Biomass Emissions Permitting in Pennsylvania

Penn State

Bioenergy Emissions and Health

Short Course

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Agenda

- **Basics: Regulated Air Pollutants from Biomass**
- **New Rules for Biomass Combustion**
  - NESHAP and NSPS (CISWI / Boiler MACT)
- **Permitting for Biomass Projects**
  - Types of projects
  - Control technology requirements
  - Other possible air requirements

Air Regulation Basics

Basics – Overriding Air Rules

- Pollutants with National Ambient Air Quality Standards (NAAQS - see 40 CFR Part 50)
- Pollutants regulated under federal NSPS and NESHAP rules (see 40 CFR parts 60, 61, and 63)
- Regulated new source review pollutants (see 40 CFR §52.21(b)(50))
- Title V regulated air pollutant as defined (40 CFR §70.2)
- Pollutants regulated under a State Implementation Plan (SIP) or under state or local rules or policy (e.g., air toxics policy)

Basics – NAAQS Standards

Pollutant	Concentration ($\mu g/m^3$)	Averaging Time	Form
CO	10,000	1-Hour	High Second-High
	40,000	8-Hour	High Second-High
Pb	0.15	3-Month	3-Month Rolling Average
PM10	150	24-Hour	High Second-High
PM2.5	35	24-Hour	98^{th} Percentile 24-hour
	15	Annual	Maximum Annual
NO2	188	1-hour	98^{th} Percentile of Daily Maximum 1-Hour
SO2	196	1-hour	99^{th} Percentile of Daily Maximum 1-Hour
	1,300	3-hour	High Second-High

Basics – Who Regulates Air in PA?

- Pennsylvania Department of Environmental Protection (PADEP) responsible for implementing PA air regulations and is administrator for most Federal air rules.
- Philadelphia Air Management Services (AMS) and Allegheny County (ACHD) have autonomous programs with rules that are similar or the same as PADEP's
- U.S. EPA - Region 3 out of Philadelphia has direct oversight for PA

Basics – Major Air Regulations for Combustion

- Federal New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Boiler Maximum Achievable Control Technology (MACT) OR Commercial & Industrial Solid Waste Incinerator (CISWI) Standards

New Rules for Biomass Combustion

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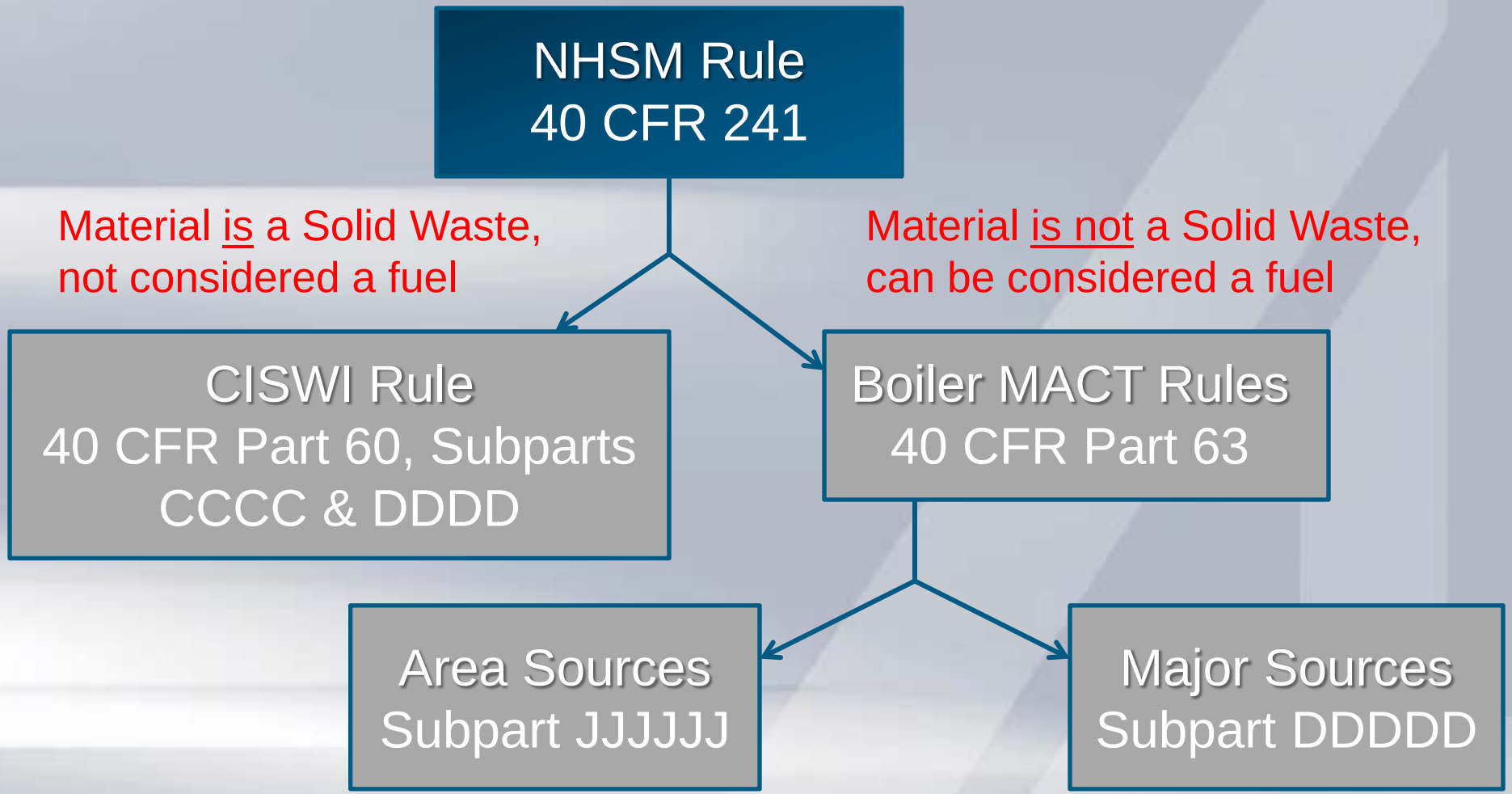
4 Rules: Overview



NHSM Rule: Biomass

The following "traditional" fuels are not wastes:

1. Fossil fuels and derivatives
2. Virgin wood
3. "Clean cellulosic biomass" (contaminant level similar to virgin wood) are not secondary materials or solid wastes unless *discarded*. Examples:
   - Agricultural and forest derived biomass (forest thinnings, wood pellets)
   - Urban wood (tree trimmings)
   - Energy crops (corn stover)
   - Crop residues (peanut shells)
   - Wood from forest fire clearance activities, or disaster debris
   - Clean construction and demolition wood.

NHSM Rule Basics

Non-hazardous secondary materials burned or used in combustion units ***are solid wastes unless***:

- Material used as fuel: remains within ***control of the generator*** and meets the ***legitimacy criteria***.
- Resinated wood, and scrap tires under the oversight of established tire collection programs, that meet the ***legitimacy criteria.***
- ***Discarded Material*** has been ***sufficiently processed*** to produce a material that meets the ***legitimacy criteria***.
- Non-Discarded Material that has been handled outside the ***control of the generator*** has been approved by U.S. EPA on a case-by-case basis.

NHSM Rule
Sufficiently Processed

- Remove or Destroy Contaminants:
  - Removing wire from shredded tires or removing paint from painted wood.
- Improve Fuel Characteristics:
  - Drying and pelletizing biosolids or shredding and blending scrap plastics.
- Improve As-Fired Energy Content:
  - Removing moisture, dirt and/or metal to improve heating efficiency.

NHSM Rule
Sufficiently Processed

- Improve Ingredient Characteristics:
  - Processing of high carbon fly ash to remove carbon and produce a specification concrete fly ash.
- Minimal operations like shredding do not constitute sufficient processing.
- Self Implementing.

NHSM Rule
Legitimacy Criteria for Fuels

- Valuable commodity:
  - Storage period.
  - Management consistent with an analogous fuel.
  - Protective of the environment.
- Meaningful heat value (>5,000 Btu/lb):
  - Combustion unit recovers energy.
- Comparable or lower contaminant levels.

NHSM Rule
Solid Waste Determination Steps

1. Traditional Fuel?
2. Discarded?
3. Sufficiently Processed?
4. In Control of Generator?
5. Petition Needed?
6. Meets Legitimacy Criteria?

Fuel or Solid Waste? Example No. 1

Dried Biosolids:

1. Traditional Fuel?
2. Discarded? ⇨ No
3. Sufficiently Processed? ⇨ Yes. Solid Waste, unless…
   ⇨ Assumed Yes, Non-Solid Waste
6. Meets Legitimacy Criteria? ⇨ No, Solid Waste (Contaminant Level)

Fuel or Solid Waste? Example No. 2

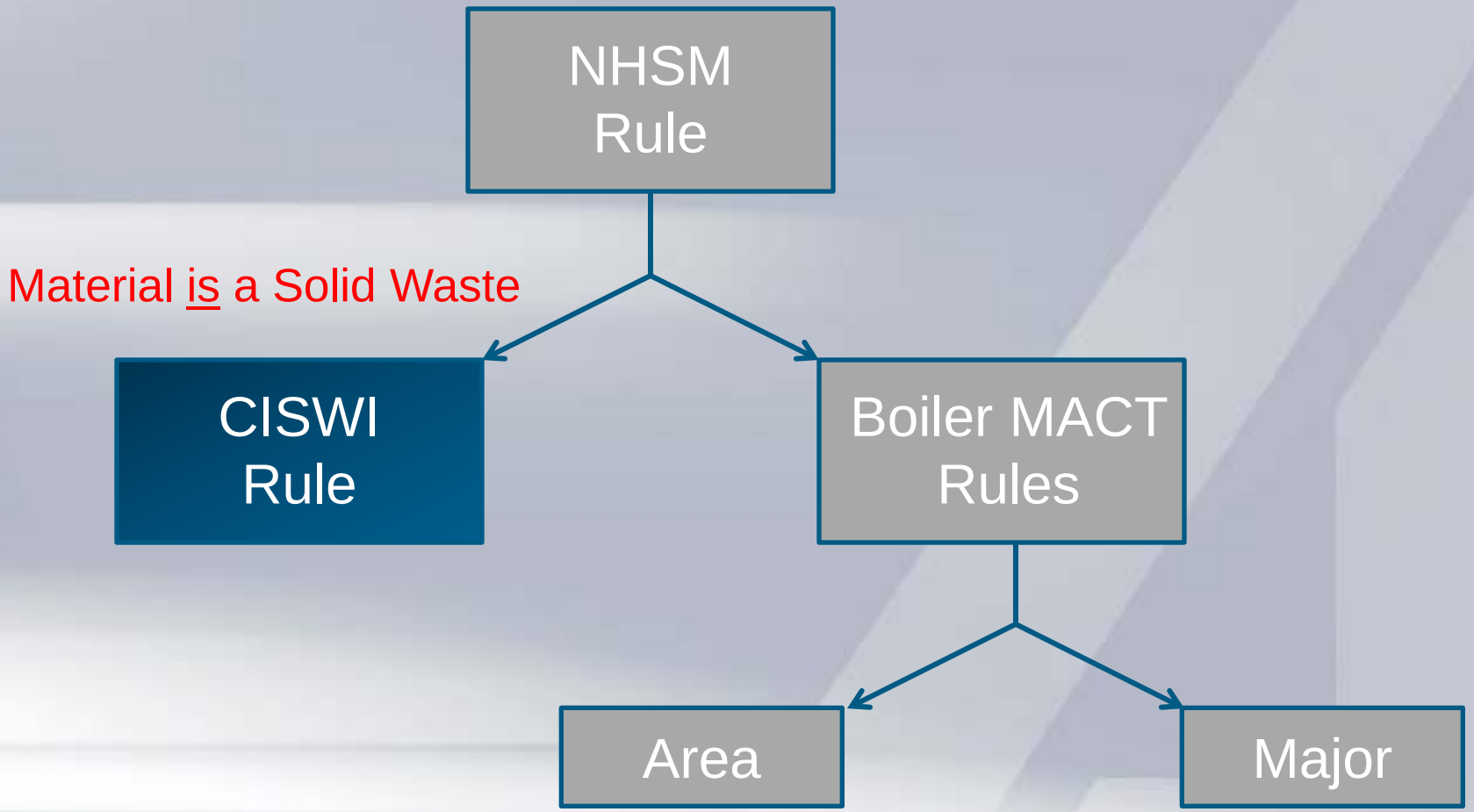
Pulp & Paper Sludge:

1. Traditional Fuel? No
2. Discarded? No
4. Within Control of Generator? Yes
6. Meet the Legitimacy Criteria? Yes ⇨ Not a Solid Waste

- or -

1. Traditional Fuel? No
2. Discarded? No
4. Within Control of Generator? No ⇨ Solid Waste, unless…
5. Case-by-case petition granted? Yes ⇨ Not a Solid Waste

Four Rules

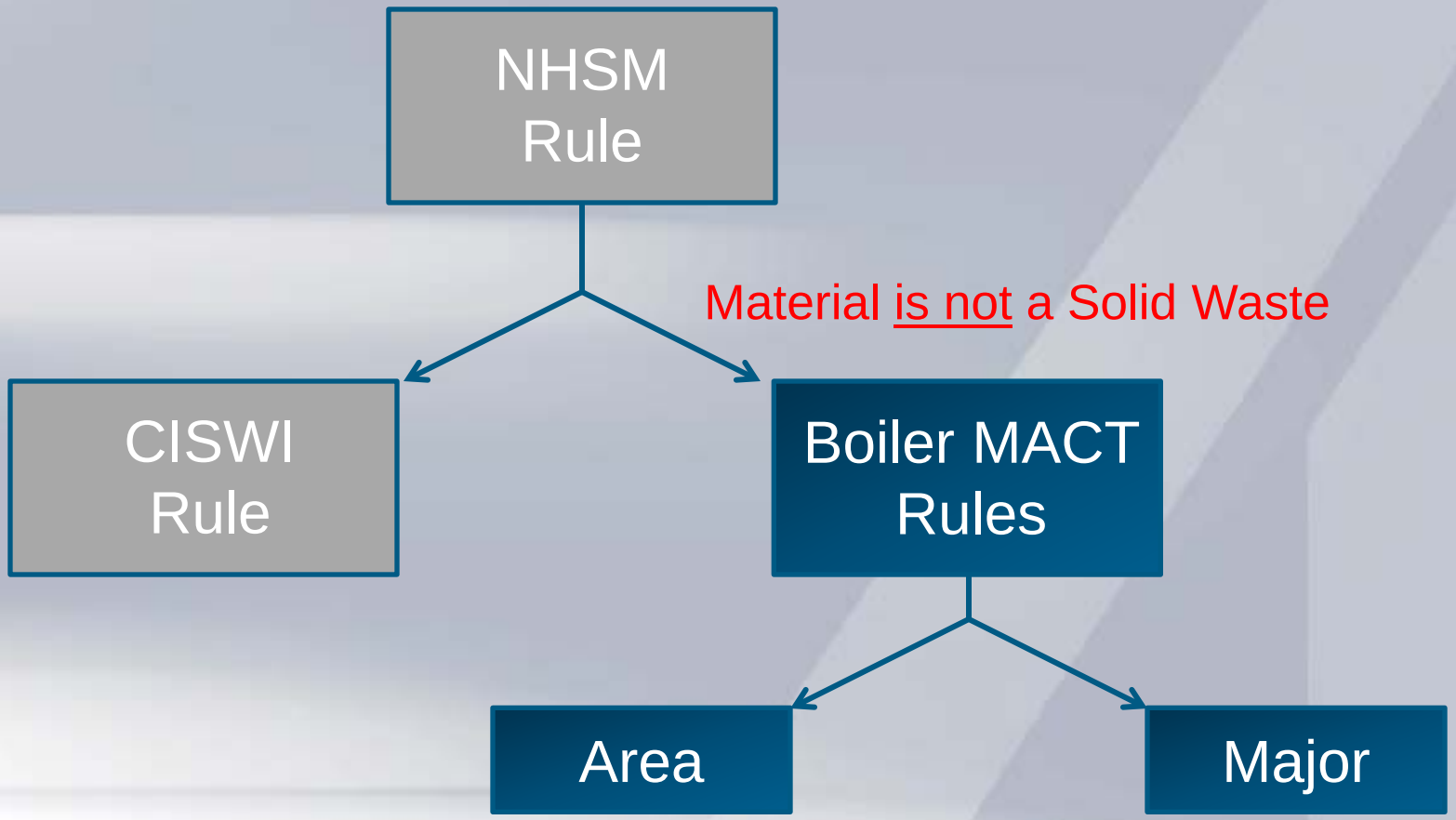

NHSM Rule
Material is a Solid Waste
CISWI Rule
Boiler MACT Rules
Area
Major

CISWI Rule - Basics

New Source Performance Standards, 40 CFR Part 60

- **All** sources (size does not matter).
- Title V Operating Permit requirement.
- Standards set for opacity and nine (9) pollutants:
  - HCl, CO, Pb, Cd, Hg, PM, PCDD/PCDF, NO_X, and SO_2.
- Operator training.
- Siting requirements (Subpart CCCC).
- Waste Management Plan.
- Monitoring and testing requirements.

The Four Rules



Boiler MACT
Regulated Pollutant → Surrogate

Major & Area Sources:

- Mercury (Hg) → None
- Non-Mercury Metallic HAP → Particulate Matter (PM)
- Non-Dioxin Organic HAP → Carbon Monoxide (CO)

Major Sources Only:

- Dioxins/Furans (D/F) → None
- Non-Metallic Inorganic HAP → Hydrochloric Acid (HCl)

Major Source Boiler MACT (Subpart DDDDD)

Major source of HAP = > 10 TPY or more of one HAP, or >25 tons per year or more of combined HAPs.

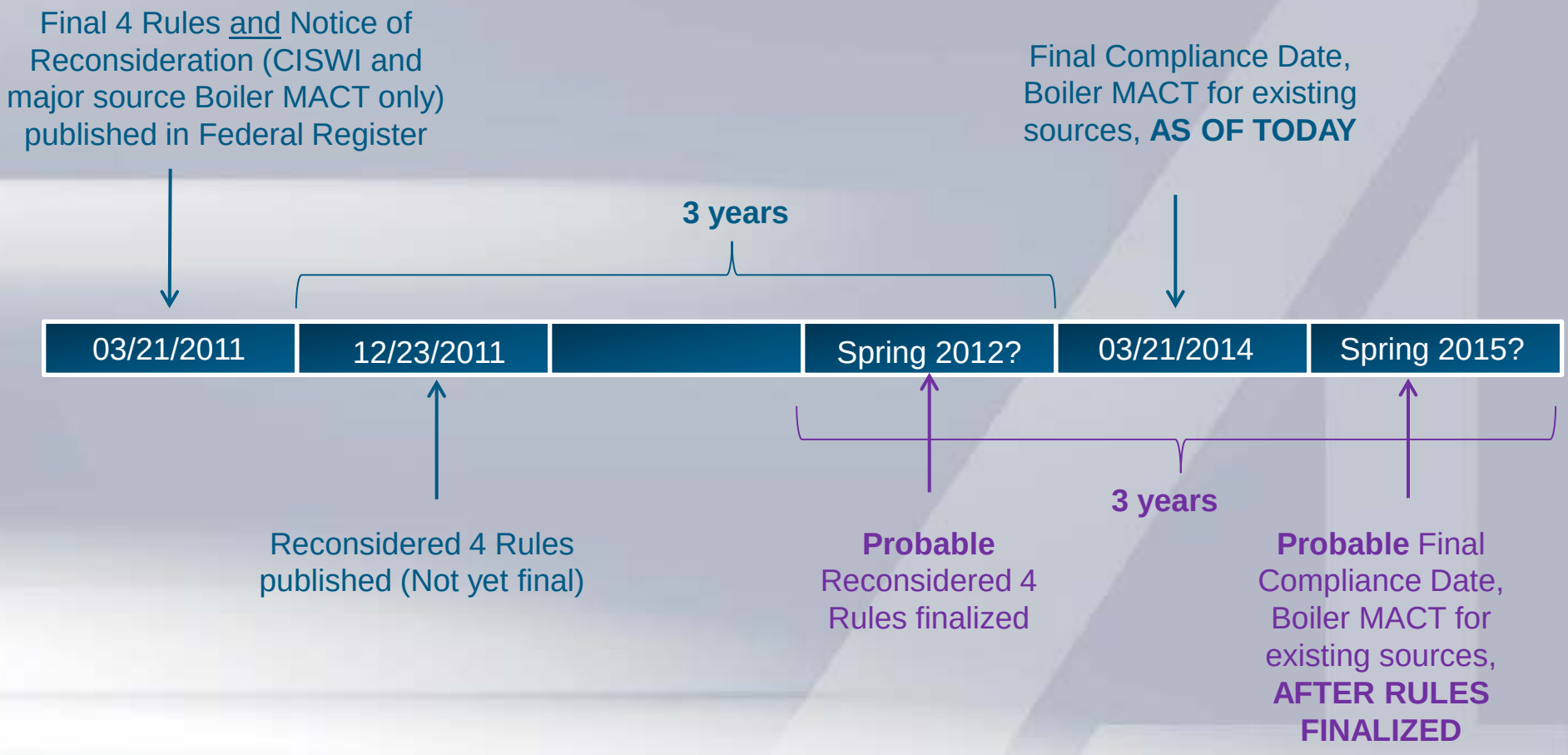
- "Biomass Unit": annual heat input ≥10% biomass
- 19 subcategories based on type of boiler
- Emission limits, testing, monitoring, recordkeeping and reporting requirements

Area Source Boiler MACT (Subpart JJJJJJ)

Area Source of HAP = any stationary source that is not a major source

- Subcategories: Coal, Biomass, and Oil
- Biomass Unit (*proposed*): Any boiler that burns any biomass and is not in the coal subcategory.
  - Coal Unit: Burns any solid fossil fuel and <15% biomass annual heat input.
- Emission limits, testing, monitoring, recordkeeping and reporting requirements

4 Rules Timing



Permitting for Biomass Projects

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Does My Facility Need An Air Permit?

MYTHS	FACTS
My facility is too small	Size *does not* matter
No one told me I needed a permit	Responsibility lies with the facility
My vendor says I do not need a permit	Vendors want to make a sale
I already have an air permit	You may need more than one permit

What Air Emissions Sources Require a Construction Permit?

- Simple Rule of Thumb: An air quality plan approval to install a source is required for **ANY** air emission sources unless:
  - The source type is listed in the PADEP rules or on the exemption list

    OR

  - PADEP makes a case-by-case determination that the source does not require installation approval

Is There More Than One Kind of Air Permit?

- Permit to Install/Permit to Construct
  - Required before emissions units can be installed or modified

- Permit to Operate/Operating Permit
  - Needed to operate equipment once installation or modification is completed

Pennsylvania Air Quality Permits

- Plan Approvals (Construction Permits)
- State Only Operating Permits
  (Minor Source /Synthetic Minor OPs)
- Title V Operating Permits
  (Major Source OPs)

Step 1: Define The Project

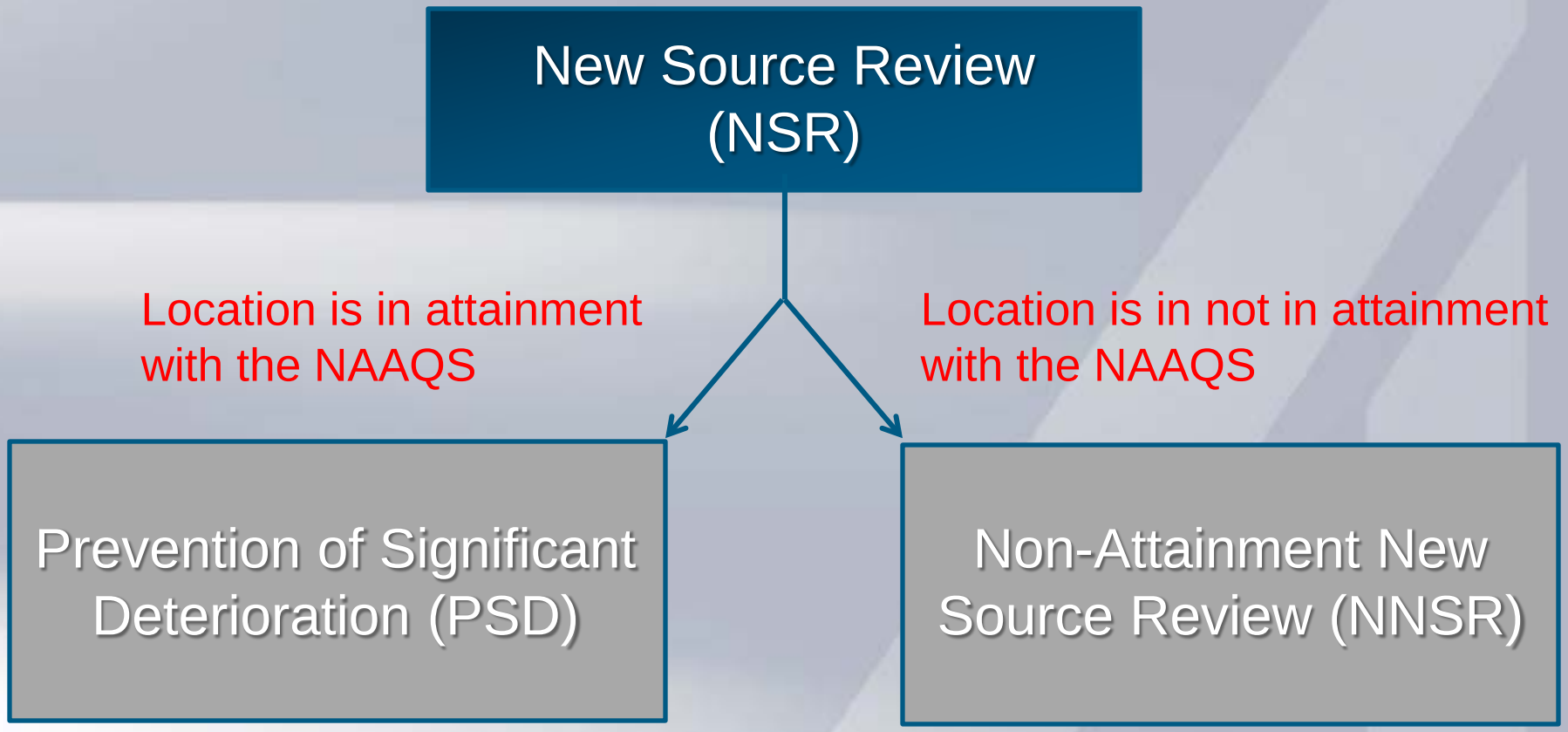
- Does this project result in the use of new and/or greater quantities of raw materials?
- For Biomass – it is likely any existing permit does not provide for biomass as a permitted fuel for the combustion unit!
- Will this project involve changes to existing pollutant control systems?
- Will this project increase my production capacity ?

Step 1: Define The Project

New Source Review (NSR) Permitting

- Applies to Major Sources of Pollutants
- The NSR permitting review has different rules depending on whether the pollutant of concern is considered to be in attainment with its National Ambient Air Quality Standard (NAAQS).

Step 1: Define the Project



Step 1: Define The Project

Prevention of Significant Deterioration (PSD)

- Applies to Major Sources emitting a pollutant for which the location of the facility is classified as attainment with the NAAQS.
- Federal PSD Program – 40 CFR Part 52.21
- Most States are SIP-approved by incorporation of Part 52.21 by reference or have developed state-specific rules based on Part 52.

Step 1: Define The Project

Non-Attainment New Source Review (NNSR)

- Applies to Major Sources emitting a pollutant for which the location of the facility is classified as nonattainment with the NAAQS.
- Federal NNSR Program – 40 CFR Part 52.24
- Requirements for SIP NNSR Programs – 40 CFR Part 51.165
- Appendix S of Part 51 – Offset Rules
- Most States are SIP-approved and have developed state-specific rules based on Part 51.165

Major Source Emission Increase

Pollutants	Precursors	Attainment Classification	Major Source Threshold (tons per year)	Significant Emission Increase (tons per year)
NOx, SO_2, Lead	NA	PSD General	100/250	As applicable
Ozone	VOC/NOX	NNSR outside of Philadelphia 5-County Area	50/100	40
Ozone	VOC/NOX	NNSR Severe-Philadelphia	25	25
$PM_{2.5}$	NA	PSD/NNSR	100	10
$PM_{2.5}$	NO_X	PSD/NNSR	100	40
$PM_{2.5}$	SO_X	PSD/NNSR	100	40
PM_{10}	NA	PSD/NNSR	100	15

Step 2: Check The Air Regulations

- Federal New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Boiler Maximum Achievable Control Technology (MACT) OR Commercial & Industrial Solid Waste Incinerator (CISWI) Standards

Step 2: Check The Air Regulations

- Pennsylvania requires that all new or modified sources are subject to review for:
  - Best Available Technology (BAT)
- And Major Air Emission Sources can be subject to review for:
  - Best Available Control Technology (BACT)
  - Lowest Achievable Emission Reductions (LAER)

Step 2: BAT / BACT

- A PSD BACT review will require performance of a "Top-Down" analysis
  - Determine what control technologies are feasible vs. technically infeasible
  - Rank "feasible" controls according to their effectiveness
  - Evaluate operating costs on $/ton basis

Step 2: LAER

- The rate of emissions based on the following, whichever is more stringent:

(A) The most stringent emission limitation which is contained in the implementation plan of a state for the class or category of source unless the owner or operator of the proposed source demonstrates that the limitations are not achievable.

(B) The most stringent emission limitation which is achieved in practice by the class or category of source.

Step 3: Determine Emission Increase

- **New Sources:**
  - Potential To Emit –
    - Max Capacity at 8760 hrs/yr unless otherwise restricted
- **Existing Major Facilities or Where the Emission Increase Will Be Major Itself**
  - Modified Sources – Projected Actual Emissions minus Baseline Actual Emissions

Step 3: Existing Modified Sources

- Calculate Baseline Actual Emissions (BAE)
- Determine a Future Projected Actual Emissions (PAE)
- Recent EPA decisions do not allow maximum credit for substitution of cleaner fuels. THIS MAKES THE PROCESS TRICKIER THAN IT SHOULD BE.

Step 4: Dispersion Modeling

- Required for PSD Major Source Permits
- New NAAQS for NO_X is very low and problematic to demonstrate compliance
- Screen modeling - simple, conservative, overestimates ambient concentrations
- Refined modeling – more complex, very expensive & causes significant project time delays

Summary

- **Basics: Regulated Air Pollutants from Biomass**
- **New Rules for Biomass Combustion**
  - NESHAP and NSPS (CISWI / Boiler MACT)
- **Permitting for Biomass Projects**
  - Types of projects
  - Control technology requirements
  - Other possible air requirements
- **No reason it shouldn't be doable!!!**

Thank you!

Questions?

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