprised of saturated vapor,
 - **Resulting in little vapor growth in UST headspace, and**
- **Vapor emissions are well-controlled:**
 - **At tank truck side;**
 - **At UST side;**
 - **At vehicle refueling side.**

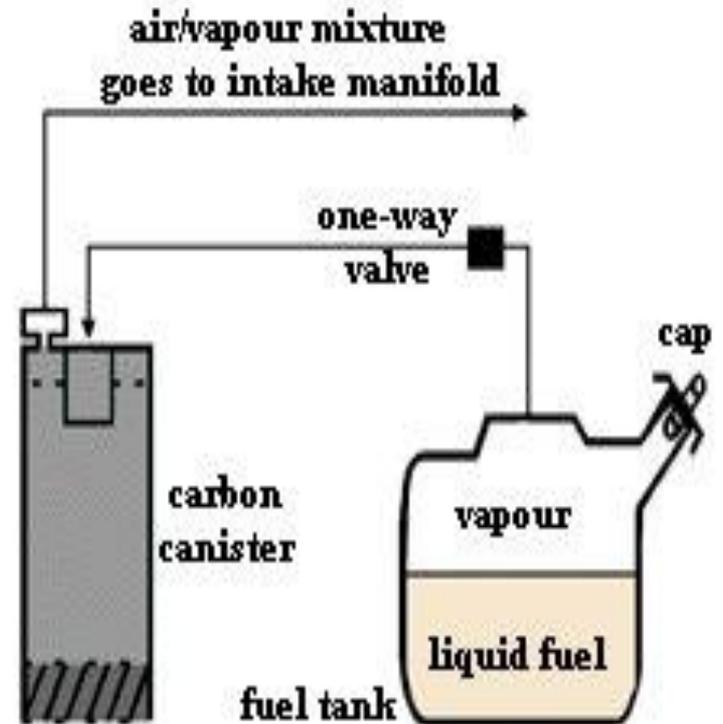
Onboard Refueling Vapor Recovery-ORVR

- **Background**
 - **1990 CAA: requiring Stage II for non-attainment areas only (such as DE and other NE states).**
 - **Attainment areas (many upwind states and areas): gas stations continuing to emit vapor, and impact downwind states.**
 - **1990 CAA: requiring ORVR as another approach to vapor control during refueling.**
- **ORVR: Vapor is captured in a carbon canister on the vehicle and later burned, thus no vapor for Stage II system to recover.**

Onboard Refueling Vapor Recovery (ORVR)



Refueling



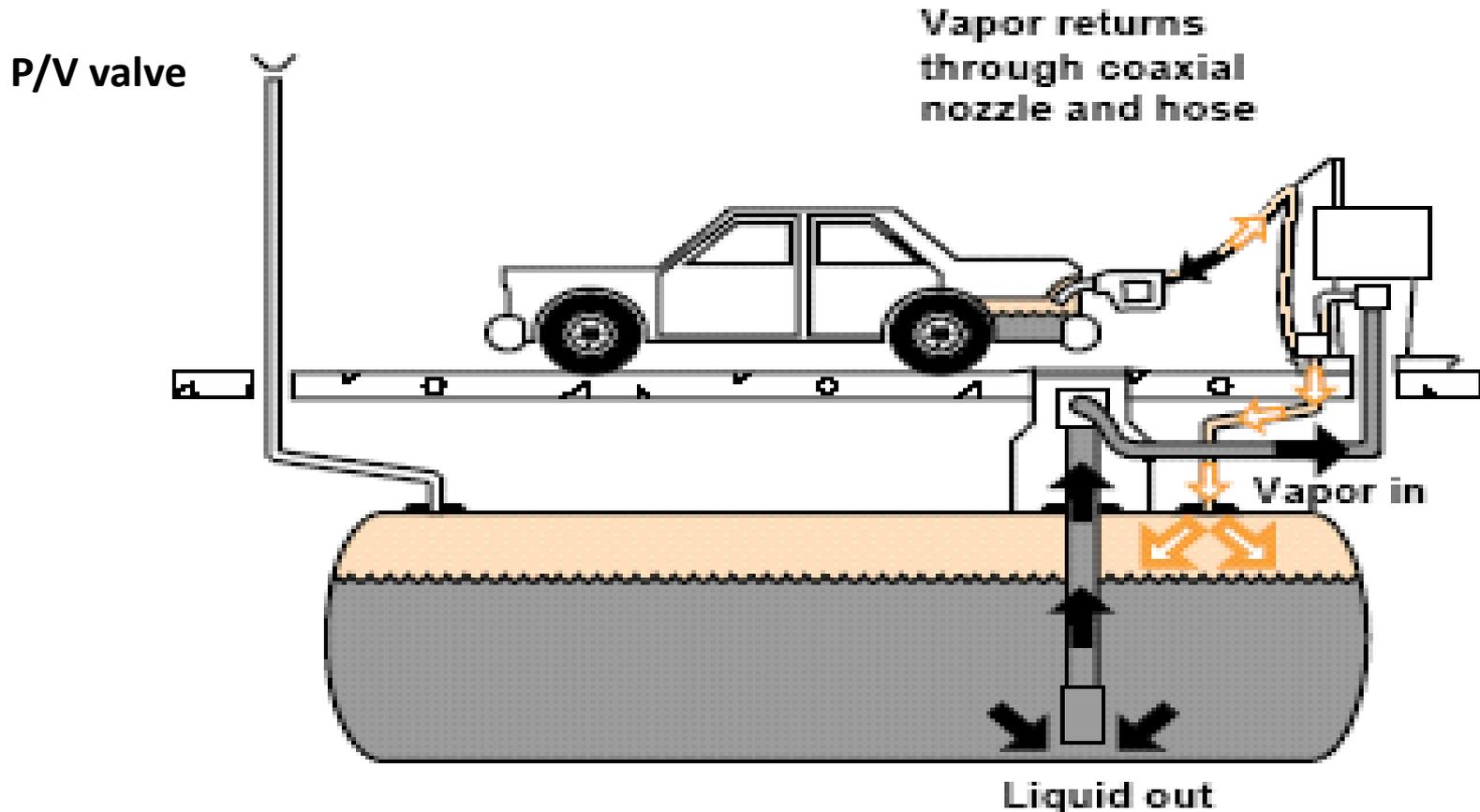
Onboard Refueling Vapor Recovery (ORVR)

- For new gasoline vehicles after 1998 → 2006:
 <6,000 lb. → <8,500 lb. → <14,000 lb. GVWR
- ORVR vehicles on road in DE

	<u>ORVR</u>	<u>Fleet %</u>	<u>Gasoline %</u>
2013	73%		81%
2020	91%		96%

- For attainment areas: an effective control
- For non-attainment areas:
 - Providing an alternative control, but
 - Creating a new (“incompatibility”) problem

ORVR and Stage II: ORVR Problem



- Before ORVR: **Saturated vapor** goes into UST, and both vehicle side and tank side emissions are controlled.
- After ORVR: **No saturated vapor**, but fresh air, into UST. In particular, significant fresh air is drawn into UST by vacuum-assist Stage II.
- Fresh air → vapor growth in UST → **new emission**: Now vehicle side emissions controlled, but not tank side.

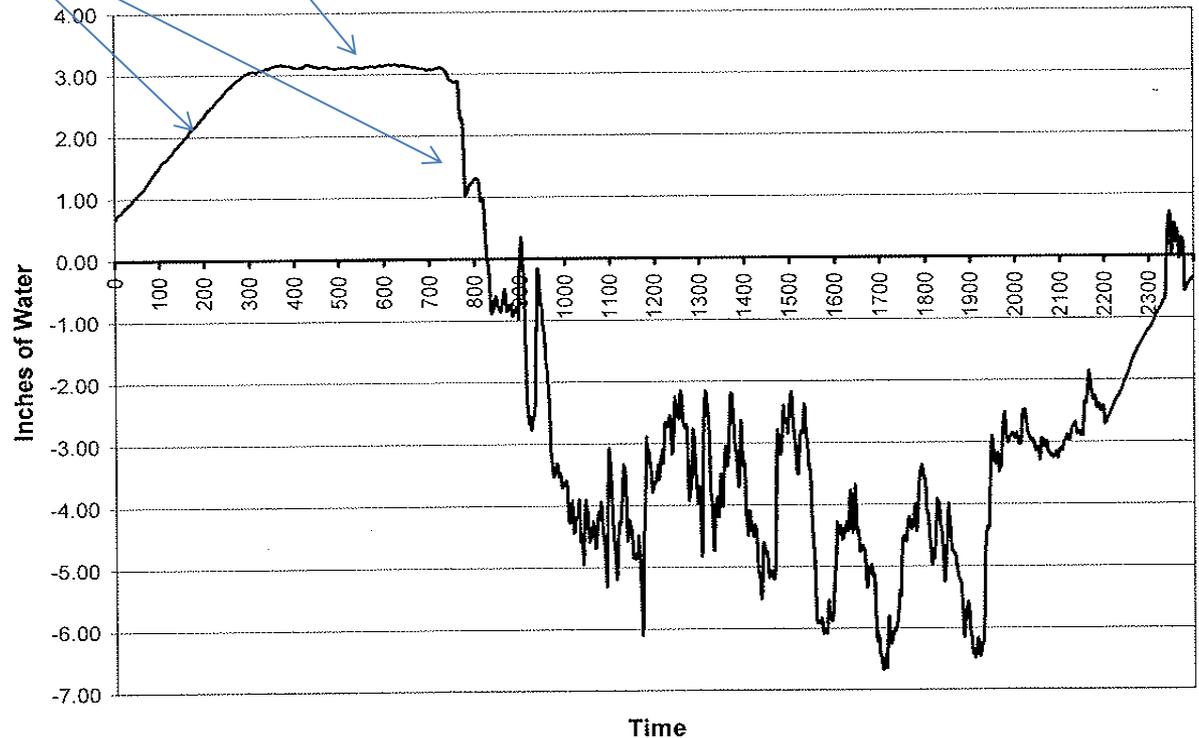
ORVR and Stage II: ORVR Problem

Tank overnight emission (off operation)

Potential
Leaks

Emission
at P/V valve

Manufacturer #1 Balance System
Typical Daily UST Pressure Profile
Saturday, November 12, 2005



Note that

- due to vapor growth from air ingested during the day,
- New emissions are induced at night

Goals of This Regulatory Revision

- All GDFs to be well-controlled
 - vehicle refueling emissions
 - UST emissions
- Provide flexibility to facilities in meeting control strategy
- Do not increase overall costs compared to current Stage I and Stage II program



Vapor Emission: Well-Controlled Facility

- We consider a well-controlled facility involves emissions from two sides:
 - vehicle fueling side being well controlled
 - UST/PV side being well controlled



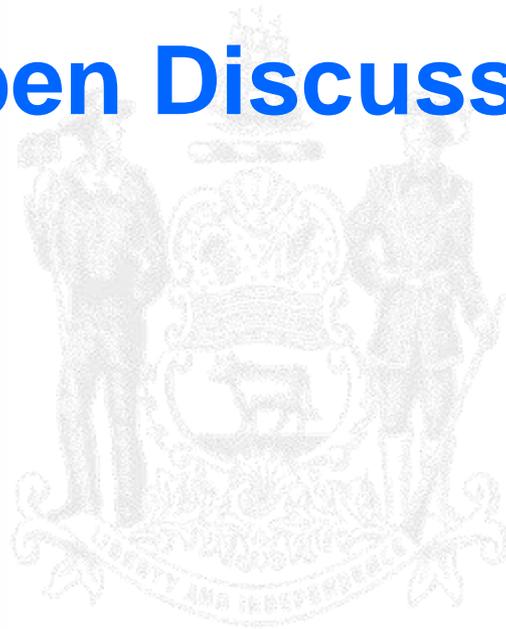
Vehicle fueling side: currently well controlled

- **ORVR equipped vehicles: provide for a well controlled refueling side.**
- **For non-ORVR vehicles: Stage II the only identified option.**
- **Stage II benefit will decrease over time:**
 - If all stage II stations were decommissioned now, refueling side emissions are estimated at **0.80 ton/day (290 ton/year) in 2013;**
 - And will decrease over time due to fleet turnover to **0.24 tpd (88 tpy) in 2020.**

UST/PV side: not currently well controlled

- Currently “new emissions” with ORVR
- UST/PV side emissions will increase over time:
 - Current UST/PV side emissions **for vapor tight system** are estimated at **0.28 TPD (102 tpy) in 2013;**
 - And will increase over time due to fleet turnover to **0.34 TPD (124 tpy) in 2020** due to fleet turnover.

Open Discussion



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Planning for Next Meeting

- 1. Date: September 26, 2013**
- 2. Location: Lukens Drive**
- 3. Tasks prior to next meeting**
 - **DAQ and Tanks Section**
 - **Stakeholders**
- 4. Agenda (to be determined)**

Thanks

