

Thank you for attending!

Chlorine in Coal

Rod Hatt

Why HCl and Acid Gas Regulations

Health – Acid gasses can be harmful

HCL, HBr, HF, others

1999 ICR included all plants Mercury

Hg and chlorine content

Chlorine gas is Cl_2

Chloride is Cl^- ion

Salt is NaCl

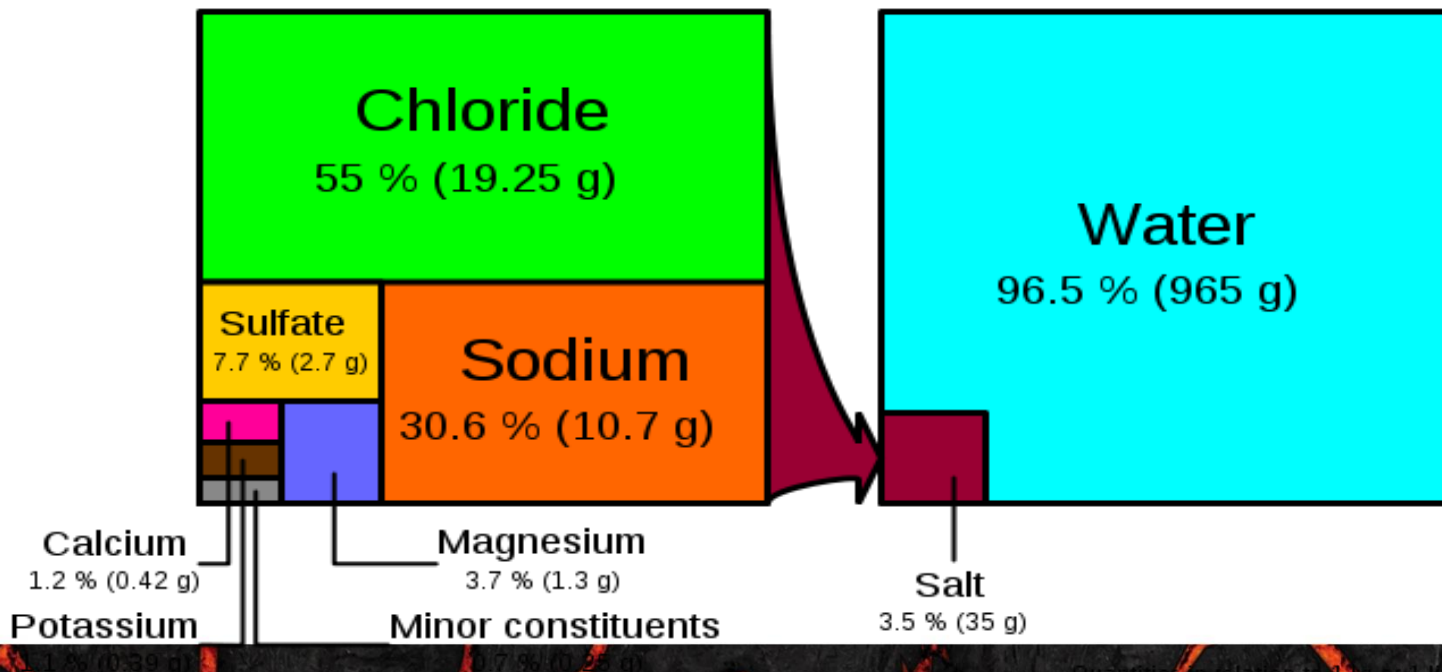
Needed for life

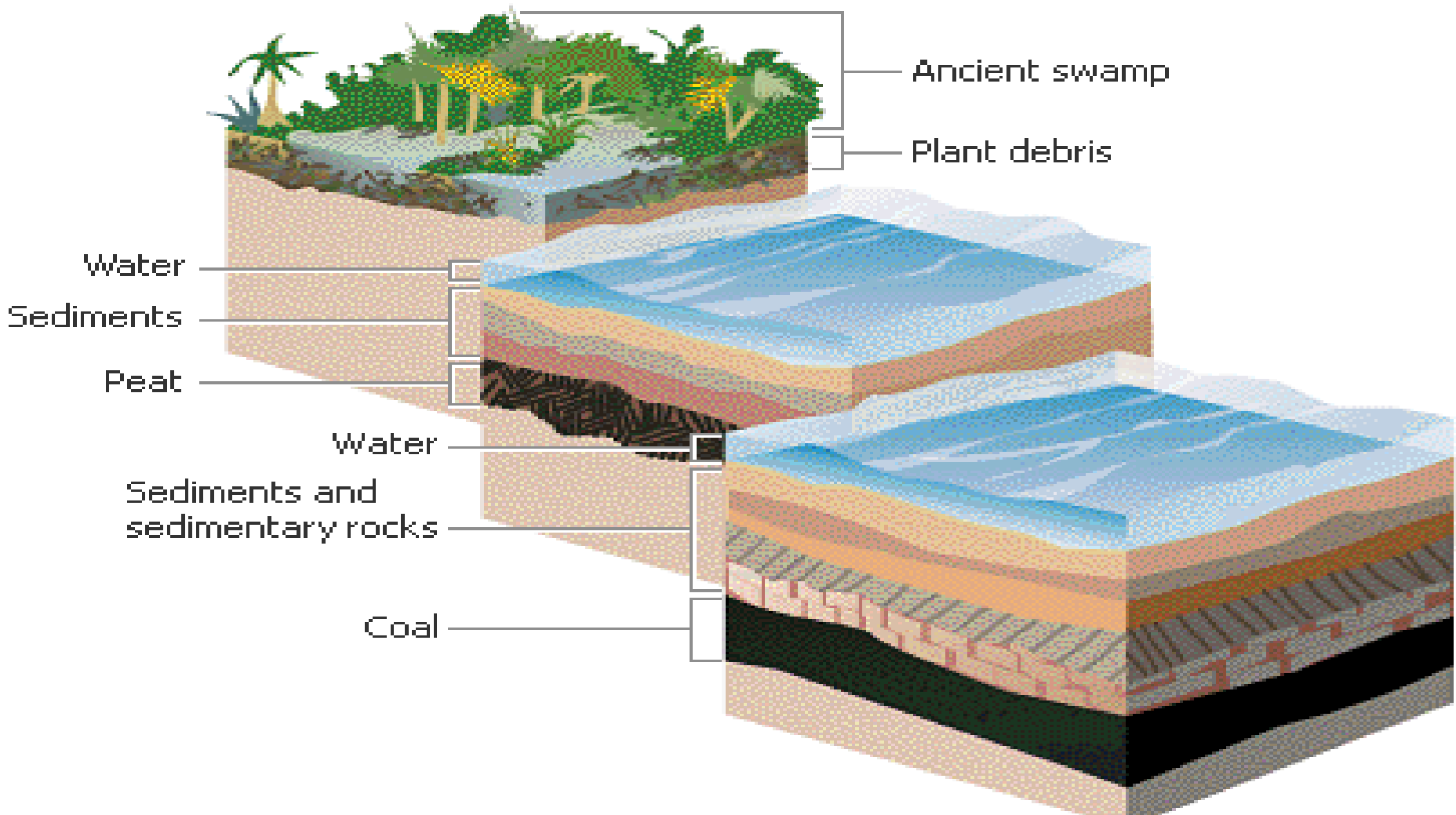
~28,000,000,000,000,000 tons of Cl in oceans

5,000,000 tons potential uncontrolled US coal

Sea salts

Sea water





Forms of chlorine in coal

Salts – NaCl

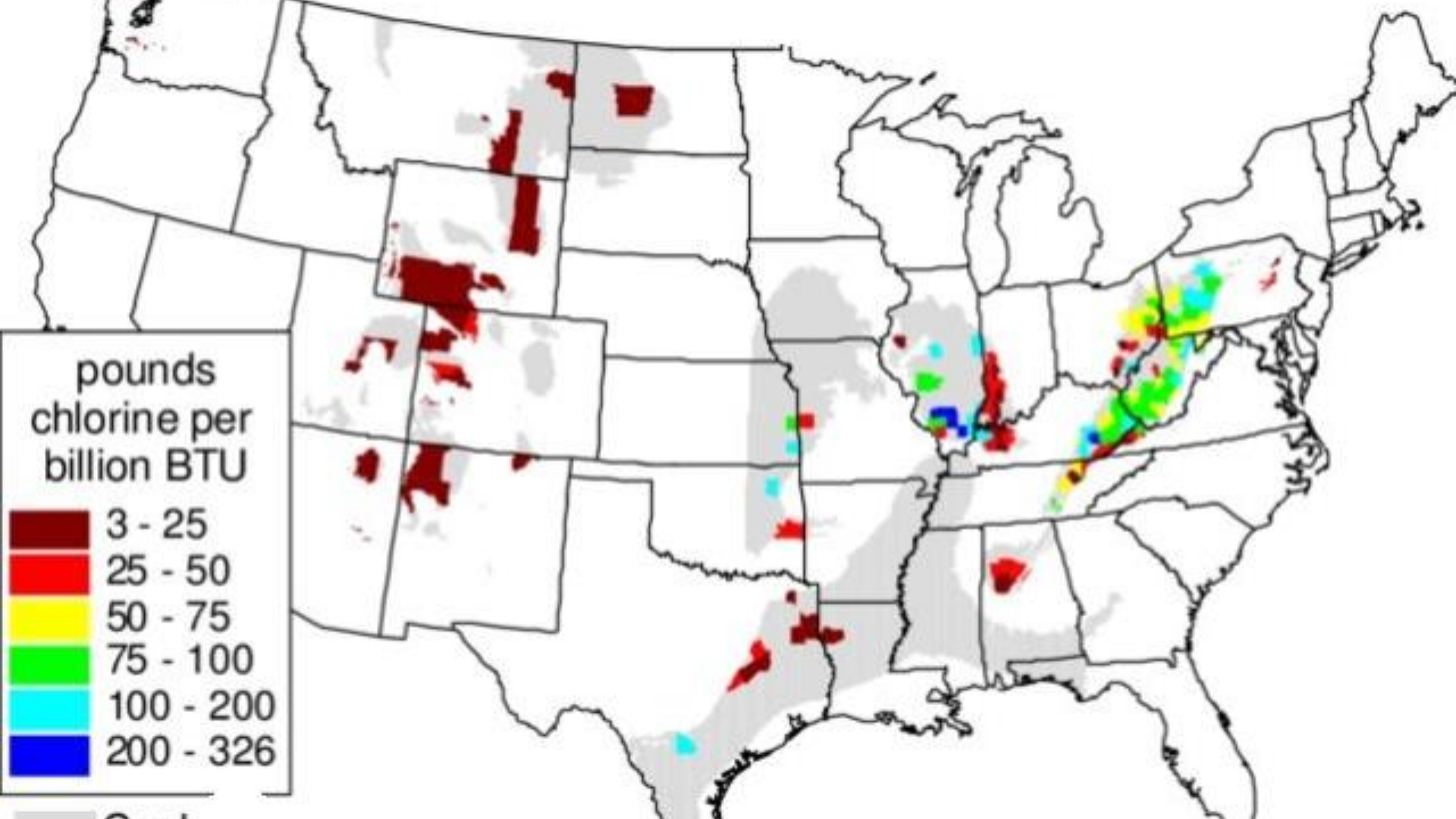
Water soluble

In pore spaces

Organic – attached to coal

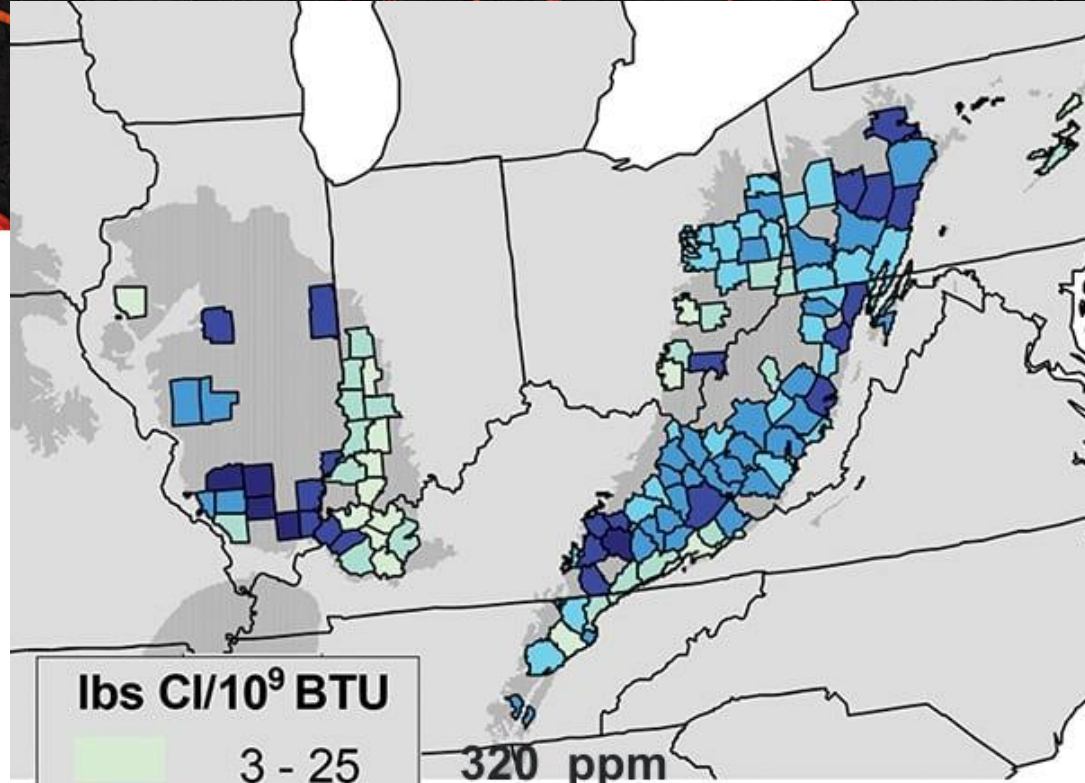
Not water soluble

**Other sources –
dust control water,
freeze conditioners,
Ocean,
road salt...**

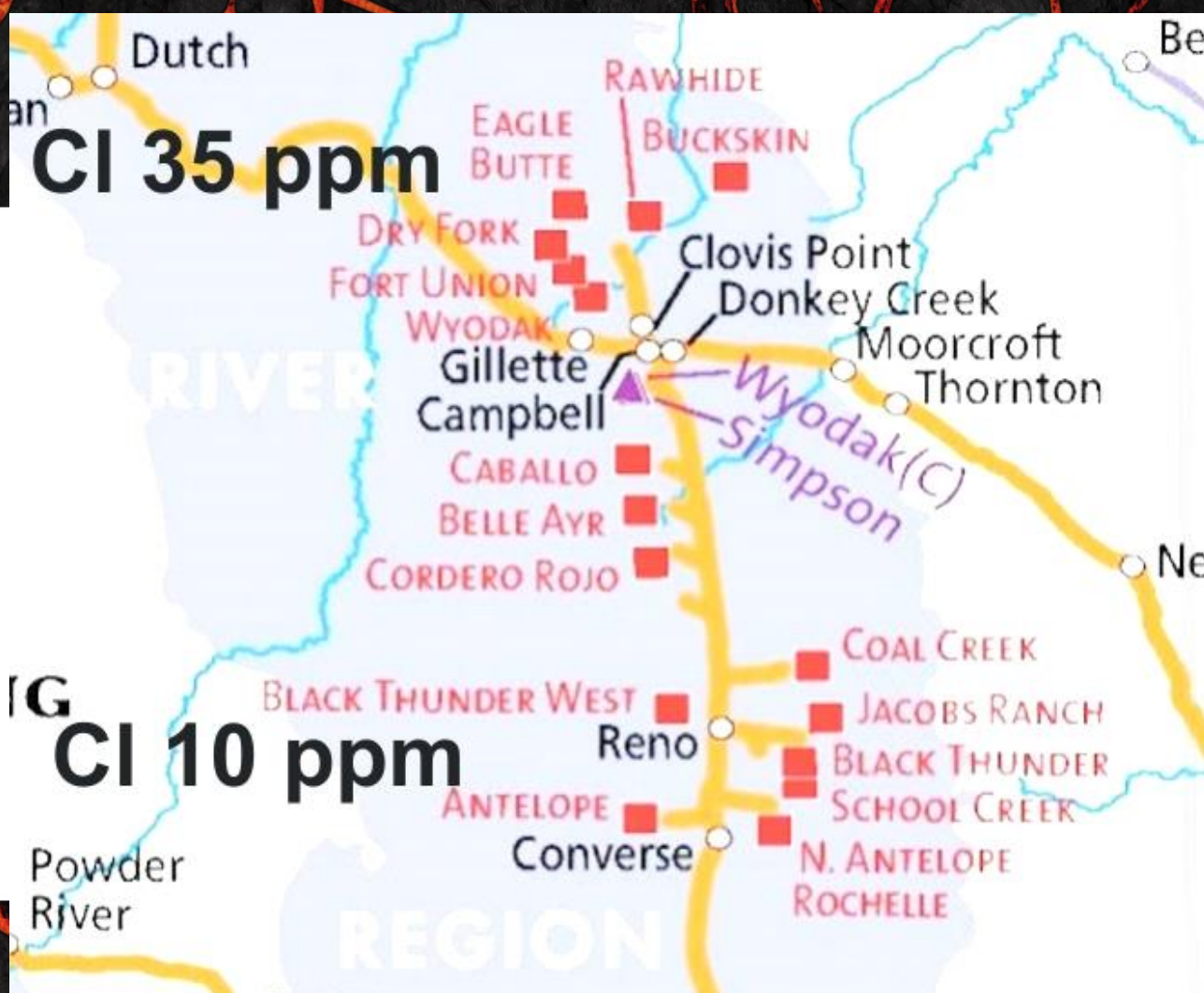


pounds
chlorine per
billion BTU

- 3 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 200
- 200 - 326

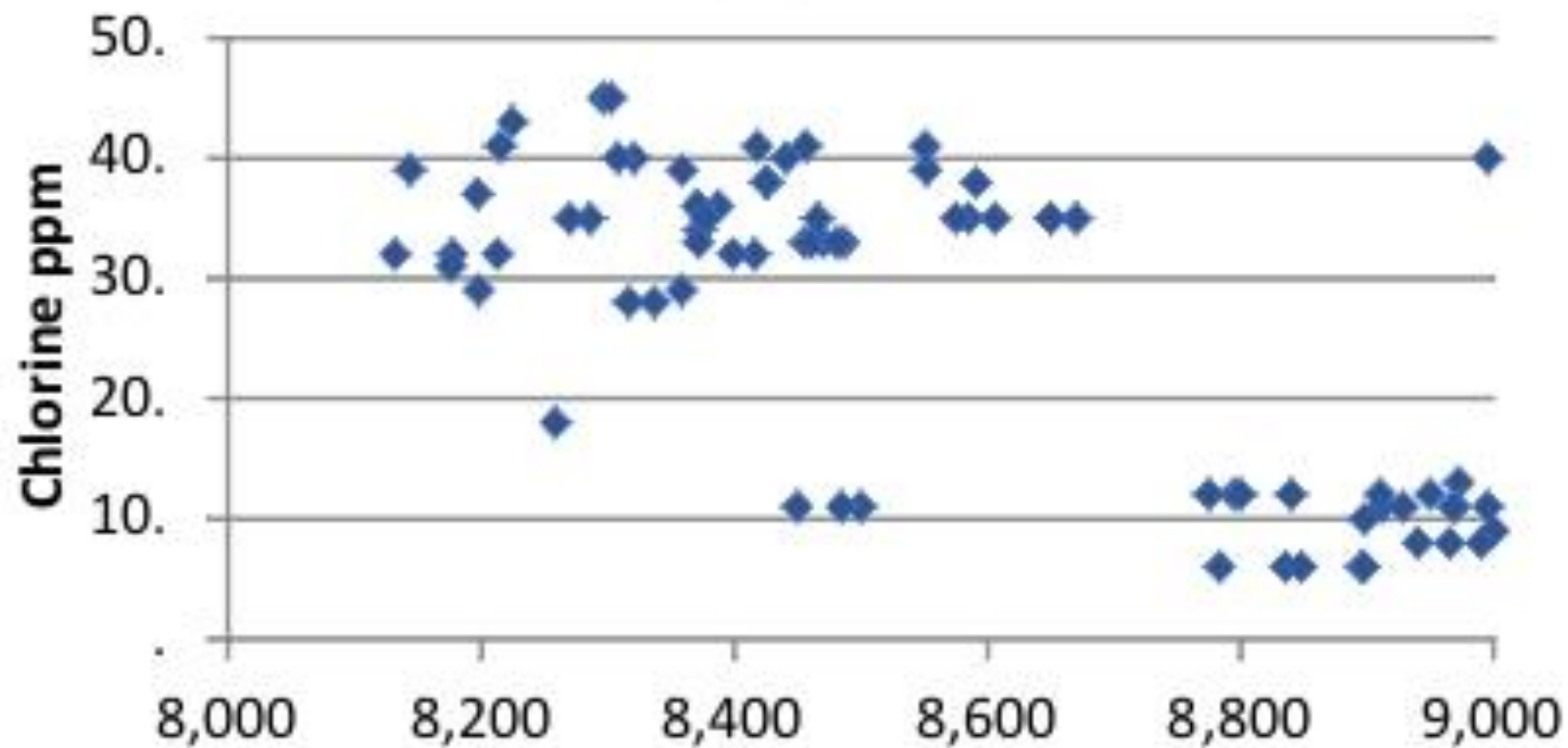


lbs CI/10 ⁹ BTU	
3 - 25	320 ppm
25 - 50	650
50 - 75	975
75 - 100	1300
100 - 200	2600
200 - 326	4240



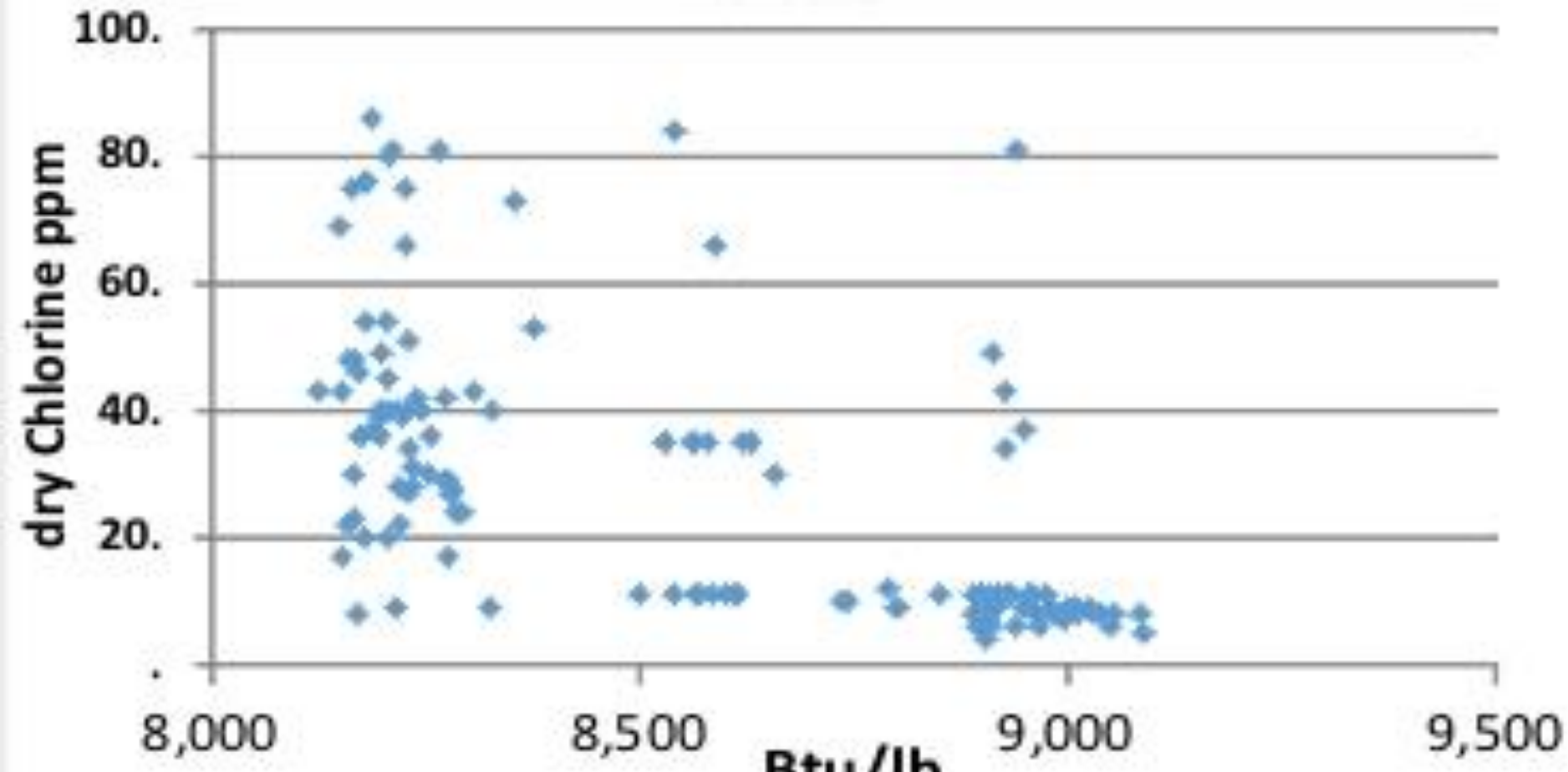
PRB Btu/lb vs Chlorine ppm

24 EIA 923



2021 Btu/lb vs Chlorine ppm

EIA 923 data





Designation: D 2361 – 02

Standard Test Method for Chlorine in Coal¹

This standard is issued under the fixed designation D 2361; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

12. Precision and Bias

12.1 The precision of this test method for the determination of Chlorine in coal, are shown in Table 1.

TABLE 1 Concentrations Range and Limits for Repeatability and Reproducibility for Chlorine in Coal

Repeatability Limit r	Reproducibility Limit R
0.03%	0.06%



Designation: D 4208 – 02 (Reapproved 2007)

Standard Test Method for Total Chlorine in Coal by the Oxygen Bomb Combustion/Ion Selective Electrode Method¹

This standard is issued under the fixed designation D 4208; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

12. Precision and Bias ⁵

12.1 The precision of this test method for the determination of chlorine in coal are shown in **Table 1**.

TABLE 1 Concentrations Range and Limits for Repeatability and Reproducibility for Chlorine in Coal

Concentration Range, $\mu\text{g/g}$	Repeatability Limit, r	Reproducibility Limit, R
220 to 2100	$48.4 + 0.13 \bar{X}$	$200 + 0.23 \bar{X}$



Designation: D 6721 – 01 (Reapproved 2006)

Standard Test Method for Determination of Chlorine in Coal by Oxidative Hydrolysis Microcoulometry¹

This standard is issued under the fixed designation D 6721; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

16. Precision and Bias ⁴

16.1 The precision of this test method for the determination of Chlorine in coal, is shown in **Table 1**. The precision

TABLE 1 Concentration Range and Limits for Repeatability and Reproducibility for Chlorine in Coal

Concentration Range, ppm	Repeatability Limit <i>r</i>	Reproducibility Limit <i>R</i>
22 – 1136	$1.92 + 0.06 \bar{x}$	$6.13 + 0.07 \bar{x}$

ASTM

D 2361 +/- 600 ppm

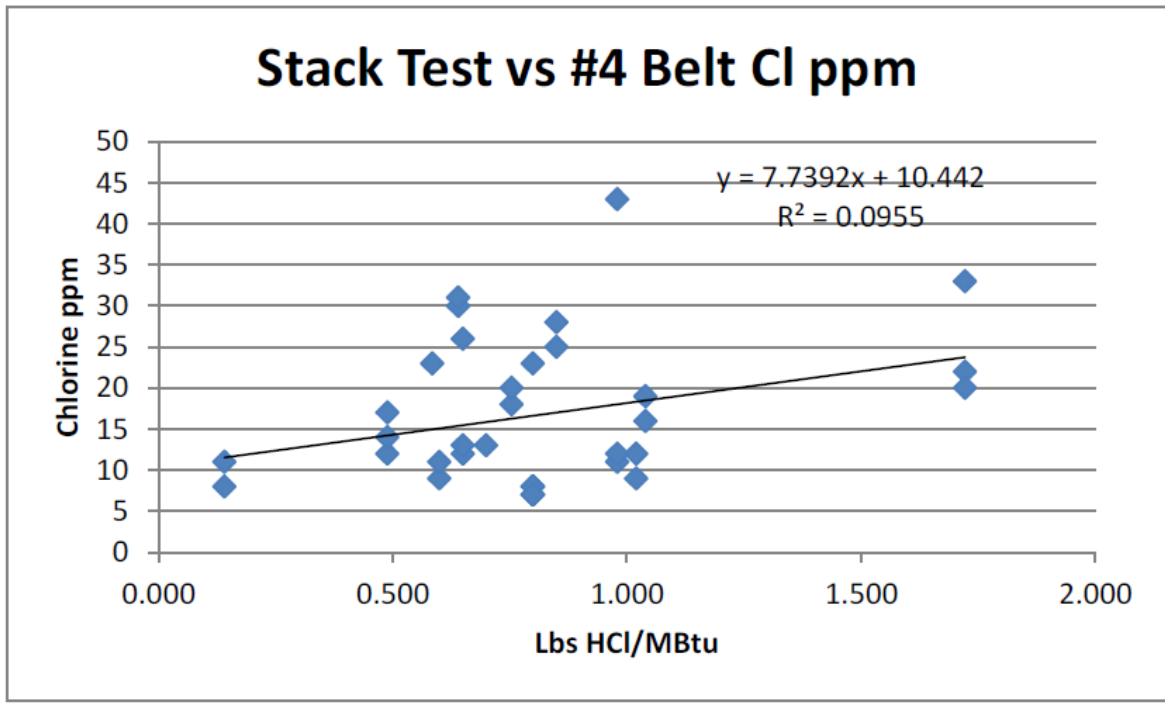
D 4208 +/- 200 ppm

D 6721 +/- 6 ppm

**MEASUREMENT OF HYDROGEN CHLORIDE IN COAL-FIRED POWER PLANT EMISSIONS
USING TUNABLE DIODE LASER SPECTROMETRY**

**K. L. Mackay,^a A. Chanda,^a G. Mackay,^{a*} J. T. Pisano,^b
T. D. Durbin,^b K. Crabbe,^c and T. Smith^c**

UDC 543.42.062:546.131



Coal Combustion, Inc.

Rod_hatt@coalcombustion.com

859-873-0188

www.coalcombustion.com

Thank you so much!