



## Project Summary

# Guidance Document for the WRITE Pilot Program with State and Local Governments

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**The WRITE Pilot Program With State and Local Governments is a major component of a new national research program being undertaken by the U.S. EPA called the Waste Reduction Innovative Technology Evaluation (WRITE) Program. The WRITE Program is implemented by the Pollution Prevention Research Branch (PPRB) of the Risk Reduction Engineering Laboratory (RREL). The guidance document summarized here provides an overview of the "WRITE Program With State and Local Governments," presents the program goals, and explains the general policy regarding funding and execution.**

***This Project Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).***

### Introduction

Throughout the last several years, many industries and government organizations have initiated management programs and modified manufacturing and processing operations to incorporate waste reduction practices. Within the past year, EPA has taken several actions to encourage a national program of waste minimization, or what since has become included in the phrase "pollution prevention." Pollution prevention is a term that has been used more frequently within the last year to describe techniques, practices, or procedures implemented by the private and public sectors to prevent the generation of pollutants. As it is used

today, "pollution prevention" has replaced the term "waste minimization" which was generally applied to the reduction of hazardous wastes, and defined in the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) of 1976.

Source reduction and recycling precede treatment and disposal in the hierarchy of waste management and are the two primary elements upon which all Agency pollution prevention activities are focused. Source reduction has been defined as the reduction or elimination of waste at the source, usually within a process. Source reduction measures include process modifications, feedstock substitutions, improvements in feedstock purity, housekeeping and management procedural changes, increases in the efficiency of equipment, and recycling within a process. Likewise, recycling has been defined as the use or reuse of a waste material as an effective substitute for a commercial product or as an ingredient or feedstock in an industrial process. It includes the reclamation of useful constituent fractions within a waste material or the removal of contaminants from a waste to allow it to be reused.

Reducing the generation of pollutants from waste streams can be achieved in many ways. Process chemistry can be changed; potential waste streams can be recycled within a manufacturing process or back into the process; process technology and/or equipment can be modified to produce products more efficiently and with less waste generated; plant operations can be changed or controlled to produce fewer and smaller waste streams or less waste in general;

changes in raw materials (feedstocks) can lead to fewer waste streams or less hazardous waste streams; and finally, changes in end products from manufacturing operations can, in some instances, be made so as to affect the types and quantities of wastes emitted.

As a part EPA's national pollution prevention program, several multimedia research, development and demonstration programs have been established within the RREL. Through these programs, waste reduction processes and technologies are identified, developed and demonstrated. Addressed under these programs are hazardous, non-hazardous, industrial and municipal wastes. The WRITE Program is the largest of EPA's pollution prevention research programs.

### **The Waste Reduction Innovative Technology Evaluation (WRITE) Program**

The WRITE Program is designed to identify, evaluate, and/or demonstrate the use of innovative engineering and scientific technologies to reduce the volume and/or toxicity of wastes produced from the manufacture, processing, and use of materials. The WRITE Program is broad in technical scope and addresses the reduction of pollutants across all environmental media: air, land, surface water, and groundwater. Attention is directed toward methodologies with the potential for reducing the quantity and/or toxicity of waste produced at the source of generation, or to achieve practicable on-site reuse or recycling of waste materials. Strong consideration is given to the applicability of a technique on an industry-wide basis and across industries. Industries of primary interest under the WRITE Program include chemical, fabricated metals, electronic, printing and publishing, lumber, petroleum, transportation, food, and textile.

The objectives of the WRITE Program include the following:

- To establish reliable performance and cost information on pollution prevention techniques by conducting evaluations or demonstrations of the more promising innovative technologies.
- To accomplish an early introduction of waste reduction techniques into broad commercial practice.
- to encourage active participation of small- and medium-sized companies in evaluating and adopting pollution prevention concepts by providing support to these companies through state and local government agencies.

- To encourage the transfer of knowledge and technology concerning pollution prevention practices between large, medium-sized, and small industries.
- To provide solutions to important chemical-, waste stream- and industry-specific pollution prevention research needs

These objectives are achieved through the implementation of research projects conducted cooperatively with State and local governments, private industry, universities, technical societies and other organizations under three WRITE sub-programs: the WRITE Pilot Program with State and Local Governments, the WRITE Program With Industry, and the WRITE Research Program (see Figure 1). Through these subprograms, approximately 30 waste reduction technologies will be evaluated and several long-term waste- and industry-specific research studies will be undertaken.

### **WRITE Pilot Program With State and Local Governments**

The WRITE Pilot Program with State and Local Governments is the largest subprogram and addresses immediate information transfer needs between government and industry. Through the joint efforts of EPA and various state and local governments, technical and economic evaluations of source reduction and recycling technologies are being conducted of manufacturing and processing operations across approximately twenty industries. This joint approach was chosen because state and local government officials are often more familiar with local industrial practices and regional manufacturing and economic interests that can affect the potential success and widespread applicability of proposed pollution prevention technologies. States currently participating in this program include California, Connecticut, Illinois, Minnesota, New Jersey, and Washington.

Under this program, \$100,000 per year is provided by EPA to each participating state/local government. The state/local government also contributes additional matching funds ranging from 25% to 50% of the cost of the research. An average of five waste reduction technologies are evaluated by EPA and each state/local government during a 3-year period. Waste reduction technologies evaluated under this program are based on several selection criteria. These include: (1) type of waste reduction technology, (2) status of development, (3) unique nature of the technology, (4)

application, (5) source reduction performance capability, (6) extent of process modification, (7) cost effectiveness of the technology, (8) process safety and health considerations, (9) cost to EPA and the State/local government, and (10) legal contractual issues.

The technical and economic evaluations conducted for each technology include an in-depth study of the process, a literature review of comparable processes, material and energy balance computations, a field demonstration, an determination of cost estimation parameters including itemization of capital operational costs, calculation of the pay back period and return on investment.

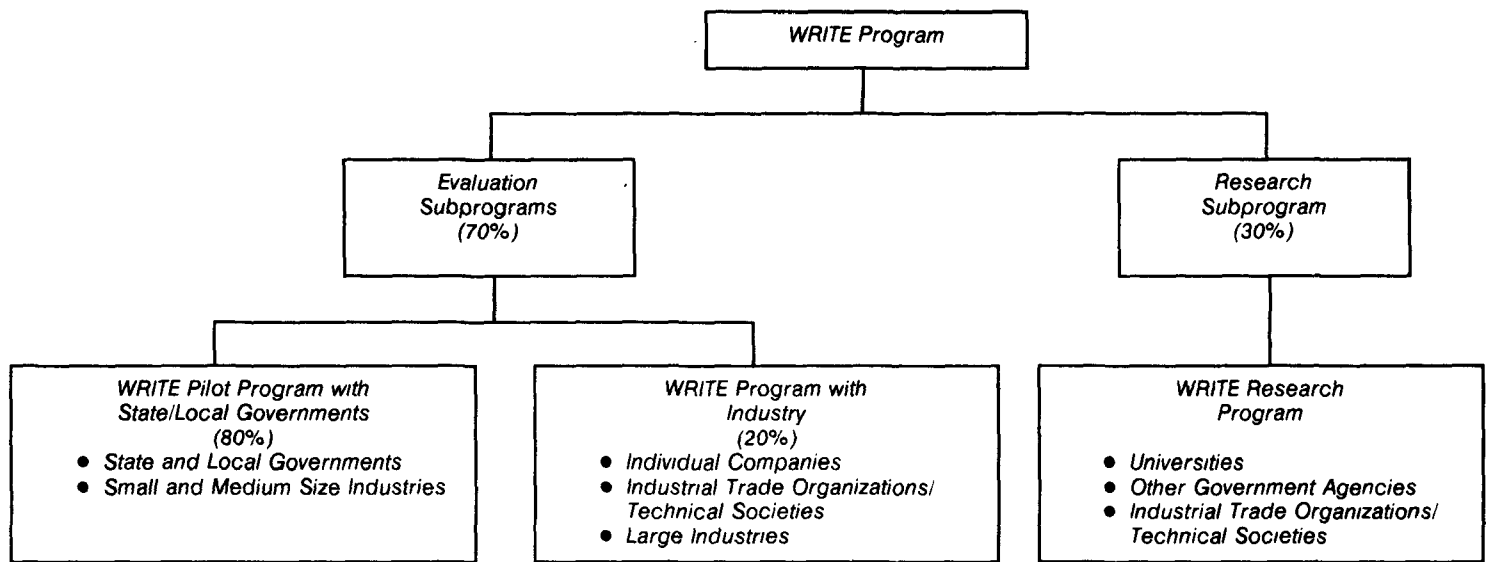
A summary of the types of information collected during a technical and economic evaluation of a waste minimization technology under this program is shown in Table 1. The example concerns the modification of a cold solvent cleaning process. In the cold cleaning of ball bearings with solvents, using a two-step countercurrent cleaning sequence can increase the cleaning efficiency. It can also substantially reduce the solvent requirement and, hence, the waste generation. This process does not involve substantial equipment modification. Material balance calculations indicate a waste reduction of 50 percent and a 33 percent reduction in fresh solvent requirements.

### **WRITE Program With Industry**

The WRITE Program With Industry focuses on evaluations of waste reduction technologies currently in use or under development by large industries. One of the objectives of this program is to encourage the transfer of knowledge and technology concerning pollution prevention practices between large, mid-sized and small industries. Under the WRITE Program With Industry, evaluations of waste reduction technologies are performed directly with industrial firms through industrial trade associations and technical societies.

### **WRITE Research Program**

In addition to evaluation programs, the WRITE Program has a research subprogram. The WRITE Research Program focuses on pollution prevention research needs, i.e., the generation of data to allow the future demonstration of emerging new pollution prevention techniques. Projects under this component of the WRITE Program address various technical obstacles to waste reduction and to chemical-, waste stream-, and industry-specific pollution prevention



**Figure 1.** The EPA Waste Reduction Innovative Technology Evaluation (WRITE) Program.

**Table 1.** Summary of Engineering Evaluation for Cold Solvent Cleaning Process Modification

Type of Application	Process modification
Stage of Development	Demonstration
Unique Nature of Technology	First-of-a-kind demonstration
Applications	Reduces hazardous waste generation in the cold cleaning operations of the parts cleaning industry, which is a medium/small-scale operation.
Performance	Achieves 50% waste reduction by reducing the fresh solvent requirement by 33%.
Need for Modification	Requires essentially only minor equipment modification.
Cost Effectiveness of Technology	Added capital costs = \$600 Net operating savings = \$380 per year Payback period = 1.6 years Note: Net operating savings include savings resulting from reduced waste disposal, reduced solvent requirement, and operation and maintenance expense.
Safety & Health	Properly designed system is considered safe. Metal cleaning systems are routinely used in industry without any safety or health problems.

issues. These research efforts are conducted with industrial firms, universities, other government agencies, technical societies, and industrial trade organizations.

### **Methods for Identification and Evaluation of Waste Reduction Technologies**

The number and type of industries, waste streams, unit operations, process modifications, and manufacturing scenarios to which waste reduction technologies can be applied are considerable and diverse. For this reason, decision tools were developed under the WRITE Program to assist in the identification and ranking of waste reduction technologies with the greatest potential toward achieving the objectives of the research program. Two of these tools, a worth assessment model and a maturity index are discussed in more detail in this guidance document.

### **Worth Assessment Model for Evaluation of Waste Reduction Technologies**

The Worth Assessment Model for Evaluation of Waste Reduction Technologies has been developed under the WRITE Program to evaluate and rank potential waste reduction technologies. Those technologies with the highest score are then considered for further study through engineering and economic evaluations. Weights have been given to each of the technology selection criteria identified in the model. The merit of each technology is evaluated with respect to these criteria. The model is presented in Figure 2.

### **Maturity Index For Technology Development**

The Maturity Index for Technology Development (Figure 3) is a second tool used in the evaluation of waste reduction technologies under the WRITE Program. Technical developments follow a hierarchy of successive steps as they proceed from the idea to commercial reality. Each step (e.g., documentation of the idea, bench-scale testing, pilot-scale testing, and sustained operation of integrated systems) has a unique set of attributes and characteristics that reflect the relative maturity of the development.

To successfully conduct an engineering and economic evaluation of a technology, a relatively high maturity is required. The U.S. Department of Energy

has developed a maturity index that can be used to determine relative maturity. This maturity index uses a numerical scale from 1 to 100 that is essentially arbitrary. Figure 3 presents the scale of development of a technology, the corresponding maturity index, and associated developmental characteristics. Technologies considered under the *WRITE Pilot Program With State and Local Governments* and the *WRITE Program With Industry* have a maturity index equal to or above 29.

### **Additional EPA Pollution Prevention Research Activities**

The WRITE Program is one of several activities currently being undertaken by EPA to address the Agency's goal of implementation of a national pollution prevention policy. A summary of some of the additional EPA activities is provided in the guidance document.

### **Waste Reduction Evaluations at Federal Sites**

This research program consists of a series of demonstration and evaluation projects for waste reduction conducted cooperatively by EPA and other federal agencies such as the Department of Defense (DOD) and the Department of Energy (DOE). The WREAFS Program focuses on waste minimization research opportunities and technical information at federal sites.

Many federal activities have established waste reduction plans and programs in the past few years. For example, an overall goal within DOD is to reduce hazardous waste generation a total of 50 percent by 1992 compared with 1985 levels. Several operation and process opportunities for waste reduction exist at federal sites that will reduce hazardous waste and result in cost avoidance or cost reduction as well as productivity, environmental, and human health benefits. Waste minimization opportunities can be applied throughout the federal community in fabrication, production, and/or maintenance processes, depending on the waste generating function. Industrial activities that support federal activities through in-house or contract efforts (whether on-site or off-site) are generally the same activities as those within the private sector. The application may vary, depending on the final product however, waste reduction techniques can be successfully employed in both the public and private sectors.

### **Waste Reduction Assessments Program**

The Waste Reduction Assessment Program (WRAP) encourages the industrial community's use of waste minimization assessments. The WRAP Program is designed to assist users in applying waste minimization assessments as a tool for identifying options for reducing waste generation. These assessments may be conducted internally by in-house teams or through external means, such as consultants, with in-house assistance. Preliminary assessments will be followed by long-term studies to verify the lasting effectiveness of waste minimization applications.

Initial efforts in the program will demonstrate and evaluate the *Waste Minimization Opportunity Assessment Manual (EPA/625/7-88/003)* published by EPA in 1988. The development of standard procedures applicable over a broad range of business sizes and type will provide a uniform basis for those decision-making roles to implement, postpone, or reject identified options. Experience with the assessment protocol will demonstrate the effectiveness of translating incentives and disincentives for waste minimization into quantifiable factors that can be ranked objectively. Where appropriate, evaluations will conclude with revisions to the manual. Suggested amendments will be transferred to state and regional waste minimization programs. Expanded efforts within the program include tailoring the EPA manual to reflect the needs of individual industries.

### **Waste Reduction Institute for Scientists and Engineers**

The Waste Reduction Institute for Scientists and Engineers (WRISE) is a joint university/EPA sponsored institute comprised of individuals knowledgeable in the principles and practices of waste reduction. Some of the Institute members are retired from distinguished careers in industry. The overall purpose of the group is to counsel EPA with respect to its pollution prevention activities and serve as liaisons to private industry generators that the Agency wishes to encourage to adopt and demonstrate waste reduction techniques. Review and comment on individual project documents and participation as lecturers in pollution prevention seminars will be undertaken by the Institute personnel.

<i>Criteria</i>	<i>Ranking</i>	<i>Weight</i>
<i>Status of Development</i>		5
<i>Maturity index 0-28</i>	(0.0)	
<i>Maturity index 29-35</i>	(0.1)	
<i>Maturity index 37-70</i>	(0.5)	
<i>Maturity index 80-90</i>	(1.0)	
<i>Maturity index 90-100</i>	(0.2)	
<i>Applications</i>		20
<i>Priority Waste</i>	(0.3)	
• <i>High</i>	(1.0)	
• <i>Moderate</i>	(0.5)	
• <i>None</i>	(0.1)	
<i>Range of other applications</i>	(0.4)	
• <i>More than one industry/process</i>	(1.0)	
• <i>One industry/process</i>	(0.5)	
• <i>Site-specific application</i>	(0.0)	
<i>Size of Industry</i>	(0.3)	
• <i>Small Scale</i>	(1.0)	
• <i>Medium Scale</i>	(1.0)	
• <i>Large Scale</i>	(0.5)	
<i>Source Reduction Performance Capability</i>		20
<i>Significant reduction</i>	(1.0)	
<i>Moderate</i>	(0.5)	
<i>Slight improvement</i>	(0.1)	
<i>No change</i>	(0.0)	
<i>Extent of Process/Equipment Modification</i>		10
<i>Low</i>	(1.0)	
<i>Moderate</i>	(0.5)	
<i>Significant</i>	(0.1)	
<i>Cost-Effectiveness of Technology</i>		15
<i>Significant</i>	(1.0)	
<i>Moderate</i>	(0.5)	
<i>Slightly better</i>	(0.1)	
<i>Poor</i>	(0.0)	
<i>Safety and Health Considerations</i>		5
<i>Beneficial</i>	(1.0)	
<i>Same as conventional</i>	(0.5)	
<i>Deleterious, but solvable</i>	(0.1)	
<i>Very hazardous</i>	(0.0)	
<i>Cost to EPA and State/Local Governments</i>		5
<i>Low</i>	(1.0)	
<i>Moderate</i>	(0.5)	
<i>High</i>	(0.0)	
<i>Demonstrator's Qualifications</i>		10
<i>Technical</i>	(0.5)	
• <i>Excellent</i>	(1.0)	
• <i>Moderate</i>	(0.5)	
• <i>Poor</i>	(0.1)	
<i>Financial Condition</i>	(0.5)	
• <i>Excellent</i>	(1.0)	
• <i>Moderate</i>	(0.5)	
• <i>Poor</i>	(0.1)	
<i>Legal/Contractual Issues</i>		5
<i>None</i>	(1.0)	
<i>Solvable</i>	(0.5)	
<i>Serious</i>	(0.1)	
<i>Length of Evaluation</i>		5
<i>0 to 6 months</i>	(1.0)	
<i>6 to 12 months</i>	(1.0)	
<i>Greater than 12 months</i>	(0.1)	
		100

**Figure 2.** Worth assessment model for evaluation of a waste reduction technology.

Scale of Development	Maturity Index	Characteristics
Commercial	100	Specific private sector interest in system application—commercial operation
	97	Specific private sector interest in system application—construction complete
	93	Specific private sector interest in system application—system design complete
	92	Specific private sector interest in system application—contract awarded
	91	Specific private sector interest in system application—letter of intent signed
Demonstrational	90	Final form of detailed system cost estimation complete for commercial plant
	85	Final form of detailed design of replicate systems completed
	83	Final form of detailed design of replicate systems possible (data available)
	80	Successfully sustained operation of prototype or modified system meeting all criteria listed below for prototype system; duration of operation sufficient to access time-based effects such as erosion, corrosion, catalyst deactivation, fatigue failures, etc., for determination of plant life
Prototype	70	Products/functions of prototype system evaluated in intended commercial application
	69	Sustained operation of prototype system at design capacity, at design conditions using design subsystem properly operation and produced design specification products
	64	Specific prototype facility operated
	60	Specific prototype facility constructed
	42	Specific prototype facility designed
	37	Specific prototype facility conceptualized
Pilot Plant	35	Cost estimate complete based on most up-to-date data
	34	Detailed engineering design complete for pilot plant based on most up-to-date data
	30	Integrated pilot plant operated
	29	Integrated pilot plant constructed
	27	Integrated pilot plant designed
	26	Integrated subscale pilot plant operated
	25	Integrated subscale pilot plant constructed
	24	Integrated subscale pilot plant designed
	23	Non-integrated pilot plant operated
	22	Non-integrated pilot plant constructed
21	Non-integrated pilot plant designed	
Proof -of-Concept	20	Detailed engineering scale cost analysis complete
	18	Integrated system engineering design and specification complete
	17	system unit operations engineering design and specification complete
	16	system engineering design analysis complete
	15	System engineering design conceptualized
	14	Engineering design data sufficient for system design collected and analyzed
Process Development Unit	13	Unit operation elements operated
	12	Unit operation elements constructed
	11	Unit operation elements designed
	10	Mode of operation of unit operation elements detailed
	9	System unit operation elements defined
Bench	8	Extensive experimental data and evaluation completed on all major system elements; experiments and analysis conducted to the point of mapping system variable responses and optimization
	7	Extensive experimental data on all major system elements collected and analyzed
	6	Laboratory scale/style experiments conducted; initial system data collected
	5	Single principle experiments conducted to verify essential system elements
	4	Detailed documentation of idea, principles, and other essential system elements
	3	Physical, chemical, electrical, etc., principles assessed
	2	Idea developed to encompass a definable system
	1	Describable idea

Figure 3. Maturity index for technology development.

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### **Pollution Prevention Information Clearinghouse**

Through the Pollution Prevention Information Clearinghouse (PPIC), a public domain computerized information network for the exchange of pollution prevention information among states, local governments, generators, industry organizations, and the federal government is being established. This activity is being jointly undertaken by EPA's Office of Research and Development and the newly created Pollution Prevention Office.

Some of the issues that have been addressed under PPIC include establishment of a commonly accepted accession/indexing technique for clearinghouse

holdings, incorporation of a hot line telephone number for pollution prevention information updates, assurance of hard copy materials when requested, and incorporation of an electronic information exchange capability. Services anticipated through PPIC include: indexed bibliographies and abstracts of pollution prevention reports and publications, case studies of demonstrations and evaluations of waste reduction technologies, a calendar of events including conferences, seminars, federal and state activities in pollution prevention, an electronic bulletin board for communication and message transmittal among users, and a list of state, federal, industry, trade organiza-

tion and other recognized contacts knowledgeable in various aspects of pollution prevention activities.

The Pollution Prevention Research Branch welcomes inquiries for additional information concerning the WRITE Program and other EPA waste reduction activities. The full report was prepared by the Pollution Prevention Research Branch of the Risk Reduction Engineering Laboratory with assistance from PEI Associates, Inc. through Contract No. 68-03-3389 under the sponsorship of the U.S. Environmental Protection Agency.

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The complete report, entitled "Guidance Document For the WRITE Pilot Program with State and Local Governments," (Order No. PB 89-220 487/AS; Cost: \$13.95, subject to change) will be available only from:

National Technical Information Service  
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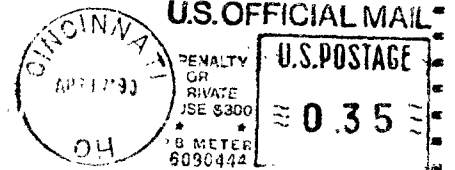
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