REDUCING REGULATORY BARRIERS TO TECHNOLOGY DEPLOYMENT

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ABSTRACT

The Interstate Technology and Regulatory Cooperation (ITRC) Work Group is a state-led, national coalition that offers products and services that are proving successful in getting new environmental technologies deployed in states across the country. State regulators involved in ITRC are excited about and committed to working together to learn more about how innovative technologies can be appropriately used to clean up both federal and private-sector sites in their states. They and others (federal partners, stakeholders, and representatives from the environmental industry) who have interests in promoting the widespread use of better, more cost-effective, innovative environmental technologies are working on ITRC teams to increase technical knowledge among states and streamline and standardize the regulatory approval process. ITRC is now five years old and has documented many examples of the ways it is making a difference in improving the regulatory milieu for new environmental technologies.

INTRODUCTION

The Interstate Technology and Regulatory Cooperation (ITRC) Work Group is a state-led, national coalition that is dedicated to achieving better environmental protection through the use of innovative technologies. Led by representatives from state regulatory agencies, the coalition focuses on creating tools and strategies to reduce interstate barriers to the deployment of innovative environmental technologies. Members of the coalition also include federal agencies, industry, and public/tribal stakeholders.

Working within teams that focus on particular categories of environmental technologies, ITRC participants create guidance documents and other publications and develop training courses that build the collective confidence of the environmental community about using new technologies and a more uniform understanding of how these technologies should be applied and regulated. ITRC participation promotes the widespread use of better, more cost-effective, innovative technologies; increases technical knowledge among states; and builds a consensus among diverse members of the environmental community about implementing new technologies.

The primary sources of information for this paper are the ITRC Annual Reports dated 1999-2000 and 2000-2001 (1,2).

ITRC OFFERS SOLUTIONS

The benefits ITRC offers state regulators, technology developers and vendors, technology users, and stakeholders include (Fig. 1):

- building a reliable network among members of the environmental community for focusing on innovative environmental technologies,
- providing a set of tools to assist decision making at contaminated sites regarding smarter solutions to environmental protection,
- helping regulators build their knowledge base and raise their confidence about new technologies,
- helping regulators save time and money when evaluating environmental technologies,
- guiding technology developers in the collection of performance data to satisfy the requirements of multiple states,
- helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations,
- providing the environmental technology industry a predictable regulatory path for commercializing new technologies,
- lowering the cost of and improving environmental protection, and
- promoting economic development through more efficient cleanups.

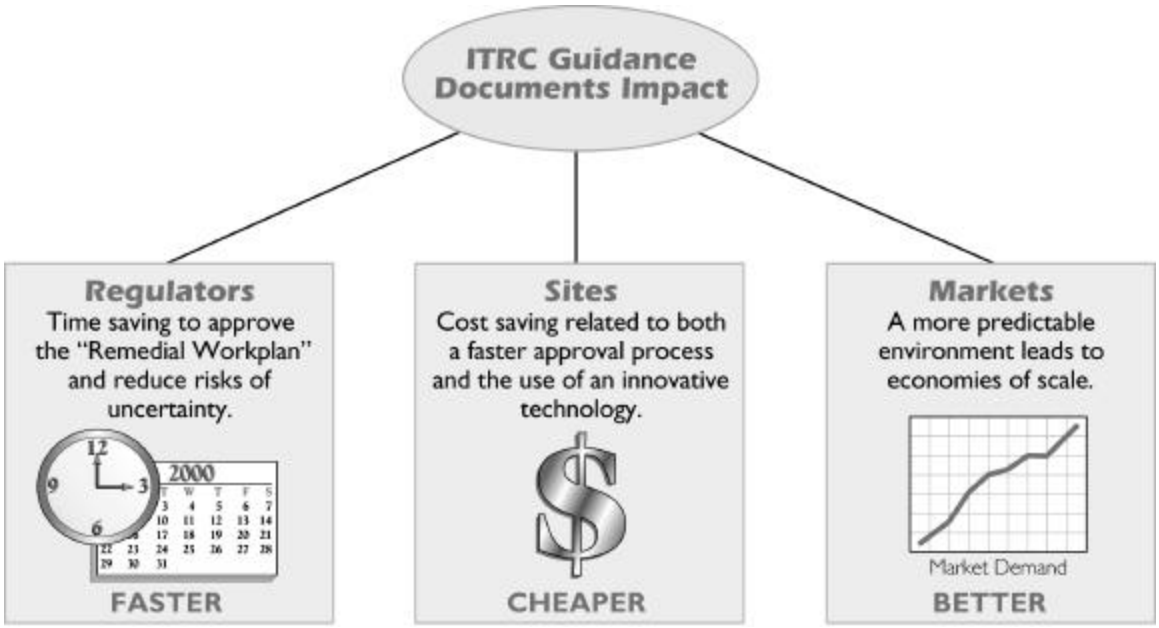

Fig. 1: ITRC Guidance Documents Impact

HOW ITRC CAME TO BE

ITRC grew out of an initiative funded by the U.S. Department of Energy and managed by the Western Governors' Association—the Federal Committee to Develop On-site Innovative Technologies, or DOIT. In June 1995, ITRC was charged by DOIT to seek ways to encourage state environmental regulatory agencies to cooperate in permitting innovative environmental cleanup technologies. Although DOIT was dissolved by WGA in June 1996, the DOIT Committee's final report recommended that the western governors make ITRC permanent, so it could "continue its role as a forum for interstate cooperation on the regulation and permitting of new technologies." The western governors concurred that ITRC would continue to function independently from DOIT, with secretariat duties being conducted by WGA.

In 1997, the Southern States Energy Board passed a resolution in support of the southern states' participation in ITRC. In response to this growth to include states from other parts of the nation, the ITRC sought to affiliate with a new host organization with national membership.

In 1998, ITRC began the process of aligning itself with an organization that provides the organization with a direct link to the highest environmental authorities within the states. The Environmental Research Institute of the States (ERIS) is now the fiscal and administrative agent for ITRC. ERIS is a 501(c) 3 nonprofit educational subsidiary of the Environmental Council of the States (ECOS), an organization of state environmental agency heads. Affiliation with ECOS through ERIS is extending ITRC's influence and leverages the support of state environmental agency heads in the solicitation of funds to support the ITRC mission. In January 1999, ERIS assumed ITRC secretariat duties from the Western Governors' Association (WGA) and the Southern States Energy Board (SSEB). Affiliation with ECOS is a major milestone for ITRC, lending a national perspective to the four-year-old organization and helping ITRC expand state participation.

By aligning with ERIS, ITRC has embraced future growth. But the organization also benefits from continuing relationships with WGA and SSEB. For example, SSEB negotiates and administers state subcontracts to SSEB member states and cosponsors ITRC workshops. WGA cosponsors some ITRC workshops. Both WGA and SSEB sponsor an ITRC circuit rider.

ITRC's federal partners are the U.S. Environmental Protection Agency, the U.S. Department of Energy, and the U.S. Department of Defense. While USEPA provides services in kind, DOE's financial support through its Office of Science and Technology has made it possible for the young organization to grow and thrive. OST's support has been critical in enabling state regulators to build a network through which to share information on the technical and regulatory aspects of implementing new environmental technologies. In 2000, DOD supported the work of the Unexploded Ordnance Team, which focuses on an issue of special relevance to DOD. Also in 2000, DOD and ITRC began working on the Technology Deployment Initiative (TDI), a new collaboration for bringing ITRC resources to bear on DOD's cleanup of sties across the country. For its part of the partnerships, ITRC is addressing, through its guidance documents and training, many of the technical and regulatory issues that impact the successful deployment of innovative environmental technologies for cleaning up DOE and DOD sites.

ITRC TEAMS SPEED ACCEPTANCE OF NEW TECHNOLOGIES

ITRC teams deliver products and services

In 2000, nine technical teams tackled the problems inherent in getting emerging technologies approved for use in their states. While six ITRC teams focused on producing documents and/or offering training on emerging technologies (accelerated in situ bioremediation, in situ chemical oxidation, enhanced in situ biodenitrification, permeable reactive barriers, phytoremediation, and technologies for characterizing and treating dense nonaqueous phase liquids), two teams began exploring issues involved in treating niche markets (the Department of Energy's radionuclides and the Department of Defense's unexploded ordnance). The Diffusion Sampler Protocol Team participated with several federal organizations to finalize a protocol on when, where, and how to use diffusion samplers for groundwater sampling.

Since 1995 when the organization began, ITRC's teams have produced more than 30 documents, including technology overviews, case studies, decision trees, reference guides, and technical/regulatory guidance. Past ITRC teams have explored the issues and produced documents addressing accelerated site characterization, low-temperature thermal desorption, and metals in soils. A complete list of ITRC products is available at http://www.itrcweb.org. The table below provides a list of ITRC technical teams that work on issues related to DOE sites.

Table I: Many ITRC teams tackle issues of concern to DOE sites

	Types of Pollution at DOE Sites				
ITRC Teams	**Radionuclides**	**Metals**	**Organics**	**Asbestos**	**Mixed Waste**
Accelerated Site Characterization	◆	◆	◆		◆
Dense Nonaqueous Phase Liquids			◆		
Enhanced In Situ Biodenitrification			◆		
In Situ Bioremediation			◆		
Low Temperature Thermal Desorption			◆		◆
Metals in Soils		◆			
Permeable Reactive Barriers	◆	◆	◆		
Phytoremediation		◆			
Plasma Technologies	◆	◆	◆	◆	◆
Radionuclides	◆				
Unexploded Ordnance					

◆ denotes remediation needs being addressed by ITRC teams

ITRC products progress from overviews to regulatory guidance

Typically, an ITRC team begins its work by producing an overview, case study, decision tree, or reference guide—documents that help regulators and other members of the environmental community build their general knowledge about an innovative technology and enhances the decision-making process. As an ITRC technical team matures, it begins working on its technical/regulatory document, which specifies a uniform set of data requirements for states to use in approving cleanup plans that incorporate a certain class of environmental technology. Adoption of ITRC technical/regulatory documents by states helps make the permitting process more efficient and uniform across states, helping technology vendors and consultants avoid the time and expense of meeting a different set of permitting requirements in each state where innovative technologies are proposed for use.

ITRC teams develop and deliver training

For three years, ITRC has offered training courses to help regulators and others become more knowledgeable about new environmental technologies. In 1997, ITRC's In Situ Bioremediation Team, in cooperation with GeoSyntec Consultants and DuPont, two industrial members of the Remediation Technologies Development Forum (RTDF), began to structure and deliver a series of training workshops on natural attenuation of chlorinated solvents in groundwater. The natural attenuation course, which was called *Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices*, was offered in eight U.S. cities, successfully reaching more than 1700 regulators and other members of the environmental community (developers, vendors, consultants, and stakeholders).

In 1999 and 2000, the Permeable Reactive Barriers (PRB) Team, following the example set by the ISB Team, offered *In Situ Permeable Reactive Barriers: Application and Deployment.* The course, which was cosponsored by USEPA, garnered some impressive training numbers and positive attendee evaluations. Twelve classes were conducted at which 1,000 regulators and more than 250 nonregulators were instructed in overseeing the design, implementation, and monitoring of groundwater remedies involving the deployment of permeable reactive barriers. The courses received high marks from state regulators from across the United States, USEPA representatives from all regions, and consultants from a number of environmental firms, who were very well satisfied with the technical content, pace of instruction, and overall presentation of information. The Permeable Reactive Barriers Team is now polling attendees to determine how the course has affected day-to-day work. The team expects to find many examples of ways the course has helped regulators and environmental consultants.

In 1999, the ISB Team, having completed its first series of classes on natural attenuation, began the next phase of its training program with the introduction of a course on accelerated in situ bioremediation. Following two dry runs in 1999, in Louisiana and California, *Accelerated Bioremediation of Chlorinated Solvents* premiered during the International Environmental Technology Expo 2000 in Atlantic City, New Jersey in June 2000. More than 80 regulators and other members of the environmental community attended the first official course in Atlantic City. Since then, the course has been presented in Boston and San Antonio. In 2001, the ISB Team plans to present this training four more times across the country.

ITRC's Phytoremediation Team also has training plans in place for a 2001 course. Based on its *Technical Information and Regulatory Guidance for Phytoremediation of Organic Contamination*, the training will include two dry runs and a full-blown course focusing on some of the technical and regulatory considerations when permitting cleanup plans that incorporate the use of plants for remediating organic contamination.

Internet-based training extends ITRC outreach

The Interstate Technology and Regulatory Cooperation Work Group (ITRC) is partnering with EPA's Technology Innovation Office (EPA-TIO) and members of the Remediation Technology Development Forum (RTDF) to provide a unique opportunity for the environmental community (state and federal regulators, responsible parties, consultants, and public and tribal stakeholders) to learn about the technical and regulatory issues of innovative environmental technologies. These training events, along with the ITRC guidance documents and network of experts, provide resources to assist the environmental community in making quality, expedited decisions when determining the appropriateness of environmental technologies as part of effective environmental waste management. To date, this successful program has trained nearly 3500 people from 49 states and 18 countries–and all from the comfort of their own offices via the Internet.

In 1999, the team that pioneered ITRC classroom training began exploring the use of the Internet as a venue for delivering training. The In Situ Bioremediation Team, in collaboration with ITRC's State Engagement Team, RTDF, and USEPA's Technology Innovation Office, began to offer periodic two-hour sessions open to regulators and others on *Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices.* This training focuses on the basic information needed to determine and document the conditions necessary for natural processes to be an effective part of remediating chlorinated solvents in groundwater. Offered 11 times during 1999 and 2000, the natural attenuation Internet-based training reached 1,885 people, representing a broad environmental audience of regulators, federal agency representatives, consultants, and public/tribal stakeholders. ITRC plans to offer this Internet-based course four more times in 2001.

Another successful outreach through Internet-based training has been *Enhanced In Situ Bioremediation of Chlorinated Solvents in Groundwater*. Enhanced in situ bioremediation (EISB) systems designed to remediate chlorinated solvents in groundwater involve input of an organic source, nutrients, electron acceptors, and/or microbial cultures to stimulate degradation. EISB systems may be used to remediate high concentration areas within plumes or source areas, provide containment of a chlorinated solvent plume, or as part of a treatment train down gradient of a primary cleanup or containment system.

This training, which was offered six times in 2000 and reached more than 980 members of the environmental community, introduces state regulators, environmental consultants, site owners, and community stakeholders to the document created by the ISB Team and RTDF: *Technical and Regulatory Requirements for Enhanced In Situ Bioremediation of Chlorinated Solvents in Groundwater*. The training focuses on a variety of amendments, which may be added to in situ bioremediation systems, the mechanism of delivery, and regulatory issues associated with approving or permitting EISB systems. In 2001, ITRC plans to offer this Internet-based course four more times.

In 2000, the Permeable Reactive Barriers Team also developed and began delivering a Web-based course—*Permeable Reactive Barriers for Chlorinated Solvent, Inorganic, and Radionuclide Contamination*, which 580 people accessed during the four times the course was offered in 2000. The PRB Team will offer additional courses in 2001 to disseminate information on technical and regulatory guidelines for installing permeable reactive barriers to remediate inorganics and radionuclides.

While both the ISB and PRB teams plan to continue offering their Web-based courses into 2001, other ITRC teams will begin to also use the Internet to offer training on a variety of subjects, chlorinated volatile organic compounds, phytoremediation, diffusion sampler protocol, and chemical oxidation.

Teams tackle many technical areas

A major milestone for ITRC has been its first ever Five-Year Program Plan, which served in 2000 as the focal point for discussions regarding ITRC's direction. Among other benefits, ITRC's multiyear planning has enabled broader member and stakeholder participation in planning ITRC's future activities, helped ITRC provide timely input for federal sponsors' budget cycles, encouraged a more strategic approach to defining and achieving goals, and established a basis for building necessary infrastructure prior to undertaking new activities.

In 2000, the Five-Year Program Plan was an evolving document that eventually encompassed 23 separate proposed activities—11 proposals for continuing activities by existing teams, 10 proposed projects to be undertaken by new teams, a project that would involve the efforts of more than one team (DOE Gate 6 Technologies), and a development support project for providing technical support and resources to help organize 2002 and 2003 teams and work plans. All the proposed topical area projects were suggested and voted on by ITRC's membership at the Spring Conference in April 2000 and again presented at ITRC's

Fall Conference in October 2000. By approving the Five-Year Program Plan with its provision for a full contingent of projects, the ITRC Board of Directors has set in motion a surge of energy and activities to move ITRC forward through the next few years.

Most of the projects approved for a 2001 start will be undertaken by existing ITRC teams:

- Enhanced In Situ Bioremediation Training Course
- Dense Nonaqueous Phase Liquids/Thermal
- Bioremediation of Nitrates and Carbon Tetrachloride
- In Situ Chemical Oxidation
- Diffusion Sampler Technology Deployment Facilitation
- Permeable Reactive Barriers Long-Term Performance Monitoring
- Phytoremediation Training
- Constructed Wetlands
- Radionuclides—In Situ Characterization, Cleanup, and Long-Term Stewardship
- Unexploded Ordnance Guidance and Training
- Small Arms Firing Range Contaminants
- DOE Gate 6 Technologies
- Project Development Support

STATE ENGAGEMENT TEAM BRINGS HOME THE VALUE

The products and services produced by ITRC's technical teams would have little impact on state regulatory agencies and the larger environmental community without the direction provided by the ITRC State Engagement Team. Composed of a point of contact (POC) from each state environmental agency that's active in ITRC, a circuit rider from both the Southern States Energy Board and the Western Governors' Association, contractor support, and a coordinator, the State Engagement Team ensures that the products of ITRC's technical teams are available, understood, and profitably used within state agencies to overcome traditional regulatory barriers to new environmental technologies. The State Engagement Team's structure connects member states with one another, with ITRC technical work teams, and with ITRC management. It is the mechanism through which states work together and share knowledge, encouraging state cleanup programs to use ITRC documents, training courses, and the professional network.

In 2000, the State Engagement Team concentrated on increasing state membership, strengthening the ITRC professional network, coordinating Internet-based training on ITRC's technical/regulatory guidance documents, and tracking and validating examples of ITRC successes.

Outreach and Communication

The State Engagement Team has enabled the organization to increase its membership to 38 states plus the District of Columbia. In 2000, Alabama, Idaho, New Hampshire, North Dakota, Oklahoma, Vermont, Wisconsin, and West Virginia joined ITRC. The State Engagement Team maintains two-way communication among member states through bimonthly conference calls with state POCs to exchange information on states' experiences in distributing and using ITRC technical products. These calls also feature a status report from an ITRC team leader, who discusses the intended value of the team's product and issues relevant to the team's technical/regulatory research. State POCs are integral in reviewing team products and discussing potential solutions to regulatory issues identified by the teams.

Training

Critical to stimulating states' use of ITRC documents is building the collective knowledge of regulators and others in the environmental community about innovative technologies and their relevant applications. In 2000, the State Engagement Team continued to coordinate the offering of ITRC Internet-based training. These training events have taken the ITRC to an international forum via the internet allowing parties interested in innovative environmental technologies from around the world to utilize the ITRC resources. . Next year, ITRC plans to offer more than 25 Internet-based training events.

Concurrence

Concurrence means that a state agrees with the guidance outlined in an ITRC technical/regulatory document and commits to using the guidance to permit an innovative technology covered by the guidance. Because ITRC technical/regulatory documents are written to serve as consistent sets of guidelines for regulators to use in approving cleanup plans that include new technologies, the most effective ITRC documents are those that have been reviewed and formally concurred with by a number of states. Consequently, ITRC works diligently to achieve concurrence from as many states as possible. States whose staff routinely uses ITRC documents as the standard for permitting new technologies can enjoy time and cost savings. And while adoption of ITRC technical/regulatory documents by states makes the permitting process more efficient for state regulators, concurrence among states on ITRC technical/regulatory documents also benefits technology vendors and consultants by making the permitting process more predictable and streamlined, helping them to avoid the time and expense of meeting different sets of permitting requirements in each state where innovative technologies are proposed for use. Concurrence is an ongoing activity—documents printed in past years remain open to concurrence, and the number of states that have endorsed ITRC documents is growing.

Success Documentation

In engaging states to "Build More Successes," the State Engagement Team documents ways ITRC products and services are being successfully used within states and the environmental industry to lower the costs of compliance and/or remediation for states and/or environmental firms. The State Engagement Team also documents how ITRC is benefiting DOD and DOE. The State Engagement Team has currently documented more than 130 success stories from states, industry, and federal agencies and is following up on more than 100 potential successes. In 2001, the team will employ a variety of strategies to identify, pursue, and publicize the successful use of ITRC documents and training. An electronic process relying on e-mail and Internet survey forms will be instituted to obtain feedback on ITRC's products and services.

ITRC IS MAKING AN IMPACT AT FEDERAL SITES

ITRC products and services have made a difference at federal sites, including the following.

Colorado

Natural attenuation training, offered through a collaboration of ITRC and the industrial members of the Remediation Technologies Development Forum (RTDF), has helped Colorado regulators consider the use of natural attenuation at over 17 facilities, including military and DOE sites where solvents, metals, radionuclides, explosives, or petroleum compounds are to be remediated.

At DOE's Rocky Flats Environmental Technology Site, the Mound Site plume is groundwater contaminated with volatile organic compounds and small amounts of various radionuclides. DOE

proposed using a subsurface impermeable plastic membrane and a collection line to direct groundwater into a reactive iron treatment system. The regulator from the Colorado Department of Public Health and Environment reviewing the proposed remedial work plan reported that his review was enhanced and made more efficient by having access to guidance provided by ITRC, which addressed the pertinent technical and regulatory issues for implementing a permeable reactive barrier.

Kansas

Participation in ITRC's In Situ Bioremediation Team, use of the ISB guidance document, and natural attenuation training helped the Kansas Department of Health and Environment recognize a classic biodegradation pattern within a chlorinated solvent plume at Strother Field, an active Army base in Kansas. By taking the lead in identifying the natural attenuation process, the Kansas regulator accelerated the identification of remedial alternatives for the site, saving the Army significant expense. Kansas' ITRC experiences were also key in natural attenuation being considered as a remedy for a chlorinated solvent plume at a Formerly Used Defense site. KDHE helped refine the conceptual model for degradation pathways at the site by providing references from the natural attenuation course manual.

New Jersey

Two technologies that were studied by the ITRC Metals in Soils Team are being used in New Jersey at the Ft. Dix Army Base. ITRC soil washing and phytoremediation documents were useful in obtaining state approval for the RangeSafe system, which combines phytoremediation with soil washing, to clean lead-contaminated soil from small-arms firing ranges in an environmentally acceptable and cost-effective way. Phytotech, Inc. and Bescorp, two companies that participated with the ITRC Metals in Soil Team, partnered in the demonstration of the RangeSafe system.

Pennsylvania

The state's and DOD's participation in ITRC has led to an historic agreement for cleaning up more than 1,000 inactive military installations in Pennsylvania. On July 4, 1998, the Pennsylvania Department of Environmental Protection (PADEP), the U.S. Department of Defense and the military service branches, and the Defense Logistics Agency signed an historic multi-site cleanup agreement, which was a direct outgrowth of interactions among team members on the ITRC Policy Team. As a result of the agreement, a comprehensive effort to assess and eliminate potential environmental and public health risks at military sites in Pennsylvania has begun 10 years earlier than originally planned by the armed services.

ITRC IS BENEFITING STATES

The State Engagement Team works with states to document the value of their ITRC participation. Among the relevant success factors are states' making use of ITRC products and training to help regulatory staff and technology vendors in the deployment of innovative technologies and states' making institutional changes that foster the regulatory acceptance of new environmental technologies. ITRC calls these two measures of success *product use* and *institutional changes*, respectively.

During 1998, ITRC initiated a major effort to begin validating examples of states' product use and institutional changes. As part of the State Engagement Team's efforts, ITRC documented 38 examples of ITRC guidance documents being used to expedite regulatory reviews and increase acceptance of innovative technologies at specific sites. The State Engagement Team also documented 46 examples of institutional changes.

The map below (Fig. 2) shows the states that have hosted ITRC training, states whose citizens have received ITRC training, states where use of ITRC guidance documents have led to streamlined deployments of technologies, or states that have changed the way they do business due to their ITRC participation.

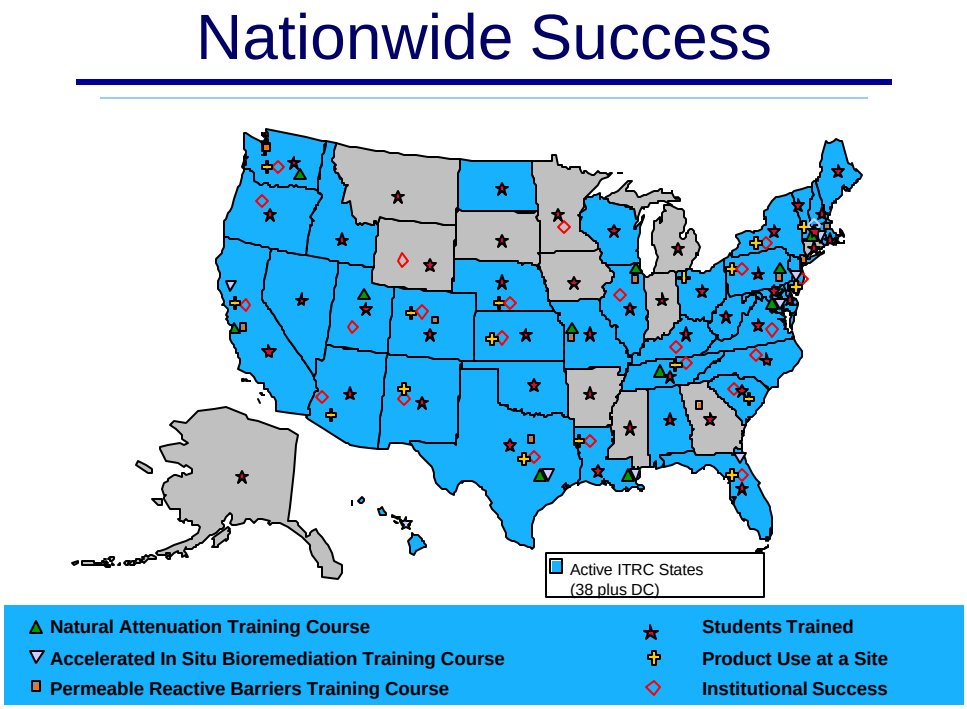

Fig. 2: ITRC Generates Nationwide Success

The following examples are evidence that ITRC is making a difference among member states in breaking down barriers to the use of innovative environmental technologies.

Saving time with guidance documents

The permeable reactive barrier (PRB) technology was first deployed in Massachusetts and New Jersey in 1998 using ITRC guidance and design documents, which were released in final form in March 1998. The most obvious and immediate benefit to Massachusetts and New Jersey was reducing the time required to approve and permit this technology by having the ITRC knowledge base and guidance documents readily available. In Massachusetts, at least several months were saved—a value to all parties involved. In addition, the amount of state regulatory staff time needed to manage this project was cut in half—a savings of 200 to 300 hours.

Similar results were reported from New Jersey, where the site geologist estimates that he saved about 20% of the usual time required just in the technical review of the PBW installation design. From a broader perspective, the most important benefit is that this PBW technology is now more readily available for use in both states. PBW offers many advantages. It is an in situ passive system, so operation and maintenance requirements are almost nonexistent, especially compared to active/mechanical systems like pump and treat, soil vapor extraction (SVE), sparging, or similar approaches that usually require power and labor for many years. The lesson underlying these examples is that the initial time required for regulatory approval and innovative technology acceptance may be significantly reduced if ITRC guidance

documents are available and used by state environmental regulatory personnel when a new technology is first being deployed.

Building state-based support systems for new technologies

To extend the benefits of ITRC participation and foster the use of innovative technology within all sections of the organization, the Nebraska Department of Environmental Quality (NDEQ) initiated an innovative technology forum. The forum was developed as a team effort by staff from each section, under the leadership of staff from the Superfund Section that participates in ITRC. The forum is more than a source for technical information, its support by upper management also encourages staff and managers in each section to incorporate innovative technology into the day-to-day processes of the department. The primary benefit from this initiative is expected to be that the type of informational exchange that occurs on an external basis through ITRC will now also occur within the internal processes of NDEQ.

Streamlining procedures for approving new technologies

New York has extensive experience using thermal desorption technology to clean up hydrocarbon and chlorinated solvent-contaminated soils. ITRC has identified seven examples that demonstrate that by using ITRC thermal desorption guidance documents, the New York Department of Environmental Conservation is maintaining a consistent approach in reviewing and approving cleanup projects involving thermal desorption technologies. In practice, the guidance documents have minimized regulatory costs and standardized requirements, allowing realistic feasibility evaluations in the remediation technology selection process. The use of these ITRC work products saves the state time in reviewing work plans and other documents, as well as providing assistance to staff not as familiar with the technology.

Likewise, remediation design personnel and technology vendors are using the work products to predict requirements and collect data to prove that the technology meets those requirements. Preliminary comparisons between projects approved before and after ITRC guidance documents became available seem to indicate a reduction of several months in iterative reviews. Site owners should enjoy cost savings because remediation can actually begin sooner and costs associated with regulatory uncertainty no longer need to be built into vendor's prices.

Several years ago, the cost of thermal treatment of hazardous wastes was routinely estimated at around $150 per ton. Recent bids for similar treatment have been less than $50 per ton. Although this cost reduction is due primarily to competition with other options (land disposal), decreasing regulatory uncertainty has definitely played a role. The public will benefit as permanent treatment technologies are selected and deployed more quickly, and the guidance documents ensure that the appropriate requirements have been considered. Site owners who save money because of smoother regulatory paths may invest savings in cleaning up other sites that otherwise would not have been remediated. The lesson underlying these examples is that, even when a state considers the use of a technology to be a conventional deployment, ITRC guidelines continue to serve a useful purpose as they are incorporated into the state's routine processes, providing consistency and predictability, and leading to further time and cost savings.

Inspiring institutional changes within states

States active in ITRC have implemented initiatives that demonstrate how involvement in ITRC is fostering state culture changes, leading to opportunities for expanded use of innovative technologies within states. For example, Oregon has instituted a number of changes that signify its embrace of innovative technologies. During 1997, after 20 members of the Oregon Department of Environmental Quality attended ITRC-sponsored training on monitored natural attenuation, the state signed its first

record of decision incorporating MNA. Today, Oregon DEQ regularly considers MNA when evaluating remedial technologies for many organic contaminants. In the summer of 1998, Oregon DEQ issued guidance specifying that MNA meets the "treatment preference" for hot spots. These events illustrate the evolutionary process by which state agencies assimilate and then apply the innovative approaches and technical opportunities that are developed, encouraged, and supported by ITRC.

New Mexico is another state where policy changes are streamlining the deployment of innovative technologies. While participating on the ITRC Low-Temperature Thermal Desorption (LTTD) Team and helping collect case studies of the technology's performance, staff from the New Mexico Environment Department (NMED) became impressed with the technology's reliability in treating chlorinated solvent–contaminated soils. The state's support of thermal desorption has only grown since then. Staff in the department's Hazardous and Radioactive Material Bureau routinely uses the LTTD guidance documents to review work plans and develop specifications for the treatment of hazardous soils contaminated with chlorinated organics. On December 6, 1999, NMED approved the use of LTTD as a presumptive remedy for media contaminated with volatile and semi-volatile organic compounds. The department's decision to promulgate an LTTD presumptive remedy boosts state use of LTTD because a presumptive remedy standardizes part of the remedy selection process, entailing less time and expense for consultants to prepare and regulators to review work plans.

California is using ITRC documents and training to enhance its own planning documents. The California Regional Water Quality Control Board in the San Francisco Bay Region has amended groundwater-related sections of its water quality control plan, also known as the Basin Plan, in response to ITRC documents and training on natural attenuation. As the master policy document on water quality for the region, the Basin Plan describes the legal, technical, and programmatic bases of water quality regulation for the region and drives the regional board's efforts to manage water quality. Unlike traditional plans that often become obsolete, the Basin Plan is updated to maintain pace with technological, hydrological, political, and physical changes in the region.

Clarifying the regulatory implications of RCRA 3020(b)

ITRC provides a forum for states and other participants to identify and address regulations that are potential stumbling blocks to the deployment of emerging environmental technologies. One example is ITRC's catalyzing the U.S. Environmental Protection Agency to clarify a statute that in the past had been used by many states and USEPA offices as a regulatory barrier to the deployment of enhanced in situ bioremediation. RCRA 3020(b) requires that contaminated groundwater be "treated to substantially reduce hazardous constituents prior to injection." But the ITRC In Situ Bioremediation Team found through its case studies that groundwater with certain amendments can achieve reduction of hazardous constituents only after reinjection of the groundwater into the subsurface. The ITRC In Situ Bioremediation Team supported using contaminated groundwater as the host for additives, such as organic carbon, nutrients, electron acceptors and/or microbial cultures, and then reinjecting the amended groundwater to enhance in situ bioremediation of contaminants. ITRC supported reinjection of contaminated groundwater on the basis of environmental soundness—the inherent similarity of the reinjected groundwater to the remaining groundwater in the plume promotes cleanup while reducing the accumulation of wastewater.

In the fall of 1999, ITRC requested that USEPA clarify the impact of RCRA 3020(b) on reinjection. In the subsequent letter from USEPA, Matthew Hale, Deputy Director of USEPA's Office of Solid Waste, described the reinjection approach as "consistent with section 3020(b)(2), as long as the hazardous constituents are substantially reduced, either before reinjection or as a result of subsequent in situ bioremediation." (He went on to specify that the reinjection be "a CERCLA section 104 or 106 response

action or part of a RCRA corrective action intended to clean up contamination; and the response action or corrective action is sufficient to protect human health and the environment upon completion."). (3)

The positive response from USEPA led the ITRC State Engagement Team to construct a working principal that encourages states in their acceptance of enhanced in situ bioremediation. USEPA's reinterpretation of RCRA 3020 and ITRC's working principal are steps forward in the championing of enhanced in situ bioremediation among states.

ITRC Working Principle

"ITRC states are amenable to a proposal that would include injection of an additive as long as there is a demonstration that it will not create a problem and demonstrate that the additive is necessary to accommodate the remedial goal."

ITRC WEB SITE—A REPOSITORY FOR ITRC PRODUCTS AND NEWS

During 2000, ITRC made great strides in improving the function of its Web site found at http://www.itrcweb.org, which now contains all ITRC guidance documents and other products, all issues of the quarterly newsletter *Quarterly Update*, and an updated fact sheet for promoting ITRC. The overhauled Web site also allows approved users to post news items, add calendar events, and use team-specific pages. The ITRC Web site is proving a valuable asset for disseminating ITRC products and information about classroom and Internet-based courses to a broad audience, as well as keeping the members of this rapidly growing organization informed about team activities, planning meetings, and other conferences.

CONCLUSION

The state-led Interstate Technology and Regulatory Cooperation Work Group is developing guidance documents, training programs, and a professional network that are furthering regulatory acceptance of innovative environmental solutions. Across the nation, ITRC is helping state environmental agencies improve the protection of human health and the environment through increased use of innovative environmental technologies. More deployments of emerging environmental technologies become possible as states establish new policies and change their cultures to facilitate the acceptance and permitting of new technologies. Continued support for this unique network is critical to achieving improved efficiencies in cleanup and acceptance of new environmental technologies within the regulatory community. Federal agencies such as DOE and DOD should continue their involvement and support of the group to increase multi-site deployments of innovative technologies.

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