CREATING A LINK BETWEEN REGULATORY DEVELOPMENT AND TECHNOLOGY DEVELOPMENT

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ABSTRACT

As agencies of the United States Government, both the Department of Energy and the Environmental Protection Agency share common responsibilities for protecting human health and the environment. The DOE must generate, store, treat, and dispose of regulated wastes in a manner compliant with established regulations. The EPA develops and enforces these regulations to the extent authorized by the U.S. Congress. It is important to realize that existing regulations and statutes do not create a risk free environment. While the goal is to ensure protection of human health and the environment, there are limits to this protection based upon economics, existing technical capabilities, as well as our ability to measure and predict risk.

It is these limits that the DOE and the EPA have agreed to attack. Through the development of new technologies in conjunction with modifications to the existing regulatory structure, the DOE and the EPA have agreed to share the knowledge gained through collaborative efforts to improve the current system. The Memorandum of Understanding signed by the DOE and EPA in February of 2000 is expected improve both the process of developing new technologies as well as allowing for development of better regulations.

INTRODUCTION

The EPA bases its compliance standards on establishing an acceptable level of emissions typically associated or demonstrated by a specific type of technology within a specific industry group. These specific technologies, whether they be process or control technologies, tend to become standardized throughout an industry. While incremental improvements may occur, there is typically little radical change within this process. These technologies may or may not be capable of reducing risk to desired levels.

However, the EPA has recently been requiring some facilities to conduct site specific risk assessments to ensure that the standardized acceptable emissions levels are indeed protective of human health and environment. These risk assessments have on occasion found that the commonly accepted emissions standards are not acceptable and that more efficient processes or control technology may be required. This provides a challenge that drives industry and technology developers to pursue new treatment processes, new emissions control technologies, or to limit or eliminate the generation of specific wastes that may no longer have viable treatment alternatives.

Conversely, when industry including the DOE develops new technology to meet these new demands, there arises an opportunity for the EPA to assess whether these new developments represent a new regulatory opportunity. If these new technologies are broadly applicable to a specific industry, the EPA may consider whether is sufficient reason to require this new technology for other facilities. Some of the considerations that enter into this type of decision include cost, ease of retrofit, residual risk, and facility turnover.

The DOE on the other hand must comply with the environmental standards established by the EPA. The DOE ships some of its waste to commercial facilities. However, there are wastes generated by the DOE that do not have commercial options available. The DOE has constructed treatment facilities for some of these wastes while attempting to entice commercial facilities to develop new options for the treatment of other wastes. DOE is subject to environmental regulations and has signed up to numerous compliance agreements that require the treatment of mixed wastes by certain dates. Because of these commitments, the DOE is a very interested observer in assessing the availability of treatment capability and capacity for mixed waste in a very limited market.

In order to maintain the viability of this treatment capacity, the DOE must remain cognizant of potential changes that may affect the ability of these facilities to assist the DOE in meeting its commitments. If these potential changes are being driven by changes to the regulatory framework for these facilities, the DOE

must work with those facilities to ensure that the capacity remains available. These changes may demand improved processes, better control technologies, or totally new processes. The DOE should not wait until new regulations are issued demanding crisis response, but should remain cognizant of the regulatory development process and be prepared to implement new technologies to meet the new challenges.

CREATING THE CONNECTION

In order to address these concerns, the DOE and EPA signed a Memorandum of Understanding (MOU) on collaborative research efforts in February of 2000. This MOU was designed to ensure that the DOE considered the EPA's plans for regulatory changes in its technology development efforts. In addition, this collaboration would enable EPA to have an early view of newly developing technologies allowing them to better anticipate changes in the capability of new technology. The early involvement of EPA and State permit writers should enable DOE to better understand the needs of those permit writers and to address them in system design rather than as add-ons to already designed processes. Hopefully this will reduce the overall complexity of developing technologies.

In order to make the MOU a reality, the EPA and the DOE have to meet in open forum and openly discuss their goals and projects to establish common goals and objectives. There must be mutual agreement that there is mutual benefit in collaboration. The EPA must see the benefit in aligning the DOE's environmental research their goals and initiatives. The DOE must also recognize the benefit of EPA providing insight into early experimental design rather than learning about new technologies only after they are thought to be market ready. Only when these agencies recognize the benefit of working together will there be true collaboration.

This MOU has been initiated with four work groups designed to address specific current concerns. These work groups include alternatives to oxidation technologies, particulate continuous emission monitor application to HEPA filtered systems, treatment of high mercury wastes, and an assessment of long term science needs to ensure that the treatment technologies of the future will be ready when they are needed. These workgroups are comprised of DOE, EPA, and State representatives. They are still in the development stage and are limited mainly by funding and time commitments of their members. These workgroups are designed to promote participation by those interested in the specific topic.

ALTERNATIVE OXIDATION TECHNOLOGIES

The DOE is examining alternative oxidation technologies for applicability to mixed waste treatment. For example, the Secretary of Energy's Blue Ribbon Panel recently completed an assessment of alternatives to incineration for the Advanced Mixed Waste Treatment Facility in Idaho. The TMFA will likely evaluate these technologies for applicability to mixed waste and will potentially select and evaluate specific technologies in a series of comparative tests. The DOE needs to factor into these evaluations and studies the appropriate regulatory questions that might arise during their eventual implementation. The EPA needs information and data on the performance of these alternative treatment technologies as potential candidates for RCRA Land Disposal Restriction Best Demonstrated Available Technology determinations with particular interest the fate of metals during the organic destruction. The EPA also needs data on operational parameters impacting performance suitable to establish permit and compliance parameters. This topic includes a broad assessment of all of the potential alternative treatment technologies combined with case studies of specific alternative treatment technologies. Case studies will be used to help the DOE obtain input from regulators to ensure that the right data are being collected and the EPA needs performance and operating data for compliance. The key benefit of managing this project in a coordinated manner is that it will supply key data needed for both the DOE needs and the EPA needs for data on the performance of alternative treatment technologies specifically for organics and the fate of metals.

PARTICULATE MATTER CONTINUOUS EMISSION MONITORS ON HEPA SYSTEMS

HEPA filters are commonly used on mixed waste treatment systems as the last air pollution control device before emissions are released to the atmosphere. As more stringent particulate matter and metal emissions standards are imposed on hazardous waste treatment systems there will likely be more applications of

HEPA systems for other waste treatment units. This area was chosen as an area for EPA and DOE cooperative activity since both EPA and DOE have shared interests in its outcome. EPA has significant interest in defining permit conditions and compliance assurance techniques for HEPA systems that are finding wider applications. DOE has interest in ensuring that HEPA filters are effectively used and reasonable monitoring and robust monitoring systems are developed and employed. Currently there is no direct technique to monitor the performance of the HEPA filters and therefore pressure drop and non-continuous DOP tests are used to evaluate the HEPA systems. A key need is an evaluation of whether Particulate Matter (PM) Continuous Emissions Monitors (CEMs) are applicable for use at HEPA filter equipped locations. The technical workgroup is examining if and how CEMs can be used as a compliance tools or simply as breakthrough indicators. The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University will be leading the experimental efforts to evaluate monitoring approaches suitable for HEPA filters coordinated by a technical work group made up of DOE, EPA and State Regulators. The key benefit of this project is that if it is managed in a coordinated manner, it will supply missing information on HEPA filter performance and monitoring for compliance assurance when applied to waste treatment systems.

TREATMENT OF HIGH MERCURY WASTE

DOE has significant quantities of mixed waste contaminated with mercury and is examining alternative treatment technologies for removing or stabilizing the mercury in the waste. EPA has significant interest in general with hard to treat wastes such as hazardous waste and mixed waste containing volatile metals such as mercury. EPA has emerging regulations on mercury including LDR re-invention and new initiatives such as the mercury action plan to address persistent, bio-accumulative, and toxic (PBTs) compounds such as mercury. In this area EPA and DOE are working together on mercury mixed waste treatment to generate data for both needs. The goals for this cooperative DOE/EPA effort on high mercury waste treatability studies is to develop technical data to support development of regulatory framework to

- Allow stabilization of high mercury mixed waste (i.e., retorting would not be required)
- Allow treatment of mercury mixed with organics without incineration (need to determine highest amounts of organics that could be acceptably co-stabilized with mercury bearing wastes and also not interfere with mercury stabilization)
- Facilitate retirement of U. S. elemental mercury stockpiles
- Support current EPA vision for revised treatment standards for [non-wastewater] mercury wastes.

The first key areas of coordination are jointly defining what to test the treated waste for and what waste matrix to test. The benefits of this coordination project to the regulatory agenda is that it can supply key missing performance data on treatment technologies for hard to treat mercury bearing waste.

LONG TERM SCIENCE NEEDS

Another area where EPA and DOE are examining options for coordination is in the area of environmental science and technology research and science focussed on mixed waste treatment and disposal. Initial efforts have involved the development of an action plan for EPA and DOE for defining options and potential activities for coordination of the long-term science and technology on mixed waste treatment and disposal. The action plan involves the review of literature and advisory board reports (e.g., NAS Panel Reports, SAB Studies and Reports) which have addressed the long range research needs in this area and recommended coordination. A key element of this activity is to develop the specific definitions of research that apply to the coordinated activity (i.e., long term, short term, core, applied, basic, etc.). The next step is to examine different approaches to strategic planning of environmental research and to identify opportunities for coordination of core environmental research at DOE and EPA. It is critically important in this activity to clearly articulate the need for core environmental research to support both EM and EPA activities. Finally the technical work group will develop processes to define specific topics of coordination for longer-term science activities.

THE REGULATORY/TECHNOLOGY DEVELOPMENT EXCHANGE LOOP

It is important to understand the feedback loop that exists between regulatory development and technology development. This interchange underlies the entire process of regulatory development as well as the need for technology development. The following discussion will show how these processes both support each other while meeting the demands of the public.

There are five major players in the world of regulatory and technology development. The first of these tends to be the largest and most diffuse. This is the public. Through their public actions and words, they encourage and demand that Congress and EPA address specific societal goals. EPA's regulatory development staff responds to the public and Congress through the development of new regulations. In addition, EPA responds to their own experts that may recommend action to respond to specific risk conditions. The DOE as well as other treatment facilities then respond with modifications to existing facilities, new facilities, or plans to develop new technologies to either control emissions or develop entirely new processes. These requirements for new technologies are then passed onto technology developers who are responsible for developing new technologies to meet these new requirements. Assuming that these technology developers have been successful, these new technologies are submitted to EPA and State permit writers. These permit writers then must assure themselves as well as the public that the facility can operate in compliance while being protective of human health and the environment. And so we come full circle to the point where the public again evaluates whether they are satisfied with the process. This process is explained in more detail in the following paragraphs.

PUBLIC INVOLVEMENT

One part of the interchange between the DOE and the EPA is the role of public involvement in the technology development. The EPA is charged with the responsibility of protecting human health and environment by congress. But how has the decision been made to focus resources on specific pollutants or industry sectors. Much of the development of environmental legislation in this country can be seen as a direct response to public outcry over environmental calamities. Much of the initiative driving the Clean Air Act can be traced to the Los Angeles air. Stories such as the Valley of the Drums drove development of the Resource Conservation & Recovery Act. Love Canal was certainly a trigger for the Comprehensive Environmental Response & Liability Act. The Bhopal incident pointed to the need for the Toxic Release Inventory. Even today, it is the public that creates much of the demand for change in environmental regulations with respect to dioxins, mercury, and other toxic chemicals. Often EPA's adoption of new regulations is merely the formalization public concern. Regardless of whether regulatory change is driven by public outcry or an assessment that shows unreasonable risk, the typical result is a need for an improvement in existing technology.

Another way that the public becomes involved in the technology development process is the public comment period typically associated with permitting a new treatment facility. The public can take this opportunity to raise concerns over specific issues at the proposed facility. It is the EPA or State permit writers responsibility to ensure that each of these concerns is addressed before a facility is permitted. This is not to say that each concern must be resolved in the way that the stakeholder would necessarily desire. However, the permit writer must be able to say with a straight face that all significant issues with respect to human health and environment have been addressed to the point where there is no unreasonable risk. This often entails the permit writer requiring improvements to either process or control equipment to ensure meeting this goal.

REGULATORY DEVELOPMENT STAFF

The EPA is charged by the people through Congress with protecting human health and the environment. There are at least two approaches that must be considered in developing regulations to ensure this protection. The first relies on requiring emissions to be limited to those levels equivalent to those obtained by the best technology in use within specific categories of industry. The second relies on evaluating the risk involved as it relates to specific emission levels at specific operating conditions under site specific conditions. Typically, the EPA will require industry wide compliance based upon an available technology

with a site specific risk assessment to ensure that those levels are protective with respect to the site specific conditions.

While the first condition mentioned above is reliant upon accepted readily available technologies, the second condition based upon site specific risk can be technology forcing. When it becomes evident through numerous permits that established standard conditions are not being protective of human health and environment, it is EPA's responsibility to address the residual risk that is not typically being addressed by standard emissions limitations. This may require may facilities to seek new technologies to better address the need for risk reduction. Often the first response to this need for risk reduction is to retrofit additional control equipment. However, increased demand may drive solutions that more efficiently address the root cause of the excess emissions rather than applying a tourniquet. These may include feed limits, feed controls, process controls, or new processes.

The regulatory development staff must also remain cognizant of the state of the art of technology development. Many existing environmental regulations were not only based on existing technologies, but also on economics. As new technology is developed, EPA must continually evaluate the potential for improving the current set of requirements. Therefore, once a new technology has been proven superior to existing technologies, EPA must evaluate that technology to assess its impact on the need for regulatory revision.

WASTE OWNERS AND FACILITY OPERATORS

The DOE and other waste treatment facility operators must comply with environmental regulations that are designed to ensure protection of human health and the environment. The generators of the waste are required obtain compliant treatment for their waste. They must be assured that treatment processes have been permitted and are being operated in accordance with the current standards. But because of the limited number of facilities that are permitted to treat mixed waste, DOE is not at leisure to sit back and wait should these facilities not be able to meet ever-changing environmental regulations. Because of the DOE's commitments to treat waste and absence of other players in the market, it is imperative that DOE ensure that treatment technology is available to meet not only today's regulations, but also to ensure that the technology is ready to meet the next generation of requirements.

In addition, the treatment of mixed waste produces unique problems that hazardous waste treatment facilities do not encounter. This need to meet additional requirements often drives the need for more controlled or less energetic systems to meet the public concerns.

TECHNOLOGY DEVELOPERS

Technology developers must respond to two masters. They must understand the needs of the waste owners. They must assess the characteristics of the waste and determine the appropriate way to treat that waste to meet the final waste form requirements to ensure the disposability of the waste. They must design their process to meet their current environmental requirements in order to even hope of getting a permit. Its often at this point where they begin to add equipment on to their system to deal with off gas emissions and other issues. It is at this point where improvements can be made to the system if the appropriate discussions were held with the permit writers to ensure that the permit writers concerns were addressed in system design and not added as an afterthought.

There is a common perception that there is a valley of death for commercializing new treatment technologies. Until the new technology can be proven, there is little incentive within the DOE system for a site to take a chance on unproven technologies. When a DOE site has made legally binding commitments to complete treatment by certain dates they typically will not bet all of their marbles on a technology that does not have a proven track record. In order to combat this perception, the DOE has developed several programs at helping these technologies through this difficult time by funding demonstrations and deployments. However one key problem has remained. Many of these technologies have had only limited interaction with the EPA and/or State permit writer prior applying for that permit. While specific demonstrations may have been observed, there is a whole other world awaiting the technology the first time

it is to be permitted. It should be required for demonstrations to include the review of the demonstration test plan by a permit writer charged with ensuring that the demonstration provided the necessary data to permit the facility.

THE PERMIT WRITER

As noted above in the public involvement section, the permit writer is required to stand up in front of the public and justify why a specific facility is justified in receiving a permit to construct and operate. In order for a facility to convince a permit writer to take this step, a permit writer will often request extensive information especially for unproven innovative processes. This information includes process conditions, normal operating envelope, failure modes and associated causes, emissions, in addition to waste feed limitations. Many of these data requests catch technology developers by surprise by their magnitude and depth of detail. Developers accustomed to permitting processes under the Clean Air Act where the main concern is limited to actual emissions levels are amazed when the RCRA permit writer starts requiring detailed process information and waste characterization information. Again the permit writer is seeking the depth of knowledge and understanding that will allow them stand up with confidence at the public hearing and justify that the facility will be able to operate with causing unreasonable risk to human health and the environment.

AROUND A ROUND TABLE

The first step in getting these diverse groups to work together is to ensure that there is a common understanding of each other's goals and drivers. We must recognize that the other side is not making requests just to be difficult. Each side is working within their paradigm of what they believe is necessary to accomplish their jobs. Allowing the other side to see within your paradigm allows them to understand why the data has been requested or why the request for data is being questioned. Elimination of the us vs. them attitude is critical in working towards a common solution. We all agree that the waste must be dealt with and in a manner that is protective of human health and the environment.

CONCLUSIONS

Recognizing the interdependence of these groups is key to moving the MOU forward. If this MOU is to be more that just a piece of paper, these diverse groups must work together to understand each other needs. It will only be through close cooperation that we succeed in eliminating or even significantly reducing the delays encountered in the valley of death that faces innovative treatment technologies. The MOU is just the first step. Now we actually need to listen to each other and work together to ensure that the ultimate goal of treating the waste while remaining protective of human health and the environment is accomplished.