Can Industry Comply?

Bob Fraser, QEP

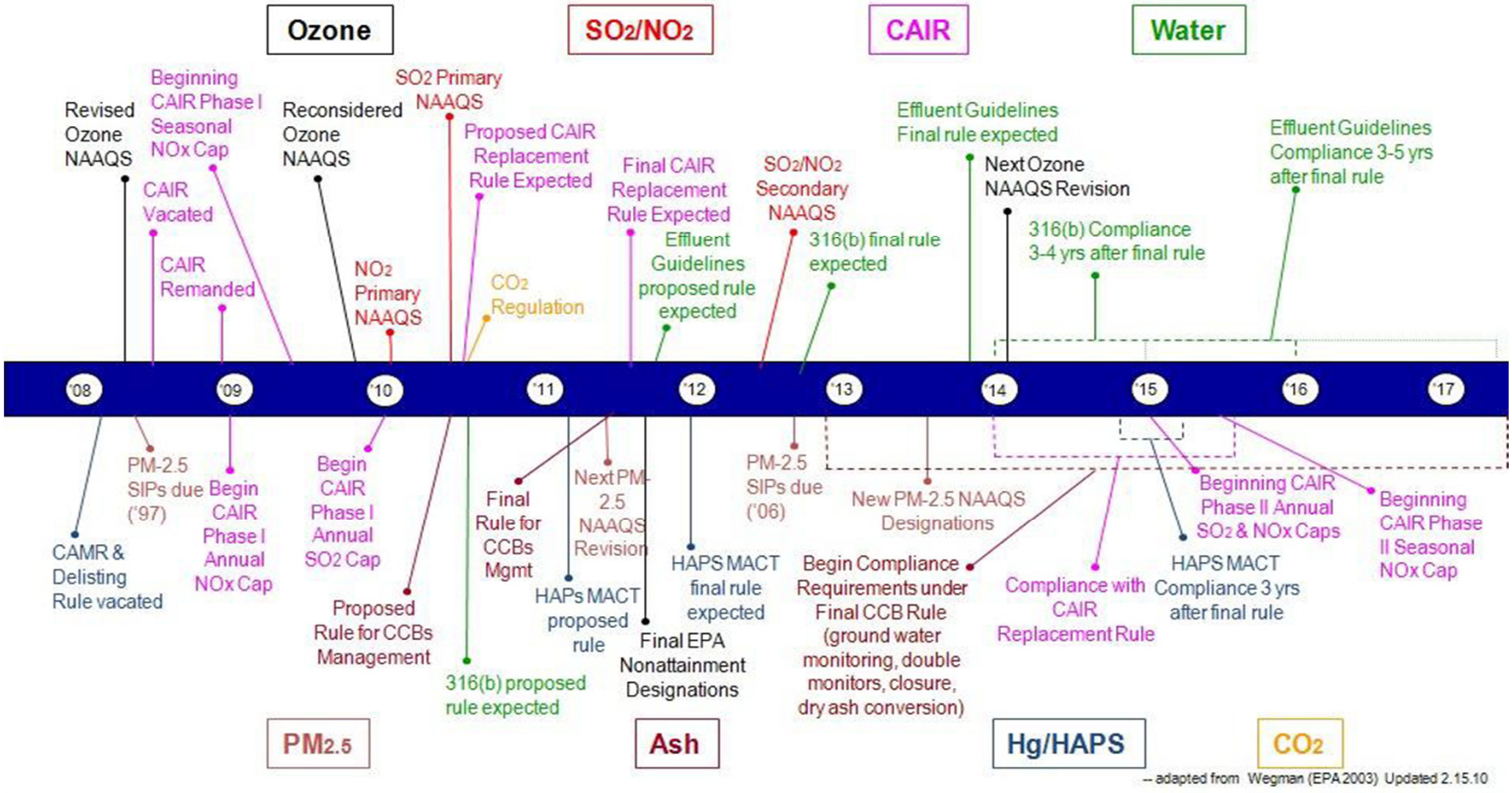
Delivering sustainable solutions in a more competitive world

ERM

History Tells Us..

- Checks and balances will prevail
  - The voice of CIBO
  - Constituency's and jobs
  - Litigation
  - Extreme political agendas eventually neutralized
  - Unreasonable/unachievable requirements eventually moderated
- Expect multiple delays
- Early compliance is never rewarded
- American ingenuity when money to be made
  - SCR will never work for coal"
  - "Acid Rain will bankrupt the US economy"
  - "PM CEMS don't work"
  - "It can't be done"
- All price forecasts (gas, electricity, allowances) are always wrong!

Train Wreck or Coaster? (Hold On)



-- adapted from Wegman (EPA 2003) Updated 2.15.10

ERM

The Regulatory Pendulum

- **Administration Goals 2009-2010**
  - Environmental mandate
  - Regulate coal and oil out of business
  - Renewables and green jobs
- **New Congress 2011**
  - Industry, mining, railroads, unions
  - EPA not responsible for U.S. energy policy
  - Anti-recovery, anti-Jobs
  - Congress sets EPA's budget
- **Administration Goals 2011-2012**
  - Get re-elected!
    - Carol Browner "resigns"
    - ICI Boiler MACT stayed
    - EGU MACT Rule "different"
    - 316(b) Rule

Bracketing Risk

- Boiler-by-boiler – every one is different
- 10 - 20 year planning horizon
- Regulatory matrices, projected impacts
- Best case, reasonable projected case, worst case
  - Compliance (expenditure) date
  - Requirements of compliance
  - Cost to comply
- Air, water, ash, other
- Documentation of rationale

The Fraser Hypothesis. By 2021..

- Viable solid fuel Boilers
  - LNB's with advanced OFA and SCR
  - FF with membrane bags
  - Acid Gas Scrubber
- Viable liquid fuel boilers
  - ULSD
  - LNB with FGR
  - Catalyst?
- Viable natural gas boilers
  - 9 ppm ULNBs, or
  - Combined cycle cogen with SCR and oxidation catalyst

What is our Best Path from Here to There?

Upgrade or Convert to gas?

- 20-year cost of energy, coal
  - Cap-ex & op-ex upgrades – 20 yr amortized
  - $/MMBtu coal @ 80% + purchased electricity @ 30%
- 20-yr cost of energy, on-site gas combined cycle
  - Is gas available? What cap-ex and op-ex?
  - Supply, demand and shale gas ($/MMBtu)?
  - Size (thermal power match), STG repowering?
  - Cap-ex & op-ex – 20 yr amortized
  - 70-90%, low CO2
- Give up coal and it will never come back

APC Upgrades (3 cases)

- **CUECost +**
  - Publicly available, transparent, repeatable
  - +/- 30% for stand-alones
  - Tuned with empirical data, - +/- 20% or better
  - Supplemented with vendor data
    - Fuels
    - Repowering
    - Pond closures
    - Cooling towers
    - Others
  - Limitations and Refinements

Refinements

- **Each device in CUECost is stand-alone**
  - Layering
  - LNB + SNCR
- **Vendor Supplements**
  - Polishing FF
  - ESP Upgrade
  - Trona Injection
  - ACI
- **Retrofit factor!**

Other Factors – Capacity, Reliability, Fuel Diversity

- More capacity needed?
- Boilers too large?
- Ultra-reliability?
- Fuel diversity?
  - Economics, seasonality
  - Backup
  - Negotiating strength
  - Risk mitigation
- Carbon - policy, goals, economics?

Other Factors - Cooling Water Intake

- Design Intake > *2.0 MGD* & at least 25% for cooling. Upper limit on number of *fish killed* allowed. Site specific technology including intake velocity reduction to 0.5 feet per second.
- Withdraw at least 125 MGD; required to conduct *entrainment* studies *to help permitting authorities* determine whether/what site specific entrainment controls will be required.
- Mitigation Strategies
  - Reduce face velocity at screens
  - Ultra-fine mesh screens
  - VFD's
  - Closed cycle cooling
  - Other case-specific

Other Factors - Ash Ponds

- Closure costs understood
- Convert to dry system
  - Beneficial re-use
  - On-site engineered mono-fill
  - Off-site landfill
- Permitting

The Law of the Jungle