



Joint CIBO - E2e Survey on Boiler MACT Compliance Strategy and Costs

CIBO Annual Meetings, Oct. 2013

Introduction – Carl Bozzuto, CIBO and Alstom

Survey Design – Dr. Nicholas Ryan, Harvard and MIT
E2e Faculty Affiliate





Introduction – Carl Bozzuto

Background on E2e Project

- **The E2e Project** (e2e.mit.edu) is a research organization co-founded by MIT and UC Berkeley, global leaders in energy research
 - Established with the aim of running field studies to produce good evidence on economic returns to energy-efficiency
- Due to shared interest in understanding the drivers of efficiency and investment in the industrial sector, E2e was invited to attend CIBO's Quarterly Meeting in September 2013
- Based on those meetings, CIBO and E2e are proposing a research project to assess the economic impact of BMACT
 - First step a comprehensive plant survey of compliance strategies and their costs

Brief History of Boiler MACT

- **Past:**
 - Boiler MACT rules date back to 2004
 - Since then there has been a long history of rules being almost finalized and then changed
 - Overturned in 2007 one month short of compliance data
- **Today:**
 - The January 2013 rules (compliance date January 31st, 2016) are probably close to the final rules
 - Some pending litigation, but not likely to affect the core emission limits
 - CIBO members thinking or beginning to think about investments to achieve compliance

How Will BMACT Affect Members?

- **This is the \$5.5 billion—or more—question**
 - EPA Fact sheet estimates more than compliance will cost ~\$5.5B for major and area source boilers.
 - The CIBO estimate is \$12 billion.
 - Existing cost estimates from EPA's 1998 database do not represent current costs
 - Cost estimates from vendor surveys useful but do not represent plant-level constraints or plans
- **Questions on cost not easy to answer**
 - What will members do to comply? What will they spend?
 - Huge range of compliance options in play: fuel switch, fuel sourcing, emissions controls, unit retirement, and so forth. This makes cost predictions sensitive to analysis.

What is the Value Added of This Survey for CIBO Members?

- **Top-flight researchers**
 - E2e is an independent, non partisan, research organization whose only interest is informing policy choices via rigorous evidence
 - Affiliates bring cutting edge statistical analysis and policy experience
- **Results for CIBO member base**
 - Inform members as they start to finalize their BMACT strategies and put them into effect
 - Estimates not just of technical means of compliance but economic costs in terms of higher prices, lost output and so forth
- **Longer-term policy channels**
 - Survey can provide a basis of solid evidence for realistic regulation
 - How can CIBO give strong policy feedback to DOE and EPA as BMACT comes in force and CO₂ rules next down the pike?



Research and Survey Details – Nicholas Ryan

E2e Uses Rigorous Analytic Methods to Estimate Returns to Energy-Efficiency

- E2e Goals:
 - Find/study underlying economic causes for efficiency differences
 - Measure **overall economic impact** of policy choices
 - Use state-of-the-art research methods, especially randomized controlled trials (RCTs) and quasi-experimental methods to generate such evidence
- E2e was founded by **Michael Greenstone**, **Chris Knittel** (both MIT) and **Catherine Wolfram** (UCB) and has network of affiliates from leading universities
- Recent work by Greenstone and others is the best rigorous documentation of the economic costs of environmental regulation*
 - Using two decades of plant-level micro-data they estimate that the annual economic cost of the Clean Air Act is ~\$21 billion (in 2010 dollars)

**Greenstone, List and Syverson (2012) [“The Effects of Environmental Regulation on the Competitiveness of U.S. Manufacturing”](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2145006##)*

What Does Boiler MACT Have to Do With Energy-Efficiency?

- Compliance strategies are wide open
 - Small changes: fuel sourcing, blending, combustion controls, etc.
 - Big changes: fuel switching, abatement investment, retirement.
 - Compliance strategies therefore encompass many aspects of plant operations and have a complex set of economic effects on production decisions
- Future of energy use in U.S. manufacturing caught up in these investments
 - What *fuels* are going to be economically viable?
 - What *sectors* are going to be economically viable?
 - What is *regulation* going to look like in the future?

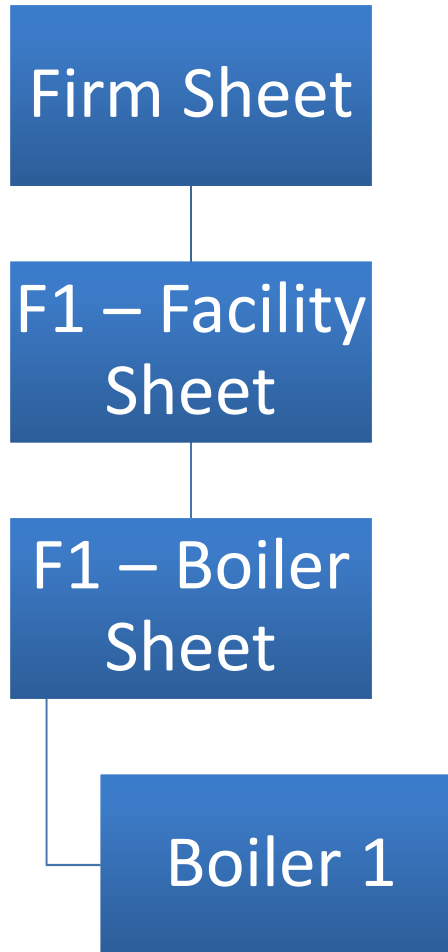
Overview of Study Goals

- The survey will collect extensive ground-level data (from members, at plant and boiler level)
 - Current, comprehensive, representative of plant circumstances
 - **All data will be anonymized.** No individual plant or firm will be identified. Only aggregate results will be published or presented
- E2e will conduct statistical and economic analysis of economic cost of compliance including a wide range of strategies
- The results will be presented to CIBO members (timelines to follow)
- E2e will use the data and analysis to come out with academic and policy-relevant publications on industrial energy-efficiency and environmental compliance

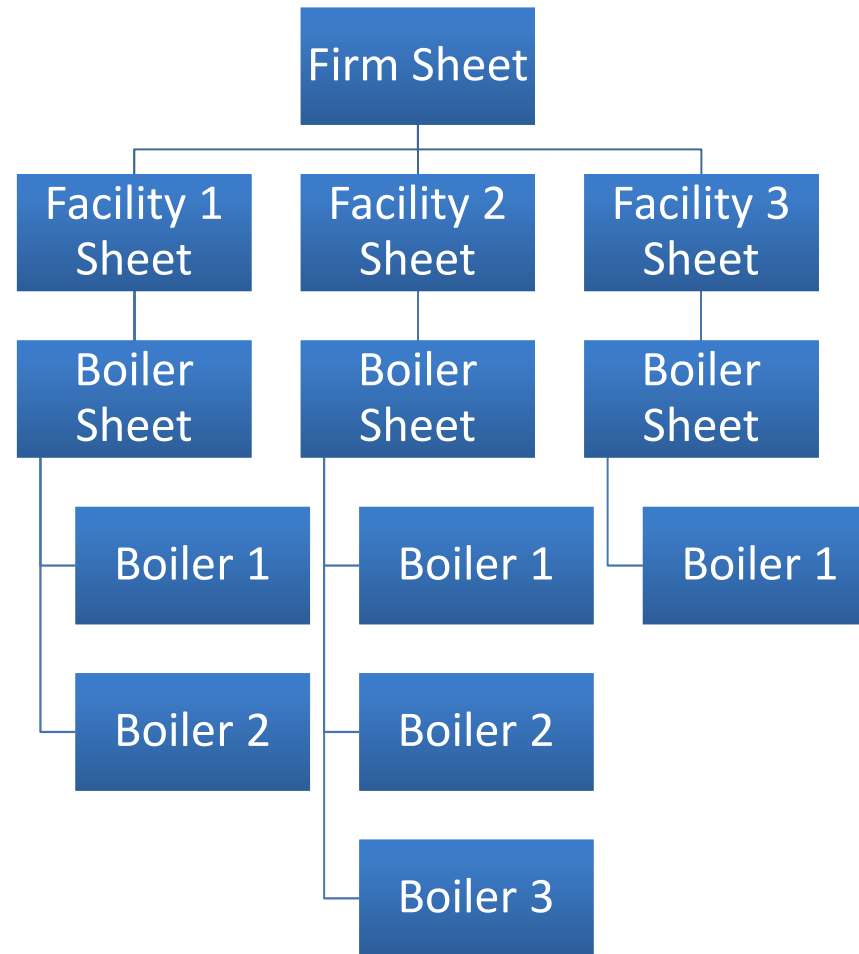
Confidentiality is Absolute

- **All data will be anonymized** and stored in a de-identified form
 - No name, address, contact or other specific information
- E2e researchers are experienced in handling confidential data and have often worked under non-disclosure agreements
 - Billing data from utilities
 - Bidding data from electricity auctions
 - Manufacturing micro-data from the census, almost certainly including data from CIBO member plants
- Detailed data means solid research results
 - Individual plant- or facility-level data needed for statistical analysis
 - Economic side of compliance important. E.g. value of lost output?
 - Publications and presentations will not contain any individually identifiable information

Survey Has Sections on Firm (brief), Facility and Boilers (detailed)



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Firm Sheet Details

- Firm sheet
 - Contact information for respondent
 - Firm information
 - Facility Inventory
 - Question on corporate level BMACT compliance strategy
 - Questions on organizational structure of capital and energy use decisions
- Question: What if I do not represent a firm?
 - Some questions only relevant for industrial companies
 - Bulk of the technical and fuel consumption information relevant to all fuel-burning members

Firm Sheet Details: Facility Inventory

Facility Inventory

This section lists all facilities of the company that consume fuel and for which data is reported in the corresponding facility sheet. Please add additional rows if more than 15 facilities are covered.

17	For how many facilities is data reported overall?	number	
18	Facility / Plant	facility number	1
	Name		
	State		
	City		
19	Facility / Plant	facility number	2
	Name		
	State		
	City		
20	Facility / Plant	facility number	3
	Name		
	State		
	City		
21	Facility / Plant	facility number	4
	Name		
	State		
	City		
22	Facility / Plant	facility number	5
	Name		
	State		
	City		
23	Facility / Plant	facility number	6
	Name		
	State		
	City		
24	Facility / Plant	facility number	7
	Name		
	State		
	City		

Facility Module Details

- The facility module contains the following sections:
 - Firm-linked information (Industry type, CIBO membership status)
 - Energy management practices
 - Recent investment in energy-using systems
 - Fuel price expectations
 - Fuel consumption and expenditure for key fuels used in the facility
 - Electricity generation and consumption
 - Production and raw material consumption
 - Capital stock
 - Labor inputs

Facility Sheet Details: Energy Investments / Retrofits

Energy-Efficiency Retrofits

Did you undertake any capital expenditures / retrofits for the following systems in the last year? *Please fill one row for each separate project.*

		Answer (Yes/No)	Help from source?	What was done?	Total expenditure (\$)
16	1	---	---		
	2		---		
	3		---		
	4		---		
	5		---		
17	1	---	---		
	2		---		
	3		---		
	4		---		
	5		---		
18	1	---	---		
	2		---		
	3		---		
	4		---		
	5		---		
19	1	---	---		
	2		---		
	3		---		
	4		---		
	5		---		

Facility Sheet Details: Fuel Consumption

Fuel Consumption and Expenditure - Primary Fuel

This section gives aggregate consumption / sourcing characteristics for the facility's primary fuel. The sections immediately below ask the same questions for alternate / additional fuels. Please fill one section for each fuel used. The boiler module on the next worksheet contains more detailed information on fuel characteristics. Please keep the labeling of "Primary Fuel", "Alternate Fuel 1", etc. the same across the facility and boiler sheets.

		Answer				
38	What is the primary fuel used in this facility, when ranked by expenditure?					
	What are the purposes for which the facility consumes this fuel?					
	<i>Indirect use</i>					
39	Boiler Fuel	percent of total				
	<i>Direct process use</i>					
40	Process Heating	percent of total				
41	Process cooling and refrigeration	percent of total				
42	Other direct production processes	percent of total				
	<i>Indirect process use</i>					
43	Facility HVAC	percent of total				
44	Other direct non-process uses	percent of total				
What are the largest physical sources of fuel for this facility over the last year?		First source	Second source	Third source	Fourth source	
45	Do you know the source?	(yes/no)				
46	Country of source					
47	State of source					
48	Mine / field of source					
49	What is the average length of the contracts used to procure this fuel?					
50	What share of this fuel is procured on contracts greater than 1-year in duration?					percent
51	What share of this fuel is procured on the spot market?	percent				
52	What is the consumption of this fuel over the last 36 months?	Month No.				Month
	<i>Change most recent month and all others will adjust automatically</i>					
		1	Oct-13			
		2	Sep-13		"	
		3	Aug-13		"	
		4	Jul-13		"	

Boiler Module Details

- The boiler module covers following areas:
 - Boiler type, age and size, Furnace design
 - Fuel type
 - Water treatment, boiler control systems
 - Heat recovery and auxilliary systems
 - Efficiency and environmental performance
 - BMACT compliance strategy
 - Investments / changes undertaken
 - Investments / changes planned
 - Unit and plant operations and O&M info

Boiler Sheet Details: Compliance Strategies

Boiler MACT Compliance Status and Strategies					
		<u>Boiler 1</u>	<u>Boiler 2</u>	<u>Boiler 3</u>	<u>Boiler 4</u>
32	Would this unit be deemed a major source of Hazardous Air Pollutants (HAPs) as per the Boiler MACT Rule effective 1/1/2016? (Yes/No)				
33	Would this unit be deemed an area source of Hazardous Air Pollutants (HAPs) as per the Boiler MACT Rule effective 1/1/2016? (Yes/No)				
34	If this unit is a major or area source, do you expect that it will be compliant with the Boiler MACT rules in its present configuration and with its current source of fuel? (Yes/No/Not sure)				
35	If not, what are the compliance strategies towards which you have already taken steps that incurred expenses , through investment, equipment procurement or fuel procurement?	<u>Boiler 1</u>	<u>Boiler 2</u>	<u>Boiler 3</u>	<u>Boiler 4</u>
(a)	Fuel blending (Yes/No) (planned type/ratio) (total capital cost) (total annual cost)				
(b)	Fuel Switching (coal to gas etc.) (Yes/No) (planned type) (total capital cost) (total annual cost)				
(c)	Invest in emission control technology (Yes/No) (planned type) (total capital cost) (total annual cost)				

We Need Your Help!

- Three key elements for a useful survey – *response, response and response!*
 - Given diversity of membership, will only be able to provide analysis relevant for plants like yours (fuel, capacity factor, sales) if plants like yours respond
 - The survey aims to be useful to CIBO members but can credibly do so only if there is a significantly large proportion of respondents returning the survey.
- Regulation will continue to be a big driver of technology and profitability.
 - The main way for individual firms to move the policy needle will be via participation in groups like CIBO and contributions to common analysis.

Survey Timeline

- CIBO and E2e leadership want initial results available to members in a timely manner, before compliance and investment decisions are made
- Timeline:
 - Survey distributed to members **November 1, 2013**
 - Excel workbook with firm, facility and boiler sheets
 - E-mail distribution to CIBO contact
 - Critical to distribute copy to respondents *at each facility* for detailed responses
 - Responses requested by **January 10, 2014**
 - First cut of survey results by **March 2014** quarterly meetings if possible (**June 2014** at the latest / for further analysis)

Questions?

Key Contacts

- E2e
 - Web Address <http://e2e.mit.edu/>
 - Program Director K.V.S. Vinay, kvsvinay@mit.edu
- CIBO
 - Carl Bozzuto

Thank You!