Casting Environmental Governance: The Evolution of Regulatory Relationships in the Wisconsin foundry industry

by

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ABSTRACT 

This thesis examines the evolving shape of environmental governance using an extended case study of the Wisconsin Department of Natural Resources, drawing on their efforts to reduce pollution in the Wisconsin foundry industry. This analysis follows the development of the Department’s efforts to change their practices over the past 30 years and explores a more recent “institutional innovation” called the Benzene Reduction Action Team (otherwise known as BRAT Co.) The organization is a virtual company that brings together members from the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Cast Metals Association (WCMA), a trade organization representing the foundry industry, in a partnership to help the industry comply with Wisconsin’s Hazardous Air Pollutant rule and to collaboratively develop alternative compliance procedures. This thesis situates BRAT Co. in a wider context of government efforts to innovate within a regulatory environment and to redefine how an environmental agency can help to reduce pollution through a cooperative process that actively involves the regulated community. 

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Chapter 1: Introduction

Environmental Governance

The first twenty years of “command and control” regulation has produced significant improvements in the quality of air and water. Analysts and practitioners have begun to recognize that this regulatory structure, along with its institutional trappings, is increasingly out of step with the demands of environmental protection.

Environmentalism is evolving from an essentially elitist movement accompanied by a complex system of laws and policies fixated on preserving undeveloped land and resources and controlling pollution from major sources to a more democratic call for healthy, sustainable communities across geographic, economic and cultural lines. Instead of merely reacting to environmental changes and decrying the pollution and waste generated by our liberal capitalist economy, an expanding environmental constituency is devising alternatives to traditional approaches to economic development and environmental protection.¹

This shift is rooted in a critique of command and control regulation:

Because of its inherent information-gathering and decision-making limitations, centralized regulation produces a fragmented jumble of particularistic commands that cannot meet the needs for intelligent priority setting, and for integrated pollution and waste prevention and control on a multimedia, facility-by-facility or region-by-region basis….The necessarily fragmented proliferation, under different statutory programs, of detailed requirements for control of discharges from specific waste streams into particular media prevents facility managers from adopting integrated approaches to reduce environmental risks at less cost.²

Critics note that in practice, command and control regulation creates an insulated sphere of action and circumscribes agencies’ ability to balance competing imperatives or organize substantive venues for participation:

It is usually neither necessary nor desirable to engage a wide range of people in the process of applying regulatory tools. This is not to say that regulators should be shielded from public involvement or scrutiny. Participation by a limited number of people, for example, on an advisory or policy-making board, is often useful for oversight and for suggesting when the application of generalized rules must be bent to accommodate special circumstances. If the enterprises or individuals being regulated gain control of regulatory agencies, it is useful to have advocates for other perspectives on advisory boards. However, the essence of regulation is consistency and predictability, features that are inconsistent with the active involvement of large numbers of people….Regulators also seek to be insulated from external pressures, so they can focus on protecting the values they are mandated to safeguard….Consistency is important, and law gives them little room for balancing the values they are supposed to protect with competing values….It is relatively easy for regulators to join in efforts that inform others about their requirements, and sometimes to synchronize decision processes. But sharing in a decision, or bargaining about outcomes is hard to do.³
The need to preserve consistency and predictability in command and control regulation is at odds with the push for innovation that develops in regulatory agencies.

The view from within a regulatory agency produces similar insights. A sector specialist from the Wisconsin Department of Natural Resources (DNR) describes the pressure for change that is developing in the organization:

I think there are a lot of efforts coming from some good thinking that is saying, ‘well we’ve done a great job with environmental protection so far, and our traditional, command and control tools had gotten us to a good place, but to go past that we really need to start putting more of the responsibility on a company’, in a different way, not that it’s, ‘here’s your hammer, you go past that and you know, we’re going to getcha.’ But having them start to think about all of the consequences of doing business, which include what impacts you have on your environment, those should be, in my mind, that should just be part of what it takes to do business, along with where you get your people from, what kinds of raw materials do I need, environmental impacts should be right in there. And in order to do that, we need to, as regulators, come up with different tools, because the stuff we have now doesn’t get us to that next level that we need to go. So I think we have a lot of people within DNR have very strong feelings about that, so you have a lot of these programs, these attempts to try to get there.4

Despite the commitment to change that exists in the DNR, the task of “get(ting) there” is difficult when no one is sure where “there” or “that next level” is. This is partly due to the degree of uncertainty in environmental regulation – the nature of environmental problems is complex and dynamic. Daniel Fiorino, Director of the Environmental Protection Agency’s Performance Incentives Division, describes how this is expressed in the world of public policy making.

“…the goals may be unclear or in conflict; information is missing or unreliable; options may be poorly defined or ignored; policy emerges piecemeal, in fits and starts; and results often are different from what was intended. …in a complex world, there are simply too many choices, reconciling too many different goals, based on too little information, made by too many people…”5 Overlaying a process of innovation on this uncertain ground is exceedingly problematic.

An example from a regional Environmental Protection Agency (EPA) office illustrates how this challenge emerges. The office became interested in the concept of innovation and a group of motivated individuals coalesced. Their first act was to form a committee to develop ideas about how they could encourage innovation. One of their first activities was to define innovation so that they could identify “an innovation” in practice. The instinct to seek consistency and predictability almost immediately circumscribed the possibilities of what innovation could be.
An Emerging Response

Charles Sabel, Archon Fung, and Bradley Karkkainen have traced the broad outlines of the new form of environmental governance as a theory of practice in their article, “Beyond Backyard Environmentalism.” They summarize the conundrum of command and control compliance mechanisms and the motivation behind efforts to reform it:

The distinguishing feature of centralized regulation is its claim to a modest omniscience. Though regulators renounce the pretension to complete knowledge of a complex and changing world, they nonetheless attempt to determine enduring solutions to well-specified problems. The result of this combination of confidence and self-deprecation is regulation that, piece by piece, attempts too little and too much. There is too little regulation in the world of centralized command because detailed regulation requires sharp boundaries between what is regulated, and what is not (otherwise, rule making would require plain old, immodest omniscience). But under complex and changing conditions, problems just outside the regulated zone will frequently turn out to be just as significant as those within it... But where it does aim for more definitive solutions, centralized command often regulates too much. The best available solution at the moment of adoption may have long-term, unintended consequences that outweigh early gains. Or the very successes of the best current solution may hinder the search for better ones. Even when the parties to the original rule suspect that they have been overtaken by events, fear of re-opening discussions may prevent them from taking advantage of new opportunities. Those who broadly speaking favor regulation worry that confessing error opens the door to backsliding and jeopardizes their authoritative claims. Those who generally oppose regulation worry that new rules may expose them to even greater costs than the old. 6

In response to the tensions generated by traditional regulation, a network of actors, including academic institutions, non-profit groups, government agencies and private sector industries has begun to explore new institutional platforms that address the complexity and uncertainty of modern environmental problems. The assumption is that as the nature of environmental problems changes, the institutions and networks involved in environmental protection also need to change. The shifting landscape of environmental problems calls for a new cast of characters as well as for a new array of tools for implementation. This emerging approach is captured by Sabel et al.:

...This framework discounts the possibility of central, panoramic knowledge more steeply than either centralized command or market-simulating regulation, and it puts a higher premium on collaborative processes that allow central and local actors to learn from one another and from their actions in the world. It would use these surprises to revise the rules that frame collaboration, then seek further discoveries under guidance of the more capable frame, and so on. The philosophy of this architecture is pragmatist: while it rejects immutable principles, it keeps faith with the idea that we can always institutionalize better ways of learning from the inevitable surprises that experience offers us. 7

This approach draws on three central themes. First is the importance of interaction and joint problem solving. Second is the deliberative dimension of the process of change. And third is the
notion of learning as a central concept in the process of developing new practices and institutional frameworks. Interaction and joint problem solving are important because part of the failure of command and control regulation was the distinct roles it created for industry and government, and the polarized and antagonistic relationship it fostered. New approaches to environmental governance attempt to reformulate these roles and foster cooperative, interactive relationships as a means to improving environmental protection. The deliberative aspect of reform rejects the political foundation of command and control regulation and alternatives like market mechanisms, which treat policy as a process of aggregating established interests. In the pluralist tradition, this aggregation occurs in an incremental and reactive process of change, rather than a pro-active one. “Conventional thinking about environmental policy, which is based on pluralism and neoclassical economics, tends to deal with issues in the same incremental fashion. As new problems emerge, new laws are passed. If environmental conditions worsen, standards can be tightened and permits made more difficult to obtain.”

James Connelly and Graham Smith, in their article, “Collective action, power and decision making,” contrast the way pluralist and direct deliberative visions of democracy characterize the policy processes that frame and further environmental goals:

In the everyday world of competing pressure groups and interests, power is fought with power, cunning with cunning, knowledge with knowledge, self-interest by rival self-interest. The pluralist view is that in a modern society the public policies adopted are largely the outcome of this competition. … The test of a good policy is not that it maximizes the decision makers’ values, but that it secures the agreement of the interests involved. … However, there are drawbacks to this pluralist approach in the field of environmental policy. … If all groups and interests actually were roughly equal, the pluralists’ conclusions might seem to be otherwise reasonable. However, they are not equal in power, influence or access and even if they were, there is no reason to suppose that the outcome of mutual bargaining will be the most suitable policy response. If the activity of policy makers lies in securing compromise between competing interests, rather than in the nature of the problem to be faced, there is every likelihood that the policies agreed, while securing the adherence of those most immediately affected, will be irrelevant to the task in hand. … Is it possible to move away from policy making as the outcome of jostling between unequal interests? One answer may be to institute new political forums in which people can deliberate in public about matters of common concern. … Deliberative institutions presuppose the capacity of ordinary people to question and reflect on policies and priorities…If the environmental movement wishes to create conditions suitable for genuine debate on matters of principle, it should seriously consider pressing for initiatives and institutional design of this sort to be included in policy-making processes.

Connelly and Smith point out how traditional environmental regulation, stemming from the pluralist tradition, fails to produce the kinds of policy resolutions that are suited to contemporary environmental challenges. In addition, decision-making in such an institutional environment is by nature exclusive and precludes the direct exercise of deliberative democracy that would provide multiple points of access for people to “deliberate in public about matters of common
concern” and contribute directly to the legitimacy and effectiveness of policy-making processes. Emerging environmental policy reform embraces the deliberative potential of regulatory interaction.

The third central characteristic of this new approach to environmental governance is the commitment to organizational learning. The broad architecture of change, development, and innovation that Sabel and others describe demand expression in the organizational contexts and inter-organizational relationships in which regulation is practiced. Organizational learning “theorists”, like Chris Argyris, Donald Schon, and Peter Senge, provide an account of organizational change and learning that draws on similar foundations as proposals for institutional reform and a new architecture of regulation. The theory of organization learning offers insight into how public agencies or industries may confront the challenges of innovation in the face of a changing environment and in spite of institutional lassitude.

...The core challenge faced by the aspiring learning organization is to develop tools and processes for conceptualizing the big picture and testing ideas in practice. All in the organization must master the cycle of thinking, doing, evaluating, and reflecting. Without, there is no valid learning. 10

Donald Schon captures this “cycle of thinking, doing, evaluating and testing ideas…” in his account of a “reflective practice, in the spirit of Deweyean inquiry that seeks to integrate thought and action, theory and practice…” 11 Engaging in reflective practice, Schon suggests, demands the creation of “communities of inquiry” that can pursue a collaborative process of learning and problem-solving. “In science and common sense alike, Dewey thought, inquiry is inherently social. Like Pierce before him, he saw individual inquirers as members of communities of inquiry, bound by community responsibilities of a contractual nature. 12 …They would need to develop …environments designed to help learners discover how they already see things and to confront them with surprises that trigger the search for new ways of seeing things.” 13 Schon’s account resembles the construction of learning offered by Sabel et al.: “…we can always institutionalize better ways of learning from the inevitable surprises that experience offer us.” 14

If “inquiry is inherently social” as suggested by Schon, collaboration between industry and regulators, as well as the involvement of other actors, is central to successful problem solving. While command and control regulatory decisions largely stem from an exclusive set of “experts,” more nuanced regulatory decisions would incorporate the views of a wider array of social groups. Collaboration becomes a “reflexive learning process” 15 that “necessarily” 16 involves “negotiation between different epistemologies and subcultural forms, amongst different discourses; and as such it…entail(s) the development of the social or moral identities of the actors involved.” 17
As Ulrich Beck suggests, it is precisely through the process of interaction among groups with “different epistemologies and subcultural forms” that learning is achieved. Policy and regulation thus become a forum for this interaction. Collaboration also helps to ensure accountability and legitimacy in the policy-making process.

Argyris and Schon offer distinctions that are useful for analyzing learning and the development of practices at the level of the organization and for anticipating the challenges of innovation. They distinguish two methods of organizational inquiry, “single and double-loop” learning. The first method, “type I” or “single-loop learning”\textsuperscript{18} “…connects detected error—that is, an outcome of an action mismatched to expectations and, therefore surprising—to organizational strategies of action and their underlying assumptions. These strategies or assumptions are modified, in turn, to keep organizational performance within the range set by existing organizational values and norms. These values and norms themselves...remain unchanged.”\textsuperscript{19} Double-loop learning, by contrast, includes the process of revising goals and provides a setting in which actors may test assumptions about relationships.

Double-loop learning, refers to the two feedback loops that connect the observed effects of action with strategies and values served by strategies.... Organizations continually engaged in transactions with their environments regularly carry out inquiry that takes the form of detection and correction of error. … In some cases…the correction of error requires inquiry through which organizational values and norms themselves are modified, which is what we mean by organizational double-loop learning. … In this type of organizational double-loop learning, individual members resolve interpersonal and intergroup conflicts that express incompatible requirements for organizational performance. They do so through organizational inquiry that creates new understandings of the conflicting requirements—their sources, conditions, and consequences—and sets new priorities and weighting of norms, or reframes the norms themselves, together with their associated strategies and assumptions.\textsuperscript{20}

Double-loop learning in a “community of inquiry” may then set the stage for a process of innovation in a regulatory environment in which learning becomes part of the process of regulating.

A recent example highlights the importance of the distinction between single and double loop learning. The Nuclear Regulatory Commission discovered extensive corrosion in the lid of a nuclear reactor in Toledo, Ohio and held the plant’s managing entity, FirstEnergy Corporation, accountable. The president of FirstEnergy’s nuclear division responded by accepting responsibility, but noting that FirstEnergy was “a learning organization (that) would inevitably encounter occasional problems.”\textsuperscript{21} While it is true that learning occurs when organizations make mistakes and seek to correct them, the commitment to learning is not
meant to excuse gross oversights in public safety. FirstEnergy’s President presents a caricature that captures the fears about the consequences of mixing regulation and learning when the consequences of failure are severe. The distortion at the heart of this caricature is that a learning organization merely responds to errors. As Argyris and Schon highlight, learning involves the responsibility for organizing and engaging a community of inquiry that actively examines its practices and the ways that norms and commitments shape these practices. These commitments enhance the ability of the organization to identify problems and to find the blind spots created by organizational routines. This is precisely what FirstEnergy had failed to do.

This new model of environmental governance places innovation front and center. It is clear from the critique of both policy analysts and practitioners that the direction of practice must change and that this will require a reinvention of institutional arrangements, organizational practices and inter-organizational arrangements. Random House Dictionary defines innovation as “something new or different introduced; the act of innovating; or the introduction of new things or methods.” To innovate means, “to introduce something new; make changes in anything established; to introduce as if for the first time; to alter.” Thus innovation — understood as introducing something new — contrasts with changing something that is established. When an agency attempts to change the way they do business, they encounter this contrast in the question of whether the process of change takes them further away from their goals or is a necessary part of achieving their goals. This is particularly problematic when agencies have missions that are simultaneously broad, like “protect human health” and narrow, as in “mitigate air pollution.” This is even more problematic when the nature of environmental protection is evolving or uncertain. “In situations of uncertainty, we must be able to experiment and adjust policies as we learn more about the nature of the problem and the effectiveness of our responses.” Thus it is critical that the process of innovation involve a continuous re-examination of the goals of the process.

Regulatory innovation or reinvention can be a small band-aid for gaping wounds in our system of environmental governance or it can fundamentally revitalize the system by steering an agency in an entirely new and presumably healthy direction. In practice a useful path often combine these approaches. Yet it is also important to clarify these distinctions in order to confront the risks involved in trying new things, where there aren’t always clear road maps or precedents in practice.

…people don’t realize the incredible extent to which traditional organizations are designed to keep people comfortable and to inhibit taking risks. The learning cycle is a continuous process of experimentation. You cannot experiment without taking risks.
Yet innovation of the magnitude suggested by continuous learning is bound to trigger conflicting requirements and to require inquiry into organizational values and norms and at the least a reframing of problems. This represents a launching point for the development of a new institutional framework for environmental governance.

In the account that follows, I trace the development of organizational practices and relationships in the regulation of the foundry industry in Wisconsin. I give particular attention to a recent invention called the Benzene Reduction Action Team Company (BRAT Co.) that is intended to express a new understanding of regulation and involves the kind of reflection that Argyris and Schon endorse. The process of arriving at reflection and the reflection itself is not as ordered or measured as they imagine, but is effective. The analysis of this account reflects the challenges of innovation and regulatory development when viewed as an organizational activity.
Thesis Methodology

This thesis is an extended case study, based on in depth personal interviews and interactions with representatives from the Wisconsin Department of Natural Resources, BRAT Co. members, the Wisconsin Cast Metals Association and local environmental groups from October 2001 to May 2002. My research involved attending BRAT Co. meetings and DNR Stakeholder meetings in person and through conference calls, as well as visiting an operating foundry in Milwaukee, Wisconsin. In order to record this research, I also taped and transcribed the majority of interviews and meetings.

The interviews addressed the following issues: the origins of BRAT Co., the evolution of the group, how people outside of BRAT Co. (at the DNR, the EPA, or the foundries) view the group’s efforts, the emergence of surprises or unanticipated events as the group developed, and significant issues or problems that have arisen.

The case study analysis is based on primary and secondary source materials from the DNR, the EPA, and the foundry industry, in addition to articles and books by academics and policy analysts.
Chapter II:
Casting Environmental Governance at the Wisconsin Department of Natural Resources

Overview

The intuition behind BRAT Co. is captivating. Representatives from the foundry industry and the DNR would “leave their business cards at the door and pick up new ones when they assembled as BRAT Co.” As members of BRAT Co. they would explore and jointly construct a shared identity that is neither agency nor industry. BRAT Co.’s mission is to develop processes and means to improve and manage benzene emissions in the foundry industry. Since June 2001, BRAT Co. has been meeting as a group in monthly or bi-monthly daylong meetings to draft and review the language of an Environmental Management System (EMS.) While they also spent time writing language for the revision of Wisconsin’s NR 445 rule, governing the state’s air emissions, much of their time has been focused on cooperatively developing the EMS. Using a common identity as the basis for working toward an environmental goal marks a clear departure from traditional regulatory systems which constructed adversarial relationships.

BRAT Co. has deservedly attracted national attention from EPA Headquarters as well as from other industries. Their experience demonstrates, however, how challenging the innovation process is in practice. BRAT Co. members have grappled with issues of accountability, trust, management, identity, communication, control, stakeholder involvement, and organizational direction. They have confronted significant tensions between the process and the commitment to the need for outcomes. The BRAT Co. members are involved in the process because of the prospect of an alternative method of compliance for foundries which would be less onerous and more realistic for both the agency and the industry. On the other hand, several leaders in the agency, as well as some BRAT Co. participants, are growing skeptical about its long-term viability. Since BRAT Co. has not yet “technically” produced any quantitative results, as in measurable emission reductions, it is difficult to measure the “success” or progress of the group over time.

BRAT Co.’s experience demonstrates the difficult and messy nature of the process of moving to a shared form of governance and constructing a community of inquiry. Although they have made great strides in institutionalizing a cooperative relationship, it is clear that the process of innovation, particularly within the context of an evolving regulatory agency, is complicated and often disjointed.
The Wisconsin Foundry Industry

Before turning to the details of the evolving relationship between the Wisconsin foundry industry and the Wisconsin Department of Natural Resources, I would like to provide an overview of the industry and its importance to the local economy.

A foundry is an establishment for producing cast metal parts, primarily iron, steel, and aluminum. Cast metal is formed through a process of pouring molten metal into a sand mold. When the metal solidifies, it becomes a casting. The two major inputs of the process are recycled scrap metal – the melting material – and sand for the castings. The sand for molds comes from specialized sand suppliers.
The major markets for metal castings are automotive, electrical, agricultural, heavy truck and rail industries. Firms in Wisconsin make castings that range from manhole covers cast by Neenah Foundry to engines for Harley Davidson motorcycles, engine parts for the big three automakers and heavy truck manufacturers, and pipes and fittings. According to the American Foundry Society, “more than 90% of all manufactured goods and capital equipment use castings as engineered components or rely on castings for their manufacture.”

Metal casting is the 6th largest industry in the US. As of 1997, Wisconsin was the third largest casting producing state, after Ohio and Indiana, shipping 12% of total tonnage in the US. There are approximately 120 foundries in the state, the majority of which are small to medium size facilities with 100 or fewer employees. The foundry industry is clearly a major contributor to the economic vitality of the state, yet historically it has been viewed as a “dirty” industry that presents severe environmental challenges in solid waste and air pollution. In the 1970’s, it was one of the “traditional smokestack industries” because of the dust and air pollution created in the open casting process. In addition, 80% of the 100 million tons of sand the industry uses annually becomes waste that must be landfilled.
The evolution of the relationship between the Wisconsin Foundry Industry and the Department of Natural Resources resembles experiences that have developed throughout the US, in different industries and agencies, on the state and federal level. For the purposes of this paper, I divide the evolution of these relationships into three phases. I call the first phase conventional regulation, more commonly known as “command and control.” It is emphatically marked by the Clean Air Act’s appearance on the regulatory scene. The second phase, a period of “experimentation and co-education”, is marked by the emergence of EPA’s “innovative” compliance schemes such as Project XL (which stands for Excellence and Leadership), and at the state level, by the beginning of a partnership between DNR and the foundry industry. The last phase is marked by a formalizing of experimentation and a forging of a common identity with the establishment of the Benzene Reduction Action Team (BRAT Co.)

**Phase 1: Command and Control Regulation**

A sector specialist for the DNR described her view of the foundry industry during this first phase, and her perspective of the changes that have occurred in the relationship between firms and regulators.31

D: Historically, (the foundry industry) has been an industry sector that there was a lot of...I don’t know if antagonistic is the right word, but there was a lot of tension. It’s an old industry...if you go to a foundry...it’s like going back in time. And I think it amazes some people who have never been in a factory, to go into this place and you’ve got hot metal and you’ve got sand...you feel like you’re in a Dickensian novel, you go in there and you go, ‘whoa!’ ...But I’ve found in the people, and I’ve been working with this industry for the last ten years, the people that I have been able to work with are just super. They’re there to try to educate me about what it takes to do their business and they’ve gone beyond what they really need to do and have always been cooperative and always been, ‘Well, look, here’s the problem, this is how we run our business...’ They’ve really taken that attitude to try to educate regulators about what it is they do, so we...could help them then, fit our regulations to their business...and they don’t fit in well.”

E: Now when you say that historically there was this tension, where did that...come from...?

D: I think because it’s a dirty industry...it’s an industry that is sometimes hard to understand. They had a lot of severe environmental problems…

E: Like what?

D: …In order to melt metal, the traditional way to do it was through something called a cupola, which is a big furnace that you put coke in, you put raw pig iron, scrap iron in and it melts it and if you don’t have emission controls on it, it’s a very dirty process. Now the industry controls it, and they’re great recyclers…32

The DNR representative’s comments touch on some of the challenges of this first phase of conventional regulation. The Clean Air Act was one of the first “command and control” regulations and gave the EPA the authority to list and regulate air toxics, with deadlines for
industries to comply. These new federal environmental regulations began to take effect in a period when global competition, changing technologies, and the economic recession in the early 80’s created a difficult environment for the foundries. The consolidations and plant closings that resulted raised tensions between the foundry industry and state and federal environmental agencies, and engendered feelings of resentment and distrust. This was consistent with the more general tensions that arose from implementation of early command and control regulation.

D: Through the ‘70’s and ‘80’s, I think they were one of the traditional smokestack types of industries that really got hit hard by the first command and control wave of particularly Clean Air Act regulations. They’ve got a lot of particulate sources, and I think regulators were blamed for shutting down a lot of foundries.

E: Did that happen?

D: It happened, but if it’s totally environmental regulations, I don’t know. We get blamed.

E: Was there a decline in the foundry industry already?

D: Probably if you would go back and take a look at the economic situation, yes...and then you have more stringent environmental regulations, you have add-on control equipment – that’s never happened before. It was expensive, it was something that wasn’t built into operating budgets. So through the ‘80’s there were facilities that shut down, consolidated. It’s hard to point fingers at any one thing, but if you talked to an industry member, they would say, yes, that’s what it was. People say the same thing about some potential for current regulations, which are going to come at the same time as the current economic downturn.33

“After the 1977 adjustments (to the Clean Air and Water Acts), legislative politics surrounding the air and water acts remained just as intense and explosive, but for the next decade the contending forces (i.e. - environmentalists and the business community) were in total deadlock.”34 Wisconsin added to these contentious relations, in 1988, by passing Hazardous Air Pollutant Rule, Wisconsin Adm. Code NR 445, that extended the scope of regulatory oversight by setting standards for over 400 hazardous air pollutants (HAPS), including Benzene. (Today, this rule includes over 600 HAPS.)

In addition to the obvious sticking point of imposing additional controls on industry, Wisconsin’s new rule was contentious because of the way it calculated the risks posed by HAPS:

Carcinogens are categorized by the strength of evidence that they may pose a hazard. When there is sufficient evidence the chemical can cause cancer in humans, the chemical is called a known human carcinogen. In the Wisconsin hazardous air pollutant rule, these chemicals are placed in what is known as Table 3A of the rule. Sources which emit these chemicals above a threshold amount called a de minimis, may be required to install control equipment to control these emissions. The control technology approach used here is called the Lowest Achievable Emission Rate (LAER). ...There is a variance procedure in the rules however. If a source can demonstrate to the department that it is economically infeasible, that health is protected and the source meets a level of control called Best Available Control Technology (BACT), the source is then relieved from the requirement for meeting LAER emission levels. ... It is important to note de minimis values for
carcinogens were established as a result of compromise and the limited information that was available at the time (1987-1988). As a result, de minimis values are in some cases established that reflect a risk range of one in one million (10⁻⁶), but in other cases represent much higher risks. In other cases, a default de minimis level was chosen of 25 pounds per year for known carcinogens (Table 3A) and 250 pounds per year for suspected carcinogens (Table 3B).³⁵,³⁶

Because the trigger for regulation – 25 pounds per year of emissions – was set at a low value, the rule had the potential to demand drastic changes in industrial processes. In 1990, just after Wisconsin passed NR 445, Congress passed the new amendments to the Clean Air Act. These amendments added 182 HAPS, including Benzene, to the seven air toxics already on the list and instituted a permit program for large facilities. These permits require reporting “on which pollutants are being released, how much may be released, and what kinds of steps the source’s owner or operator is taking to reduce pollution, including plans to monitor (measure) the pollution.”³⁷ The new amendments required EPA to engage in a balancing act:

...EPA may have to specify exactly how to reduce pollutant releases, but wherever possible companies will have flexibility to choose how they meet requirements. Sources are to use Maximum Available Control Technology (MACT) to reduce pollutant releases; this is a very high level of pollution control. EPA must issue regulations for major sources first, and must then issue regulations to reduce pollution from small sources, setting priorities for which small sources to tackle first, based on health and environmental hazards, production volume, etc.³⁸

The EPA has yet to issue national regulations for the foundry industry and there is wide conjecture about the effects this will have, including its effects on the relationship between state and federal requirements.

Many industries, including the foundry industry, were not pleased with NR 445 or the 1990 amendments to the Clean Air Act. Mirroring challenges taking place at the national level, Wisconsin’s DNR was sued by several state industries, including a handful of the large foundry companies,³⁹ following the passage of NR 445:

The hazardous air pollutant requirements have been controversial since their adoption. For example, not long after chapter NR 445 was adopted, it was challenged by a group of 23 manufacturers, industry trade groups, the Wisconsin Hospital Association and Shawano Community Hospital. In May of 1990, the State Appeals Court upheld the WDNR’s authority to establish emissions limitations on Wisconsin sources....⁴⁰

Thus the predominant characteristics of this first phase were a high level of antagonism, resentment and distrust between the foundry industry and the DNR, and the use of litigation as a forum to debate the shape of regulations and their implementation.
A National Shift

The lawsuits and fights of the late 1980’s and the early 1990’s marked an “end of an era” for environmental policy at the state and federal levels. Environmental agencies began to respond to criticisms of command and control regulation, and to examine their own practices. These adjustments to previous errors resemble “single-loop learning.” Overall, this process has become a movement from a practice of “controlling” industries, through the development of alternative compliance mechanisms, to more direct concerns with changing practice in regulated firms. This reframing fit with broader proposals to implement the “regulatory reform and devolution of federal power first championed by right-wing and centrist politicians during the Republican congressional sweep in 1994...” It also fit, however, with practical experiences of regulators, such as the DNR representative’s interactions with the foundry industry. “…EPA and many state environmental agencies have initiated programs aimed at simplifying and streamlining environmental regulation to achieve better and faster environmental results than under the traditional command-and-control system.” EPA’s Project XL is a good example of these efforts. The program was designed to increase flexibility for those companies or businesses which met or went beyond compliance with existing regulations. A former New England EPA official described her efforts with Project XL:

Project XL is an experiment in seeing how far the EPA, working with the regulated community and other stakeholders like environmentalists and workers, can go in helping the private sector do the right thing. No one at EPA wants to give up the store, nor do we want to be perceived as pandering to corporations and industry. We simply want to try to advance the project of getting more and better environmental results by demonstrating that environmental performance is really a business advantage. But first we have to establish the models.43

The projected benefits of these reforms include enhanced environmental performance, cost savings to industry and overall progress toward cooperative relations between agencies and industries. These efforts are also understood to provide the opportunity for regulators to gain “experience with more innovative techniques and build confidence that can be used to make the transition to the next stages of government policy.” Despite these gains, many questions remain unanswered about how agencies would measure and verify these new environmental gains. Environmental and community organizations are wary of the new innovations because of their potential to devolve into backroom deal making, insulated from public oversight. Because the reforms have not addressed these concerns, accountability has become a central problem and a sticking point in their development. From a learning perspective, programs like Project XL reflect a commitment to experimentation and innovation, but lack the creation and engagement of a “community of inquiry” that is necessary for learning and addresses concerns about accountability.
Phase 2: Experimentation and Co-education at the Wisconsin Department of Natural Resources

As environmental regulation began to shift at the national level, the relationship between the WDNR and the foundry industry also began to change. A DNR representative suggests that, “...the DNR relationship with industry has been evolving ever since I started working here and I started about 10 years ago and that was sort of the end of the adversarial part. People had been regulated long enough by then that they knew that the DNR was there to stay and that they had learned how to be more cooperative.” This shift, in 1990, was aligned with the DNR creation of a sector specialist position for the metal casting foundries. This person then became a single-point of contact for the industry, who functioned as a resource to help resolve compliance and regulatory issues.

The Environmental Coordinator at a Wisconsin foundry (also a WCMA and BRAT Co. member), suggests the industry became interested in changing its relationship with the state because, “...the difficulties encountered by the industry early on sent them a clear message and set the stage for managers to take action.” The industry’s attitude changed because firms recognized and accepted that the regulations “were here to stay” and that if they didn’t deal with the situation early on in the process, they would be dealing later, under duress and with fines. In addition, once the foundries saw that “the hammer wasn’t going to fall” they began to feel more comfortable in working with regulators. People from the foundries acknowledged that they had to understand the regulators’ interests and what their job is, for industry to do its job. This recognition was essential to create a win-win situation in the long run. According to the foundry Environmental Coordinator, this shift was accompanied by a recognition that dealing with environmental issues as part of their business plan was the “appropriate thing to do.” He describes how many of the foundries in the state were motivated to cooperate by concerns that they would end up in an unfavorable playing position if they held out. There was a sense that facilities that didn’t work with the agency might be subjected to more stringent enforcement that would put them at a competitive disadvantage. Foundries outside the state expressed similar concerns that the Wisconsin foundries were raising the bar for everyone else. These firms remain attentive spectators of BRAT Co. and other developments in the state.

The foundry Environmental Coordinator also suggests that the DNR began exploring alternative compliance measures because they recognized that “using the club wasn’t an effective policy.” While DNR staff have arrived at that realization, the reasons they cite are slightly different than what the foundry representative surmises. Moreover, the change in DNR’s attitude and policy
developed through a series of false starts and is still evolving.

A project manager from the DNR highlights the disparity between this national consensus that “using the club” was ineffective, and the prevailing views among practitioners at an organization like the DNR. Many staff hold the view that the system doesn’t need to change, but what is needed is more money and more staff. Speaking about the changes that have occurred in the agency, a DNR project manager comments: “…I’m realizing that there really are sort of 2 camps… I’ve been associated a lot with the camp that’s more into, ‘We need change’ so when I say we, I guess I’m referring to that group of people, but as a total percentage of the department, I’d say that’s maybe 20% and then 80% really don’t feel, view, this as a positive change…. A lot of people feel that it’s sort of a selling out.”

Such differences, or even confusion over such questions, directly affect an organization’s ability to foster an environment of learning and innovation. Senge notes that, “Learning… cannot be done alone. It can occur only within a community of learners.” If everybody is not “onboard” in the sense of acknowledging the need for change and development, tensions among staff in the agency may develop and exacerbate the gap between ideas and practices. Such tensions can even inhibit discussion of whether proposed changes are desirable. Organizations are unlikely to engage in experimentation and/or learn without social forums in which individuals can discuss and explore their experience and ideas.

In the mid-1990’s, the DNR received a push from outside. Regardless of how people felt in the agency, it became clear to the state legislature that things had to change because of practical demands. The backlog of permits in the water branch of the DNR had all but halted their issuance of permits.

…government has been realizing all along that its means of working with industry to control pollution is becoming less and less effective, with backlogs of work, so they were looking for new ways to do things. …in terms of regulating, our regulatory effectiveness has been sliding down hill because permits are not the most useful tool for controlling a lot of pollution, that where the problems are right now, the old tools, a permit is an old tool, it was developed a long time ago...

As a result, the legislature wrote a clause into a budget bill that asked the department to evaluate its permitting system and provided a consultant for the department to carry out the study. Thus, the catalyst for change was external recognition and a mandate that framed the situation as a problem that needed a remedy.
When the consultant completed an initial study, however, it was clear that the DNR, as an organization, was not ready to change. “The consultant that we hired, I remember, she went to the management team and she showed them a graph describing an organizations’ readiness for change and it went from 1 to 7 and she had DNR off the chart.” Nonetheless, the consultant continued to work with people in the agency to interview stakeholders and conduct an analysis of the agency. Her final report provoked resistance in the agency, to the point where they asked the consultant to revise her comments.

D: IBM was at the end of their contract, and we were directed to change the report to such a degree that we had to extend the contract for IBM, and to the point where the folks at IBM were starting to feel uncomfortable because they were being asked to modify the recommendations to such an extent that... It was a mess...the IBM person stood up and said...“I will only go so far in this, I can’t, my credibility is at stake...”

E: And what were the recommendations?
D: There were some that were internal management, there were some that basically went into the environmental issues...you're trying to permit everyone to such a degree and...you're focusing on a hundred and fifty pollutants for every discharger to this amount of detail and you need to take some risks and evaluate that and build that into your program. So you know you can’t do everything with everyone. It becomes like a block when you're trying to do that... We have these processes in place to evaluate facilities and they were new and they were very cumbersome and we didn’t have any way of being flexible in terms of how we dealt with some facilities, like a cheese factory, you know. Was there really a reason we were making them go through the same sort of analysis and even collect the same sort of data as a paper mill? So by asking everybody to do the same thing and treating them all the same, we weren’t taking into account the size of the discharge, the potential pollutants that they had and it was overkill. And we were treating them all like they were violators basically. So it just got so log-jammed because of that.

E: ...and then what happened?
D: We modified the recommendations somewhat. And we had some very stressful meetings with the Department leadership team and we eventually got the report approved and then after that we had to mend bridges and start implementing the report. The report was really never implemented, and the recommendations were really never addressed, except in a very superficial way.

These marginal adjustments suggest both the kind of defensive reasoning and marginal adjustment of “single-loop learning” that frustrate efforts to open learning. The agency responded to the immediate error – the inefficiency of the permit system – but did not inquire into systemic causes. Beyond this initial adjustment, the agency achieved little organizational learning – their values or goals didn’t evolve and they resisted substantively implementing the consultant’s recommendations.

After the IBM study concluded around 1994, the Department reorganized. The “agency’s sweeping internal reorganization (was) aimed at improving agency efficiency and effectiveness; better integrating department programs; improving customer service; encouraging public/private
partnerships that benefit environmental management; and managing resources and the environment on a natural geographic basis.” Despite this enthusiastic characterization of the changes, some of the DNR staff are not quite as congratulatory. They see the conflicts that were prompted by the reorganization. “The reorg…was to make us more integrated, which is not a bad thing. And it was to reduce or increase the ratio of supervisors to non-supervisory staff, so as to make less supervisors and more workers. And really what the regions saw, was that the regions got decentralized and flung out into these smaller offices, but the central office kind of stayed where they were…” Thus while the reorganization may have had more immediate impact on the agency than did the IBM recommendations, it also expressed a model of top-down changes that was at odds with the direction in which the agency was trying to move its practice. This disparity has undermined support for change:

D: …there’s a lot of cynicism at the DNR. We’ve done a lot of projects to try to make changes that have never been implemented. At least the perception from a regional viewpoint is that they’ve never been implemented. And this last reorg, that we had really affected the regions and it didn’t affect the central office as much, but the regions are all irritated…there was also a big efficiency study about 5 years ago where a lot of recommendations were made and there was the perception that none of those recommendations were implemented…

E: What kind of recommendations?

D: It was the beginning of all that total quality management stuff, so it was more looking at using the teams, and team approaches, and how to communicate better with the public, to find out if the operations permits programs were doing its job…

As the agency as a whole was exploring new management strategies, the Air Branch and the foundry industry were beginning to work cooperatively on NR 445 compliance issues in a style markedly different than before. This shift in attitude was consistent with the more general shift away from strict command-and-control regulation:

...we should expect a less confrontational style of environmental politics at the state level, as long as the focus is on the use of nonregulatory tools. ... Regulation tends to involve ideological and confrontational politics. Developmental politics is less confrontational. It tends to involve assembling changing coalitions of diverse interests into a consensus that permits action. So as states play a larger role in a policy area and focus on problems that they can handle most effectively with the tools they use best, they are likely to encounter a style of politics that is different from the struggles of private interests against crusaders.

This shift changed the way the agency characterized the foundry industry. A representative from the DNR describes her perspective:

This industry has taken a position where they want to be proactive. The WCMA’s major function is to become involved with drafting legislation, drafting policy in a proactive way. ...I mean not in a negative sense, but I think it’s to their credit, that they’ve realized, you don’t wait and then complain. You try to get in there while things are going in,
help people understand what it is that they do, how this is going to affect them, are there other things that we can do, to get the same environmental effects without putting them out of business.58

In addition, the industry portrayed itself in a positive light. The following conversation with a foundry industry representative highlights this perspective:

F: ... I think the industry as a whole is very proactive.
E: ... It doesn’t seem like the typical profile for industry. ... why do you think they’re different from other industries? It sounds like you’ve worked in other industries...
F: An extremely good work ethic. Moral ethic.
E: I wonder why that is...
F: I don’t know. It might be the type of people. Very honest, very hard workers...values are very strong. I respect almost everybody in the company. It’s really amazing. Where I didn’t in other industries.59

Another foundry representative attributed the industry’s pro-active approach to their good long-term management and planning, for example when, in the mid to late 1980’s, the industry implemented quality systems. In addition, he noted that the industry management has historically been supportive of the work force and has empowered them so that they feel that they can contribute.

The Co-education Process

In the early 1990’s, at the beginning of what I call the “second phase” in the evolution of environmental governance at the DNR, a foundry industry representative describes how a “co-education” process emerged from the interaction between the industry and the DNR in three stages. The first stage began after NR 445 was issued, when the DNR formed a foundry workgroup to explore compliance issues and to collect information about air emissions from the foundries. During this stage, it came as a surprise to everyone that the foundry industry emitted benzene.60 Historically, the industry had been worried about obvious inputs and outputs, like dust from the sand and metals they used. Since they didn’t use benzene as an input in production, they were surprised to find that such a toxic substance was created as a byproduct. Because there was no test information and little documentation concerning the amount of benzene produced in the foundries, it was extremely difficult for the DNR to carry out permitting and ensure compliance as they were accustomed to in other industries and with other HAPS. The discovery of benzene emissions in the foundry industry is a perfect example of the kind of unexpected realizations or surprises that Sabel and Schon suggest drive the change in uncertain environments where information is imperfect. It is also the kind of surprise that demands a flexible regulatory response.
The second stage of the “co-education” process, which lasted from approximately 1994-1996, began after the DNR and the WCMA collected sufficient information about emissions, and began pilot studies of traditional pollution control measures and new source permitting based on testing end-of-pipe emissions. According to one industry representative, everyone agreed that end-of-pipe control technology was not a cost-effective means to control pollution. This was evidently based on reports demonstrating the cost ineffectiveness of the methods proposed.

Even during this joint exploration of the problem of benzene emissions, the agency and the industry retained different attitudes towards benzene. Both EPA and DNR regulations treat benzene emissions as a health risk. The industry, however, remained rather critical of this determination and held a different view of the risks. A foundry industry representative explained that some of the urgency was taken out of the effort to reduce benzene emissions because the modeled risk, even without the end of pipe controls, were not unacceptable. This was because the concentration of benzene was low due to the large volumes of air in the foundry and in the plant dust collection systems. The observed concentrations fell below OSHA standards. This comported with a more general skepticism about how the EPA and environmental regulatory agencies calculate the human health risks of HAPS. Another foundry industry representative echoed this sense of the risks of foundry air emissions:

F: ...NR 445 is ...based on HCGIH (American Conference of Government Industrial Hygienists) toxicity values. ... And (on) another list, IARC (International Agency for Research on Cancer) it's toxicology data. So what the state of Wisconsin did is they took these two lists of toxicology data and ...they used a one in a million risk factor with the lethal doses and they extrapolated a concentration. ...and then they converted this to a pound per hour emission rate, coming out of the entire operation, modeled at that worst case point, whatever it was, and set that as a standard, that lb/hr emission rate. Well for Benzene it’s 250 lbs/yr. and this operation emits 6,000 lbs/yr. of benzene based on emission factors and stack test data, is how we determine that.... There’s never been a documented health, I mean, we don’t have any cancer clusters, or anything like that ... And even within our operations, we’d definitely see it within our plants.

E: ...Could you describe where the benzene emissions are released in relation to where workers are...?

F: There aren’t workers there, right there. They’re in mold lines that are hooded and then they’re routed to a control device and then out in the baghouse...you’re exposed to more benzene filling your gas tank...every time you’re at a gas pump...you’re exposed to more benzene than you are exposed to within our plant. It’s not a health hazard, it’s not a health hazard. In a way...it’s the toxicology data that’s questionable...it says in the rule, on the list, “should not be applied to air emission standards.” I mean nobody is standing on our stack eating benzene, or breathing it...Because they pumped enough into a rat, they pumped enough benzene into a rat, that it showed sickness... and it says on there, “do not apply for air emission standards” yet the state of Wisconsin chose in 1988 or whatever to apply them for air emission standards. The EPA, to talk about the relationship between them and what Wisconsin is doing, they’ve said they would never regulate benzene like
that, because there’s no way … it’s too wishy-washy, it’s not a set in stone emission rate that they can test for and compare, are you above or below, are you in compliance or not…63

The lack of foundation that a “set in stone emission rate” would provide presented a problem for regulation as it was practiced conventionally in the DNR.

A DNR representative described how the discovery of benzene emissions from the foundry industry triggered a series of adjustments in practice at the agency during this second phase:

Within the state air toxics rule, we have fairly low threshold values for benzene emissions. And in the early ‘90’s we discovered benzene was emitted from foundry operations. So we spent a lot of time with the industry, with the WCMA, trying to at first, quantify those emissions, and then deciding what to do about it. So I’ve worked with them since that time, on various projects that we did stack-testing to quantify emissions. And then once we knew what they were, applied those emission factors to all the foundries in the state and came up with about a list of 40 facilities that …are subject then, to our limitations. And our limitation is worded such that it’s a Lowest Achievable Emission Rate (LAER) which would mean that we would have to have incinerators or some very stringent add-on controls…what we did with the industry, because we knew that it would be too expensive, and that their air handling practices don’t allow for that and a lot of these operations aren’t close-captured… They spent time educating us, and trying to figure out, “what do we do about this?” And then we came up with a strategy for compliance with our state rule that looks at, basically, pollution prevention. What can they do to their sand systems to minimize the stuff that they use, that causes the benzene, because they don’t buy benzene. It’s an inadvertent by-product and we put in there a continual improvement cycle and we’ve developed some metrics to monitor how that sand system is performing. It’s a potential to emit.64

Thus the foundry workgroup started with the assumption that the traditional practice of setting an emission rate and then setting work practice standards around it would be limiting. As a result, they didn’t actually set an emission rate and instead looked at best quality management techniques and at the concept of continuous improvement.

A foundry industry representative echoed the DNR representative’s account of this second phase in a more technical fashion: “A BACT (Best Achievable Control Technology) analysis does consider cost, so for a new source, constructing in Wisconsin, they would technically have to meet LAER. We’ve done LAER analyses for foundries and we’ve determined that the lowest available emission rate technology is a process change and that process change is material substitution….So in ‘90-’92, to comply with 445, this facility started looking into sea coal substitutions, and used a lignite technology as our replacement for sea coal and our emissions dropped drastically.”65
The description of the process of discovering a new means of reducing emissions reflects how joint-problem solving can produce marginal improvements that coalesce as new forms of practice. As suggested by Sabel et al.: “It would use these surprises to revise the rules that frame collaboration, then seek further discoveries under the guidance of the more capable frame…”66 A foundry industry representative further explains:

Based on the sand system testing that (a DNR representative) did last summer (2001) in relation to this variance, it was determined that we had the lowest emission rate per ton of iron ore in the state, which is really exciting. We have very clean sand. So to ensure that this variance is allowed and alternative methods for compliance for foundries is allowed, that’s why I’m involved in this effort, is to make sure that that happens. And to get measurable gains. And we can, and we’ve done it here, and we could possibly go further but I’m not sure how we’re going to be able to, just because of, the process doesn’t work if you push it too far, but we’re willing to help other foundries comply with this rule.67

Thus these new practices emerged from the collaborative relationship between the agency and the industry. In the prior stage of command and control regulation and antagonistic relationships, such developments and outcomes would have been infeasible. The DNR and foundry industry representatives describe a process of joint problem solving which requires a commitment to learning and a relationship based on trust.

During the third stage of the “co-education” process between the agency and the industry, from 1997 to 2000, the foundry workgroup began exploring source reduction and process changes, such as looking at innovative ways to modify the foundry water system. Through this research, it became apparent that many things could be done to reduce emissions without creating problems with the casting quality, but as two industry representatives noted, “only to a limit.” Based on existing technology, at a certain point in the source reduction process, the casting quality begins to suffer. Because experimenting with inputs could reduce air emissions and produced cost savings for the foundries there was a mutual recognition that continuous improvement was a good match for the foundry industry. The agency then started to translate their findings on source reduction into a permit format.

In the fall of 1999, the Air Management Branch’s “Air Matters” publication included an article about the work that had been completed between the DNR and the WCMA. In this article, they specifically called the process “P2” or Pollution Prevention, a strategy that agencies and industries had been using since approximately 199368 to reduce pollution.

Using less of these organic/combustible materials means lower emissions. While this may sound easy, each sand system and foundry has its own unique set of process characteristics. Manhole covers, engine blocks, brake shoes or cylinder sleeves are
not created equally. Changing sand formulations and industry practices takes time. The WMCA/DNR emission reduction strategy will enable foundries to measure the amount of combustible material available to create hazardous emissions and allow them the choice of how to modify their operations/sand formulas in a continuous process improvement structure. Changing industry practices also enables potential cost savings from minimizing the use of costly additives and resins, keeping sand in use longer (thus reducing the need for landfill disposal) and opening up beneficial reuse options due to cleaner sand waste. Establishing a continuous improvement regulatory structure allows for emission reductions without creating an artificial regulatory endpoint that might limit further reductions.⁶⁹

A compliance inspector for the DNR described his view of this period. He emphasizes the relationship between the character of interactions between the industry and the agency, and the discovery of practical steps for source reduction, and what we might call institutional learning.

D: We’ve come up with a pollution prevention compliance plan for foundries to meet their commitment to reduce benzene....
E: And when did this plan come into place?
D: It was put into a permit about 2-3 yrs. ago, so at that point it was finalized…to 98%. But it had been in the works for about 7 or 8 years...
E: …but where did the whole process start?
D: Well the process started with Tom McManny in Grede Foundry -- he was issued one of the first permits that was looking at benzene emissions from castings. Up till that point…smoke was particulate. It was like no one really understood that it was organics. … Well up until this point, the casting industry would, you know... so much coal, so much resin, and the more the better because there were less defects in the castings. So based on that, they looked at reducing the amount of resins in the cores, coral and other organic additions into the green sand molds....the core mold would have 2-2.5 % resin for a pound of sand and now they’ve drawn it back to like 1.8. For the molds themselves, they would be adding coal, a lot of it. And now they’ve found coal substitutes…there always was a coal substitute, but they also found that having a coarser grind of coal, you got the same kind of reductions of benzene that the coal substitutes would have.
E: That’s interesting.
D: It is. And then there was a proprietary or copyright control technology that helped a couple of the foundries … because we’ve determined that the mold acts as a control device itself, because of the organics coming through… So…if you have a mechanism to clean the sand grains of those organics, then you reduce emissions the next time it’s reused… It’s kind of...intuitively obvious when you see the results, when you go write it.
E: And why do you think it wasn’t being done before?
D: If you look at EPA emission factors…it’s just particulate … And that’s what we always used too. So it was ignorance.
E: So you were saying that that was the start of this whole process. … Why do you think that switch happened?
D: There’s a perceived benefit by both parties. Suzan Lindem and I built up quite a relationship between a number of foundries and DNR over the years. These were the foundries that were leading the way in exploring ways of reducing benzene already....
E: …It seems like there are a lot of pre-existing conditions to this relationship. How many years was it that you were working with the foundries before this started happening?
D: About 6-7 years.
E: Was that relationship built through trial and error or ...?
D: I don’t know... you know, Tom McManny in the Grede Foundry, the facility I regulate as the compliance inspector...even though I issued an enforcement order against them, I’ve been reasonable and in requests since they work with me, so. It’s just being reasonable.
E: I can see other situations where there wouldn’t be as much...
D: There isn’t...trust me.
E: So what are some of the stumbling blocks that you’ve encountered up to this process and before then?
D: ... In one instance, I know a compliance inspector isn’t really looking at all the requirements that the foundry has to do, he’s assuming they’re doing them. ... With all new ideas or technologies, it’s not a continuous...process through the end. Sometimes it’s back and forth.
I don’t know if some other people would be as tolerant to see someone backslide for a bit, knowing that the ultimate goal is still going to be achieved...

These comments also highlight the challenges of promoting flexibility in a highly linear regulatory framework. The notion of allowing a company to “backslide” so that they can make progress in the future is antithetical to how regulators normally work – the system does not include a mechanism for tolerating noncompliance. In addition, the risk-averse nature of the system creates a barrier to experimentation.

What this DNR representative calls the “back and forth” of new ideas is partly a process of learning, and partly a function of the trust that he established in working with facilities. It is also a reflection of the messy nature of innovation. Nonetheless, some might call this tolerance a “co-optation” of regulators. Why should agencies allow companies to “backslide” even for a little while -- especially if the backsliding involves the emission of hazardous air pollutants? These concerns are based on the idea that a regulator, by establishing a cooperative relationship with a foundry facility, would lose sight of his goal to reduce emissions. Yet if the goal of the regulator is reframed – that is if the goal becomes not to force the reductions of emissions, but to encourage and to help facilities in reducing their emissions – then the cooperative relationship becomes a critical part of this process, rather than a loophole of accountability or a sign of co-optation.

Despite the implicit reframing that occurred, the question of ensuring and measuring compliance is still a problem, though not any more so than before. The process of experimentation and exploration in response to the discovery of benzene emissions that occurred through the regulatory process constituted a form of organizational learning. “It...use(d)...surprises to revise the rules that frame collaboration, then (sought) further discoveries under guidance of the more capable frame, and so on. ...(it) institutionalize(d) better ways of learning from the
inevitable surprises that experience offers us.” The ability of the agency and the industry to engage in a process of collaborative problem-solving also signaled the development of a “community of inquiry.” Finally, the story of collaboration also reflects how the agency sought to “institutionalize better ways of learning” that developed out of the discovery of benzene in the industry.

Despite the success of this strategy with the foundries involved in the agency workgroup, not all DNR employees were thrilled about the new permits that included LAER variances. This sentiment and the efforts to achieve a working balance are described by two DNR representatives:

D: And it was a struggle, because that’s...definitely not the way we do things. And even getting it into that permit now and setting that out, we’ve gotten comments from within the DNR, that people don’t really like that...
E: From whom?
D: From compliance inspectors, probably mostly, because it’s really touchy feely, and it’s not set in stone, so it’s hard to inspect, it’s hard to know if somebody’s complying. ... (A DNR representative) is the compliance inspector for Grede Foundries, so he and I kind of worked on this permit together. .... It’s like I’m the counselor that’s trying to keep them on the right side of the law, and he’s the enforcer who’s trying to find out what they’ve done wrong.
E: ...So how were (the permits) supposed to work?
D: ...(the foundries) really don’t have to reduce emissions to comply with this. So that’s also a problem. What you have to do is do a certain amount of testing and optimize your system. But the way the permit’s written, if they just do the testing and report on it and monitor their system, then they’re in compliance. But then there’s the added word that you will try to optimize the system, but that is not very measurable. So there are problems with it, which is why...I think the EMS approach sort of came into being, because this doesn’t fit into the permit section in DNR. ...I’m a person who likes new things and likes change, but that’s threatening to a lot of people. I think especially people that end up in state government. It attracts people who are more conservative, in a sense. ...it’s so easy when you know how to do your job and do it well and you don’t want to mess that up and try to learn something new...You want to be able to do your job. And when people start throwing things at you, and people often throw things at you that don’t work.

D: I think it’s just the difficulty of doing something new where it’s hard, it’s just hard, you know? And then you get bogged down, and then you feel disillusioned, and you’re breaking new ground and that’s always hard... These accounts reflect the challenges of innovating on an individual level—not only do institutional structures resist change, people do as well. And not because they don’t believe in environmental protection or change, but for more mundane reasons like not wanting to do things differently after ten or twenty years. These habits are a central part of functioning in complex environments but they also become sticking points for learning and change. Senge highlights this: “Learning that changes mental models is immensely challenging. It is disorienting. It can
be frightening as we confront cherished beliefs and assumptions.”74 For an organization like the DNR, this extends to redefining central operating concepts like compliance. Jerry Speir, the Director of the Tulane Institute for Environmental Law and Policy, captures the ambiguity such organizations confront:

What is compliance, exactly? I’ve asked that innocent question in many different circumstances and have yet to get a dispositive answer. … We are told—often enough that you have to believe it—that “no one is ever in 100% compliance 100% of the time.” Some people use the term “substantive compliance.” Does that mean performance that adds no unpermitted impacts to the environment? That is, does it distinguish itself from “procedural compliance,” which would include all the “paperwork requirements”? Or is it simply performance sufficient to pass subjective muster with state (or federal) regulators as adequate, under the circumstances, to avoid sanction?75

Both the DNR representatives quoted above recognize the importance of changing the understanding of compliance – it is clear to them that the traditional means of permitting does little to reduce emissions. Their commitment to the process thus comes from their frustration with the old system and from their openness to try new strategies, despite the challenge of measuring change.

**The Wisconsin Department of Natural Resources’ State-wide Innovation Initiatives**

While the Air Branch of the DNR, the WCMA and individual foundries were working to help foundries in the state comply with NR 445, the top management of DNR was working to develop state-wide mechanisms to encourage just the kind of alternative compliance schemes they were experimenting with:

…we had been working on the notion of cooperative environmental agreements, and this whole innovation issue for a few years. And the DNR has a rich history of public-private partnerships, and above-compliance tools…(A DNR manager) especially, was really interested in how you get those companies who want to play, above compliance, to get there, and give them the flexibility to do it.76

DNR’s “rich history” includes several landmarks along the road to innovation. In 1997, the Wisconsin legislature signed Wisconsin Act 27, establishing Wisconsin’s Environmental Cooperation Pilot Program. This allowed the DNR to enter into ten cooperative agreements over five years with businesses in order to promote innovation and experimentation in environmental regulatory compliance: “DNR agrees to reduce administrative requirements and to give businesses greater flexibility in meeting federal and state environmental regulations. In return, participants must evaluate their entire effect on the environment, establish goals to reduce their overall level of pollution, and document their progress toward those goals.”77
In March of 1998, the U.S. EPA and the national non-profit, non-partisan association of state and territorial environmental commissioners, known as the Environmental Council of States (ECOS), signed the Joint State/EPA Agreement to Pursue Regulatory Innovation. This initiative hitched on to the Clinton administration’s regulatory reinvention process, citing the former President on the first page of the Agreement:

"...We must encourage innovation by providing flexibility with an industry-by-industry, place-by-place approach to achieving standards, ... But we will require accountability that such standards be met. Rather than focusing on pollutant-by-pollutant approaches, attention must shift to integrated strategies for whole facilities, whole economic sectors, and whole communities."

The Joint Agreement set the ground rules under which States could submit innovative ideas to the EPA regions which would be fast-tracked, and approved projects could be implemented more quickly.

In 1999, the former Wisconsin Department of Natural Resources Secretary George E. Meyer (a former ECOS President), and the EPA’s Acting Regional Administrator for Region 5, signed the first state Memorandum of Agreement which would “guide the working partnership of both agencies in fulfilling the principles of the Joint State/EPA Agreement to Pursue Regulatory Innovation…and the objectives of the Wisconsin’s Environmental Cooperation Pilot Program: to pilot and evaluate innovative environmental regulatory methods…. “

The intuition behind the program was that it would spur companies to go beyond compliance and foster the development of new compliance measures not allowed under the current regulatory system. Not intended to be a compliance loophole, the EPA and the DNR would retain their enforcement authorities over those companies that sign an agreement:

State-company agreements would be legally-binding and could allow WDNR to waive or modify permit procedures, for example, in exchange for a company establishing an environmental management system to address conventional pollution subject to environmental restrictions. State-company agreements could also call for companies to seek environmental improvements not subject to current regulatory mandates, such as energy and water savings.

These agreements set the following expectations for participating companies: “Plans to implement an environmental management system, a commitment to superior environmental performance, specified waste reduction goals in measurable and verifiable terms, pollution limits that are at least as stringent as those prescribed in current law, any approvals that are replaced by the agreement, any operational flexibility and variances granted, all applicable rules and regulations covering a company are eligible for inclusion, a commitment to release periodic performance evaluations and report any violations discovered, and a plan for public involvement and participation.” The MOA also outlines the requirements for public participation: “Anybody
who is or may be affected by the activities at a facility that wants to enter into an agreement may participate in negotiations through public comment and meetings. There are currently eight companies that have signed agreements with DNR since 1999 and informal conversations with DNR staff suggest that the program has had a slow start, with only a handful of agreements signed.

Surprisingly, this new direction for the agency emerged not long after the permitting study by IBM and after the department reorganization. A DNR representative describes this shift:

D: ...the Department reorganized between the initial permit study and the EMS projects... The new organization was designed, but it wasn’t really implemented very well, so I think a lot of the managers were feeling like we were in chaos and I think...they saw the EMS as a potential, for maybe helping to put some order to things. And I think they also recognized (that)...one of the goals of the reorganization was that we needed to find a better way to work with people, outside the agency, the external stakeholders and I think they really liked the idea of walking the talk... I think really probably the primary reason is that George Meyer who was secretary, was a very firm director and everyone knew he was in favor of it. And I think that carried a lot of weight too. I mean basically, if George wanted to get something done and promote it, then I think most of the management team knew that was something that they should go along with.

E: And with the new programs, the EMS work was going to come from within, and the sense was that people would be able to make recommendations?
D: Well I think George was the one who initiated it or it was initiated internally--it wasn’t the legislature telling us we have to... That might have been part of it... maybe the situation hasn’t changed that much but it might also be the difference between starting a project and (looking at) the final report, because there was a lot of uproar over the final report ...

The DNR representative’s comment about finding order out of the chaos caused by the Department reorganization highlights the extent to which processes of change create uncertain and unsettling environments. Senge captures this challenge during an interview with Ed Simon, President and COO of Herman Miller:

Senge: If we must give up some of the safety of a traditional organization, does that mean that a learning organization is in a constant state of turmoil?
Simon: Our task is to find a new balance. Embracing change doesn’t mean abandoning a core of values and precepts. We must balance our desire for continuity with our desire to be creative. We must learn how to not abandon that core, while simultaneously letting go of past ways of doing things. ... This requires a new paradigm, a new model of how organizations work—organizations that operate in a continual learning mode, creating change.
While Simon presents a slightly different approach to organizational learning in that “core values” in this context are to be retained, he speaks to the transition DNR confronted in moving to an EMS approach. The DNR’s “core value” of environmental protection was put out of balance by the creation of a new process for regulating – the EMS – that demanded “letting go of past ways of doing things.” This tension between old and new practices created the sense of chaos mentioned above by the DNR representative.

Reactions that checked and blocked innovation were not only internal. The agency’s enthusiasm towards the Joint State/EPA Agreement to Pursue Regulatory Innovation was not shared by everyone. Environmental groups were not particularly pleased with these new developments. The local chapter of the Sierra Club, Wisconsin Environmental Decade and Wisconsin’s Environmental Decade drafted a letter expressing their concerns:

“We are skeptical that good public policy will result from this MOA or the implementation of ECOS or the WI Environmental Cooperation Pilot Program (“Break Through”) legislation, 1997 WI Act 27. We are also skeptical of this as a model for success or the need for offering these programs. These experiments in regulatory flexibility seem to be increasing the burden on the state and federal agencies without clearly demonstrating how in the long run they will learn how to institutionally resolve their own pressing issues of staff morale, dwindling resources, lackluster enforcement programs, and an expanding regulated community.”

In August of 1999, a wider group of environmental NGO’s from Wisconsin assembled to write “A Sniff Test for Evaluating Environmental Regulatory Reinvention Projects.” Speir summarized the main concerns of the report:

First, there are the why questions: Why can’t the project be done under existing law? Then there are the performance measure questions: How will we know it’s better? Are there clear goals and objectives? When and how will evaluation be done—and against what baseline? Then there are the process questions: Who’s involved? How will decisions be made? “Do citizens have a meaningful role—[meaning] “the potential and opportunity to affect the outcome”? Will stakeholders have the necessary resources to complete the project? There are concerns expressed for enforceability and costs. And there is a concern for the trade between performance and regulation. “What regulatory relief is being considered?” And “what will be the corresponding public benefits?”

The issue of accountability is particularly challenging. The “Sniff Test” notes the problematic nature of the multiple roles that a regulatory agency must adopt to encourage flexibility:

What is the role of the state regulatory agency—facilitator, regulator, granter of variances or all of the above? It is very difficult for an agency to simultaneously play several different roles in one project. The more effective projects are those where an outside facilitator is brought in so that the agency can maintain its regulatory stance and not have to facilitate the process as well. By statute, state environmental agencies are air, water and land “cops” and industrial facilities are “permitted entities”, not “clients.” It is important that this relationship be
maintained throughout the project. A critical question for the agency is: “How will agency efforts to protect the environment be improved based on this project?”

These concerns draw on and express the traditional differentiation of roles that is embedded in regulatory relationships and practices. They also express a more general wariness about the change and development in organizational roles that is demanded by a commitment to innovation and learning.

These groups were certainly not alone in their concerns about the viability of these cooperative agreements and the ability of environmental management systems to achieve greater environmental protection. There has been widespread criticism of the use of EMS’s by regulatory agencies, despite their current prevalence in the states.

EMSs reflect a faith in the process; the presumption is that a more efficient process should produce a better outcome. The theory is solid but the proof is lacking. Critics worry that incorporating such a voluntary system into the regulatory process may risk backsliding in an organization’s performance or collusion between the regulator and the regulated. Trust among stakeholders is low. Any experimentation with voluntary systems must maintain a strong option to enforce existing regulatory performance minimums and must show clear performance outcomes that are superior to the status quo. Otherwise, the credibility of the enterprise will be instantly undermined.

Similar to critiques that derailed Project XL, the critique of EMSs focuses on the problematic nature of ensuring accountability and measuring efficiency -- two issues which arise repeatedly throughout the evolution of environmental governance.

Thus the second phase of “co-education” and experimentation in the evolution of environmental governance at the DNR reflects a commitment to continuous improvement and to developing cooperative relationships. This very commitment, however, triggered an inhibitory response expressed as a growing wariness about the uncertainty of experimentation and innovation.

**The Next Generation of State-wide Innovation Initiatives**

While the pilot EMS projects were getting underway, DNR leadership was developing the next generation of state-wide programs. After the agency had spent over a year and a half negotiating the EPA-state MOA, they had learned more about the obstacles to innovation and began drafting legislation for Green Tier, a system of tiered regulation based on contract law principles, which would be “a continuous improvement system that builds trust among participants.” Green Tier is a voluntary program for regulated organizations that want to be exemplary stewards and unregulated organizations that want to cooperate on environmental tasks. The DNR describes the program as “a due diligence tool to benefit regulated parties, give regulators compliance comfort
and provide credible data for a learning system that builds trust among all parties.”

It is significant to note that Jeff Smoller, a key proponent of Green Tier at DNR, is very interested in and aware of the concepts of the “learning organization.” In a memo to the DNR, he quoted a Financial Times analysis that noted that a learning system should allow for “‘rethinking company culture to deliver solutions rather than boxes’...Similarly Green Tier can deliver innovations, intellectual property and high-end environmental protection, if its players demonstrate good faith and sound reasoning to produce results that benefit everyone over time.”

In addition to Smoller’s familiarity with learning organization concepts, the Department found strong role models for their innovation efforts in other state agencies and in European counterparts. In his memo, Smoller mentioned the “working together model” used by Wisconsin’s Committee on Labor-Management Cooperations, as well as learning tools embedded in Bavarian compacts and Dutch covenants. “…a learning arrangement exists in the Netherlands’ pulp and paper industry where a Consultive Group advises ways to achieve the ‘stretch environmental goals’ in part by testing of innovative technology. In Bavaria, businesses, universities and governments sponsor trade shows, commission scholarly papers and invite outside experts to help them pursue ambitious goals.” Both these European examples reflect an effort to engage a “community of inquiry” in the process of problem solving.

As Green Tier is currently being debated by the state legislature, policy analysts remain relatively optimistic:

The contract idea is an intriguing one, and the concept could bear fruit. But if it does, it will face the same issue as the current state experiments: tension between the states and the EPA over how far the states can deviate from federal requirements. There will be the same issues about information (how to generate it, how much is enough) and the same potential for EMSs to produce it (or not). And there will be the same concerns about the public process for approving the deal…

DNR also expects Green Tier to be equivalent to the pending Stewardship Track of Performance Track, an EPA program that rewards industries and companies that have a record of sustained compliance, good neighbor practices, and a commitment to continuous improvement. After an application process, the EPA grants selected facilities greater regulatory flexibility as well as national recognition for their work. Despite the program’s attempt to move toward flexible models of governance, the reliance on incentives reflects a lingering thread of command and control regulation that is at odds with the learning model.
The DNR’s wider efforts around regulatory reform, coupled with their embrace of organizational learning and their collaboration with other environmental agencies engaged in similar efforts, reflects a strong commitment to this process of change. It also reflects a recognition of the magnitude of institutional change required to affect significant progress.
Chapter III: The Benzene Reduction Action Team

Phase 3: Formalizing Experimentation and Institutional Innovation

The third phase in the evolution of environmental governance at the DNR is marked by an effort to capture the collaborative work accomplished by the foundry workgroup through the development of BRAT Co. Different accounts persist of how the BRAT Co. idea was born, but they all involve collaboration with a consulting firm called WSP that specialized in Environmental Management Systems. According to one account, the story began when Jeff Smoller, from the DNR, worked with Ed Quevedo, a representative from WSP Consulting, in a multi-state working group. After they had worked on several projects together, Smoller invited Quevedo and another WSP consultant, Peter Wilson, to speak to the upper management at DNR. Wilson had been working in London on ISO 14000 standard development and with the European model of the EMS, the “EMAS.” According to a DNR representative, “…he was very involved and had a lot of experience. More so than any American company. And I think they brought along someone from BMW, who they were working with in Germany, trying to help forge that partnership.” The variant account is that Quevedo gave a “carte blanche offer” in a speech at a conference with EPA and state regulatory people. He said, ‘Look, if you guys are interested in EMS’s, I’ve done them with the Dutch, I’ve done them in Europe and I’m willing to come over here and work with a government agency on EMS’s. I think that would be really exciting.’95 And so the story goes, “…after EPA just sat there with their mouth open, saying, ‘I don’t know, I don’t think we’re going to do an EMS, but thanks for offering,’ Suzan Hunt Bergen, who has since retired, ran up to Ed Quevedo and said ‘How about you come to Wisconsin, we’ll take you up on your offer and you can help us do an EMS?’”96 The DNR representative also noted that Bergen, who was the recycling coordinator at DNR, was “a real open person to innovation.” Thus the origin of BRAT Co. developed in part from an effort to adopt an EMS approach to environmental governance.

Regardless of where exactly it all began, when Quevedo and Wilson came to the DNR, the upper management was thrilled to hear about the proposal:

So they (Ed Quevedo and Peter Wilson) came and gave a presentation to the upper management team in our department, and said, ‘you know, this is what we think you could do, here are the benefits.’ …and Ed is a very dynamic speaker and so is Peter, and our upper management team was like, ‘Where do we sign up?!’ They were very enthusiastic. So they decided to go forward, and then they decided to nominate some pilot areas from the organization.97
A DNR representative described how an internal EMS would work: “...an EMS really just is a type of management system that focuses on how we set environmental goals. So by us (DNR) developing one, (we are) analyzing our own environmental performance...” The difference between the process described here and former DNR efforts to innovate is that the DNR, itself, becomes the object of inquiry. Rather than responding to errors created outside the agency, the internal EMS process seeks to open a process of internal reflection that suggests a step toward second loop learning.

...our pilot sites have compliance issues, just like with the private sector.... the first step in the process is to define all of your activities and then resolve the impacts they have on the department or...on the environment. So you look at all your activities and analyze them for environmental impact. And I've seen some facilities, they do it in a very systematic fashion, where they're going through and they're actually looking at all of the processes and scoring, and then I've seen other facilities that just, it seems like they're just kind of brain-storming and they jot things down and...it doesn't appear to be a very well thought out analysis. And I think that's a problem area, I think a lot of it depends on the performance goals that the company or the organization sets... what that means for our agency is that it takes, it gets a little complex, because we are a public environmental agency, so its almost our whole business, so it is complex, but...I think we broke it up into two areas, one is operationally...we have a number of facilities that are just very much like private sector industries. We have fish hatcheries, we have parks, we have fleet services, we have those sorts of things that are just exactly the same as an industry, so we evaluate those for environmental performance, for energy use, that sort of thing. Then we also, in our pilot program, this gets to BRAT, look at...what is our environmental performance related to policy development, or permitting or compliance, that sort of thing..."

This process of examining organization goals is a central part of second loop learning and reflects a systems-level understanding of regulatory problems that goes beyond the behavior of industries.

...so could we take the same sort of a system that was primarily set up for a manufacturing type of facility and apply it to our other operations that weren’t manufacturing in nature, but more regulatory in nature? So that’s what we tried to do and we selected our initial sites. We picked maybe 2 or 3 operational sites and then a couple policy sites, and which we call policy...they’re addressing more--what are the environmental impacts from the rules we developed?, the decisions we made, that sort of thing."

The EMS thus becomes a mechanism for rationalizing this process of learning.

According to the WSP consultants, the EMS for each site was supposed to act as “this interconnecting gear system where everybody’s goals are in sync” or as a small cog which is interlaced into a larger wheel of the DNR. This image was articulated by several members of the BRAT Co. team:
Well there's wheels within wheels. … This is going to get complicated. I don’t know if I get it or not, but we're going to write an environmental management system for foundries as it relates to reducing benzene emissions at the foundry. …hopefully a foundry would identify benzene emissions as a significant aspect in their facility EMS, so that we have the cogs intertwining from there.\textsuperscript{102}

…But what should have happened if the design had played out as originally intended, was that the air program would have developed an EMS which would have evaluated the permits and rule-making processes and developed a system for managing those in the same way that an individual foundry might have an EMS on its foundry. And then the results of BRAT Co. would be sort of fed, BRAT Co. would be one cog spitting out recommendations which would have been fed into the Air Programs’ EMS...\textsuperscript{103}

…what the EMS does do is set environmental priorities, so if it does that for the state of Wisconsin, and then it sort of linked up with industry so that our goals are sort of driving their goals...I think a lot of the European models are driving towards that. So he saw that, when we were setting up the pilot, we were sort of trying to hold that ultimate vision of maybe everybody working together under some sort of management system...\textsuperscript{104}

In January of 2000, the DNR chose the Air Program Branch as one of its pilot EMSs and that summer, approached the WCMA to become involved in the project which later became known as BRAT Co.

…basically the department leadership team made a decision that they wanted to look at some of the types of work areas within the agency, and then we solicited people to volunteer for it. And then we put together BRAT’s program team of people and each of the sites that had volunteered came in and talked a little bit about what they’d like to accomplish. …it was very interesting, it was one of those social things where it was made so attractive that all the volunteers wanted to be chosen…I mean, Air (was saying) “Oh please choose us, please choose us!... I think …there’s a tendency to jump to new projects because maybe they’re perceived as being fun as opposed to...and I think that there was an opportunity there to be recognized... an ability to show leadership within the agency and within the nation in terms of our, as a public agency, so I think for that reason, people were attracted. (In addition,) the leadership in the Air and Waste division was a little bit promoting of this. Mary Jo Kopecky...is one of those who sees a lot of benefit in innovation, so she promoted that with the heads of the Bureau programs in that division\textsuperscript{105}

While the enthusiasm to participate in the pilot programs may sound contradictory to earlier comments about the proponents of change in the agency being in a minority, these comments demonstrate how clusters of support may emerge from a wider commitment to experiment with practices. This support may also reflect how the agency itself is not a constant or monolithic organization, but one whose energies may have waned and grown over time.

A foundry industry representative described the next steps: “…Suzan came to WCMA, the environmental group, and asked for our help, and we have a very good working relationship
with Suzan and the reason why we’re all here is to maintain that relationship and hopefully to create some better working systems for us and for the DNR..." According to another foundry industry representative, it was “a natural extension of the work already being done” since the industry already had a cooperative relationship with the state. The normal antagonistic barriers were absent and “to get involved...made sense.” Thus the second phase of “co-education” during which the DNR and the WCMA began working together had constructed a strong foundation for a more formal process of collaboration and collective inquiry.

A foundry industry representative further explained that the reason why the DNR came to WCMA to participate in the EMS pilot was because someone had seen the similarities between what they had been doing with continuous improvement in the foundries and the language that the EMS uses. “…we thought we could just apply EMS language to that effort that we already went through…” There was evidently a clear sense from the industry and from the DNR, that the EMS pilot program was an outgrowth and perhaps even a duplication of their previous work:

E: If you hadn’t been chosen as one of the pilots, do you think this same thing would have happened?
F: Yes, I really do. Efforts did happen prior to that. ...WCMA’s environmental committee had a training on our variance, with an educational element on benzene reduction strategies...I think those types of activities would have continued...in a much more efficient way.
E: Do you think so?
F: Oh yeah.
E: So what do you think are the benefits of BRAT then...?
F: A benefit is being able to potentially implement change within the DNR. That was one that we weren’t doing. The efforts that we had before, the educational efforts... were for WCMA and for the DNR to help everybody understand the variance.
E: So why do you say BRAT would help implement change within the DNR?
F: It was just happening within the WCMA, the WCMA efforts were just focused on the variance, but with BRAT Co. we can potentially implement change within the DNR.
E: And what kind of change would that be?
F: Allowing EMSs and the use of EMS as a compliance tool. Streamlining permits so the permits could be obtained faster...which can be an issue for foundries, specifically because, to construct something, there’s so much equipment...the main upgrade to the plant, it’s impressive, just monstrous. It takes a long time to do these projects and a lot of times, well for this project we decided to go forward with it in July and it started operating Jan 2nd so I had to get an expedited permit, and I got my permit the first week of November that allowed construction to begin and the equipment was delivered days later. At that point if it had been late, we would have been out in the rain because the timing was so tight. It’s the American economy... That’s an effort that we tried to do through Suzan, but the BRAT Co. just kind of formalizes it."
While BRAT Co. was perhaps a continuation of previous efforts, these comments highlight a critical difference in this new phase of collaboration, namely, the ability to "implement change in the DNR." The establishment of BRAT Co. reflects an effort to conceptualize and build on the groups’ former experience of joint problem-solving, except in this phase, the exploration is turned inward. Despite this new development in the process of organizational learning, the foundry industry representatives’ comments about how BRAT Co. could eventually give way to the use of EMSs as a compliance tool reflects the multiplicity of goals involved here. While BRAT Co. members may agree that their work represents a step towards organizational development, they have different perceptions of what the process will bring. According to this foundry industry representative, BRAT Co. represents the mechanism through which alternative regulatory compliance measures like EMSs will become institutionalized.

BRAT Co. reflects the DNR’s commitment to change and as well as a new institutional response to the evolving problem of environmental governance. Bringing together the industry and the agency to create a single entity with a shared identity marks a significant departure from previous efforts to work with or involve the regulated community. In this light, BRAT Co. has the potential to become what Sabel calls a “constitutional order”:

> My strategy is to characterize the new types of organizations in the public and private sectors as instances of a governance structure that I will call constitutional order because of its affinities with democratic politics....they adapt to changing environments...because they are based on trust—partners’ mutual understanding that none will exploit the vulnerabilities that partnership creates... ¹⁰⁸

Similar to Schon’s “community of inquiry,” a “constitutional order” attempts to bring together partners with shared or compatible goals, into a framework that embraces direct participation and joint problem-solving and learning.

**The Development of BRAT’s Goals**

During a presentation to the Innovation Stakeholder Meeting in January 2002, (which was ironically attended solely by industry and agency representatives), Lloyd Eagen, the head of the Air Branch of the DNR, described why the agency chose to the work with the Wisconsin Cast Metals Association as an EMS pilot. First she noted the strong working relationship between the two groups as a result of their previous work on BACT and LAER compliance issues and Best Management Practices. Second, she wanted to further develop their work on continuous improvement: “If all we do is shoot for compliance, we’ll miss many environmental gains.”¹⁰⁹ Lastly she noted the need to use resources wisely:
…the EMS project (is) much like Research and Development. I am willing to spend the time and effort now to develop a stronger relationship with the foundry industry and develop a partnership that will take less time in the future….we don’t have staff and won’t have staff to play “gotcha”…We need to foster business responsibility to take on environmental stewardship as a key element in corporate vision. 110

The desire to avoid playing games is reminiscent of Sabel’s call for “mutual understanding” and trust in the process of building a “constitutional order.”

Eagen also described that the goal of BRAT Co. was to determine how to structure public policy and regulation so as to help both the industry and the DNR to improve the environmental performance of their operations. In particular, the group had set a goal of reducing benzene emissions by 30%. BRAT Co. would achieve this using an EMS to guide their advocacy, education, research, monitoring and tracking efforts. The results would also include streamlined permitting and more comprehensive and tailored regulations. Although these commitments reflect a faith in the process of collaborative problem-solving, the results-orientation suggests the ongoing tension created by the “unknowns” inherent in the process.

Despite the clear mission outlined by Eagen at the stakeholder meeting, the purpose of BRAT Co. took a long time to develop. While the WSP consultants began helping the group take its initial steps in developing an “internal” Environmental Management System in November and December of 2000, BRAT Co.’s goals evolved as the group interacted with new consultants and different stakeholders.

BRAT Co., under the guidance of WSP consultants, began the EMS process by creating flowcharts which outlined seven current activities that linked the foundry industry and the agency. They also created “wish lists” which “represent the beginning of a consensus view of how the state of affairs in these seven key activity areas could be improved or optimized.”111 Reminiscent of a foundry industry representative’s comments about BRAT Co.’s capacity to change DNR processes, the “wish list” reflects the DNR’s “openness” to engage in self-reflection, a critical step in the learning process. Rather than beginning a process of innovation with an examination of problems outside the agency, the process here began with observations inside the organization. “(T)he EMS aspects of BRAT”112 were “the characteristic activities of the organization which cause or lead to environmental impacts”113 which included permitting, rulemaking, policy development, enforcement, the foundry casting process, reporting, and record keeping. The program manager for BRAT Co. from the DNR described the group’s initial efforts in developing their EMS:
Well the original intent was to look at these processes. …when you go into an EMS, you try to understand what our various environmental aspects that have some impact upon the environment, either positive or negative. And so the way that we went about defining our aspects was a little bit different. I mean no one has done this before and so we struggled with that and so we finally came up with these different sets of processes and typically what you’d do is that you’d look at processes in order to understand what the environmental aspects are and then you rank those. And what we did is we said, well, these are the main things that we’re doing, these processes, we’re going to have to label these as aspects and then we’re going to see how we can go about changing the aspects themselves which are really processes. 

After the group had developed their aspects, the consultants then guided the group through a “truth testing” process that provided them with two policy scenarios against which the action steps developed for each aspect were “tested.” (See Figures D and E) The “truth testing” represents the consultants’ attempt to engage BRAT Co. in a joint process of analyzing their practices. BRAT Co. also provided an organizational context for reflexive practice to occur, a space which was not available during the IBM study or the reorganization process.

### METHODOLOGY

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<tr>
<td>OUTCOMES (Wish List)</td>
<td>These are the Common Categories</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: RANK ACTION STEPS (Flow charts):</th>
<th>Chronological sequence of events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order in Sequence</td>
<td></td>
</tr>
<tr>
<td>OUTCOMES (Wish List)</td>
<td>What is most important to get the activity accomplished</td>
</tr>
<tr>
<td>Order by Importance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3: TEST</th>
<th>Look again at a radical scenario</th>
<th>This is a “truing up,” a test to see if the order works the way it’s supposed to. Also used to identify the interactions between regulatory agency and industry in identifying area of greatest inefficiency</th>
</tr>
</thead>
</table>

| Step 4: REVISE | |

Figure D: EMS Methodology
(Source: Wisconsin Department of Natural Resources)
Instructions:

Test the validity of the flow of the Action Steps and Priority of the Outcomes by applying the scenario: USEPA pronounces a new regulation requiring states to impose zero benzene emissions goal within one year; How do we go about doing it and what's most important for each identified key activity/aspect area.

As the scenario is applied:
1. identify (with an *) the action step that is the most inefficient (in terms of environmental gain) and
2. circle the desired Outcome that is best able to bridge the gap (strongest link) between the industry and regulatory agency.

I. RULEMAKING

Action steps:

<table>
<thead>
<tr>
<th>Action Steps</th>
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</thead>
<tbody>
<tr>
<td>Initiation Internal and External (3*)</td>
</tr>
</tbody>
</table>

Outcomes: Sound Science (6*); Simple; Environmental Quality; Inclusive (2*); Flexible; Legally Sound; Cost Effective; Timely; Consistent; Improvement Cycle

II. CASTING

Action Steps:

<table>
<thead>
<tr>
<th>Action Steps</th>
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<tbody>
<tr>
<td>Sand</td>
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<tr>
<td>Pour</td>
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</tbody>
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These two were considered together for this exercise.

Outcomes: Cost effective (*2); Flexible; Sound Science (*7); Environmental Quality; Simple; Innovative; Energy Efficiency; Consistent; Timely; Improvement Cycle

III. PERMITTING

Action Steps:

<table>
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<tr>
<th>Action Steps</th>
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<tbody>
<tr>
<td>Application (1)</td>
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</tbody>
</table>

Outcomes: Simple (*7); Sound Science (*2); Environmental Quality; Timely; Flexible; Inclusive; Legally Sound; Cost Effective; Consistent; Improvement Cycle

Figure E: EMS “Truth Testing”
(Source: Wisconsin Department of Natural Resources)
While the exercise helped the group define its goals to a certain extent, the worksheet given to the team members was rather didactic and may reflect why their assistance was not terribly well received in the long run. This “misplaced concreteness” is clear in the way the worksheet concluded: “You have now finished, assuming a disciplined and dedicated approach to the process, your aspects work in a crisp relatively accurate, fashion.”

Although the group had defined and ranked their aspects in order of importance, they later decided to focus on three aspects – permitting, rulemaking, and revising the casting process:

…in December of 2000 and January of 2001…they were just finishing the original exercise with Ed Quevedo …they selected their aspects and linked their aspects to outcomes…Rulemaking, casting, permitting, and they had a few others that they had selected originally, but they narrowed it down …they had done their original systematic view of each one of these aspects with the action steps and outcomes, I think really well diagramed.116

BRAT Co. also outlined their environmental management programs at this time, which were more specific actions that an individual in the group would take to achieve the things they needed to do to reach their stated objective, called “targets.” For example, operating under the casting goal, a foundry industry representative took on the target of studying changes in the casting process that would reduce benzene emissions. To achieve this target, she assembled a group of “experts”, and is pulling together international and national work that has been done on the issue of reducing benzene emissions in the foundry industry. The process of identifying concrete steps to achieving goals reflects how BRAT Co.’s work was able to instigate further branches of this original community of inquiry.

Adding EPA Consultants

The disjointed character of the process is clear in the addition of the EPA consultants. One of the problems that an organization like the DNR always has to manage is its relationship to the federal government – in this case the EPA.

As BRAT Co. began working with the WSP consultants to define their goals, the DNR applied to the EPA for additional funds to help their efforts. They put their best foot forward by nominating the Air Program. EPA chose the Air Program EMS as one of 14 groups from around the country to receive training and technical assistance “in a rigorous application process that examined top management involvement, organizational support, and the ability of participants to share experiences…”117 This meant that a second consulting group, Global Environmental and Technology Foundation (GETF) began working with the DNR, after BRAT Co. had started working with the WSP group. This created tension, ambiguity, and misunderstanding:
I think the other thing has been the issue of trying to fit the BRAT company into the DNR -- overall the EMS project has been challenging in that you get different advice...initially when this project was first started we applied for part of a project with EPA and this is the second local EMS initiative for EPA ...the kick off meeting was in April of 2000 and EPA had used the consultants, Global Environmental Technology Foundation, so we worked with them. But I think early on the difficult thing was to understand what we’re trying to do here and because no one has done it before and I think people have a hard time understanding it...I’ve had a hard time maybe explaining it, because one, it has evolved, and though I’ve had university course work and training in EMSs, I’ve picked up some of that as we’ve gone on, I’ve had some of it before we started this whole process...I refer to it as a traditional EMS where there are key things that are happening in our process or activity, where you can see that, “well this is going to be an environmental benefit,” or “this is going to be an environmental problem and what are the objectives and targets in order to minimize environmental impact here.” Because we’re dealing with policy, because we’re dealing from an industry wide perspective...it’s been very difficult to discuss and to talk about and because we’ve evolved -- that’s made it more difficult also.118

These comments reflect the challenges of managing and guiding a process that is constantly evolving. Trying to incorporate conflicting advice from consultants evidently makes such management even more difficult. Another DNR representative echoed this frustration:

...we put them in the uncomfortable position of, “…we want you to take what you get from the GETF project and use it, but we also want you to be consistent with what WSP is doing in the department”, and that added a layer of complexity. It slowed down the work...119

...people in the DNR are very independent and they like to think of themselves as independent and special. Probably because the public agency treats everybody the same. So everybody’s just clamoring for that attention. We have a lot of tension...when you try to build a management system for the agency, for the whole agency, there has to be certain consistencies. But in the tension between each individual site, and building a system versus five different systems, and the role of the consultants...was supposed to be primarily about the agency building a system and then to help the sites slog through that. But we tried to use free services for a long time and...Well all the work was pro bono for a long time and so basically, they made a very generous commitment, but it still wasn’t in the long run...and you could have had a well run project. So a lot of the things on the bigger system-wide level ended up not happening and then the consultants would try to help people at the individual sites with all that structure being there and it created a lot of confusion and a lot of retracing of steps. A lot of differences between the sites. We’re having a real hard time resolving that.120

The hope was that the consultants would facilitate a process of organizational learning. The layering of multiple consultants and efforts that occurred in the process made learning, in the end, inefficient and confusing. One DNR representative captured the carnival of reform that emerged and disrupted coordination in the process of developing BRAT Co.’s EMS:
We have the WSP Group, we have GETF, and then there’s me as an internal consultant, and really Sue Hoops, also as an internal coordinator, leader, and consultant, so on one level, it has been really difficult to try and organize this effort, from a process perspective, because we have people inside the agency that have never done it, that’s the first thing and then people outside the agency that have done it, but tend to act like consultants, which means, what I call the worst kind of consultants, that fly in, literally from 35,000 feet, drop down, touch down for a little while and then leave again and then in between, really hard to link up with them, to learn from them...that’s ...a significant problem with this group, this interaction between people that know and have technical expertise, and process expertise and people that don’t know, but know the agency internally and know how to run groups and collaborative processes, but never the twain have really met, well, we’ve tried a few times, but it just hasn’t worked.121

While DNR management saw and recognized this tension – being pulled between two different sets of consultants – they decided to continue working with both GETF and WSP:

E: So why didn’t Lloyd or somebody see that and say, “why do we have two people who are advising the same project on different wavelengths?”
D: We were unwilling. We did see it, we talked about it at great length, and we were unwilling to alienate anyone basically by pulling out. Because GETF has connections with EPA and we want to maintain that.
E: And what does the EPA think about all this?
D: I was involved very briefly when we first were talking to them about this GETF project. They were very resistant at first, but then I was really amazed that a person from EPA flew all the way out here for a 20 minute presentation -- I thought “my gosh”, and he said some very encouraging, very motivating words, I think for our managers. ...about BRAT and the project and how he was hopeful it would succeed because at EPA they had tried to do things in the past and they hadn’t worked and he was trying to be encouraging, I think, and supportive. And I was really amazed that he went to that extent to do it, because this was the guy, who a year and a half ago, I’d be talking on the phone (with him) about what it is we maybe wanted to accomplish and he’d be saying, “well...sounds a little weird?” So that was interesting to me, but I don’t think we’ve done as good a job as we could...It was an unfortunate situation, I mean you had competing consultants, who did not get along, I mean we could have made a happy family out of it, but we didn’t. A lot of personalities.
E: That’s always hard. ...it would be interesting to talk to (EPA) about why they’re interested in BRAT and not the other projects....
D: Well we volunteered BRAT to them. ...Initially they were more interested in having one of our other sites work with them, like the park or the fish hatchery, they were very interested in, but we only offered them the air one. I can’t exactly remember why it was, because that was the last one to start and the rest of them said no, we’re on our way, we don’t want to switch midstream, but...
E: Oh, so it was about changing consultants essentially?
D: Yeah, that’s why we decided on giving (EPA) an air project...I think then (EPA) saw it as being innovative and they wanted a piece of it, and so then they started promoting it... I think there’s a lot of that that goes on. There’s a real attraction to being out there and visible.122
The DNR was clearly in a difficult position of receiving valuable support from the EPA — both financially and strategically — which had the potential to conflict with their immediate plans. Ultimately, the attempt to maintain relations with National EPA in fact became another impediment to the DNR’s learning process.

**Shifting Directions**

After BRAT Co. had already engaged a lengthy process of defining their goals and outlining their environmental management programs, for almost a year, the group decided to alter their original organizational direction:

D: I think that the BRAT Co. has redefined itself. ... early on in the pilot project life, we had heard that EMS is really the way the department is going to be working in the future. In other words, “we’re going to try to take EMSs throughout the agency and see where we can apply them and this is the work that we’re going to be doing.” Since that time we’ve had an appointment of a new Secretary, and what I have seen is that these are just pilots and we aren’t really making great strides to take this department wide and there’s a lot of issues there with... working through cultural issues, and change and “is this the flavor of the month?” as far as what management wants to do or whatever. And so during that time, after we saw where things were going, BRAT Co. kind of realigned itself and said, well look, we don’t have control over some of these processes that we’re trying to influence — casting, permitting, rulemaking. We don’t have control, even though the Department is really bearing the brunt of the cost and really putting this all together, there are other people that are in control of those processes and we have not set this up so that we’re saying, “ok, this is going to be all about changing rulemaking and permitting.” ... after we realized, “well if we want to reduce benzene emissions by 30%, we only have, you know, how many foundries at the table? All of 4 foundries at the table.” Granted a lot of them are the larger foundries. But for them to say, “we’re going to reduce 30% of our benzene emissions by such and such a date” and what they were first saying, and I got some clarity on this, at first I thought they were saying, “well, these 4 foundries are going to do (it)” and that’s great, but no, it was like, “no, we want to do it for the entire industry.”

E: Who said that?

D: The BRAT company members (did)...(then they asked,) “what influence does an environmental manager or Brian Mitchell have over each and every foundry from largest to smallest in the state?” ...and they don’t have any control over that – so that’s when the realization was that all we can do is that we can educate people – we can show them what we’ve done, we can show them what their options are, we can show them how they can create an EMS, but you’ll have to just let them do it for themselves and we have to, obviously, demonstrate the benefits that we have received from doing an EMS. ... I feel that it’s a more accurate definition of what we really can do because...the BRAT Co. isn’t supervising permitting, rulemaking and casting in the state. And so what it comes up to is that this is a group that has some boundaries to it and hopefully it has some definition and roles and responsibilities. And we’ll continue to report to our managers, through the management review that is periodically conducted. And also through more frequent updates, what the progress is and where we’re headed, but that’s really where we’re at now.
In this discussion of the evolving role of BRAT Co., the members explore the question of control – a central theme in the development of the group. In doing so, they confronted expectations and assumptions carried over from command and control regulation. By acknowledging the limits of BRAT Co.’s control over processes like casting, permitting, rulemaking, and BRAT Co.’s lack of control over other foundries, they found new meaning for control and scope for action in redirecting their efforts. By relinquishing a need to control, in the post-“command and control” mode, BRAT Co. members recognized a different capacity for influence as part of a network of actors shaping the processes involved in the foundry industry. They needed to work through this network, not against it. The recognition that the WCMA nor BRAT Co. can’t control all the foundries in the state, nor can all the foundries directly participate in BRAT Co., reflects a new understanding of regulation and innovation.

The limits on direct “control” over the smaller foundries in the state didn’t mean that BRAT Co. was without influence. The large foundries that were represented on BRAT Co. had a unique relationship with the other facilities. One DNR staff person explained this dynamic:

E: Well what about the other foundries (not in BRAT)? ...are these the leaders (in the industry) here (at the table)?
D: They’re also the biggest. 4 of the 5 biggest. ...Coincidental.
E: Is there a concern about the other ones? What’s the relationship?
D: One of the other interesting things that came out of this previously, is that there’s a significant cost savings to the individual foundry by reducing the amount of resin you use in your cores, the raw materials in your green sand. So it will make the foundry more profitable. And there appears to be a fraternity here that the larger foundries know they have the research or the ability to do research and then pass it on to the smaller foundries, and make the industry in Wisconsin a little more able to withstand the downtimes like we have now.
E: Now how does that happen? Is this an agreement between the larger and smaller foundries or is it just an understanding...?
D: That control technology does cost some money. That would be up to the individual foundry to realize that. However, it’s interesting to see how critical, just the smallest amount of change in the mold sand in the core, can start making casting defects. So it’s the experience of the larger foundries that they will try and train or guide the smaller foundries to avoid the some of the same mistakes. Because the sand systems that we’re talking about with these bigger foundries, are 6-700 tons of sand an hour, that goes through, any change you make takes quite a while to start showing up and then if they can document what type of casting defects that they’ve run into, based on what changes they made, well...
E: That’s unusual...it seems that there’s usually no incentive for the larger firms to do that or the smaller ones to follow...
D: A lot of the industry, all the foundries have to get to their niche already, so there isn’t quite the competition anymore.123a
The fraternity among large and small facilities thus smoothes the process of transferring acquired knowledge about source reduction and substitutes for BRAT Co.’s lack of influence among the other foundries in the state.

The issue of control has been a challenge for BRAT Co. because their sense of ownership and value in the process is tied up in their sense of autonomy or lack thereof. Their reflections on BRAT Co.’s relative autonomy reflect the organizational ambiguity that often accompanies change:

…it’s like (the DNR) created this organization which has good things and bad things about it because in some ways, I see a certain amount of pride when Brian Mitchell’s says “BRAT Co….” On the other hand, they continue to struggle with what they are as an organization and I am relatively concerned that because they see themselves as separate -- will they lose their effectiveness? will they be more effective? …They’re not really completely separate, I mean sometimes they call themselves the BRAT Co., but you know mom is still there, you know what I mean? Dad’s a little absent, but Lloyd is taking ownership of this, so it’s not really a BRAT Co.. But maybe we’re in the place where it’s a front and we’re not really testing out if they’re completely separate, I mean if they were free, maybe they’d be great, so I don’t know…

The reference to upper management as parents suggests that BRAT Co. is in a child-like stage of development and is not yet able to go off and make decisions or act independently. During the EMS process, the group’s quasi-government and rather marginal status in the agency ultimately undermined their ability to make autonomous decisions. Although BRAT Co.’s purpose was to develop processes and means to improve and manage benzene emissions, it was unclear how the group’s recommendations would be integrated with the management of the DNR. Despite the group’s commitment to forming a common identity, BRAT Co. did not have the authority to make independent decisions about rules or regulations. While this may have altered their original course of action, this lack of authority may also represent the agency’s response to concerns about the group’s legitimacy and co-optation.

The issue of control became explicit during a BRAT Co. meeting in which members discussed the need for third-party certification. BRAT Co. had decided to omit third-party certification as a requirement for its EMS, but when the DNR staff consulted with a representative from the Sierra Club, she was not pleased. So when the DNR came back to BRAT Co. and presented the representative’s concerns about omitting third-party certification, a few of the BRAT Co. members were vaguely perturbed and started questioning the group’s purpose. One member from the WCMA posed the question that if the DNR is just going to turn around and change an agreement in the group, then what was the use of wasting everyone’s time
making recommendations? This concern, again, reflects the persistence of traditional roles and responsibilities assumed by command and control regulation. Here, the assumption was that the locus of interaction would remain between the DNR and the WCMA. Thus while the DNR was attempting to widen the circle of the community of inquiry by soliciting input from the Sierra Club, members of the WCMA perceived this move as a disregard of the group’s purpose.

The discussion of third-party certification also touched on the issue of reflexivity – at what point does the script stop being revised? While the process of revising and revisiting goals and ideas is important, at a certain point, the flexibility of regulation must be implemented in some form. In the case of third-party certification, there had to be a response that was written into the rulebook. It’s not possible to continuously change all the rules of compliance. One DNR representative explained this problem in an interview:

...So the power, control issue...has been really dodgy. And they’re not sure how to...better manage it, but it keeps coming up and up. And I think you just have to dance with this one and I think it’s a really tough issue. But a thing to improve on would have been making it clear, about and on your representing an interest...and this group is in charge of implementing the EMS, but when it comes to issues of policy or negotiating agreements, you need to take into consideration the interest of each organization and not just this BRAT company. At the beginning, everyone was told to throw away their business cards and take new business cards that all say BRAT Co., right? Well that’s kind of a naïve or immature way to negotiate, because to say we all are one, we’re all throwing away our cards...in a certain sense that’s true, but you also have to represent your interests...

Perhaps rather than being “naïve,” the process of forging a common identity represents a willingness to work together in light of differences, rather than obscuring them.

That first meeting was a great one to observe, the first one, because it all got on the table. Because we had been upper-midwestern about the fact that we don’t want conflict and we just want to be one company working collaboratively and we forgot about that there were interests and needs that needed to be brought out and so we did kind of subvert those until later and then (a foundry industry representative) said, “Hey?! This feels like we’re getting the shaft” and people were like, “What do you mean?” So it took an awful long time for that to surface. So that, I think there were two ideas there. One is the power of control of the group and how decisions are viewed outside and the relationship back in and the second one is needs and interests and how those are represented in the group. Both, I think need to be improved. We worked them out, I think they’re very largely finished now, but it’s taken us a hell of a long time to flog through it.

The group’s struggle with issues of control and reflexivity reflects how engaging a process of innovation forces an organization to confront its past practices.
Charles Sabel, in his article, “Constitutional Ordering” describes the ongoing revisions that BRAT Co. members experienced as a central characteristic of reflexive cooperation:

...trust-based governance structures have rich, consultative institutional structures whose very existence belies the assumption that the agents expect their actions automatically to be harmonized by a confluence of belief. The central effect of these institutions, moreover, is to blur the line between policing behavior and articulating consensus that all-or-nothing views, draw to distinguish systems presuming opportunism from those presuming trust. They do this by allowing the parties to monitor one another's behavior while encouraging them to jointly reevaluate their situation in the light of these observations and adjust their reciprocal expectations accordingly. Constitutional orders thus constantly recreate themselves in the sense that their operation reinvokes, by redefining, the consensus on which they were founded.  

When regulatory agencies work closely with industries, a common concern is whether the agency will be co-opted by the industry. This assumes that the choices are co-optation or control. A joint entity like BRAT Co. refuses to accept this dichotomy and seeks instead to overcome challenges by building a “trust-based governance structure(s).” The commitment to develop a shared vision or goal doesn’t require the agency or the industry to abandon their interests. These interests provide the stake that sustains their attention. At the same time, attention to interests can work against change. “Once a shared vision starts to take root, you might think that game playing and politics would take care of themselves, dissolved by the mutual commitment behind the vision. Sadly, this view often turns out to be naive. No matter how committed people are to a shared vision, they are steeped in the habits of game playing and still are immersed in a highly politicized organizational climate. (Just because a few people start to build a shared vision, the larger organization does not immediately change.)” This creates the need to construct an environment “where self-interest is not paramount” and openness is possible.

...both the norm of speaking openly and honestly about important issues and the capacity continually to challenge one's own thinking. The first might be called participative openness and the second reflective openness. ... When managed with sensitivity and persistence, building shared vision begins to establish a sense of trust that comes naturally with self-disclosure and honestly sharing our highest aspirations. ... Organizations that fail to foster genuinely shared visions, or that foist unilateral visions on their members and pretend that they are shared, fail to tap this broader commitment.

This may explain why the issue of control arose after BRAT Co. had been meeting for several months. It is hard to sustain this sense of “openness,” as entanglements with “political” roles surface and resurface. While representatives from the DNR relinquished their “regulator” hat, WCMA members experienced difficulty with their new roles, particularly at the end of the day, when they have to report back to their facilities or corporate parents.
To search for understanding, knowing that there is no ultimate answer, becomes a creative process—one which involves rationality but also something more...This...is the state of being open. ... Openness...is a relationship you have with others. Openness emerges when two or more individuals become willing to suspend their certainty in each other’s presence. They become willing to share their thinking and susceptible to having their thinking influenced by one another. And...they gain access to depths of understanding not accessible otherwise. ... When small groups of people (as few as two or three) become deeply committed and open they create a microcosm of a learning organization. This microcosm not only teaches them the skills they need but also become a model for others.

While BRAT Co. was moving toward achieving this model, it was clear that they, or the rest of the agency, were still caught up in vestiges of the command and control era. As a result they were unable to completely relinquish old roles and assumptions about how collaboration would occur.

**Stakeholder Involvement**

One of the persistent questions in models of organizational inquiry is participation. Here the challenge of openness is expressed tangibly. While BRAT Co.’s membership is not fully consistent with Schon and Sabel’s characterization of a diverse community of inquiry, BRAT Co.’s assembly signals a movement towards collaborative processes of learning and problem-solving. The absence of local environmental or community group representatives at the table may be interpreted as an effort to limit participation with tangible effects on BRAT Co.’s legitimacy. As I have shown, it may also be understood as a boundary in the efforts to reflect on its own practice. While the DNR leadership approached several environmental groups prior to the start of BRAT Co. and consults with them on a relatively regular basis, they decided not to invite representatives from environmental groups to the table.

...a conscious decision was made to do it just with industry. Now I think Mary Jo’s idea was that BRAT Co. themselves would be more active in reaching out to other stakeholders, and for whatever reason, we haven’t seen that occur. It could be that they just don’t have the resources to do that and I haven’t really seen them go out...Mary Jo I think was instrumental in getting that MOU talked about with some of the environmental groups.

A DNR staff person reflected on BRAT Co.’s level of stakeholder involvement:

I definitely think the concept (of BRAT Co.) is great. You know it would be a stronger concept in my mind if it had included environmentalists at the table. It really would have gotten the dialogue going. But the Air Program, which didn’t have much in the tradition of working well...they had a pretty antagonistic relationship with their regulated community....Well I’m spouting this second hand from what I hear from (a DNR representative), so I wouldn’t consider it necessarily a fact, but it was her impression in working with both the Water and Air Programs that the Water Program...had a much more
helpful relationship with its regulated community than the air program. ...that’s one of the very strong benefits Mary Jo sees for the air program, that it’s starting to get some of the staff from the DNR, going, “oh, we can actually sit down at table with people and work with them together jointly rather than be fighting over conditions in a permit.” So...I have a much better feeling about that, but from what I hear from her, she considers that it was ongoing – the EMS started, the BRAT Co. started and that helped set the new direction for staff, but it’s still an issue in the Air Program. 136

Despite the Air Program’s decision, not all of the pilot EMS programs at DNR functioned in the same manner. For example, the waste program solicited input from a wide variety of stakeholders. As described in an interview with a DNR staff person:

D: The waste program decided to use another model which is ... we were going to get external stakeholder input into theirs but it wasn’t going to be very much in the department. ...They got a broad representation of people who may be affected by the waste program, so they got some private industries, like utilities, they had an environmental group, they had a county person, they had a broad representation of citizens.
E: And what were they dealing with, when you say waste management?
D: They were trying to solve the issue of how do we change our vision of what our program should be accomplishing to meet the current needs of the state related to waste. It all just sort of transformed from we landfill everything, to, we manage waste. And it’s very interesting for me to hear that... I think a lot of it might be a fear of what might come out the waste thing. I don’t know how they’re actually doing things. I don’t know how they’re actually doing things, but they’re pretty thoughtful in terms of involving people.137

The following interview with a DNR representative describes the foundry’s view of stakeholder involvement given a rather sticky experience with a public meeting for a foundry expansion permit:

E: Do you think that the foundries don’t like working with stakeholders generally?
D: I would agree with that, because it’s so explosive and the emotions run high. I was in a public hearing for (a) foundry permit and it was very emotional. People getting up on the stand and talking about neighbors that had cancer and children that had cancer, and one woman was crying...Somebody had called people and it was mostly teachers. It was in the summer and a bunch of teachers came. So these are people who are fairly well educated.... Somebody had told them that the limit was 300 lbs/yr. and that we were having a variance so that (the foundry) could emit 15,000 lbs./yr of benzene. So that was not the case at all. There’s not a limit. It was a de minimus value that they were over, that kicked in regulation. And to try to explain 15,000 lbs./yr translates into a concentration which is below concern was really difficult. So the 15,000 lbs/yr. when we did a modeling of it, was, I can’t remember the exact concentration, but I think it was .2 mg/liter, which was below the threshold limit value of 5 or 20, I can’t remember now.
E: ...but basically it was ok that they were emitting 15,000 lbs/yr. basically.
D: Well per our regulations, yeah. But that’s not going to make the public feel better....So it was very adversarial and very emotional and I’m sure that (the foundry) just hated all that and they hated all the publicity. So they’re always afraid I think when they work with the stakeholder group, that it’s going to turn into this emotional thing. And I also like to
stick with the facts. But I also feel like if it were my town, I would be concerned as well.
E: So what was the upshot of that? What did (the foundry) do?
D: Well I addressed all the comments, which I have to do for the permit, and there were about 25 pages of comments that I addressed and convinced myself and I guess the public, because they never participated again. … our public comment system…gives the public the perception that they have control over issues that they don’t…because really the only comments that matter to me are review comments: did I review the permit correctly or not? Does it meet the regulations or not? But most of the comments you ever get are more issues of zoning, or “I don’t want this company to expand here”, “it’s noisy”…a lot of issues that we don’t have any control over…E: Aren’t there other (government representatives) at that permit meeting…?
D: Usually it’s too late, by the time we’re writing the permit…they’ve already gotten their zoning switched….Yeah, we don’t do that stuff together so the public gets very irritated about it. And we feel helpless in a lot of situations too. That has always been a problem, with our program, and that was one of the things that that efficiency study was supposed to address… and the other thing in this particular hearing was that the public found out about the hearing the day before. Even though there had been a 30-day notice of the hearing. It was just in the paper once and nobody heard it and the news media of the area had not chosen to really report on it. So there’s the perception that we’re trying to sneak something through, and there’s all this distrust.
E: That’s really hard. So did the…foundry respond to any of the concerns about the cancer?
D: Well (the foundry) didn’t respond, I responded to all that. And I sent each individual that commented a copy and I never heard anything else. So I sort of think, oh, great, my response made them happy, but actually that’s probably not what happened. They just said, oh we can’t get through this bureaucracy and are further frustrated. And have gone to the Sierra Club for help, or whoever.
E: Do you work at all with the public health agency in the state?
D: Yeah, I did actually talk to the public health guy about, people had concerns about children, about asthma, so I talked to him and I quoted him in my response. But it’s not formalized and …I had to initiate that…I do believe though that they can comment on our permit.
E: Has that ever happened?
D: No, I’m sure they don’t have time. And the public has asked for a couple cluster studies, of cancer…. And (the public health agencies) have in some cases, but they usually just say, no, there’s no way to prove it….You know just talking about this, this frustration in doing this is why I think I really stick with this EMS stuff, the group, even though I think it’s a long shot that these things will get implemented, it seems to me to be the only way to address these things that I can’t get to through the regular permitting process.138

This story illustrates the ineffectual precedents that shaped the foundries’ understanding of a constructive public dialogue. In this light, it is understandable why the foundries would not want to involve community members in the BRAT Co. group. Despite this shortcoming, the interview above suggests the BRAT Co. process will help the DNR to get to “things that are beyond permits”, like stakeholder involvement. This comment is reminiscent of Sabel’s critique
of command and control regulation: “...under complex and changing conditions, problems just outside the regulated zone will frequently turn out to be just as significant as those within it...” Thus for BRAT Co., at this point in time, the group was not ready to extend the breadth of participation to other stakeholders:

E: ...in terms of the stakeholder involvement, do you think it would be feasible to have a stakeholder at the table, during BRAT meetings?
D: I was kind of disappointed that we didn’t, when we first formed the group, but I don’t think that the foundries would ever agree to that. There’s too much distrust....On both sides. I don’t think they would talk, I don’t know, it’s too bad that they’re not, because that would really give us some credibility with the environmental groups that we don’t have, and that we’re going to struggle with. (We meaning BRAT.) And it was even brought up...there’s a big printers group...which was put together to come up with rules and regs to cover lithographic and printing, where there’s a lot of air pollution in southern Wisconsin...and there were no environmental groups in that group and the environmental groups always pooh-poohed it as just being DNR in bed with industry, once again. So I still worry that this group will be perceived as that same thing.139

The level of distrust between the foundries and other stakeholder groups was clearly an impediment to the group’s ability to engage a diverse “community of inquiry” precisely because this inquiry inevitably involves questions about the roles and responsibilities of the state, the firms and even of environmental groups – not just the particulars of foundry practice – and these cannot be addressed in a narrow circle of stakeholders.

In January of 2001, at least 6 months after their meetings began, these issues became explicit when BRAT Co. drafted a Stakeholder Involvement Plan. According to the draft, the “key stakeholders” were the WCMA, the DNR EMS Core Team, and the DNR Secretary and Deputy Secretary. Other stakeholders included: foundries; foundry suppliers and CERP testing facility; Environmental/Foundry consultants, academics, and the American Foundry Society; environmental groups; DNR Staff; EPA; and the general public, neighbors and communities. The draft plan outlined the significance of each group under each stakeholder group. For example under Environmental Groups, the report stated: “This stakeholder group may be the most suspicious and nervous about the BRAT Co. and the ensuing EMS. Thus, they could interfere with the process if their needs are left unaddressed. They need to be kept informed of progress and have their concerns addressed where practical. If they become comfortable with the BRAT Co. EMS, the EMS will be more credible. They have a particular stake in the rule making and permitting aspects of the EMS.”140 Later in the report, under Environmental Policy Statement, the report indicated that “Objective 1” was to ask for review and approval from the “key stakeholders” while “Objective 2” was to “let all stakeholders know what the statement is.”141 This distinction between “key” and “other” stakeholders reflects a minimal level of
public participation. The agency and the industry representatives are only “stakeholders” in so much that they are the central players in the process. Thus while BRAT Co. has created a common identity, their sense of “other” is circumscribed by their inability engage a wider cast of characters in their efforts. Nonetheless, the report does indicate that the group should solicit input from other stakeholders, such as environmentalists. Under the category, “Defining Objectives and Targets,” “Objective 3” is to “Try to address the concerns of those who may be skeptical or nervous. Ask them to review and tell us their reactions and concerns.” Under the next category, “Delineating Action Steps,” “Objective 1” was to “…gather information upfront from affected stakeholders about current processes. Ask them what works and what doesn’t in the current processes…” Therefore while the process provides a few points of interaction with stakeholders outside the DNR and the industry, these points provide only limited feedback. In practice, these guidelines could amount to very little, especially given the section about how the group only need address stakeholders’ concerns “where practical.” If the group could justify that it wasn’t practical to address certain concerns, then only “practical” concerns, i.e., concerns that wouldn’t cause the group to radically change their course of action, would be addressed. This is perhaps the biggest challenge of extending the boundary of public participation in BRAT Co.. If participation only occurs once decisions have been made, managers won’t necessarily heed to significant critiques. In this sense, broader participation at present represents a kind of “single-loop learning” process. The plans themselves represent a marginal adjustment and the arrangements provide a way to merely respond to errors. The unmet challenge of engaging “double-loop learning” with regard to participation lies in the need to apply the lessons learned from reconstituting the DNR-WCMA relationship, to the relationship between BRAT Co. and other stakeholders.
Chapter IV: Summary and Implications

The Benefits of BRAT Co.

During interviews with BRAT Co. members, they voiced a mixture of optimism and skepticism about the benefits of the experiment and the future of the group. One BRAT Co. member from the DNR viewed their work as laying the foundation for constructing a model regulation for the future:

E: Would it be possible to apply the EMS designed for benzene to other pollutants?
D: I hope so. The biggest part of the permit and the biggest emission that the foundries have, and I think the biggest danger to public health is the particulate matter and if you use the EMS approach, it wouldn’t be the exact same thing, but if you use the EMS approach, it seems to me that all these pollutants would need to be addressed and there would be a benefit.
E: I remember somebody saying that benzene is the smallest pollutant you can “catch”, and that if you take care of benzene, then you take care of other pollutants...
D: Well you would be for volatile organic compounds and other organic compounds, but...and benzene is so hard because it’s hard to fit into traditional regulation, whereas particulate matter fits in very well with our traditional regulation. So I think that’s one of the reasons why they picked benzene. ...well everybody’s used to dust I think, and it’s just now coming out that dust causes so many other problems, so if this thing were only going to ever affect benzene in foundries, I would quit right now, but I think it’s a model for regulation in the future... it’s completely at odds with the command and control style of regulation and we’ve taken that as far as we can and there’s still a lot of health problems out there.\textsuperscript{144}

This enthusiasm suggests what Senge describes as: “…the impulse to generative learning (which) is the desire to create something new, something that has value and meaning to people.”\textsuperscript{145} The recognition that BRAT Co.’s work was “completely at odds with the command and control style of regulation” is significant because it reflects an acknowledgment of the magnitude of change needed to improve the system of environmental protection.

Two other BRAT Co. members felt that an important contribution of their work was to speed up the process of change:

D: …As one of the individuals here (at the BRAT meeting) stated...you have a number of pilot projects: green tier projects, XL, cooperative environmental agreements, you know a lot of those are pushing an EMS now also. … So is EMS the flavor of the month now? …there’s quite a bit of difference between meeting the letter of (ISO) 14001 and having a meaningful environmental management system. So we’re trying to go in the latter...
E: …Do you think that having this conversation around the table is adding value to the EMS process or do you think it could be done a different way with the same results?
D: It probably could be done a different way with the same results, but I think that would be years further in the future.
E: So this is essentially speeding up that process…”
D: I think so. Looking at a sector specific environmental management systems... If we can make this one go...I think you heard people talking about the paper council, you know, there are a lot of big paper plants in the state, so maybe this eases the way for them. It would have made my job a lot easier, I think if it had had a good EMS in place.... I mean I could essentially...turn into an auditor. I would still have the capability in case they forgot something, to (use) a little force, but it would be more of a working relationship rather than adversarial.

D: ...if you can get people into a system where you’re both actively approaching the problem together and you do have roles and responsibilities, and it’s not to say that the EMS might not go away tomorrow, but if you can realize that and have more of a cooperative approach to solving the problem, *I think that’s where the real benefit comes in*, whereas before it was just, well go ahead and do it and what we’re trying to do is we’re trying to go beyond compliance with the EMS. We realize that if we would do it the other way, we could say, “ok, you gotta meet the rule, you have to meet that rule” and that rule was developed through negotiations in the past...so, it’s a middle of the ground approach and we can always achieve greater environmental benefit by going beyond, and that’s what we hope to do with the EMS.

E: And you feel that as BRAT you’re going to be able to go beyond what you would have gotten in just pure negotiations. Is that what you’re saying?

D: Yes.

Here, the BRAT Co. members also recognize that establishing a cooperative relationship with industry is a critical part of the process.

While BRAT Co. members are focused on their own mission and internal EMS development, they also continually track upcoming changes in legislation which have the potential to significantly affect new practices they have worked to develop:

D: ...I do get the feeling that Lloyd and Mary Jo and Darrel are willing to just keep us going forever without seeing results. And I feel like we need to start moving into the meat of it and get results, because my boss does want to see some results, and we’re changing our Hazardous Air Pollutant rule (NR 445), and some people are concerned that once that rule gets changed, a lot of the foundries won’t even be covered by the rule. They’re changing it to a risk-based rule and many of these foundries have many tons of benzene, but they have so much air flow that concentrations are low, and if they do risk base, their risk analysis gets them down below 1 in a million or...they can get out of our rule.

E: So is this then moot?

D: I don’t know, we don’t know then what that foundry would do. If they’re not subject to our rule, are they not going to participate anymore? And my boss was really concerned, when he found out that only about ten percent of the foundries would be left covered under the rule, why are we wasting our time doing that? But I’m thinking, and this is where the optimist comes out, even if they aren’t under the rule, they’re going to be writing an EMS...can we still get the foundries to want to reduce their benzene for other reasons, just to clean it up, just to, for public relations? ...

A DNR representative also pointed to the upcoming changes from the 1990 CAA amendments:
D: The CAA mandates that EPA establish Maximum Achievable Control Technology by industry standard, MACT standards, for hazardous air pollutants and the iron and steel industry is one of those sectors that should have had a MACT standard out. It’s not out yet.

E: It should be out, as of 1980? Or is this something new they just came up with?

D: No, they should have...The latest version of the CAA was promulgated in 1990, and they’re ending the ten-year bend so they’re not real late, but they are late, in doing that. ... And it is going to require additional particulate controls, that’s the guess right now, because no one’s seen it, it’s hard to know. 148a

These changes in policy are example of transitions which call for a closer involvement of DNR upper management in BRAT Co.’s evolution.

Another DNR staff person voiced concerns about whether BRAT Co. had the ability to implement and follow through with its plans:

D: ...one of my dissatisfactions ... or concerns with the BRAT project ... is they’re in a touchy-feely, “we’re shaking hands”, stage, but when it gets right down to it, when you get past that, there’s a certain amount of work that needs to be done, and a certain amount of rigorous work that takes discipline, and I don’t know that the people in the Department are going to sort of belly up to the bar, to actually do that. It’s not the sort of thing that public agencies have done. ... Or do very well.

E: ...meaning they’re not good at following through, or they’re not good at...

D: Implementing. Yeah, I don’t even know if we’re that good at planning, but we’ve spent a lot of time planning, and we really minimize the actual carrying out of the work.

E: And why do you think that is?

D: I don’t know, but I think it’s consistent. I don’t think it’s just in the DNR. I think it’s because people thought they were a government agency and therefore they didn’t have to have the same sort of discipline that maybe a business would because you know, they get paid ... So that’s a big social question... (but) I think (a DNR manager) does see the DNR as a leadership risk-taking organization...

E: And you think that that’s not really the case with the rest of the managers...?

D: Yeah I really don’t think they’re ... I think they’re just the same as all the rest of them.

E: ...It sounds like there’s people who are leaders and trying to do new things, but then you’re saying that at the same time, you’re not sure if they’re really willing to sort of walk the talk. Is that right?

D: Exactly. Talk is cheap. I mean I hate to say that, but I think there’s a lot of people who feel, I think I’m sort of in the middle and there’s a lot of people on the team who see that, and so I’m getting feedback from the team people that they’re not being supported and actually getting the work done. I mean it’s actual work. 149

As with many new initiatives, the challenge of moving from planning to implementation can make new ideas seems unrealistic. So while the above comments are typical of a new project, they also raise legitimate concerns about how organizational routines and support will affect the future. By this account, the DNR management sees BRAT Co.’s work as risky and apprehensions about commitment could be self-fulfilling. The comments about BRAT Co. itself highlight the tension between the process and its outcomes, and the challenge of balancing these two aspects of
learning. The suggestion that BRAT Co. is avoiding the "actual work" disregards the importance of the group's process of development. On the other hand, DNR's measurement of BRAT Co's effectiveness may determine their future investment in the project. Participation in BRAT Co. has prompted reflection and insight into subtle ways in which systemic patterns of practice can disrupt innovation and learning.

... I think we didn't put the resources into it (BRAT Co.) that we should have and I think because of that we've made it more difficult than it needed to be and I am concerned that eventually the project will lose momentum because of that. And I think Brian was alluding to that a little bit in terms of "we didn't know how much time it was going to take." I think we could have been a bit more efficient and we weren't...the department as a whole is not very good at managing projects in the same way as the businesses.

...maybe we let down the foundries in this way, and that, combined with us not following through and making the changes in permits and rulemaking I think would be...I guess I would put the relationship with the environmentalists in there too. I think there are some edges here that have the potential for... giving people maybe a different impression...But on the other hand...I also think that the people on the team...they've been working really hard, and I was amazed at their drive and enthusiasm for the project and I just wish they had been supported better. ...(by) higher managers...and I think then it gets to the point where they weren't providing the resources they needed in terms of simple things like time and skills, but they also weren't providing direction, because it gets back to they didn't know what a management system is in the first place, so how would they provide directions?...and then managers were sort of absent from (BRAT Co.), so as issues came up and questions arose, the managers weren't there to be helpful...In the way I guess you would expect maybe an executive to sponsor a project and to help the team out. And that's not anything personal to (specific DNR managers), I think that's pretty typical of managers in the DNR. They set up a project and then they just kind of take a hands-off and I think people end up spinning their wheels and then they get a bad taste in their mouth and then managers don't know what they're doing after a while. I don't know why all that happens. It seems like a pattern.150

These comments reflect how BRAT Co. has prompted a substantive level of reflection about the process of innovation. They also describe how their leadership—in the form of resources and upper management support—has potentially waned. Other members of BRAT Co. echoed these similar concerns about the support BRAT Co. receives from the Department's leadership team, in light of the fact that they touted BRAT Co. as one of their prize new innovation efforts. One DNR staff described the challenge of managing a process in which the managers weren't familiar with the tool they were expected to use:

I see this in other areas, but one of the biggest problems I have with the EMS is talking to managers who don't know what an EMS is. So there's a knowledge gap and I think (the DNR Secretary) said it to the Department leadership team once, I was laughing, but it was something like, you can't expect to learn trigonometry by showing up at a meeting for two hours. So in my mind, there's not a person on the management team who understands what a management system is. And so they don't understand that, they focus on the things that they do understand, or the things that they see that they like, like for BRAT, they
like the idea of people working together and that’s not really inherent to an EMS. That’s just the way the team was set up and it’s really not anything that’s really driven by the environmental management system. What is driven by it is taking the permit and the rulemaking systems and professionalizing them and improving them so that you can be more effective and I don’t think they knew were biting that off.151

This DNR perspective of BRAT Co. stipulates that the central part of the process is in developing the EMS and improving the rulemaking system, while the “idea of people working together” is actually peripheral to this process. In fact, some DNR BRAT Co. members felt that their relationship with the WCMA and individual foundries may actually be hurting as a result of the challenges encountered during the development of the group. These comments again highlight the tension between a process and its outcomes, but also reflect a potential missing link in BRAT Co.’s organizational learning process. It is entirely possible that the process is suffering because the managers are operating without a sufficient understanding of how EMSs work. On the other hand, it is also possible that their focus on “working together” is not altogether misdirected, but perhaps is the mechanism whereby they may learn how the EMS process work and thus affect changes in the agency.

**Promoting Flexibility**

A common claim in regulatory reform efforts is that new practices will provide more flexibility. Interviews with BRAT Co. members reflected both the benefits and the challenges of infusing flexibility into the regulatory process. According to one DNR representative, BRAT Co.’s work provides the chance to look at rules in a more comprehensive way:

D: (The) DNR, looking at our rulemaking, hopefully we can apply an EMS to rulemaking…and some of our rules are just disgusting.
E: Like what?
D: …there’s no thought (about) what the impact of one rule is on another rule, let alone the transference of a pollutant from one medium to another medium. It’s about time regulators get smart, you know? Why should we have someone throw out… a thermal oxidizer for twenty tons of VOCs when he’s gonna be putting out formaldehyde?
E: And then another branch has to deal with it…
D: Oh yeah, yeah. So I see that as something really good that could come out of this.152

Another noted benefit of BRAT Co. is the tangible improvement of the permitting process:

We worked with consultants from IBM, we did some internal work with a group of managers, setting directions, we’ve had something that was dealing with a variety of industry people that provided us information on mainly our construction or new source permit program and now we have one of our people that is really trying to flow chart the whole process and to make a way of looking at, as an expert system, so that you’re having more consistent decisions and you’re leading everyone through, more or less the same path, because there’s so much with the air rules and the complexity of them and so what you might find is two different engineers are going to arrive at different conclusions.
and so we’re trying to avoid that. 153

Here again we see a balancing between old goals – to maintain consistency and the effort to substantively engage innovative regulatory mechanisms. This balancing acknowledges that “(t)here are limits on how much regulations can be customized to local conditions, institutions, and values without undermining the legitimacy of the regulations. Flexibility may be needed, but there are advantages to having a clear, centrally established standards, guidelines, and accountability. If these are missing, there may be confusion, public misunderstanding, and even charges of corruption.”154 Another BRAT Co. member noted that this flexibility has produced tangible cost savings in the foundry industry:

...the one person from (a) foundry who...did an EMS -- he was looking at his properties and by virtue of looking at the environmental impact, they made some changes in the process that actually ended up saving him a lot of money. So I think he... always promoted it in terms of (that) ...I think this is true for some EMSs, that the more you examine what you’re doing, that the easier it is to make improvements that usually end up in cost savings. And so there’s some that feel that way and I know that...he’s on the team and he’s sold. It’s cause he saw it, in real life, in his company. And I think that their objectives, which are to really get into the sand thing, will end up saving them money and simplifying, so that’s one motivation.”155

Measuring Improvement

As with other regulatory innovations, like Project XL, BRAT Co. has struggled with the challenge of measuring change:

E: ...how are the emissions measured...in the EMS?
D: Our consultants would have said that you don’t ever reduce your goal. What you do is you give yourself more time. So you set a goal, reducing it by 30% in 5 years, and if you don’t meet that goal, then you don’t say, ok, well we’ll reduce it by 10%, you say well we’ll still be striving for that 30%, but we’ll give ourselves another 5 years.
E: But is there a sense that if it’s not reducing at all, that something is wrong? ...
D: I don’t know. Hopefully your audit would show that, I mean if you’re trying everything and not reducing, I think that’s one thing, but I think you can obtain your, keep your certification, but, a good audit should show whether you are actually making changes or working toward that progress. And I don’t know what happens....I would say at that point, you may need to rewrite your EMS, that section of it, to say, we need to look at some other way to get at this.
E: But...in theory a foundry could even increase their benzene emissions. ...it shouldn’t, but isn’t that a possibility?
D: It is, yeah, and that’s one of the big reasons, again, why that permit that I wrote was objected to by the DNR people. It was because there’s nothing in that permit that really set the level that says they can’t go above that and to try to put information for there testing and measuring benzene is so difficult too...to even see progress, we’re even struggling with how they are going to show progress...156
The advice from the consultants that “you don’t ever reduce your goal... What you do is you give yourself more time” runs contrary to arguments on both sides of regulatory reform. On the one hand, it suggests just the kind of delayed regression disguised as learning that critics fear. On the other it dismisses the relationship between monitoring progress and revising goals that is central in organizational learning. Thus BRAT Co.’s challenge of ensuring compliance engages the problematic nature of encouraging regulatory flexibility.

A DNR staff person expressed her concerns about this characteristic of EMSs:

D: ...I think (environmental groups) have legitimate concerns that EMS’s can maybe, there is a potential there for a government to partner up with industry in such a way that is not such a good deal for the environment. The potential is there.
E: And how do you think that that potential would get played out. What part of EMS work ...would allow for that?
D: ...well they did a whole analysis of what are the pros and cons of EMSs and one of the things is that they don’t proscribe a level of performance and so I think there’s a feeling that a lot of the record-keeping and stuff, if it’s not visible to the public eye, it can be sort of a smoke and mirrors game in terms of what people are actually accomplishing.157

Ironically, just after this interview, the DNR confronted this ambiguous relationship between process and outcomes when they encountered resistance in getting specific data on benzene emissions coming from a foundry that had committed to reducing their emissions. A DNR representative explained the dynamic that developed:

D:...(the industry representative) was upset with the fact that he was doing his best to provide information to the department... I think the real issue is that the department was coming back and saying, “No, we need more information, and we just can’t put something into a new source permit that says, ‘follow your EMS’ and ‘you’re going to submit an EMS...and those portions of it that relate to benzene emissions’... you need a specific permit limitation that says, ‘this is the amount of emissions that I’m going to have’ or ‘this is an emission factor: so many pounds per hour, which is the emission rate, and so many pounds per ton of metal core, which is an emission factor.’ And that’s your baseline and if you don’t have that baseline, how can you really understand where you started off from and how can you really understand where you’re at, after you’ve gone on and done some improvements through your EMS”....what (the industry representative) was saying was, “hey I gave you the information related to the EMS” and “we should be allowed to provide something later.” And I think his other concern...was that he wants to get his permit because ...you need (it) before you can start construction, otherwise you’d be in violation of our regulation. ... In this case, since it’s an existing facility, before they bring in any equipment or increase production, they need the permit.
E: So he didn’t want to provide the baseline information about benzene?
D: ...the...permit...did not specify any emission level where they’re at. It just says, as it does in our past LAER variances, that the company is committing to continuous improvement in reducing benzene emissions....from a company standpoint...if I were in (his) shoes I would want to take a limit that I know there’s no way that I’m ever
going to go over, because I don’t want to limit my production. I don’t know... what the company’s president or our corporate parent is going to want us to do, I don’t know what the economy is going to be like, two years from now. And my point is...you’ve had variances in the past. You need to demonstrate the reductions that you’ve made, from that point in time, and you put in where you’re at, right now, based on those earlier improvements, and then let’s see where we go from here. We aren’t putting in a percentage reduction at this point in time, however, this (facility) has committed to being part of this overall 30% reduction and they should be able to help out substantially with that for the entire foundry industry....

This scenario exemplifies the challenge posed by an asymmetry of information in a regulatory environment.

E: ...Would you say that (measuring changes is) going to be a reoccurring issue? ...How do you imagine you’re going to work through that?

D: What we have established in the EMS work is we’re saying that 1999 is the baseline year and so we’re going to be using our air emission inventory and we’re going to look at it and say, what is an overall average emission factor for the foundry industry, and we have to look at that emission factor fairly closely and ask, “does this really mean what we hope it means in that we’re not having an emission factor that is so high that it’s really erroneous and the fact that just doing anything with your foundry process is going to reduce those emissions?” We really need to take into account where we’ve been, so...I believe that we have that contained in our EMS already. I don’t believe that’s going to be an issue. However, wearing my department hat now, I want to make sure that that emission factor is one that is reality or an average reality. It shouldn’t be blown out of proportion so that anything looks good and it shouldn’t be so restrictive so that we’re not going to be able to achieve any reductions from here on in. You’re right, it’s a key issue—you need to know where your baseline is, you need to know where you’re going from and so we’ll continue to work on the permit issue separately.

The idea of creating a solid platform from which the process of continuous improvement could occur was also very appealing to one DNR and BRAT Co. member:

...hopefully we’re designing a system that can first stand strong during trying times but it can also be improved upon and everybody can come back to the table and continuously try to improve, whereas the other process was, “ok, now we have to go and get people together and we have to start talking about this” and ...when you develop something, it was always the department was developing something. You’d give it to someone, they’d respond to it. What we’re trying to do with this EMS is really work together, as joint company members to develop something, and say, “ok is this something that we want?” and really work as stakeholders. And that has created some issues and some problems, because as the BRAT Co. has come to define itself more...we’re a virtual company and we believe that...our mission is to advocate and educate and that’s all based on some good research. And also some good proposals. For instance, what we did with the language for the NR 445 is we gave suggestions to the Department and they’re going to take them and use them however they will. Granted it’s a little bit different in how we’ve done things before, but at the same time, you know, the department can say, “well, thanks but no thanks.”...I think that through the environmental management system, hopefully the linkages and the relationship are going to get stronger and as the trust grows more, and people can see that the ideas and the results are actually there, that we are making
benzene reductions, people might start looking and saying, "well maybe this is the way to go and to form these stronger partnerships and I really do need to listen to what the BRAT company is saying..."\(^{160}\)

This view of BRAT Co. frames the group as a space where a forum of inquiry can gather to pursue joint problem-solving, of the kind that Sabel refers to as “constitutional ordering” or “trust-based governance structures.” Despite this perspective of the group, the endurance and primacy of the regulations within the DNR continues to threaten to marginalize BRAT Co.’s work. The fact that the “…department can say, ‘well thanks but no thanks’…” illustrates the challenge that members of BRAT Co. face as they function within a larger institutional framework.

**BRAT Co.’s Implications**

DNR representatives differentiated BRAT Co. from previous efforts to innovate at the agency:

> I guess the way I see it differently is they were given an extremely hard challenge of coming up with their objectives and setting them themselves…So…we decided we want to reduce benzene emissions and we wanted to make the permits and rulemaking more effective. They sort of started at ground zero…maybe that’s the difference. These other groups, we already said we’re going to do this and then we’ll get together and do it. …it was different for them to have a process to go through, so the EMS process itself, I think it’s a sound decision-making process, so that was different. If they get to the point where they’re actually honestly talking about casting and permits and rulemaking, and honestly being able to talk about where deficiencies or wherever it is they want to improve, and that is at least to the point where they talk about improving the environment from kind of a “what is it we can do?” I mean that is where I think it would be really moving into a new direction.\(^{161}\)

It’s been fun to get the foundry perspective on things. And to hear them talking and to see their side of it. And how enthusiastic they are about it all. And to understand that we are all very similar. On one level we all do almost the same thing, but then when we fall into our jobs, it’s different, because they have to go back to the bottom line and we have to go back to meeting the public and the regulations. That’s been a good thing, I think that participating has done for me. I am surprised by the level of resistance within the DNR because and I think that’s (because) people don’t have any idea what any of this is and what it’s supposed to do or can do.\(^{162}\)

These comments demonstrate how BRAT Co. provided an opportunity to work through an established forum for joint problem-solving as well as an opportunity for the DNR and the WCMA to each learn how the other conducts business. Participants now recognize that, “(f)or policy to work well, it must be based on an understanding not only of environmental conditions, but of the people and institutions who implement the policy and those who have to comply with the regulations and other directives it produces.”\(^{163}\)
This extended case study illustrates the challenges involved in an effort at innovation like BRAT Co.. The DNR clearly struggled to relinquish command and control practices as vestiges reappeared regularly as competing organizational commitments and incomplete frames of understanding. Nonetheless, with the formation of BRAT Co., DNR staff and industry representatives reframed the process of regulation as a process of organizational learning. This step constituted a significant departure from past practices. In following BRAT Co.'s development, we see how policy evolution emerges through a process of organizational change. It is in this context that norms and commitments are reframed. In this light, BRAT Co. is moving toward a form of what Sabel calls “trust-based governance structures (with) rich, consultative institutional structures” that provides an alternative model of regulation as a kind of “constitutional ordering.”

This experience also demonstrates the importance of acknowledging the demands of learning in a process of innovation. It requires substantial commitments of time and money and an effort to establish new forums of inter-organizational interaction that provide openness. The group’s struggle with conflicting demands illustrates the challenge involved in conceptualizing this process and addressing the problems it raises. Concerns about legitimacy, accountability, and trust are still pervasive.

My analysis suggests that the DNR’s commitment to casting a new paradigm for environmental governance through the development of BRAT Co. reflects a constructive movement towards an approach to regulation that embraces the challenges involved in innovation and organizational learning. This is significant in an environment where critiques of government efforts to promote flexibility and cooperation in a regulatory environment have renewed arguments to strengthen command and control style regulation. This study may help reconstitute an appreciation for the challenge involved in innovation and its promise as a means to promote environmental protection.

BRAT Co. runs counter to the general trend where “…the innovative programs that EPA and the states have established have attracted only a few participants and have achieved rather modest overall gains at best.”164 I have tried to illustrate how to see these programs as “‘small steps’ in a larger process of ‘adaptive management’ that lead to larger changes in environmental policy.”165 As Fiorino states: “The trial-and-error efforts of states and federal governments may not ultimately yield findings that would justify a complete rewriting of the environmental regulatory system, but such experiences, especially when carefully studied, nevertheless will inform future drafts.”166 It is essential that we understand the experiences of BRAT Co. and other similar efforts in order to help define the shape of future drafts of environmental governance.
ENDNOTES

4 Personal interview with DNR representative
7 Sabel et. Al., (October/November 1999), emphasis added.
8 John, (1994): 38
14 Sabel et al., (October/November 1999)
16 Ibid.
17 Ibid.
20 Argyris and Schon, (1996): 25
23 Ibid.
26 Wisconsin Department of Natural Resources, Innovation Stakeholder Meeting, presentation by Lloyd Eagen, January 17, 2002.

Wisconsin Department of Natural Resources website on the Metal Casting Sector, Retrieved April 14, 2002 from http://www.dnr.state.wi.us/org/caer/cea/compliance/metalcasting/ar_update.htm


Wisconsin Department of Natural Resources website on the Metal Casting Sector, Retrieved April 14, 2002 from http://www.dnr.state.wi.us/org/caer/cea/compliance/metalcasting/ar_update.htm

For the purpose of preserving anonymity, I have substituted the names of the DNR representatives with the letter “D” and the names of foundry industry representatives with the letter “F” in quoted dialogues. “E” signifies the interviewer.

Personal interview with DNR representative

Personal interview with DNR representative.


Benzene is part of the Table 3A mentioned here.

Environmental Protection Agency, Plain English Guide to the Clean Air Act, Retrieved March 18, 2002 from http://www.epa.gov/oar/oaqps/peg_caa/pegcaa03.html#topic3c1

Plain English Guide to the Clean Air Environmental Protection Agency, Plain English Guide to the Clean Air Act, Retrieved March 18, 2002 from http://www.epa.gov/oar/oaqps/peg_caa/pegcaa03.html#topic3c1

According to Wisconsin Department of Natural Resources legal council, these industries included United Foundrymen of Wisconsin, Wisconsin Manufacturers and Commerce, Berlin Foundry Corp., Grede Foundries, Inc., Neenah Foundry Co., as well as a number of companies who may or may not be foundries: A.O. Smith Corp., Briggs & Stratton Corp., The Buckstaff Co., 3M Co., Motor Castings Co., Pelton Casteel, Inc.


Shutkin, (2001): 105

Shutkin, (2001): 105

Shutkin, quoting Anne Kelly, a former special assistant to the regional administrator of EPA/New England, (2001): 106


Personal interview with a DNR representative.

Personal interview with a foundry industry representative.

Although not directly stated, this statement probably refers to the State Appeals Court’s decision, mentioned earlier, to uphold the Wisconsin Department of Natural Resources’ authority to establish emissions limitations.

Personal interview with DNR

Senge, (1990): xv
Defensive reasoning is a common response to the kinds of stress that signal a demand for learning. Argyris and Schon, (1996): 76.

Wisconsin Department of Natural Resources, Message from the Secretary, July 14, 2001, Retrieved March 25, 2002 from http://www.dnr.state.wi.us/aboutdnr/secretary/bazzell.html


The EPA and the DNR categorize benzene emissions as a “cancer causing” or a “human health carcinogen”:

“The U.S. EPA classified benzene in Group A: Human carcinogen based on sufficient epidemiological evidence, and determined an inhalation potency value of 8.3 x 10 (microgram per cubic meter.) The U.S. EPA estimates that if an individual were to breathe air containing benzene at 0.1 g/m , over a lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer (IARC) classified benzene in Group 1: Human carcinogen based on sufficient evidence in humans (IARC, 1987a).” (California Air Resources Board, “Rulemaking: Benzene as a Hazardous Air Pollutant,” September 1997, Retrieved March 10, 2002, from www.arb.ca.gov/toxics/tac/factshts/benzene.pdf) Until recently, the EPA did not regulate benzene emissions from industrial sources. They were, however, included in the 1990 CAA amendments as hazardous air pollutants and as volatile organic compounds. The 1990 amendments to the CAA also mandate that the EPA establish Maximum Achievable Control Technology industry standards or MACT standards, for hazardous air pollutants. They are due to issue the standards for the iron and steel industry this year.

Based on the equation: mass = concentration x flow.

Personal interview with DNR representative, emphasis added.


Jerry Speir, “The Environmental Impacts of EMS Implementation,” Draft, Tulane Law School,
76 Personal interview with DNR representative
81a Ibid.
82a Ibid.
83 Personal interview with DNR representative, emphasis added
84 Senge, Personal interview with Ed Simon, President and COO, Herman Miller, (1990): 349.
85 Citizens for a Better Environment, John Muir Chapter of the Sierra Club, and Wisconsin’s Environmental Decade, Letter to the Wisconsin Department of Natural Resources, March 11, 1999. Retrieved April 7, 2002 from the Wisconsin Department of Natural Resources website, http://www.dnr.state.wi.us/org/caer/cea/ecpp/epa/comments.htm
88 Skavroneck et al., August 1999
89 Speir, (2001): 199
90 Wisconsin Department of Natural Resources, “Memo from Jeff Smoller to the Green Tier Advisory Committee” (September 12, 2001): 1, Copy in possession of the author.
92 Wisconsin Department of Natural Resources, “Memo from Jeff Smoller to the Green Tier Advisory Committee” (September 12, 2001): 1, Copy in possession of the author.
93 Ibid.
94 Speir, (2001): 216
95 Personal interview with DNR representative
96 Personal interview with DNR representative
97 Personal interview with DNR representative
98 Personal interview with DNR representative
99 Personal interview with DNR representative
Personal interview with DNR representative
Personal interview with DNR representative
Personal interview with DNR representative
Personal interview with DNR representative
Personal interview with DNR representative
Personal interview with foundry industry representative
Personal interview with foundry industry representative
Personal interview with foundry industry representative, emphasis added
Wisconsin Department of Natural Resources, Innovation stakeholder meeting presentation by Lloyd Eagen, January 17, 2002. Copy in possession of author.
Wisconsin Department of Natural Resources, Innovation stakeholder meeting presentation by Lloyd Eagen, January 17, 2002. Copy in possession of author.
Personal interview with DNR representative
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Personal interview with DNR representative
Third-party certification is a process whereby firms may hire contractors – from outside a regulatory agency and the firm itself – to certify that their management systems comply with EMS standards. “It is intended to ensure that all elements specified by the standard are in place, employees are aware of their roles and responsibilities, and the system is directed toward achieving the goals the organization has specified for itself in its policy and objectives.” (Coglianese and Nash, 2001: 68-9.)
Personal interview with DNR representative
Personal interview with DNR representative
This reality is markedly different from the environment to which Senge refers in his discussion
of “openness.”

133 Senge (1990): 284.
134 Mary Jo Kopecky is the Air Branch manager at the DNR
135 Personal interview with DNR representative
136 Personal interview with DNR representative
137 Personal interview with DNR representative
138 Personal interview with DNR representative
139 Personal interview with DNR representative
141 Ibid., 3
142 Ibid., 2
143 Ibid., 2
144 Personal interview with DNR representative
145 Senge, (1990): 286
146 Personal interview with DNR representative
147 Personal interview with DNR representative
148 Personal interview with DNR representative
149 Personal interview with DNR representative
150 Personal interview with DNR representative
151 Personal interview with DNR representative
152 Personal interview with DNR representative
153 Personal interview with DNR representative
154 John, (1994): 278
155 Personal interview with DNR representative
156 Personal interview with DNR representative
157 Personal interview with DNR representative
158 Personal interview with DNR representative
159 Personal interview with DNR representative
160 Personal interview with DNR representative
161 Personal interview with DNR representative
162 Personal interview with DNR representative
Appendix I: List of Interviewees

Interviews were conducted with the following individuals:

Patrick Kirsop, DNR and BRAT Co. representative, March 5, 2002
Suzan Lindem, DNR and BRAT Co. representative, November 1, 2001
Sue Hoops, DNR representative, January 18, 2002
Darrin Harris, DNR representative and BRAT Co. facilitator, January 16, 2002
Kristin Hart, DNR and BRAT Co. representative, January 16, 2002
Mike Sloat, DNR and BRAT Co. representative, October 31, 2001
Brian Mitchell, WCMA and BRAT Co. representative, January 16, 2002
Anne Neudorfer, WCMA and BRAT Co. representative, January 15, 2002
Jeff Loeffler, WCMA and BRAT Co. representative, October 31, 2001
Liz Wessel, Director, Wisconsin Environmental Decade, January 18, 2002
Appendix II: Glossary of Abbreviations

BACT: Best Available Control Technology
BRAT Co.: Benzene Reduction Action Team Company
CAA: Clean Air Act
CERP: Casting Emission Reduction Program
DNR: Department of Natural Resources
ECOS: Environmental Council of States
EMS: Environmental Management System
EPA: Environmental Protection Agency
GETF: Global Environmental Technology Foundation
HAPS: Hazardous Air Pollutants
HCGIH: American Conference of Government Industrial Hygienists
IARC: The International Agency for Research on Cancer
ISO: International Organization for Standardization
LAER: Lowest Achievable Emission Rate
MACT: Maximum Achievable Control Technology
MOA: Memorandum of Agreement
NR 445: Wisconsin’s Hazardous Air Pollutant rule
OSHA: Occupational Safety and Health Administration
VOCs: Volatile Organic Compounds
XL: Project XL
WCMA: Wisconsin Cast Metals Association
References


Wisconsin Department of Natural Resources. September 12, 2001. “Memo from Jeff Smoller to the Green Tier Advisory Committee.” Copy in possession of the author.


