Innovation for Progress in Environmental Protection

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"But aren't we fortunate to live in a society where differing views are tolerated?"
Where We Agree

- The public wants clean air and water
- Businesses want certainty, and protection from competitors that cut corners
- Everyone wants economic growth

- Large number of regulated sources
- Noncompliance widespread
- Budgets declining

Number of Regulated Sources

- Pesticide Users
- Hazardous Waste Facilities
- Permitted Stationary Air Sources
- Permitted Water Dischargers
- Drinking Water Systems
- EPA Enforcement Actions

Number of Regulated Facilities - thousands
In Real Life Things are Messy

Real world barriers to compliance:

- Costs
- No credible enforcement
- Managers not paying attention
- Pollution controls don’t work as expected
- Staff not trained
- Estimated emissions are wrong
- Standards complex or unclear
- Fraud
- No social norm

Leads to gap between what we expected from policy and what really happens
Innovation for the Real World

Making compliance more self-implementing

- New technologies
- New strategies

A Rose By Any Other Name:
Next Generation Compliance, Rule Implementability, Practical Enforceability
Innovations: Advanced Monitoring

- Real-time monitoring
- Fence line monitoring
- Community monitoring
- Remote sensing, including ground, aerial and satellites

Emissions from refinery flares: estimated and actual
Innovations: Real Time Monitoring

Total Petroleum Puerto Rico

- Fully automated release detection monitoring at 125 facilities.
- Transmit monitoring data to central location.
Innovations: Electronic Reporting

- Information technologies make new solutions possible
- Smart tools and two-way communication
- Examples:
  - NPDES e-reporting rule
  - e-manifest
Innovations: Public Disclosure

Posting signs and compliance: evidence from Ohio

Self reported violations before and after sign posting requirement: OH in blue, other region 5 states in red

Liu and Shimshack: working paper 2016 (used by permission)
Innovations: Targeted Disclosure

Drinking water consumer confidence reports (CCR)

Mailing CCR directly to consumers (v. posting):

- Reduced violations by between 30 and 38 percent
- Reduced violations of health based standards by 57 percent
Innovations: Data Analytics

- Finding the signal in the noise
- Statistical footprint of fraud
- Predictive analytics for targeting inspections
Innovations: Third Party Auditing

- Is third party check a real check?
- Financial incentives are a powerful driver
- BUT: better design makes a big difference
Cashman Dredging & Marine

- Dredged material dumped outside of authorized ocean disposal sites.
- Innovative solution: GeoFence - GPS system that tracks position of the scow prevents dumping unless inside permitted zone; eliminates human error.
Innovations: Market Based Approaches

Potentially More Effective, Lower Cost, Higher Compliance

Acid Rain Program

NO$_x$ Budget Trading Program

Figure 5: Ozone Season NO$_x$ Emissions from All NBP Sources

- Monitors show significant decreases in wet sulfate deposition in the Eastern U.S. Source: NADP
When Do Market Approaches Work Well?

- Accurate and consistent monitoring (e.g., CEMs)
- Identifiable, known responsible entities
- Transparency in market
- Simple compliance determinations
- Ton = ton

[News Articles]

**The Washington Post**
Md. man convicted in biodiesel scam
June 25, 2012

**LAW360**
Fla. Men Get Lengthy Prison Terms For Biofuel Fraud
November 8, 2016
Innovations: Better Design of Rules and Permits

- Simplicity
- Clarity
- Design for compliance as default using all the tools
  - Example: IRS information reporting

Information reporting and compliance rates: IRS
Partial list of utilities sued to clean up coal fired power emissions:

- American Electric Power
- Southern Company
- Duke Energy
- Tennessee Valley Authority
- Ameren
- Interstate Power and Light
- Four Corners Power Plant
- Consumer’s Energy
- Minnesota Power
- Wisconsin Power and Light
- Dominion Energy
- American Municipal Power
- Westar Energy
- Ohio Edison Company
- Kentucky Utilities Company
- Nevada Power Company
- Alabama Power Company
- Illinois Power Company
- South Carolina Public Service Authority
- Wisconsin Electric Power Company
- Virginia Electric Power Company
- PSEG Fossil

Why was compliance with NSR/PSD for coal fired power so abysmal?
The Research/Regulatory Gap

Researchers

- Know a lot about what drives better performance (but much more needed)
- What researchers know isn’t known by regulators

Regulators

- Implementation not just for enforcement
- Not aware of existing research
- Field research opportunities
Big Improvements Possible

- Compliance for the real world
- Partnerships between researchers and government to drive innovation