

● ● | ***Office of Information and
Regulatory Affairs***

November 16, 2009



Issue Overview

- The high purity (“washed”) FGD gypsum used in the manufacture of gypsum board has a different composition and environmental profile than FGD sludge or unwashed FGD and does not present any environmental problem meriting regulation.
- Any regulation, definition or treatment of high purity FGD as a hazardous waste will stigmatize FGD gypsum causing a severe potential impact on the gypsum industry and the U.S. economy. The stigma and economic impact will occur even if FGD gypsum used to manufacture gypsum wallboard is excluded from regulation as a beneficial use.

Issue Overview - A More Appropriate Regulatory Alternative Exists

- Exclude high purity (“washed”) FGD gypsum from the definition of coal combustion waste byproducts or from the definition of hazardous waste and/or,
- Do not identify any coal combustion material, including FGD gypsum, as a hazardous waste.
- Address surface impoundments under EPA’s RCRA imminent and substantial endangerment authority.

What is the Gypsum Association?

- Founded in 1930 in Chicago, IL
- Members produce 99%+ of drywall sold in United States
- Organization has 8 U.S. members
- All U.S. manufacturers are members
- Industry shipped 25 billion sf material in 2008

Use of FGD Gypsum by the Gypsum Board Industry

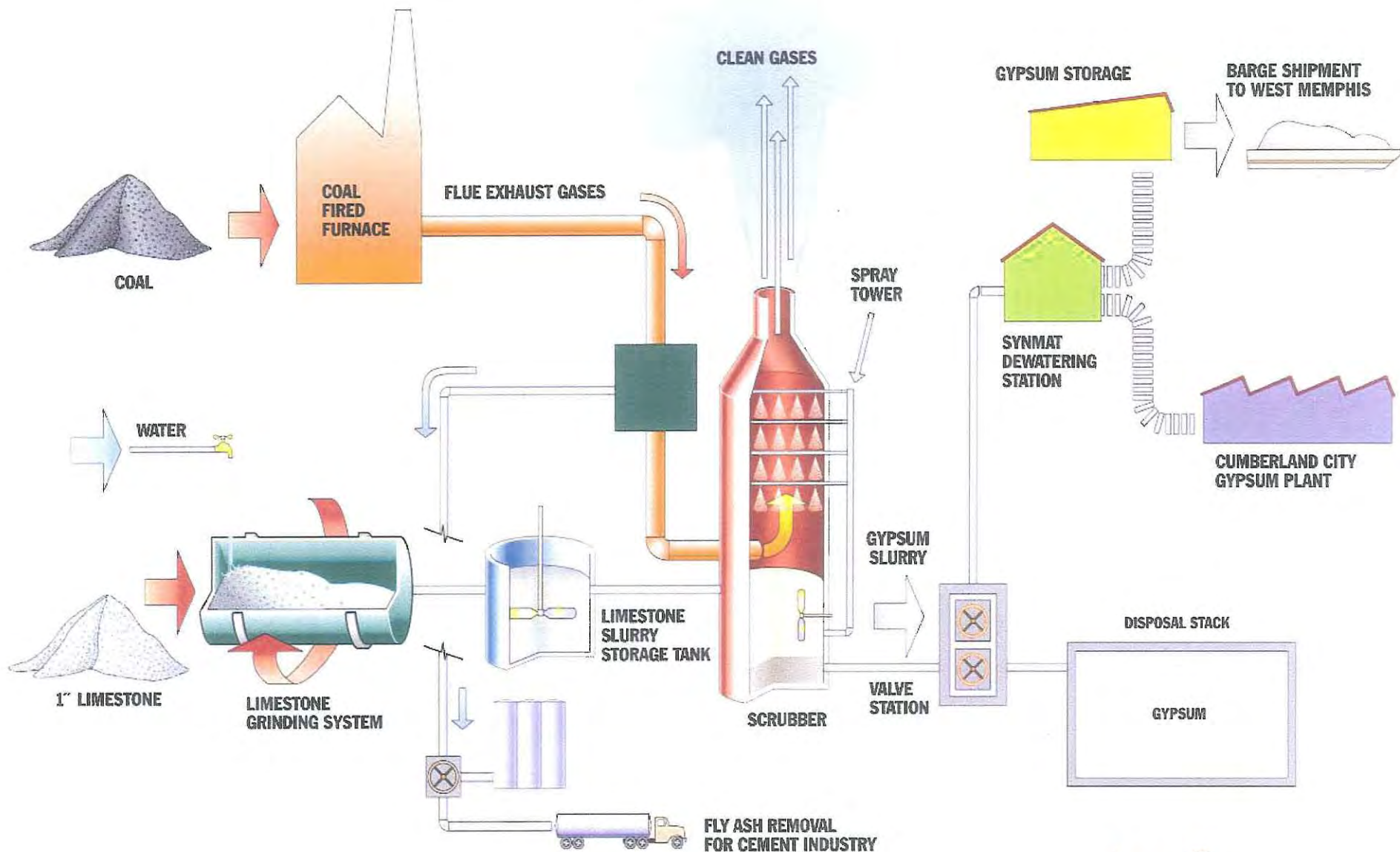
- Approximately 35% of the ore used to manufacture gypsum board is Flue Gas Desulfurization (FGD) gypsum
- 300% increase in the quantity of FGD gypsum used to manufacture gypsum board since 1999
- In 2008, gypsum board manufacturing industry consumed 60% of the available FGD gypsum
 - 8.1 million short tons of FGD gypsum in 2008
- 17 of 64 plants exclusively FGD gypsum

Only Processed High Purity FGD Gypsum is used to Manufacture Gypsum Board

- Air scrubbers generate an FGD sludge (calcium sulfite) that is either disposed of in impoundments or sent for further processing to make products.
- Coal-burning utilities process FGD sludge in several additional steps to make a washed gypsum product sold to the gypsum industry.
 - Step One: Oxidization to produce calcium sulfate – gypsum slurry. This “unwashed” FGD gypsum is either landfilled or sold for application to farm land as an agricultural supplement.

Only Processed High Purity FGD Gypsum is used to Manufacture Gypsum Board

- Step Two: Washing and dewatering oxidized slurry occurs through a centrifuge and vacuum belt system to remove impurities, fine particulates and to meet the contractual specifications of the wallboard manufacturer.
- The washed gypsum used for production of wallboard is 95% to 98% calcium dihydrate and is low in chlorides and other impurities.
- Each step generates wastes, wastewaters and processed material with different constituents and characteristics.



There are no Environmental Problems Associated with FGD Washed Gypsum

- Trace elements in washed FGD gypsum:
 - Present at levels comparable to gypsum approved for use as food additive by FDA.
 - Present at levels that would be acceptable for residential soil.
 - Based on comparison to residential direct contact criteria (USEPA RSLs).
 - Present at levels in leachates protective of groundwater used as drinking water if generated in soil.
 - Based on comparison to drinking water criteria and standards adjusted with default dilution factors.
 - Do not meet TCLP criteria for definition for hazardous waste.
- Common uses and applications of FGD gypsum are not expected to pose a concern for human health or the environment and do not require being regulated.

Total Concentrations of Trace Metals

- Metals data compiled from available literature for:
 - Unwashed FGD gypsum
 - 46 samples
 - Washed FGD gypsum
 - 9 samples
 - Natural gypsum
 - 47 samples
 - Limited data sets
- Data were then compared to:
 - Risk-based screening levels for residential direct contact
 - http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/generic_Tables/pdf/composite_si_table_run_APRIL2009.pdf
 - Each other
- Focus is on maximum reported concentrations to be conservative

Total Concentrations of Trace Metals: Washed vs. Risk-Based Screening Levels

- Trace metals in washed FGD gypsum all are well below soil RSLs for direct-contact
 - 5X to 7500X lower

Element	Concentration (mg/kg)	
	Washed	Residential Soil Standard
Antimony	2.1	31
Arsenic	3.8	39
Barium	52.8	15000
Cadmium	0.4	70
Chromium	18	280
Cobalt	3.3	23
Copper	0.95	3100
Lead	11.5	400
Mercury	0.95	4.3
Molybdenum	4.6	390
Nickel	0.83	1500
Selenium	2.6	390
Thallium	0.7	5.1
Zinc	3.08	23000

NOTE: Concentrations shown are maximum concentrations for each material.

Total Concentrations of Trace Metals: Washed vs. Natural

- Trace metals in washed FGD gypsum are generally similar or less than those in natural gypsum.

Element	Concentration (mg/kg)	
	Washed	Natural
Antimony	2.1	0.53
Arsenic	3.8	13.4
Barium	52.8	218
Cadmium	0.4	0.494
Chromium	18	10.2
Cobalt	3.3	32.7
Copper	0.95	97.9
Lead	11.5	38.4
Mercury	0.95	0.0844
Molybdenum	4.6	51.4
Nickel	0.83	18.3
Selenium	2.6	<3
Thallium	0.7	0.316
Zinc	3.08	288

NOTE: Concentrations shown are maximum concentrations for each material.

Total Concentrations of Trace Metals: Washed vs. Unwashed

- Trace metals in washed FGD gypsum are generally similar or less than those in unwashed FGD gypsum.

Element	Concentration (mg/kg)	
	Washed	Unwashed
Antimony	2.1	5.8
Arsenic	3.8	3.4
Barium	52.8	118
Cadmium	0.4	0.3
Chromium	18	55.2
Cobalt	3.3	2.03
Copper	0.95	5.05
Lead	11.5	2.59
Mercury	0.95	1.46
Molybdenum	4.6	2.44
Nickel	0.83	6.28
Selenium	2.6	25
Thallium	0.7	0.6
Zinc	3.08	22.6

NOTE: Concentrations shown are maximum concentrations for each material.

Total Concentrations of Trace Metals: Washed vs. Scrubber Sludge

- Trace metals in washed FGD gypsum are generally much less than those in scrubber sludge

Element	Concentration (mg/kg)	
	Washed	Scrubber Sludge
Antimony	2.1	15
Arsenic	3.8	40
Barium	52.8	2500
Cadmium	0.4	1.5
Chromium	18	350
Cobalt	3.3	40
Copper	0.95	--
Lead	11.5	30
Mercury	0.95	0.6
Molybdenum	4.6	30
Nickel	0.83	--
Selenium	2.6	4
Thallium	0.7	12
Zinc	3.08	--

NOTE: Concentrations shown are maximum concentrations for each material.

Total Concentrations of Trace Metals: Washed vs. Unwashed vs. Scrubber Sludge

- Trace metals in scrubber sludge are generally much higher than those in both unwashed and washed FGD gypsum

Element	Concentration (mg/kg)		
	Washed	Unwashed	Scrubber Sludge
Antimony	2.1	5.8	15
Arsenic	3.8	3.4	40
Barium	52.8	118	2500
Cadmium	0.4	0.3	1.5
Chromium	18	55.2	350
Cobalt	3.3	2.03	40
Copper	0.95	5.05	--
Lead	11.5	2.59	30
Mercury	0.95	1.46	0.6
Molybdenum	4.6	2.44	30
Nickel	0.83	6.28	--
Selenium	2.6	25	4
Thallium	0.7	0.6	12
Zinc	3.08	22.6	--

NOTE: Concentrations shown are maximum concentrations for each material.

Evaluation of Metals Leaching

- Leaching data (metals) compiled from available literature for:
 - Unwashed FGD gypsum
 - 4 samples
 - Washed FGD gypsum
 - 2 samples
 - Unspecific gypsum (could be washed or unwashed)
 - 12 samples
- Data were then compared to:
 - Risk-based screening levels and Standards
 - Maximum & secondary maximum contaminant levels (MCLs/SMCLs, USEPA)
 - Drinking water equivalency levels (DWELs, USEPA)
 - Treatment technique action levels (TTAL, USEPA)
 - Tap water screening level (Tap RSL, USEPA)
 - Each other
- Focus is on maximum reported concentrations to be conservative

Evaluation of Metals Leaching: Summary

- pH has significant effect for some elements
 - Titration to extreme pH will liberate metals from any solid matrix
 - Limited data set to pHs between 5 and 9, plus TCLP
 - Focused on maximum concentrations to be conservative
- Most elements were below RSLs in leaching tests
 - For those that were above, nothing was more than 4X higher
 - All well below typical dilution-attenuation factors of 10X to 20X
- Washed FGD gypsum leaches metals at lower concentrations than unwashed FGD gypsum

Washed FGD Gypsum vs. RSLs

- Comparison of leachate produced at the natural pH of FGD gypsum
 - Neutral
- All trace metals but one below respective RSLs in leachate
 - Selenium approx 2X higher
 - Well within allowable dilution-attenuation factors

Element	Concentration (ug/L)		
	FGD Gypsum Leachate	Screening Level	
Antimony	0.6	6	MCL
Arsenic	2	10	MCL
Barium	80	2,000	MCL
Cadmium	2	5	MCL
Chromium	4	100	MCL
Cobalt	2	11	Tap RSL
Copper	--	1,300	TT AL
Lead	0.1	15	TT AL
Mercury	0.002	2	MCL
Molybdenum	11	200	DWEL
Nickel	--	700	DWEL
Selenium	90	50	MCL
Thallium	0.3	2	MCL
Zinc	--	5,000	SMCL

NOTE: Concentrations shown are maximum concentrations for each material.

Washed FGD Gypsum vs. RSLs (cont'd)

- Comparison of leachate produced over a range of pH
 - 5.5 to 9
- All trace metals but three below respective RSLs in leachate
 - Cobalt, selenium, cadmium higher
 - All well within allowable dilution-attenuation factors

Element	Concentration (ug/L)		
	FGD Gypsum Leachate	Screening Level	
Antimony	3	6	MCL
Arsenic	10	10	MCL
Barium	700	2,000	MCL
Cadmium	9	5	MCL
Chromium	11	100	MCL
Cobalt	20	11	Tap RSL
Copper	NA	1,300	TT AL
Lead	0.14	15	TT AL
Mercury	0.002	2	MCL
Molybdenum	20	200	DWEL
Nickel	NA	700	DWEL
Selenium	200	50	MCL
Thallium	0.315	2	MCL
Zinc	NA	5,000	SMCL

NOTE: Concentrations shown are maximum concentrations for each material.

Washed FGD Gypsum vs. RSLs (cont'd)

- Comparison of leachate produced via TCLP
- All trace metals but two below respective RSLs in leachate
 - Cobalt, selenium are higher
 - All are well within allowable dilution-attenuation factors

NOTE: Concentrations shown are maximum concentrations for each material.

Element	Concentration (ug/L)		
	FGD Gypsum Leachate	Screening Level	
Antimony	NA	6	MCL
Arsenic	5	10	MCL
Barium	NA	2,000	MCL
Cadmium	10.9	5	MCL
Chromium	13	100	MCL
Cobalt	NA	11	Tap RSL
Copper	NA	1,300	TT AL
Lead	1.8	15	TT AL
Mercury	< 0.3	2	MCL
Molybdenum	NA	200	DWEL
Nickel	NA	700	DWEL
Selenium	334	50	MCL
Thallium	NA	2	MCL
Zinc	NA	5,000	SMCL

Washed FGD Gypsum vs. Unwashed

- Comparison of leachate produced over a range of pH
 - 5.5 to 9
- All trace metals in washed FGD gypsum are less than those in unwashed
 - 1X to 500X lower

NOTE: Concentrations shown are maximum concentrations for each material.

Element	Concentration (ug/L)	
	Washed	Unwashed
Antimony	3	10
Arsenic	10	10
Barium	700	800
Cadmium	9	40
Chromium	11	30
Cobalt	20	40
Copper	NA	NA
Lead	0.14	2
Mercury	.002	1
Molybdenum	20	30
Nickel	NA	NA
Selenium	200	2000
Thallium	0.315	4
Zinc	NA	NA

Calcium Sulfate (Gypsum) from Natural Gypsum

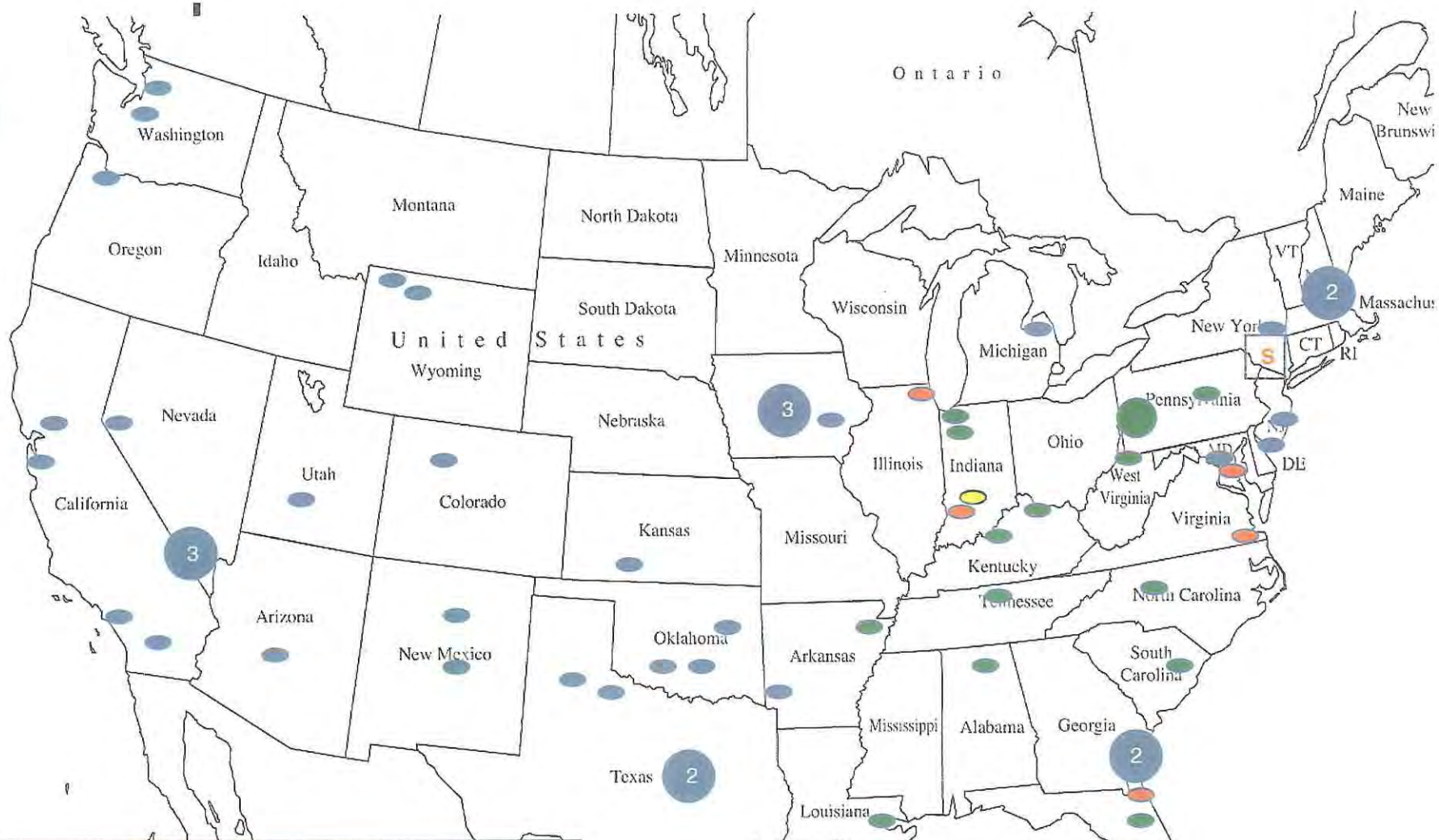
- Listed as Generally Recognized as Safe (GRAS) (21 CFR 184.1230)
 - A food substance that is not subject to premarket review and approval by FDA because it is generally recognized, by qualified experts, to be safe under the intended conditions of use.
 - To be used in food at levels that do not exceed good manufacturing practices.
- FDA recognized uses include:
 - Dietary source of calcium
 - Condition water used in brewing beer
 - To control tartness and clarify wine
 - An ingredient in toothpaste, canned vegetables, flour, bread, ice cream, cheese and other foods






Additional Reasons not to Characterize FGD Gypsum Used to Manufacture Gypsum Board as Hazardous

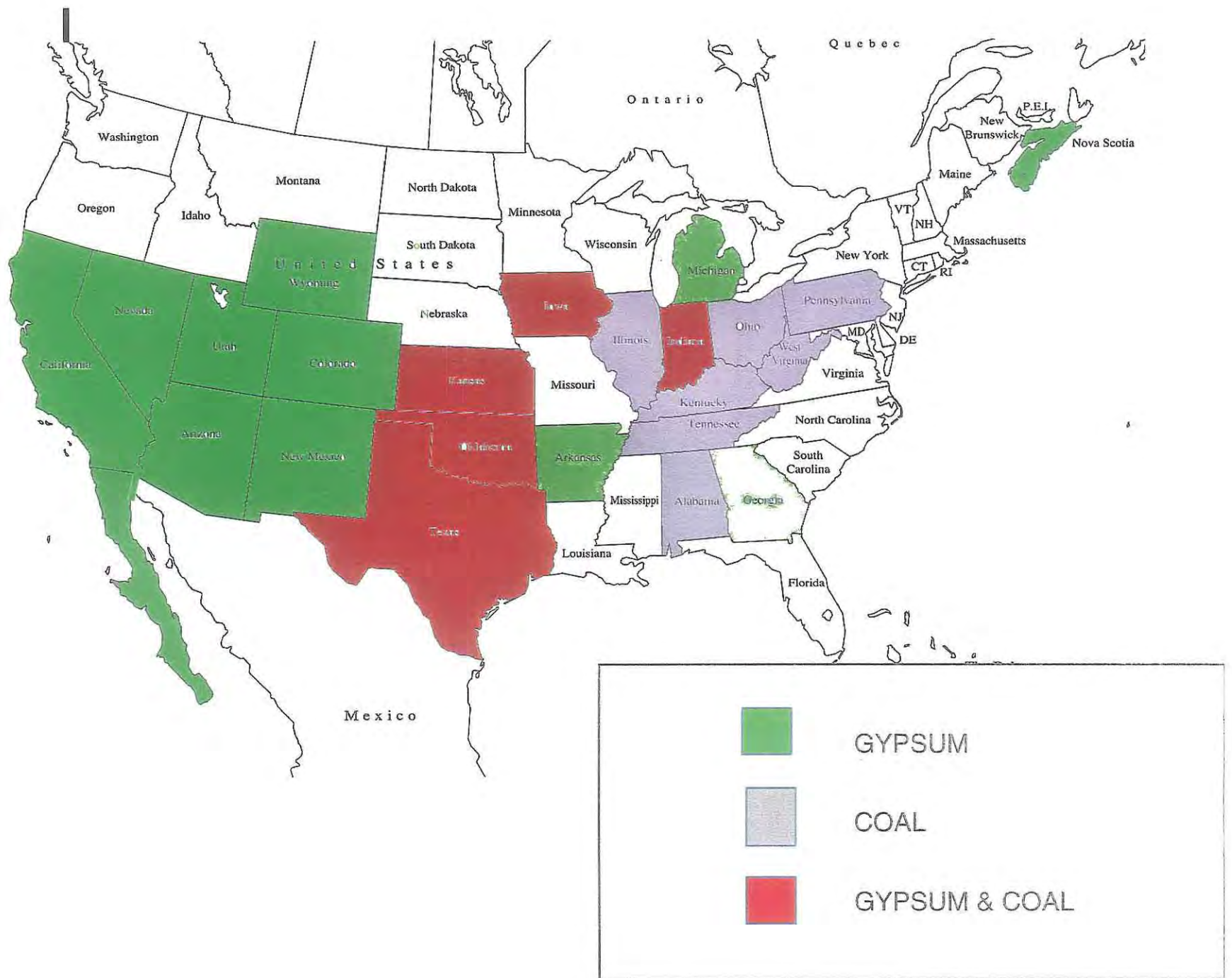
- Previous EPA determinations conclude it is not hazardous
- There is no new EPA data indicating high purity FGD gypsum is hazardous
- EPA has consistently encouraged use of FGD gypsum for gypsum board manufacturing to encourage waste minimization

- ● ***Regulation, Definition or Treatment of High Purity FGD will have a Severe Negative Impact on the U.S. Economy and the Gypsum Industry***

- Compliance Costs
- Direct Impact on Industry
- Indirect Impact on Industry
 - Stigma on Material
 - Beneficial Use Designation will also Carry Stigma
- Impact on U.S. Economy



-  40 NATURAL ORE FACILITIES – LITTLE OR NO FGD
-  6 NATURAL ORE FACILITIES – UP TO 25% FGD
-  1 MIXED FACILITY – APPROX. 40 – 60% FGD ORE
-  17 FGD ORE FACILITIES – LITTLE OR NO NATURAL ORE
-  1 FACILITY CONVERTING FROM NATURAL TO FGD



Impact on A Manufacturing Facility

- Washingtonville, PA
 - Opened 2008
 - 1 billion sf annual capacity



- FGD gypsum source is immediately adjacent to plant
- Costs of conversion to natural ore:
 - Natural ore transported in from Canada via ship and rail or truck or rail from Midwest U.S.
 - Convert rail infrastructure
 - New crushing and grinding equipment
 - Storage and transport

General Economic Impacts from a Change in Regulatory Characterization of FGD Gypsum

- Direct Impact on Manufacturers
 - Market price of wallboard rise 29%
 - Causes 6% drop in demand
 - \$232 million negative impact on annual profits of wallboard manufacturers
- Direct Impact on Construction Industry
 - Total construction industry profits decrease by \$1.2 billion
- Direct cost of Plant Conversion/ Modification

General Economic Impacts from a Change in Regulatory Characterization of FGD Gypsum

- Collateral Impact on Residential Housing Market
 - Increase in price of wallboard will cause 2700 fewer houses to be constructed for the first two years after implementation of the regulation.
 - Annual economic loss of \$625 million.
 - Additional annual tax loss of \$241 million
 - Annual job loss of 8200 jobs



Additional Economic Impact

- Increased tort liability issues for buyers and applicators
- Increased costs and complexity of scrap material disposal
- Reluctance of architectural community to specify
- Complexity of transport and storage of FGD gypsum ore
- Spill remediation costs and concerns
- Potential material shortages during surge in demand for building materials

Issue Overview - A More Appropriate Regulatory Alternative Exists

- Exclude high purity (“washed”) FGD gypsum from the definition of coal combustion waste byproducts or from the definition of hazardous waste and/or,
- Do not identify any coal combustion material, including FGD gypsum, as a hazardous waste.
- Address surface impoundments under EPA’s RCRA imminent and substantial endangerment authority.