

Mercury Allowances and Strategies: Peering Through the Mist

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Overview

- Overview of scenarios that could play out, assuming there is trading
- Impact of state allocations on trading
- Impact of co-benefit controls on the market and pricing
- Where does sorbent injection fit in?

Regulatory Scenarios and impact on trading

CAMR

MACT

Trading

Fragmented Markets

No Trading

Will result from
various state
regulations

The possibilities

Federal State	MACT	CAMR
No State Regulations	No Trading	Open Market
State Regulations	No Trading	Fragmented Market

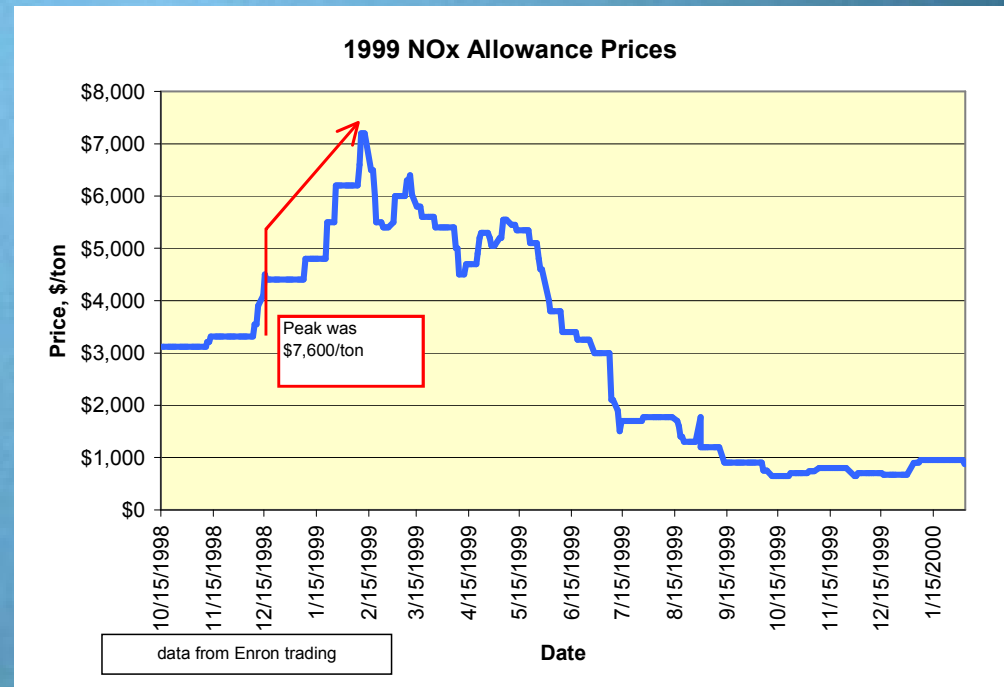
Fragmented Markets

impact on trading

- Less liquidity than full trading
 - Lower volume
 - Higher transaction costs
- Price discovery more difficult
 - May see price spikes
- More volatility

Previous Allowance Market Experience – OTR NOx market

- High volatility during initial price discovery period.
- Driven by Fear and Greed
- Prices eventually settle down



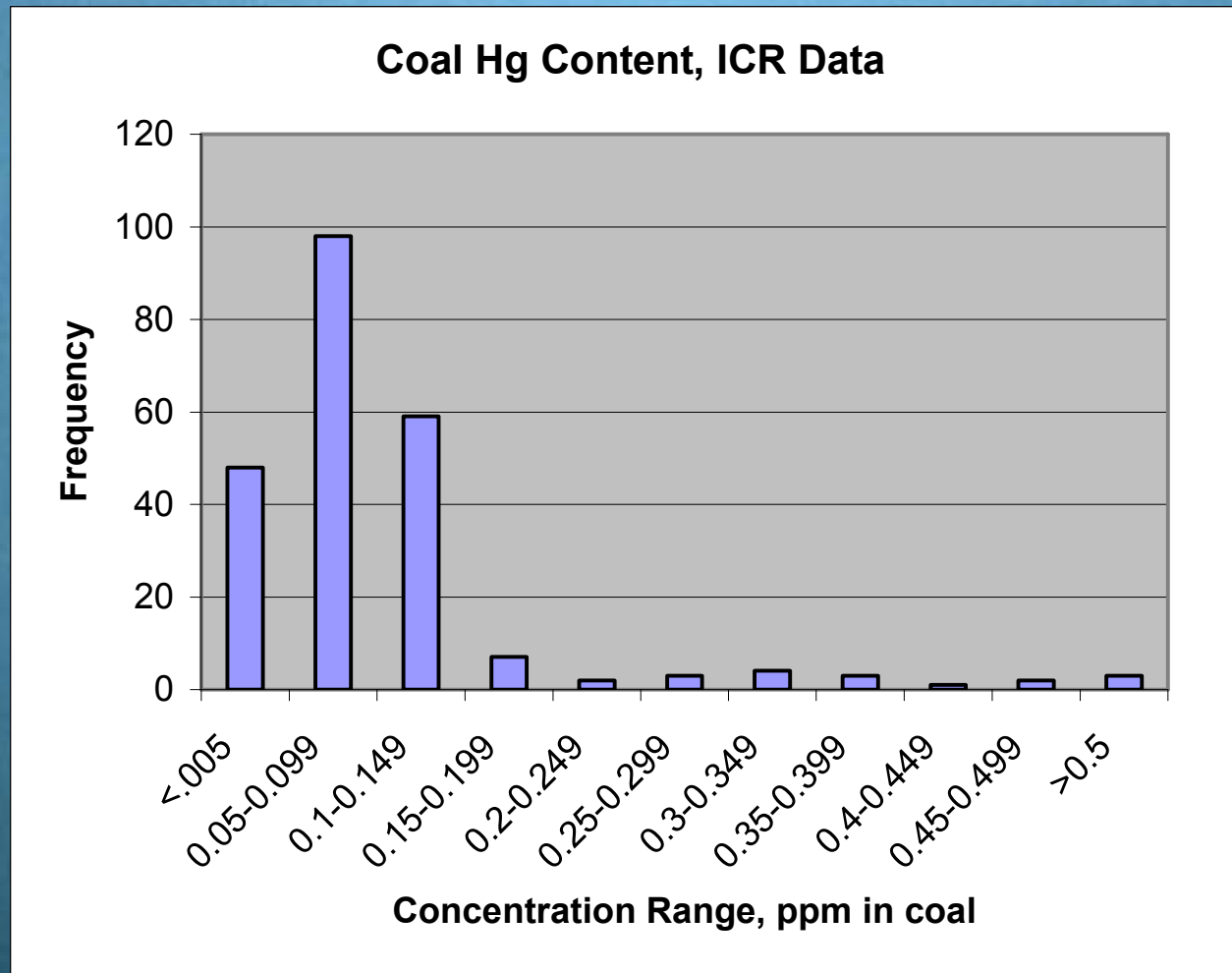
SIP Call NOx Allowances



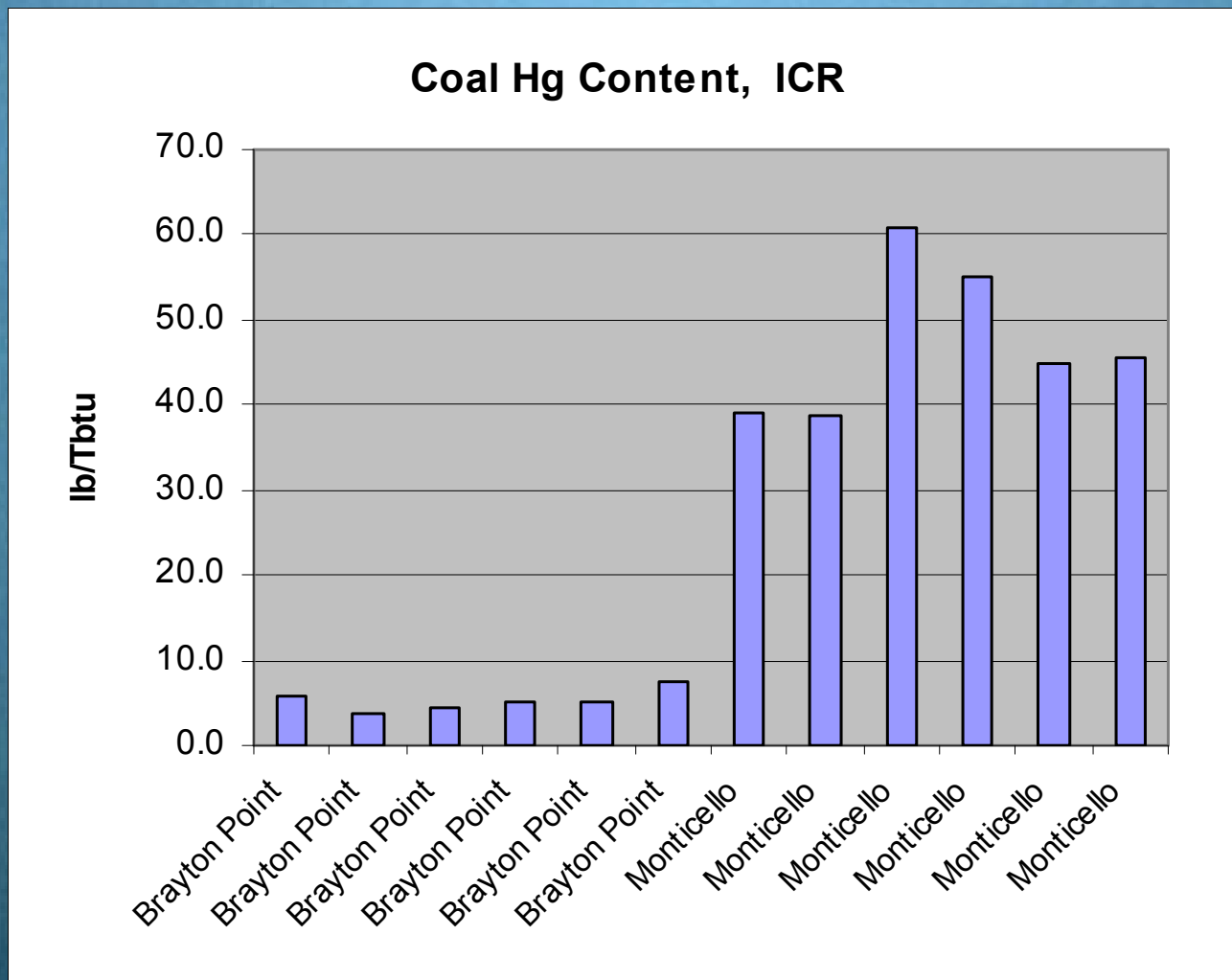
Effect of Allocations

- Favorable to Western States, especially Lignite units
 - But for some lignite units, may not be enough
- New technologies are looking good for Western Coals
 - More on this later
- Coal mercury content can be variable
 - Adds risk to doing nothing
- Will units in Western States overcontrol?

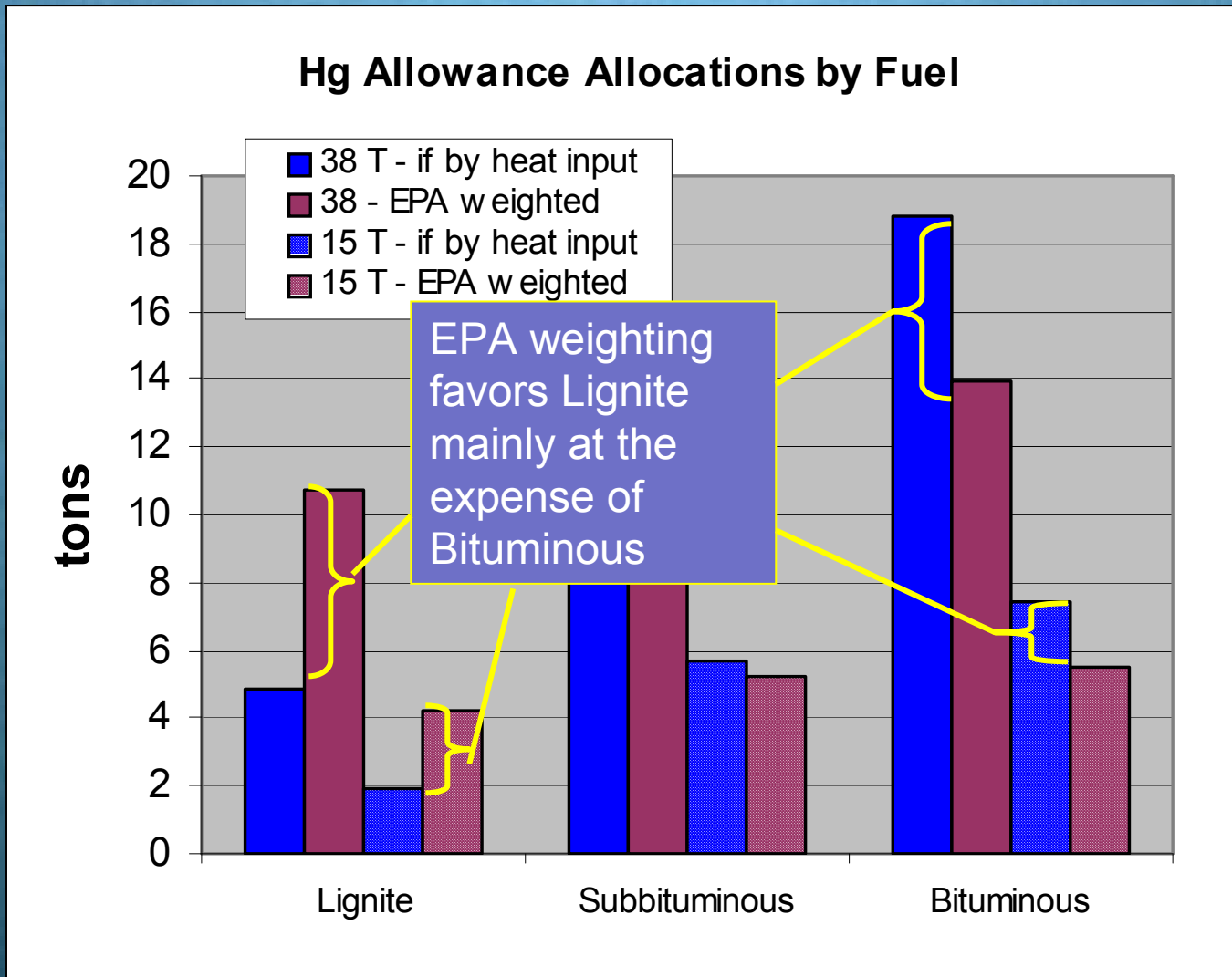
Hg Content in Fuel



Hg Variability in Coal

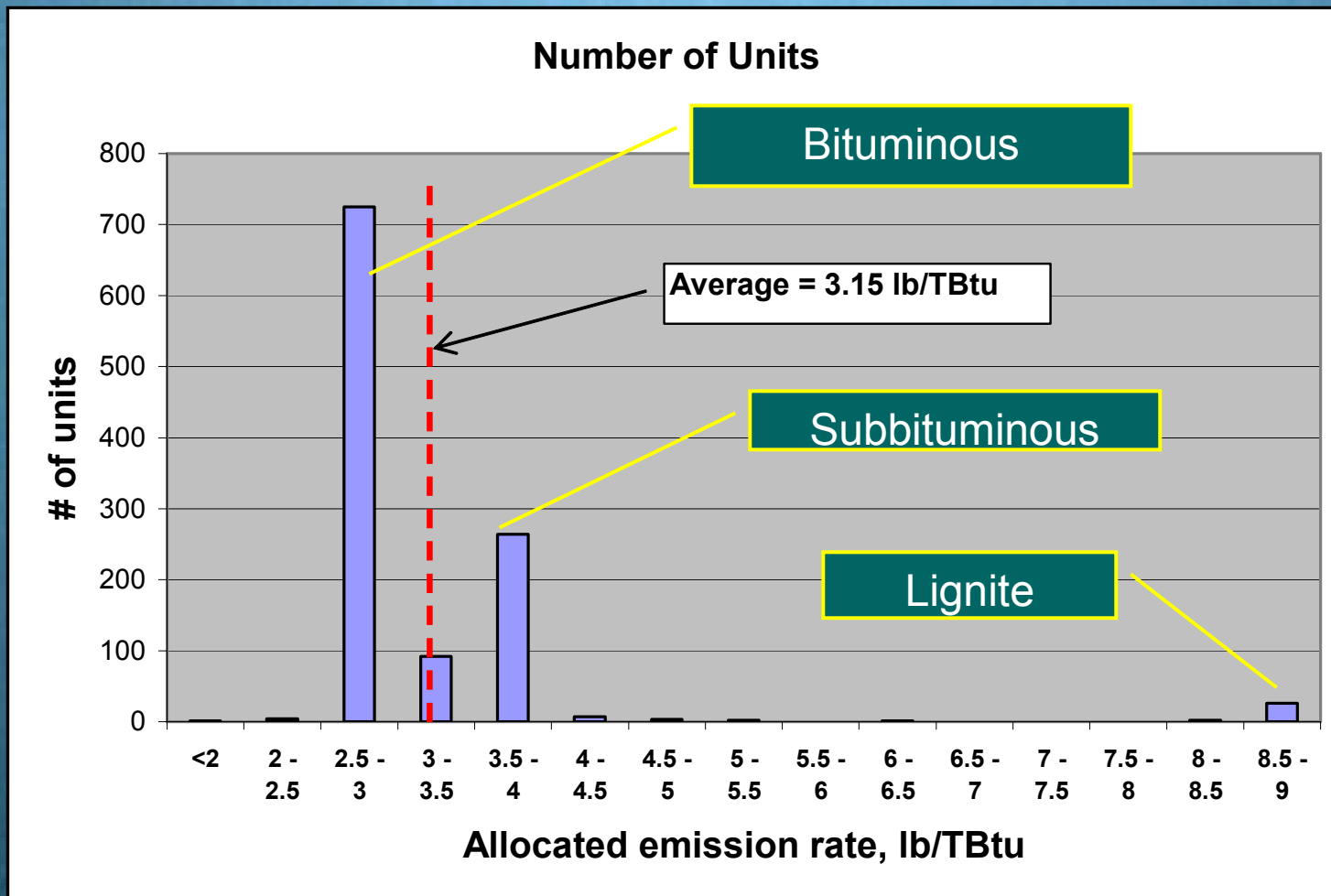


Effect of Allocations



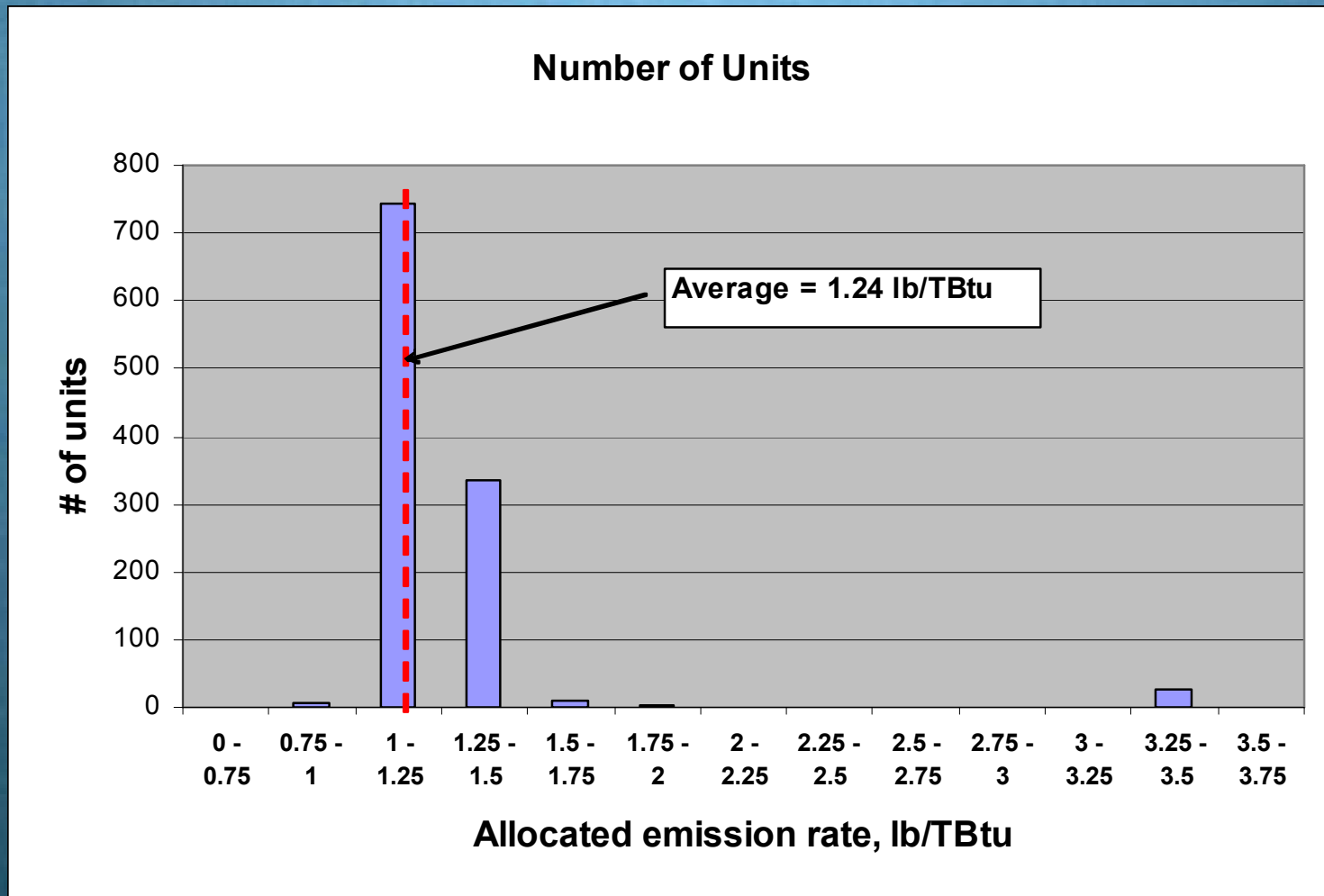
Effect of Allocations

38 TPY budget



Effect of Allocations

15 TPY budget



Compliance Strategies

- Cobenefits
 - Will they be enough?
- Mercury-specific technologies
 - Sorbent injection

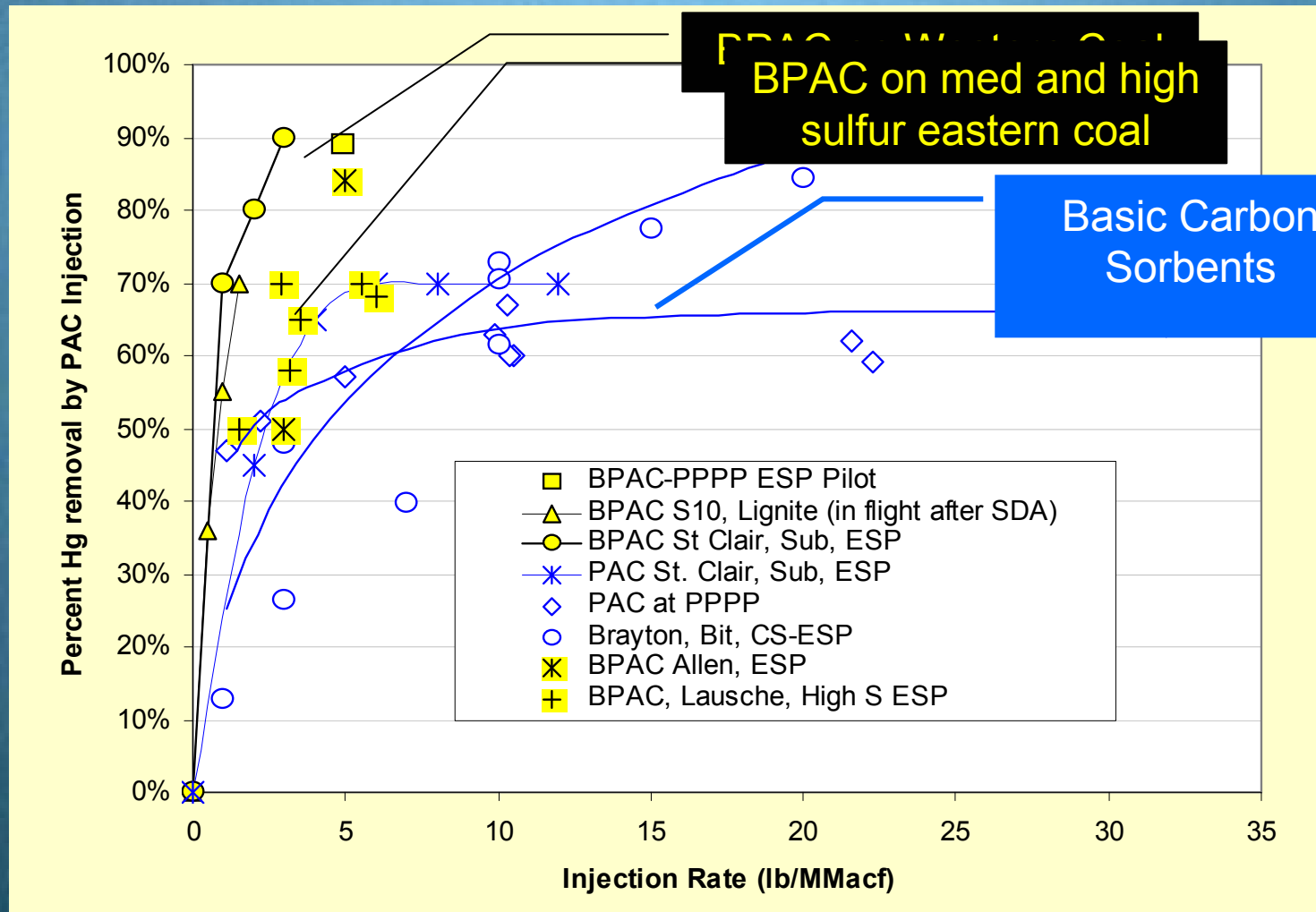
Cobenefits

- CAMR
 - Projected to be adequate through 2018. But, mercury controls may be necessary beyond.
 - Effect will be to depress allowance prices
- MACT
 - Won't be enough for many units
 - Demand for mercury-specific technology
- Fragmented, or mixed market
 - There will be demand for mercury-specific technology

Mercury-Specific Controls

- Sorbent injection is the only technology with broad full-scale experience
 - Powdered Activated Carbon (PAC) and chemically treated PAC are the most widely tested and successful sorbents
 - Mineral-based sorbents under development
- Chemically treated sorbents appear to have big advantages, especially for low-rank coals

Sorbent Injection



Similarities to cooking

- It's a lot easier to add a missing ingredient than it is to remove something you wish wasn't there.
- It's easier to add halogens to improve sorbent performance in Western Coals than it is to remove SO_3 from higher sulfur eastern coals.



Comparing Technologies

	FGD	SCR	Hg Sorbent Injection
Cost \$/KW		~\$100±	Under \$5
Timing	~2 years	1-2 years	6 months

Technology can be deployed quickly in response to market signals



Sorbent Operating Cost

- Treated PAC sorbent cost contributes around **\$10,000/lb** of Hg removed¹
- Operating costs increase if fly ash marketability is affected.

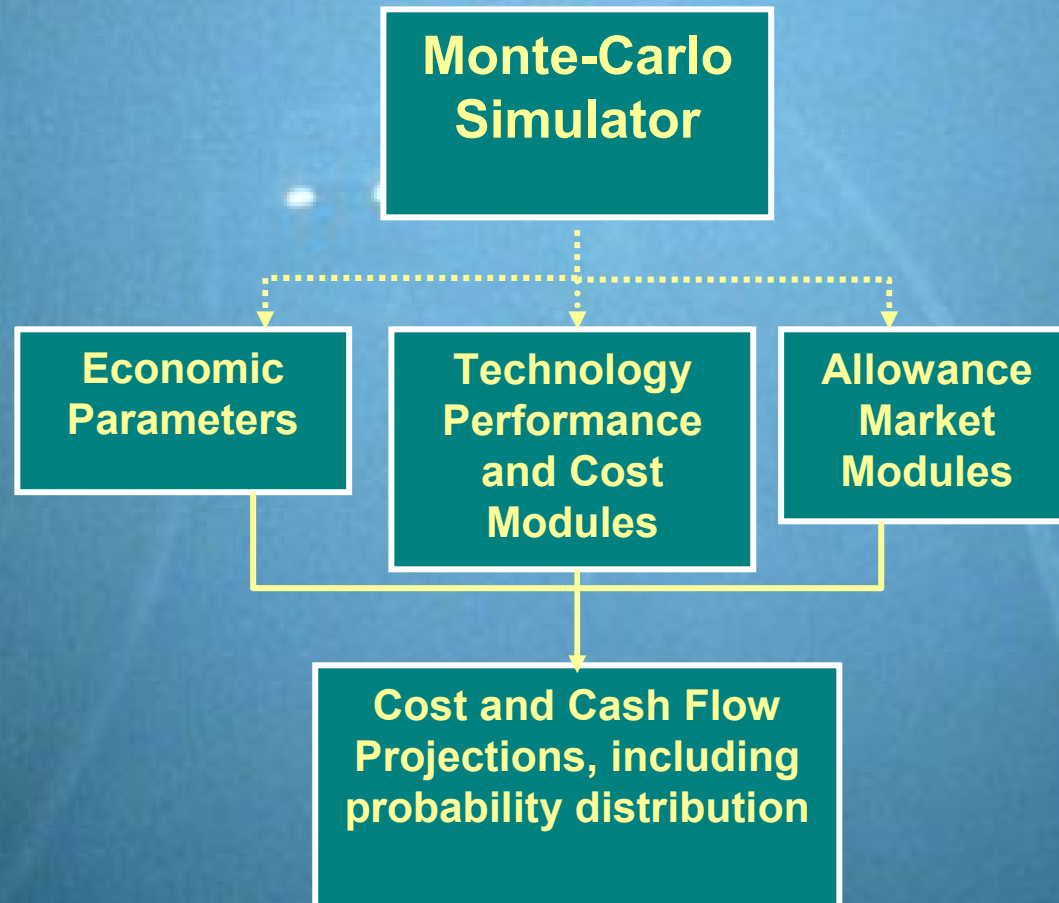
If coal Hg is 3 times as high, this drops to about \$3,000/lb!

1 Based on presentation by Nelson at 2005 DOE Contractor's meeting – 90% removal from a Western Fuel boiler using a treatment rate of 3 lb/MMacf

Conclusions on Sorbent Injection

- Systems are quick and inexpensive to install
- New sorbents work especially well on western fuels, where allowances are most plentiful relative to heat input
- Sorbent injection effectively establishes a “cap” on Hg allowance costs and should reduce volatility from what has been seen for other markets

Putting it all together in an uncertain world



Control Technology Performance and Cost Modules

Pollutant	Control Technologies
NOx	<ul style="list-style-type: none">• Combustion Controls• SNCR• SCR
SO ₂	<ul style="list-style-type: none">• Limestone Forced Oxidation Wet FGD• Spray Dryer Absorber• Advanced Dry FGD (CFB Scrubber)
Hg	<ul style="list-style-type: none">• Sorbent Injection – PAC, BPAC, and others• Multipollutant control technologies• Cobenefit approaches with other control technologies
PM	<ul style="list-style-type: none">• Dry Electrostatic Precipitator• Reverse Gas Fabric Filter• Pulse Jet Fabric Filter• Wet Electrostatic Precipitator
Multipollutant	<ul style="list-style-type: none">• Electro-Catalytic Oxidation (ECO)

Mercury Controls

For Multipollutant Control Situation

- Possible to characterize cost and risk of various technology approaches for a fleet of assets
- Possible to test combinations of technology choices and trading with market derivatives to manage risk
 - Tailor your risk and capital expenditure
- Ability to test impacts of a wide range of uncertain variables on cash flow
 - Allowance prices
 - Fuel Prices
 - Wholesale power cost
 - Capacity factor

Summary

- Hard to say what regulatory scenario will ultimately play out
- If trading is nationwide, lignite and other western coal units may be an important source of allowances
- Expect some initial volatility in mercury allowance prices – eventually settle down.
- Availability of sorbent injection will tend to reduce volatility in allowance market compared to NOx experience
- However, a fragmented market will tend to increase volatility and cost
- Analysis needs to factor in uncertainty