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Reinventing Regulation of Agriculture: Alternative Performance Standards for Concentrated Animal Feeding Operations

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Concentrated Animal Feeding Operations (CAFOs) are point sources of pollution and require Clean Water Act permits. The 2003 regulations allow Large CAFOs to propose alternative performance standards (APS) that offer equivalent or better environmental performance than the baseline technology. Principal obstacles to APS success include the complexities of demonstrating superior performance, cost uncertainties for obtaining approval, CAFO risks of participation, inter- and intra-organizational barriers of permitting agencies, and potential lawsuits brought by environmental groups. Despite obstacles, APS offers potential for technology innovations and reduced environmental compliance costs.

Key Words: Clean Water Act, Concentrated Animal Feeding Operation, performance standards, permitting, regulation

JEL Classifications: L51, Q51, Q52, Q53, Q55, Q58

Concentrated Animal Feeding Operations (CAFOs) are point sources of pollution under the Federal Water Pollution Control Act, which is popularly known as the Clean Water Act (CWA, 33 U.S.C. 1251 *et seq.*). The federal environmental regulations governing CAFOs were revised by the Environmental Protection Agency (EPA), for the first time in 25 years, in early 2003 (68 FR 7176, February 12, 2003). Approximately 10,500 of the largest CAFOs will require a National Pollutant Discharge Elimination System (NPDES) permit by 2006. Effluent limitations and standards (effluent limitation guidelines, or ELGs) in CAFO permits apply to management and disposal of manure, litter, and process wastewater and generally contain technology-based effluent limits based on specified pollution control technologies and practices, plus additional best management practices (BMPs).

Although land application is the most common form of waste disposal, a land-constrained CAFO may find that the adoption of a technology such as higher-order treatment/utilization technologies used in public wastewater treatment plants is less costly than land application and may be able to demonstrate that pollutant discharges are less than those achieved with standard pollution-control technology. The revised regulations will allow a CAFO to propose alternative performance standards (APS) that will produce equivalent or better environmental performance (less discharge) than the baseline ELGs.

Sweeten, Miner, and Auvermann suggest that the APS approach offers significant opportunities for research and demonstration projects between the private and public sector, including methods and technology to (1) reduce dietary nutrient requirements and nutri-

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ent excretion, (2) improve vegetative systems that reduce loadings to bodies of water, (3) develop treatment systems to convert ammonia emissions to harmless nitrogen gas, (4) improve cost effectiveness and reduce atmospheric emissions of anaerobic digestion and thermal conversion systems, and (5) recover nitrogen and phosphorus byproducts from manure.

For the EPA, APS represents a significant departure from technology-based permit requirements for livestock feeding operation point sources and is a further step in the movement initiated by the Clinton administration to "reinvent regulation." For CAFO owners, APS offers the opportunity to develop and implement site-specific pollution prevention or treatment technologies that might lower compliance costs. As the APS program is launched, critical issues to be examined include the criteria and process that CAFOs must use to demonstrate equivalent or better than baseline performance, the consideration of multiple environmental pollutants and media in permits, incentives to participate, permit and monitoring requirements of delegated permitting authorities, and risks to CAFOs of participation. The focus of the present article is the APS approach and obstacles to its implementation.

Background

The CWA rules that regulate animal feeding operations were last modified with establishment of ELGs for feedlots in 1974 and subsequent CAFO regulations in 1976. Only about 2,500 of the estimated 238,000 U.S. animal confinement operations were permitted before the 2003 revisions, primarily because of state laws limiting the coverage of animal feeding operations and the exclusion of poultry operations with dry manure-handling systems. In 1989, environmental and consumer groups sued the EPA for failing to enforce the CWA in 18 point-source categories, including CAFOs. As part of the subsequent settlement, the Clinton administration EPA issued proposed revisions of CAFO regulations and ELGs in 2001. On taking office, the Bush administration was faced with the task of modifying the proposed CAFO revisions to make them consistent with its own environmental protection approach. In July 2002, EPA issued a Notice of Data Availability that presented a summary of data and comments received during the public comment period. One of three elements of the notice was ". . . the potential creation of alternative performance standards to encourage CAFOs to implement new technologies . . ." (67 FR 7187). Several comments received by EPA contended that the 1974 ELG guidelines, as well as the proposed revisions, discouraged innovation in treatment and pollution prevention technologies by focusing on containment rather than treatment. In response to such comments, the EPA included the APS provisions in the final CAFO regulations, noting similar voluntary options in previous ELG revisions for the pulp and paper industry (40 CFR Part 430).

The 2003 revisions significantly alter both the NPDES permit regulations for CAFOs and the requirements in those permits. Although the scope of the final regulations is substantially less than what was proposed, the number of permitted CAFOs will increase by six times by 2006, and many state environmental agencies will be forced to dramatically increase their permit and enforcement programs. The regulations establish size thresholds and retain existing discharge conditions that define which animal feeding operations are Large, Medium, or Small CAFOs.[1] Large CAFOs are defined strictly by size (see Table 1) and are the only CAFOs affected by the 2003 ELG revisions.[2]

The CWA authorizes the NPDES permit system (40 CFR 122) to regulate point-source discharges of pollutants to surface waters of the United States. In 2001, more than 400,000

[1] Under some circumstances, animal feeding operations may be designated by EPA or the permitting authority as CAFOs. EPA estimates that permits will be required for 10,526 Large CAFOs, 4,452 defined or designated Medium CAFOs, and a small number of designated Small CAFOs.

[2] If animal feeding operations are defined or designated Medium CAFOs or designated as Small CAFOs, effluent limits in their permits are based on best professional judgment of the permit writer.

Table 1. Large CAFO Minimum Size Thresholds[a]

	Number of animals
Cattle or cow/calf	1,000
Mature dairy cattle	700
Veal calves	1,000
Swine over 55 pounds	2,500
Swine under 55 pounds	10,000
Turkeys	55,000
Chickens other than layer hens (dry manure handling)	125,000
Layer hens (dry manure handling)	82,000
Layer hens or broilers (liquid manure handling)	30,000

Source: 68 FR 7191.

[a] One-time capacity at or greater than these thresholds define the facility as a Concentrated Animal Feeding Operation (CAFO).

facilities or sources were operating under NPDES permits in over 50 industries. NPDES permits are granted for no more than 5 years and specify the conditions under which a facility is allowed to discharge into receiving water bodies. Such permits contain effluent limitations, along with record keeping, monitoring, and reporting requirements, special conditions, and standard conditions. Although the EPA is the responsible agency for implementing the CWA, the Agency issues relatively few permits to affected facilities. Instead, most states have been delegated to be the NPDES permit authorities. Currently, only Alaska, Idaho, Massachusetts, New Hampshire, and New Mexico are not delegated to issue NPDES permits through state agencies. As a consequence, a report by the National Academy of Public Administration (NAPA) estimated that 75–85% of all NPDES permits are issued through state-delegated programs. The EPA's own estimates are that only 500 permits will be issued directly by EPA, whereas 15,000 CAFOs will be permitted through state agencies. Delegated states are currently in the process of revising state statutes and regulations to be equivalent to or stricter than federal regulations. For existing operations that are now defined as Large CAFOs, coverage under an NPDES permit must be sought by April 2006. Compliance costs to Large CAFOs are estimated at $283 million per year, and those to Medium CAFOs are estimated at $39 million per year (68 FR 7244).

Incorporated within the NPDES permit are baseline guidelines and standards that define pollutant discharge constraints, required management practices and technology, and record-keeping requirements for CAFOs. Although such stipulations refer to environmental performance, these guidelines and standards are primarily technology design standards that Large CAFOs must implement. Regulation under NPDES has historically been based on such design standards, requiring that permitted facilities follow a prescribed set of production and/or control technologies and practices. Many agricultural BMPs are examples of design standards, such as engineering specifications for the construction and maintenance of animal waste storage systems. Estimates of pollution output reduction are based on engineering studies and not on-site monitoring. Monitoring compliance with design standards is typically cheaper and easier than monitoring performance. Many permitted facilities prefer this command-and-control approach, because compliance costs can be determined with near certainty.

The EPA has established categories of livestock types in the revised effluent guidelines, and there are some differences between the categories. One category includes dairy, beef cattle, and heifer operations, for which effluent guidelines apply to both existing and new Large CAFOs. A separate category applies to swine (including immature swine), poultry, and veal Large CAFOs. Existing operations in the latter category are subject to the same effluent guidelines as new or existing dairy, beef cattle, and heifer Large CAFOs. The EPA made relatively few revisions in existing ELGs for these CAFOs. The baseline ELG remains that discharges are prohibited except for rain-induced overflows from a properly managed facility built to contain all manure, litter, and process wastewaters, plus runoff and storm water from a rainfall event of 24-hours duration with 25-year frequency. For new poultry, swine, and veal Large CAFOs, more

stringent New Source Performance Standards (NSPS) are required. NSPS for these operations will require the containment of manure, litter, and process wastewater, plus the runoff and deposition from a 24-hour storm event with recurrence once in 100 years.

As an alternative to the baseline ELGs, the new regulations include provisions under which a Large CAFO may voluntarily propose to operate new technologies and management practices that match or surpass the pollutant reductions that would be achieved by compliance with baseline effluent guidelines and standards (68 FR 7221). For new or existing dairy and beef cattle Large CAFOs and for existing poultry, swine, and veal Large CAFOs, such proposed technologies and management practices must provide assurance that manure and wastewater discharges from the production area (animal production facilities and manure storage) will achieve environmental performance equal to or better than those expected from the baseline ELGs.

For new poultry, swine, and veal Large CAFOs, there are more stringent requirements placed on APS. For these new CAFOs, environmental performance across the whole farm and across all media (such as air and water) must be equal or superior to the stricter NSPS standards. For both categories of CAFOs, accepted APS would then replace baseline effluent guidelines and standards as enforceable requirements in the CAFO's permit.

APS reflects the EPA objective of promoting beyond-compliance industry examples by setting environmental losses from technology and practices under baseline ELGs as the performance standard. Performance standards may establish a ceiling on pollutant discharges, leaving the permitted facility to determine the appropriate technology or practices to achieve compliance, or they may be extended to provide incentives for pollutant reductions greater than required. With identical limits on pollution output, each facility could seek the most cost-efficient technology or practices to achieve the desired performance. Such standards encourage research and innovation to develop lower-cost methods of reducing pollution. The most significant drawbacks of performance standards involve the difficulties in measuring pollutant output and the related high monitoring and administrative costs of the permitted facility and/or the enforcement agency.

The vision of the EPA is that APS will stimulate technology innovation in the livestock industry such that industrywide pollution control technology moves steadily toward zero discharge standards. It is expected that CAFOs will propose alternative technologies or practices because they will derive monetary and/or nonmonetary benefits. The regulations state: "CAFOs are expected to derive substantial benefits from participation in the alternative standards approach, through greater flexibility in operation, increased goodwill of neighbors, reduced odor emissions, and potentially lower costs . . ." (68 FR 7223). The EPA is considering additional incentives to stimulate participation, including those available through other voluntary programs, which will be discussed below.

CAFOs that request APS for their permits are expected to have a good compliance history and not to be involved in current enforcement actions. CAFOs seeking APS provisions must conduct an analysis of their operation and present a comparison of environmental performance with the baseline standards and the alternative plan. Proposals are to be submitted with the CAFO's permit application or renewal.

Stakeholders and Obstacles for APS

The three primary stakeholders in the APS process are the candidate CAFO, the delegated state permit authority (in 45 states), and the EPA (see Figure 1). The CAFO's interests are to develop and obtain approval for alternative permit provisions that promise net monetary or nonmonetary benefits exceeding those of the baseline requirements. The EPA wants to provide flexibility, achieve beyond-compliance environmental performance, stimulate innovations in pollution prevention and control technology that may later become the industry standard, fulfill its statutory duties, and stay within the limits of agency resources. The

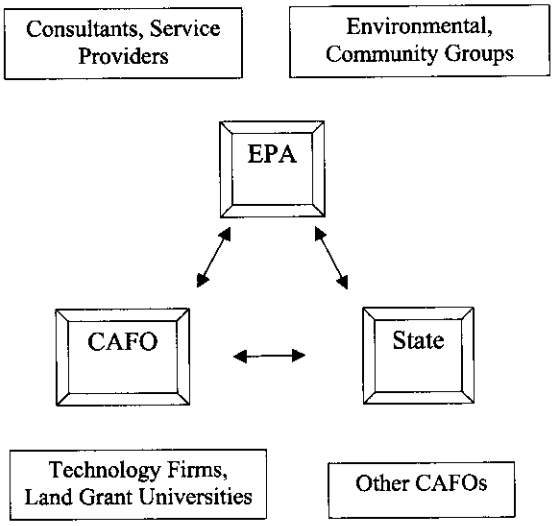

Figure 1. Stakeholders in Alternative Performance Standards Program

state authority is interested in protecting the environment under its jurisdiction and may be interested in obtaining authority for flexibility in meeting its NPDES obligations while aiding livestock businesses in the state.

Other stakeholders may also have significant interests in the APS process. Environmental and community groups seek to ensure that flexibility such as APS does not come at the cost of environmental deterioration or the local quality of life. Technology companies and universities are keenly aware that APS could offer opportunities for new technology development, research, and/or sales. Similarly, consultants and service providers may have interests in developing APS plans for CAFOs. Finally, nonparticipating CAFOs have interests in the APS process, because the technology accepted for APS may later become the required technology standard of the future.

Principal obstacles to the successful implementation and function of the APS process include uncertainties and difficulties in demonstrating superior performance, CAFO costs in obtaining approval for the APS, CAFO risks of participation, inter- and intra-organizational barriers of environmental permitting agencies, and threats of lawsuits by environmental groups. Each obstacle is briefly discussed below, and suggestions are offered for overcoming some barriers.

Demonstrating Superior Performance: New/Existing Dairy and Beef Cattle, Existing Swine, Poultry, and Veal CAFOS

When a CAFO in one of these categories requests alternative performance standards in its permit, it must provide evidence that the alternative technology will produce at least equivalent pollutant reductions in the production area (livestock production and manure storage). The CAFO must provide a technical analysis that estimates pollutant discharges from a system that is designed to comply with the baseline effluent guidelines versus discharges from the proposed alternative. The comparison should be based on site-specific climate data as well as manure and wastewater characteristics. The EPA suggests an approach that uses a computer-simulation model to estimate pollutant discharge with the baseline and alternative scenarios over a 25-year period. A detailed methodology is presented in supporting documents for estimating median annual overflow from a liquid-waste storage facility (Bartram and Brazy). Analysis of the alternative system must provide comparable estimates of median annual overflow. The analysis must include expected reductions in all pollutants found in manure, litter, and process wastewater at the facility (the regulations specifically mention nitrogen, phosphorus, Biological Oxygen Demand (BOD), metals, and pathogens). The treatment of lagoon effluent routed through constructed wetland strips to allow discharge directly to streams might be an example of an alternative technology. Other examples could include anaerobic digestion or solids extraction plus wastewater treatment.

Demonstrating Superior Performance: New Large Swine, Poultry, and Veal CAFOS

The EPA states in the final regulations that total containment is technologically and economically feasible for new swine, poultry, and veal Large CAFOs. For these types of operations, the CAFO must demonstrate that site-

specific innovative technologies will achieve environmental performance across all media and across the entire operation which is equal to or better than that of the baseline NSPS. Any pollutants that are expected to be discharged from the production area (e.g., overflows during very severe storm events) under the baseline NSPS must be offset by an equal or greater reduction in pollutants released to environmental media from the production and land application areas. The CAFO is expected to conduct a whole-farm environmental audit (typically mass-based) to quantify expected discharges and demonstrate to the permitting authority's satisfaction that the proposal will achieve improved environmental performance across multiple media. The CAFO must present plans for implementation, monitoring, and reassessment based on monitoring results. The final regulations provide a support document with an example of a whole-farm audit that is developed by hand with site-specific and published data (Vanatta).

Both types of APS provisions pose significant challenges for CAFOs. For comparative analyses of discharges from the production area, the CAFO must assess pollutant discharges, such as ammonia to the atmosphere. At a minimum, pollutant discharges through air, leaching, and surface runoff must be considered for a whole-farm audit. The CAFO must estimate discharges to air and water of nitrogen, phosphorus, sediment, BOD, or any other pollutants (particulate matter, methane, hydrogen sulfide, volatile solids, antibiotics, and hormones are mentioned) from animal confinement, manure storage and handling, and land application areas.[3] The example whole-farm audit compares only nitrogen loss reductions to air and water. It is unclear whether cross-pollutant or cross-media tradeoffs could be quantified and considered.

Costs and Risks for CAFOs

CAFOs may choose to prepare APS plans if monetary or nonmonetary benefits are expected to result in net gains for the CAFO. Monetary benefits may be realized by (1) lowering the costs of compliance, (2) lowering other CAFO production costs, (3) creating additional sources of revenue, or (4) enhancing product prices. Costs of compliance could be reduced, for example, if a constructed wetland were found to treat process wastewater from a dairy milking parlor at less cost than land application. Specific cost-reduction or revenue-enhancing benefits of APS provisions depend on site conditions, CAFO management capabilities and motivation, available technology within the industry, and market structure. Nonmonetary benefits include recognition for environmental stewardship within the industry, the local community, and/or the consumer public. Such recognition could be a valuable (if intangible) pillar of corporate image strategy.

The EPA already has indirectly contributed funds for financial incentives through Section 319, and U.S. Department of Agriculture Environmental Quality Incentives Program funds are now available for livestock operations to seek cost sharing for new technology. However, for such incentives to stimulate adoption, CAFOs must be able to forecast potential monetary and/or nonmonetary net benefits in their proposed APS plans apart from cost sharing.

Risks to CAFOs from APS participation depend on the design of the APS plan and the site-specific characteristics of the facility. Types of risk to CAFOs from implementing APS plans may include performance, cost, financial, and obsolescence risks (Bosch and Pease). Performance risk is the possibility that the APS plan will not achieve its expected pollution reductions. The level of performance risk depends on how strictly the permit authority holds the CAFO to the planned pollution reduction. Performance risk is lower if the permit authority is willing to accept lesser performance as long as performance under the APS plan is better than that under the baseline plan. For example, a poultry-litter incineration plant built as part of an APS plan may have higher than anticipated pollutant air emissions, but overall lower pollutant loads than would

[3] The APS application must consider nutrient pollutant losses from manure, as well as feed and commercial fertilizer.

be realized if manure was land applied under the baseline plan. If the permit authority accepts such performance, the CAFO does not incur additional costs to correct the problem.

Performance risk also is faced when CAFOs are not able to implement their APS plan within the timeline spelled out in the permit. Delays can occur because of natural disasters as well as institutional causes. For example, local permits to construct manure handling or processing facilities may be delayed because of political opposition or bureaucratic mistakes that are outside the control of the CAFO, or contractors may not meet construction deadlines.

Human factors contribute to performance risk. CAFO employees or contract farmers may not implement the APS plan as designed by CAFO management. For example, the APS plan may require contract producers to deliver their livestock manure to a central processing plant. For one reason or another, some farmers may not do so. The firm operating the manure processing plant could become financially bankrupt because of mismanagement or adverse market trends, in which case the APS plan could not be successfully implemented.

Cost risk refers to the possibility that costs of implementing the APS may be higher than anticipated. Costs could be out-of-pocket, such as construction costs to build manure storage and handling facilities, or transportation costs to haul manure. Unanticipated economic events such as oil embargoes and labor strikes could raise these costs. Costs could also increase if equipment or facilities must be updated to attain performance objectives.

Cost risk also includes the possibility that opportunity costs (income forgone as a result of the APS plan) exceed expectations. For example, reducing supplemental phosphorus in conjunction with adding phytase to rations could increase mortality and/or slow livestock growth if it is carried out improperly. An alternative manure handling or storage technology may transmit diseases to livestock on some participating farms, resulting in higher death losses and/or slower growth.

Financial risk, the uncertainty about a firm's financial viability because of the way it is financed, can be increased by additional borrowing and investments to implement the APS plan. Capital investments for manure processing, distribution, and handling under the APS plan may increase substantially relative to the baseline plan. Firms that carry a higher proportion of debt may be unable to meet financial payments if business revenues fall. Firms with high debt loads may be unable to secure debt financing for APS plan investments.

Obsolescence risk refers to the possibility that a capital investment undertaken to implement the APS plan may become obsolete, meaning that it is cheaper to abandon the investment than to continue its use. Obsolescence occurs because better technology becomes available. For example, a manure incineration plant may not be competitive with newer designs, such that the old plant cannot be operated profitably even though the plant construction cost has already been written off. Obsolescence may also occur when local conditions change. For example, if a poultry integrator abandons a region, a poultry litter processing plant may become uncompetitive and obsolete because of a lack of locally produced litter.

Possibly the largest risk faced by a candidate CAFO involves costs associated with obtaining approval from the permitting agency. These risks are uncontrollable and unpredictable from the CAFO's perspective. Some such risks may be associated with impediments to APS permit approval both within the EPA and between the delegated state agency and the EPA.

Obstacles Internal to the EPA or between the EPA and Designated State Agencies

The concept of using alternative permitting procedures to stimulate technological innovation and superior environmental performance is not new to the EPA. In 1993, the Technology and Economics Committee of EPA's National Advisory Council for Environmental Policy And Technology recommended redesigning permit procedures to encourage regulated facilities to expand multimedia and pol-

lution prevention environmental improvement efforts, supporting state initiatives and pollution prevention facility planning, and altering personnel reward systems to encourage EPA staff to champion pollution prevention. The CAFO rule also cites examples of voluntary beyond-compliance programs in the pulp and paper industry and the pesticide industry.

The EPA has considerable experience with beyond-compliance programs such as Project XL and the more recent National Environmental Performance Track (NEPT, www.epa.gov/performancetrack/). The EPA seeks to promote NEPT as the reference standard of facility-based environmental performance. Launched in 2000, the program had more than 300 public and private participants in 41 states by early 2003. Applicants are expected to demonstrate superior environmental performance by documenting compliance and achieving environmental performance beyond regulatory requirements, by establishing and maintaining an environmental management system, and by informing and seeking community input about the facility's environmental performance. NEPT offers participant incentives such as (1) low priority for routine inspections; (2) regulatory and administrative incentives; (3) recognition events, awards, and articles; and (4) regional and national networking events with the EPA and other participants. Regulatory and administrative incentives are in various stages of development as the NEPT office explores flexibility alternatives with the EPA Offices of Water, Air, and Solid Waste and with state agencies. To date, no outside analysis of program effectiveness has appeared in the literature.

A similar program offered by the Clinton administration was Project XL (eXcellence and Leadership). Foreman states that Project XL was instituted to allow permitted firms to assess innovative technology and practices for achieving environmental protection at both the facility and the community levels, provided that the firm can demonstrate that the proposed changes will yield superior environmental performance. In their analysis of Project XL, Blackman and Mazurek noted that Project XL was regarded as the prototype for a new site-specific approach to environmental permitting. They addressed the issues of project development costs, the project development and approval stages, and differences in project development costs among 11 Project XL firms. They found that the average project costs to the participating firm were approximately $350,000 and that costs to the EPA of a project (primarily in personnel time) were approximately $110,000. On average, 26 months passed between the preliminary proposal and final EPA approval. More complex and innovative projects were also more costly projects to the firms and to the EPA. As of January 2001, the 1995 Clinton administration goal of 50 Project XL firms was reached, and EPA is no longer accepting applications to the program.

To successfully implement APS within the regulated livestock sector, there would be significant obstacles for the EPA to overcome, both in its internal operations and between EPA and delegated states. Four barriers discussed by NAPA and Davies et al. concerning reforms in permitting that are likely to be significant for APS include the following:

(1) Media-based and statute-based operation of offices within EPA. The multimedia and multipollutant approach envisioned for new poultry, swine, and veal Large CAFOs may not be achievable within EPA, because the media-based offices of EPA (e.g., Air, Water, and Solid Waste) regulate under different statutes and with varying statutory enforcement powers. In many innovative permit programs, there has been inadequate flexibility for multipollutant or multimedia permits because of organizational and cultural differences within the EPA. APS will require prior agreement within the EPA and between the EPA and states on allowable permitting flexibility for APS.

(2) Delegation to states without significantly relinquishing control and oversight. NAPA documents cases in which the EPA granted permitting flexibility but retained final decision authority whether it would allow a proposed innovative program. Blackman and Mazurek conclude that nearly one-half of firms' costs in obtaining EPA approval for

Project XL proposals were incurred in interactions with the regional office of the EPA and obtaining final approval from the EPA, as opposed to much lower costs for developing the proposal, negotiating with outside stakeholders, and interacting with local regulators. APS will require state agency commitment to an alternative standards approach, and the EPA must be prepared to allow a flexible application of delegated authority.

(3) Inadequate permit writing and monitoring resources in delegated states. Although permit agency costs for reviewing, approving, and monitoring an APS plan have not been estimated, it is clear that APS will require significantly more resources for permitting and monitoring than baseline requirements. The approach emphasizes flexibility of plans adapted to site conditions, management capabilities, and market opportunities. Proposed APS plans will require more time to study and monitor because of variations in the processes for storing, handling, and utilizing livestock wastes. Although delegated states must write 15,000 CAFO permits before 2007, it is unclear how many states will have sufficient skilled personnel resources to implement an APS approach as well. With current fiscal crises in many state governments and EPA transfers forming only 26% of average state agency costs, the shortage of personnel resources is likely to be the most intractable obstacle to the implementation of APS in CAFO permits. Third-party certification could reduce the administrative burden on state permit authorities. A third-party firm with recognized expertise and objectivity could be contracted by the CAFO to assist in the development of the APS plan. The plan would have to be reviewed by the permit authority, but personnel time required could be greatly reduced if the permit authority had confidence that accepted procedures were followed in developing the plan. Third-party certification would require state permit authorities to specify how third-party firms could obtain and maintain licenses to submit plans. The American Society of Agronomy's Certified Crop Adviser (CCA) Program provides a model for a third-party certification program, although CCA technicians currently operate outside the regulatory arena (www.agronomy.org/cca).

(4) Lack of statutory authority for flexibility. The CWA does not specifically authorize flexibility in NPDES permit requirements, and the EPA is often concerned whether it has the legal authority to grant flexibility, such as that proposed for APS. Without explicit statutory authority, the EPA's actions concerning beyond-compliance programs and permits are likely to be cautious, narrow, and subject to litigation.

Threats of Litigation by Environmental Groups

A substantial obstacle to reforming the permit process is skepticism of reform by individuals and groups promoting environmental protection. In his analysis of the sustainability of reform, Foreman states that "environmental populism" advocates a strong public voice in environmental programs and decisions. Foreman states that environmental populists "... frequently exhibit strong skepticism toward the scientific inquiry and data gathering that reinvention advocates want improved as a pathway to reform" (p. 152). The precautionary principle—government should approve no action unless all environmental effects are known with certainty—and the "Polluter Pays" principle are used to argue for the strict interpretation and enforcement of environmental laws and regulations. Flexibility in permitting should only be allowed if it can be proved that all environmental consequences will be, without exception, better than those of baseline technology. The focus on efficiency, regulatory flexibility, and cost minimization is either misplaced or carried out with bad intentions.

Foreman contends that conflicts between environmental activists and policy reformers are a serious obstacle to reforming environmental regulation. He states:

> "The most straightforward obstacle reformers face is the perception that environmental reinvention might allow shirking of responsibility by business or government, resulting in environmental degradation, unacceptable

> health risks, or an unnecessary stalling of the war against pollution ... Efficiency alone has never been a compelling value to activists or to the public, and it remains politically anemic as a basis for environmental reinvention" (pp. 156–57).

Conclusions

Economic analysis clearly shows the social benefits of performance standards for environmental protection, but it is possible that administrative transactions costs and other factors discussed here may outweigh any potential benefits of APS for participating CAFOs. Economists have a clear role in analyzing and bringing under public scrutiny the linkages between environmental policy mechanisms such as APS and transaction costs to public agencies and regulated facilities. Voluntary performance standards such as APS offer opportunities for reducing private and social costs of environmental protection (Tietenberg). Economists should assist policymakers in developing mechanisms whereby the social benefits of performance standards can be realized.

The APS procedures within the revised ELGs offer the potential for significant pollution control and treatment technology innovation by Large CAFOs. Such CAFOs must analyze multipollutant and/or multimedia environmental outcomes of livestock production processes and must navigate an unexplored permit process to obtain APS in their permits. Broadening the scope of environmental management in this manner may help livestock producing firms to expand their vision of pollution prevention, and such innovations may generate cost-reducing or revenue-generating alternatives for the nonregulated sector as well. There are significant challenges in costs and risks for CAFOs, intra- and inter-organizational coordination of environmental agencies, funding for APS permit review and approval, and avoiding litigation, but the APS system also offers considerable potential for technology innovations and reduced environmental compliance costs.

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