Integrated Strategy for Public Involvement at the Paducah Gaseous Diffusion Plant

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Abstract

In 2003, the Kentucky Research Consortium for Energy and Environment (KRCEE) was created at the University of Kentucky through the efforts of US Senator Mitch McConnell. The Consortium's mission was to provide technical support to the US Department of Energy (US DOE), the US Environmental Protection Agency (US EPA), and the Kentucky Division of Waste Management regarding non-consensus issues associated with clean-up efforts at the Paducah Gaseous Diffusion Plant National Priority List Superfund site. In 2009, KRCEE was asked to develop a community-based end state vision that would encompass the range of community perspectives and preferences for the site's future after US DOE closes the facility. This paper provides an overview of the methodology that has been developed and is being implemented as part of this process, as well as lessons learned in interfacing with a diverse set of stakeholders.

Site Description

The Paducah Gaseous Diffusion Plant (PGDP) is the only active uranium enrichment facility in the United States. Located in the western part of McCracken County, KY, the facility is approximately 10 miles west of Paducah and 3.5 miles south of the Ohio River (Figure 1). The plant is located on a US DOE reservation that encompasses approximately 3,500 acres, including property leased to the state of the Kentucky to augment the West Kentucky Wildlife Management Area (WKWMA). The WKWMA provides an effective buffer around the 748 acres that comprise the plant's main industrial operations (US DOE, 2001).

US DOE property is bordered to the north by the Tennessee Valley Authority (TVA) Shawnee Steam Plant which, along with another facility in Missouri, provides electricity to the PGDP. US DOE property is bordered to the south and west by the WKWMA. Several private properties directly border US DOE property to east.

Following the initial discovery in 1988 of Technetium-99 contamination in nearby drinking water wells, US DOE initiated a Water Policy, which provides potable water at DOE expense to properties overlying or potentially overlying a contaminated groundwater plume. This plume has affected both residential and agricultural properties to the east and west of the PGDP (Figure 2).

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Site History

In 1988, the Kentucky Cabinet for Human Resources (CHR) Radiation Control Branch (RCB) discovered Technetium-99 (99 Tc) in private drinking-water wells northwest of the Paducah Gaseous Diffusion Plant (PGDP). Technetium-99, a man-made radioisotope that is a by-product of nuclear fuel rod fissioning, was introduced to the PGDP enrichment process through spent nuclear fuel rods from the US DOE Savannah River nuclear facility. The discovery of 99 Tc and, subsequently, Trichloroethylene (TCE) in drinking-water wells led US EPA and US DOE to enter into a formal Administrative Consent Order (ACO) under Section 104 and 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The ACO required that US DOE investigate and address the nature and extent of the PGDP-related contamination and its potential impacts on human health and the environment.

On May 13, 1991, the Commonwealth of Kentucky and US DOE signed an Agreement in Principle (AIP). This non-regulatory program provides funding for independent, impartial, and qualified assessments of past, present, and future environmental and health issues related to but not addressed by CERCLA and other regulatory programs at contaminated US DOE sites. Agreements in Principle were initiated by US DOE to provide funding for additional data collection and assessments in response to potential public distrust of the agency related to cleanup of existing sites.

On August 19, 1991, Kentucky issued US DOE a Resource Conservation Recovery Act (RCRA) permit for the treatment and storage of hazardous PGDP wastes. The RCRA permit requires US DOE to comply with environmental laws and regulations in the cradle-to-grave management of hazardous wastes, worker safety, record keeping, emergency planning and prevention, and protection of public health and the environment.

On May 31, 1994, US EPA placed the PDGP on the Superfund National Priorities (NPL) list, which identifies contaminated sites across the nation that US EPA has designated as high priority based on potential threats to human health and the environment. Following a site's addition to the NPL list, federal law requires that responsible state and federal agencies enter into a Federal Facilities Agreement (FFA) outlining the agencies' roles and responsibilities. These include investigation and implementation of corrective measures, as well as the integration of state and federal cleanup requirements into an effective and comprehensive process. After four years of negotiation, US DOE, US EPA, and the Commonwealth of Kentucky formally signed the FFA in 1998.

As part of the FFA agreement, management of clean-up efforts first involved characterization of all potential sources of contamination into solid waste management units (SWMUs) or Areas of Concern (AOC). This process included a qualitative evaluation of contaminant types and concentration, release mechanisms, likely exposure pathways, estimated points of exposure, and potential receptors based on current and reasonably foreseeable future land and groundwater uses. These sources were then grouped into one of five media-specific Operable Units (OUs):

• Groundwater OU
• Surface Water OU
• Soils OU
• Burial Grounds OU
• Decontamination and Decommissioning OU
• Comprehensive Site OU

Subsequent management activities associated with each OU typically involve several steps or phases including: 1) remedial investigation, 2) baseline risk assessment, 3) feasibility studies, 4) record of decision/selection of a particular remedial action, 5) remedial design, and 6) remedial action. In most cases, management of each OU involves several different projects that address the contamination/risk issues associated with one or more SWMUs or AOCs. For example, the Groundwater OU includes several different projects: 1) on-site TCE source remediation, 2) the Northwest and Northeast Plumes, 3) the Southwest Plume, and 4) potential sources associated with two off-site landfills. Specific timelines for each of these projects are established and tracked via the FFA and an annual Site Management Plan developed by US DOE. Assurance of project performance is provided by a CERCLA five-year review process (US DOE, 2009).

Public Perceptions of the PGDP

While the PGDP has enjoyed strong support from many who reside in the Paducah area, primarily because of the number of jobs the facility provides and its subsequent impact on the regional economy, a number of residents who live near the facility have developed a strong distrust of the federal government and of US DOE, in particular. The site has been the focus of many federal investigations, as well as the subject of numerous published articles in such newspapers as *The Washington Post* (Warrick, 1999) and in such magazines as *The New Yorker* (Mason, 2000). The site also is suspected to have served as the inspiration for a recent novel (Mason, 2006).

Based on numerous interviews with local stakeholders, it appears that US DOE's past attempts to educate and involve the Paducah community, including the creation of a public information center and the formation of a Citizen's Advisory Board comprised of local residents, have largely been unsuccessful in building trust, especially with many residents who either live near the facility or are active in environmental and health advocacy. Thus, additional attempts to involve the general public in any substantive way toward developing a future vision for the facility can engender reactions ranging from extreme skepticism to apathy to anger. As one local activist put it, "[DOE's] process seems to be…how can we get around the interest of the people, how can we get them to swallow this one more time" (KRCEE, personal communication, July 2009).

Risk Based End State Process

In 2002, the US DOE Office of Environmental Management (EM) developed a detailed strategy in response to a top-to-bottom review of the agency. One of elements of this strategy involved the development of Risk-Based End State (RBES) vision documents for

each of its facilities. A draft RBES for the PGDP was developed in 2004 (US DOE, 2004).

This document subdivided the risks associated with the facility into nine different hazard areas, including groundwater operable unit, surface water operable unit, cylinder yards and DUF6 conversion facility, etc. The document then provided risk assessments for each of the hazard areas, as well as risk management strategies and risk levels associated both with currently planned remediation actions and with a modified plan. The RBES process required that stakeholder input be sought from Paducah's citizens.

Risk Based End State Project

In 2009, US DOE approached the Kentucky Research Consortium for Energy and Environment, or KRCEE, at the University of Kentucky to undertake the development of a community-based end state vision for the Paducah Gaseous Diffusion Plant. A research team was created that involved eight different professionals with specific associated expertise. These are summarized in Table 1.

Table 1. Project Research Team

Name	Expertise
Dr. Lindell Ormsbee	Project Management
Dr. Chike Anyaegbunam	Community-Based Participatory Communication
Dr. Ted Grossardt	Structured Public Involvement/Keypad Technology
Dr. Keiron Bailey	Structured Public Involvement/Casewise scenario evaluation using fuzzy theory and artificial neural networks
Anna Hoover	Health and Risk Communication
Mitchael Schwartz	Health and Participatory Communication
John Ripy	Computerized scenario visualization/Keypad Technology
Ben Blandford	Computerized scenario visualization/Keypad Technology

Guiding Principles

The team's first step was to create a strategic plan and methodology for developing the community-based vision. During this process, four guiding principles were chosen for the project:

1) Per instructions from US DOE, the process incorporated the recommendations of a report entitled "The Politics of Cleanup" (ECA, 2007) that reviewed past DOE community involvement strategies at three major DOE facilities: Rocky Flats, Mound, and Oak Ridge.
2) The final methodology was designed to maximize the level of citizen control. A modified version of the ladder of citizen participation (Arnstein, 1969) ultimately was included (see Figure 3). Not only did the ladder provide a guideline for use by the team, it also served as a way to gauge public perceptions about past and current levels of community involvement, as well as preferences for future involvement.

3) A key to the potential success of the project was to involve as large and diverse a group of stakeholders as possible. Consequently, the community-based participatory communication (CBPC) methodology was selected. CBPC has been described as "a process of raising consciousness and deep understanding about social reality, problems and solutions, rather than persuasion for short-term behavioral changes that are only sustainable with continuous campaigns" (Dagron, 2001). In particular, an attempt was made not only to solicit stakeholders' values about their local community and preferences for future uses of the PGDP property, but stakeholders also were actively involved in developing the overall decision-making process and scenarios for consideration.
4) Finally, Structured Public Involvement (SPI) was selected to further maximize stakeholder participation, as well as to insure that the final matrix of possible end state vision scenarios provided a representative sample of both the scenario and the stakeholder decision spaces. During the implementation of SPI, each public meeting participant is given a small keypad transmitter (about the size of a credit card) that provides the opportunity to respond anonymously to different questions. The collective feedback can be instantly displayed to all participants. The data also can provide more detailed information for analysis through the Casewise Preference Model (Bailey et. al., 2001), helping to identify clusters of stakeholder preferences and aversions for sampled scenarios, and even more importantly, predicting preferences and aversions for other parts of the sample space for which specific scenarios were not actually evaluated. The latter capability becomes increasingly important as the complexity of the land use decision space increases, making it infeasible for the public to evaluate all possible scenarios.

Process Methodology

Utilizing the previously described guiding principles, the team developed a three step process model (see Figure 4).

Step One – Stakeholder Identification. The first step of the process was the identification of key stakeholder groups within the community. After initial research and based on previous work by KRCEE in the Paducah community, 16 different stakeholder groups were identified (see Table 2). A process advisory board comprised of representatives from each of the 16 groups was then constituted. The advisory board functions to pre-test individual steps of the process prior to community-wide implementation and, where warranted, to recommend modifications to the process or associated components. Advisory panel representatives were selected based in part on their status within their respective stakeholder groups, as well as their potential to bring members of their constituencies into the planning process.

Prior to the development of a decision matrix of possible end state scenarios, each advisory panel representative, along with dozens of other stakeholders, was interviewed and asked to help identify: 1) key community values and visions; 2) concerns/issues/community perceptions about the future closing of the PGDP; 3) the identities of other potential stakeholder groups and key community leaders; and 4) their stakeholder group's opinions about the feasibility of certain future land use options for the facility. Following this

interview process, the KRCEE team developed an initial set of future site scenarios that encompassed the range of suggestions obtained from interviewees. These scenarios were pre-tested with the advisory board through a series of small group meetings. Simultaneously, the advisory board pilot tested the proposed protocol for Phase II stakeholder focus groups. Following pilot tests, which were recorded with the consent of the participants, several changes were made to both the initial protocol and the trial scenarios.

Table 2. Key Stakeholder Groups in Paducah

1. Residents Near the PGDP
2. Employees at the PGDP
3. Environmental and Health Activists
4. Economic Development Advocates
5. Healthcare Professionals
6. Educators
7. Media
8. Religious/Spiritual Community
9. Wildlife/Recreation Enthusiasts
10. Travel and Tourism Interests
11. Neighboring Communities, e.g. Ballard County Citizens
12. The U.S. Department of Energy
13. US DOE Contractors
14. Local Government, e.g. Paducah City Council, McCracken Co. Commission
15. The PGDP Citizens Advisory Board
16. The Regulatory Community, including both federal and state agencies

Step Two – Stakeholder Meetings. Following pre-testing and revision of the focus group protocol, focus groups were implemented with the stakeholder groups. Because of logistical constraints and the large number of stakeholder interests, a reduced number of focus groups were held in which distinct-but-related stakeholder groups met jointly. These meetings were conducted over a two week period in Paducah. Per the revised protocol, focus group participants engaged in several exercises designed to identify 1) community values, 2) concerns and issues, and 3) existing beliefs and information gaps. A detailed discussion of the CBPC process as implemented in Paducah is provided by Anyaegbunam et al. (2010).

One component of the CBPC protocol included the presentation of potential future vision scenarios developed by the Structured Public Involvement team. The SPI team created the focus group scenarios in consultation with the advisory board, limiting the number to allow sufficient time for discussion and evaluation, but selecting scenarios that provided a robust and representative sample of the total decision space. Focus group participants were asked to discuss specific scenarios as they related to the previously identified community values, concerns, and beliefs. Following the discussion, participants evaluated the scenarios anonymously using SPI keypad technology. A detailed discussion of the application of the SPI process at Paducah is provided by Grossardt et al. (2010) and Bailey et al. (2010).

Based on the results of Phase II, a new protocol was developed to guide a series of large public meetings. Prior to implementation, the process advisory board again pre-tested the Phase III protocol and suggested modifications.

Step Three: Community Meetings

After revision of the community meeting protocol, it will be implemented at a series of three community-wide public meetings. Participants will be provided with a set of potential scenarios that will be selected and refined based on focus group outcomes and the input of the process advisory panel. During the public meetings, the KRCEE team will provide initial explanations of each scenario, after which participants will evaluate the scenarios using keypad technology. The sites and times of the three meetings will be chosen in consultation with the advisory board and stakeholder groups to maximize participation and stakeholder diversity. Table 3 provides a list of several potential sites.

Table 3. Potential Locations of the Public Community Meetings

1. Heath High School (based on it proximity to the PGDP)
2. West Kentucky Community and Technical College (based on its proximity to interstate 24 and the city of Paducah)
3. Maiden Alley Theater (based on its proximity to downtown Paducah)
4. Paducah City Hall
5. The Chamber of Commerce

Following the public meetings, community responses will be aggregated and analyzed, and a final report will be prepared and presented to the advisory board. Based on feedback from the advisory board, the report may be further modified. The final report will be presented both to US DOE for inclusion in its Risk-Based End State vision document and to the community as documentation of their preferences for use in discussions with state and federal representatives about the future of the PGDP.

Summary and Conclusions

This project has provided a unique opportunity to combine different methodologies and technologies toward the development of a community consensus document for a future land use decision. The final vision document should provide a much greater level of community ownership and acceptance than would be achieved through more traditional methods. It is hoped that the experiences from this study will provide a successful template for addressing future complex problems that involve public participation from numerous stakeholder groups.

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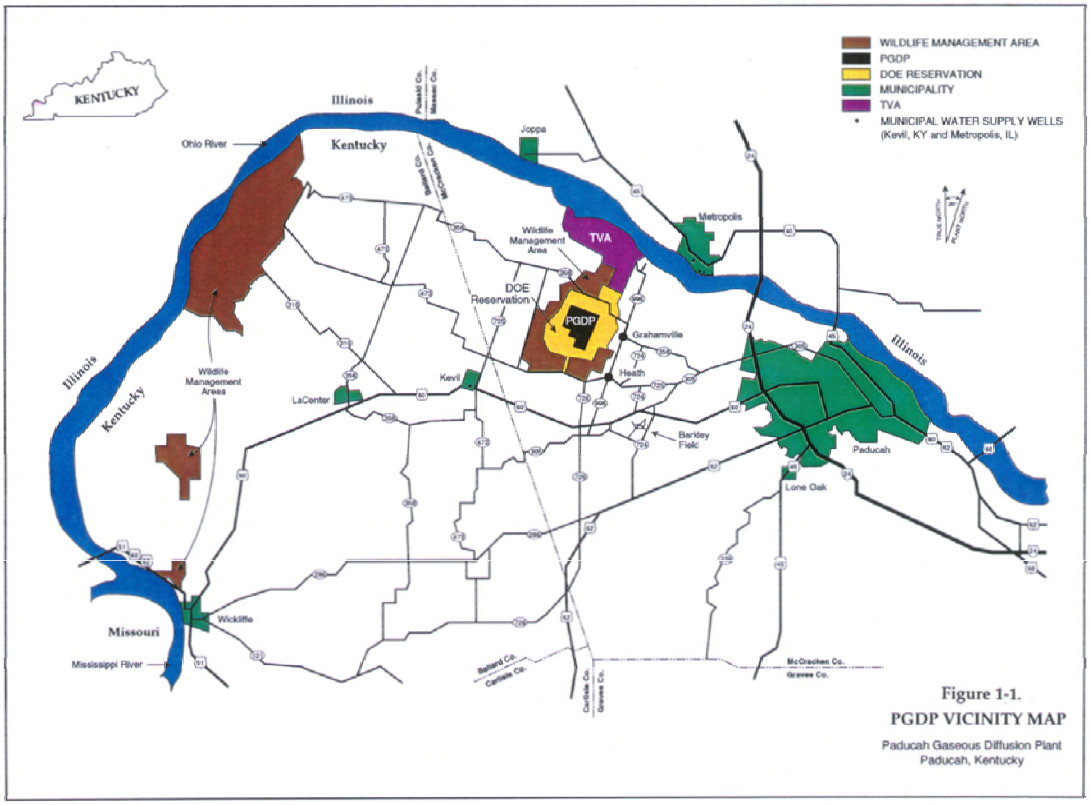

Figure 1. Location of the Paducah Gaseous Diffusion Plant (DOE, 2001)

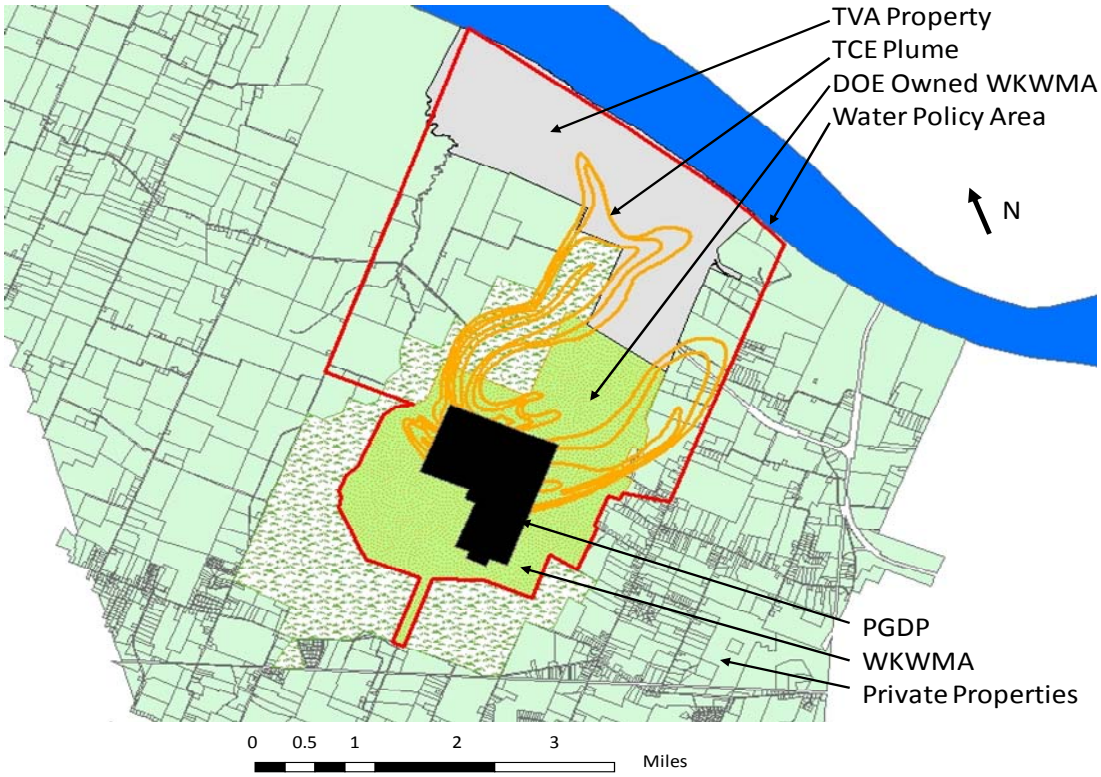

Figure 2. Land Use Around the Paducah Gaseous Diffusion Plant

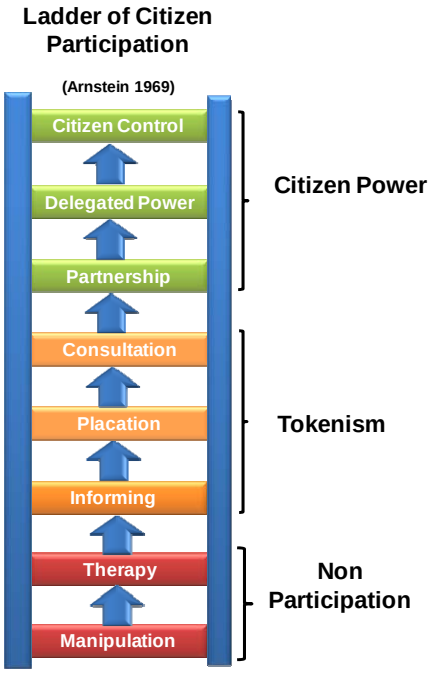

Figure 3. Modified Ladder of Citizen Participation from Arnstein (1969)

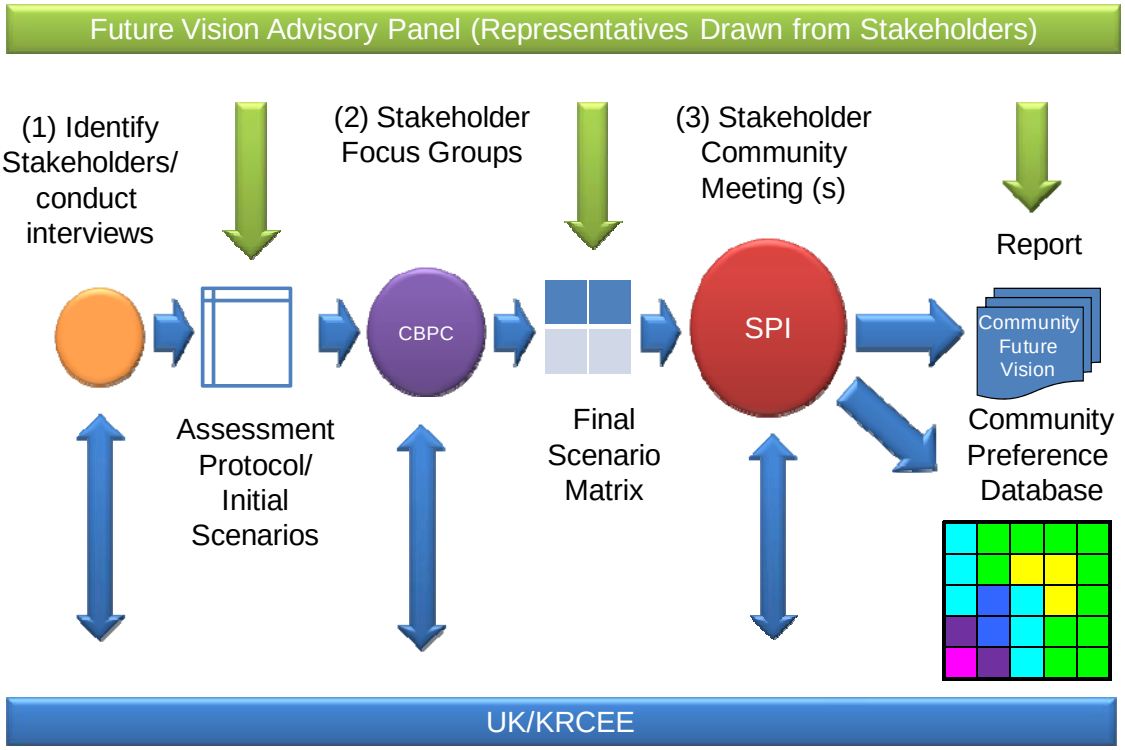

Figure 4. PGDP Future Vision Process