UNDERSTANDING Environmental Policy

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Chapter 4

Why Companies Let Valuable Gasoline Leak Out of Underground Tanks

The Nature of the Problem

In Title I of the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Solid Waste Disposal Act of 1976, the U.S. Congress began to regulate underground gasoline and chemical storage tanks. In 1986 the Superfund Amendments and Reauthorization Act (SARA) established a leaking underground storage tank trust fund to pay the costs of cleanups when tank owners could not be found or resisted a cleanup order from the government. Over the past century, underground storage tanks have become the preferred method of storage for the ever increasing quantities of petroleum and chemicals needed to fuel our lifestyle.

Underground tanks were used for safety and economy. They were thought to be less explosive than above-ground tanks, and land could be saved by placing them under parking lots, buildings, and other above-ground facilities. In the early 1980s, the EPA estimated that more than one-fourth of the nation's underground tanks were leaking and posed risks to the environment and public health (Feticiano 1984; U.S. EPA 1985). Around the time that tank regulation began in the 1980s groundwater contamination was becoming a political issue in parts of the United States dependent on groundwater for drinking. Releases of gasoline and its chemical additives from leaking underground storage tanks were a major source of groundwater contamination.

In 2000 groundwater consumption totaled 83.3 billion gallons per day, or about 24.1 percent of freshwater consumption (U.S. Geological Survey 2005). Although this may seem like a relatively small percentage, the EPA reported that, in 2002, 11,746 water systems serving 183.7 million people in the United States, relied on surface water, while 41,691 systems serving 84 million people relied on groundwater. Nearly all (95 percent) of our rural population depends on groundwater for daily use.

While regulation began in the mid-1980s, and much progress has been made in bringing this problem under control, the EPA reported the following figures in 2005:

- More than 670,000 underground tanks are regulated by EPA
- Since 1984, nearly 1.6 million tanks have been closed by EPA
- EPA has received reports of 447,233 tank leaks since the program began in 1984
- Cleanups have begun at 412,657 sites and have been completed at 317,405
- 129,827 cleanups have not been completed

Initially the problem of leaking tanks was puzzling, because the material in underground storage tanks was thought to be a product with economic value. In the early 1980s, it gradually became clear that toxic industrial waste creates problems when released into the environment. Toxic waste is essentially dangerous garbage and obviously of little value—the poorly understood refuse of production processes. But the material leaking out of underground tanks is the material that owners of the tanks are in the business of selling. One might assume, then, that we simply had to tell the owners that their tanks were leaking and they would want to fix them as soon as possible.

The reality of any environmental problem is complicated, and there were a variety of reasons why tanks were leaking. For one thing, underground moisture was seeping in because of leaky pipes and connections. Gasoline tanks were not protected against corrosion because no one thought they would rust. Nor did most people know that gasoline additives were harmful. Because gasoline was so inexpensive, preventing or stopping slow leaks was not cost-effective. Furthermore, many leaking tanks were the result of inattention or ignorance, such as leaks occurring at abandoned gas stations or one- or two-pump stations that were an added convenience at a rural "mom and pop" grocery store. Some leaks even occurred when gasoline was being pumped into or out of underground tanks.

As a result of tank regulation, approximately 1.5 million tanks were taken out of service in the program's first two decades (EPA 2004a). What remained, largely, were the tanks of major oil companies and their franchisees (Cohen, Kamieniecki, and Cahn 2005, 116). Consequently, there were fewer gas stations but with many more gas pumps. Self-service pumps eliminated most of the low-wage jobs associated with pumping gasoline. Moreover, pay-at-the-pump technology a few years later eliminated many of the cashier jobs that had survived the advent of the self-service pump. These changes resulted in an ever increasing number of underground tanks and a shrinking number of people to keep track of their contents.

Environmental damage to the property and health of people living near leaking tanks is an important dimension of the problem. It became clearer in the 1980s and 1990s that the owners and operators of leaking tanks were liable for the costs of these damages. The potential and actual liability of leaking tanks, along with increased government regulation of tank installations, resulted in tank owners and operators changing their behavior. There were also many closures and sometimes abandonment of existing tanks. Given all the existing and potential costs of tank leaks, it is difficult to understand why more than four hundred thousand tank leaks have been reported in the past two decades (U.S. EPA 2002c).

Leaking Tanks as an Issue of Values

The development of the problem of leaking underground storage tanks has several value dimensions. The value of human safety and protection of property was what stimulated the burial of tanks in the first place. Many tanks were installed during the 1950s and 1960s, a time when our knowledge of ecology was limited, and placing tanks underground should be seen largely as an expression of ignorance and not a lack of concern about protecting groundwater. The second relevant values are mobility and economic consumption. We built gas stations everywhere to give us maximum freedom to express our economic preferences. These values also contributed to the expansion of suburban development and sprawl, which, in turn, created demand for the placement of underground storage tanks throughout the countryside (Cohen, Kamieniecki, and Cahn 2005, 116).

What do I mean by the values of consumption and mobility? The huge consumption of material goods and services by American society is well documented and need not be reiterated here. With regard to the latter value, it is undeniable that America is a mobile society. Approximately 43 million people, or 16 percent of all Americans, relocate each year (U.S. Census Bureau 2002, section 3–1). When we relocate we expect certain distinct features in our new location as well as a familiar set of goods and services. Our desire for mobility is also reflected in travel data. According to the American Automobile Association (2004), more than 38 million Americans traveled fifty miles or more during the July 4 weekend in 2003. Mobility in the United States is almost synonymous with freedom. The extreme value placed on mobility in American culture requires expending a significant amount of energy. Coupled with the value placed on owning one's own home in a rural-like setting, the resulting suburban sprawl has placed gas stations in remote and ecologically fragile places. The problem of leaking tanks, therefore, is a result of consumption patterns resulting from these value choices.

In a free market economy, where production and consumption are highly valued, both are seen as needing no justification. Even environmental protection is justified as a form of consumption. We need to protect the environment so we can enjoy it. Gasoline stations are placed wherever there is sufficient demand for gasoline. The impact of the development and travel that gasoline enables is an effect to be mitigated if necessary. So great is the priority placed on the value of consumption that it is rarely questioned.

As a willing participant in the American system of freedom, mobility, and high energy consumption, I am not arguing for its end but simply pointing out its unquestioned acceptance. We could live according to a set of values that placed a higher priority on preserving ecology or that promoted a spiritual rather than material lifestyle. An expression of the value of ecological preservation would be a policy that required greater development planning and a more meaningful assessment of environmental impacts than currently exists. Although the policy we now have does require that we consider environmental impacts, it also allows us to ignore those effects.

Appreciating the values involved in the problem helps us to understand the presence of underground tanks throughout the United States, including in environmentally sensitive areas. They do not explain, however, why the tanks leak. While a throw-away society clearly discards certain valuable resources such as gasoline, it does not advocate the disposal of unused products of value such as gasoline. To understand that aspect of the problem we need to look at the issue through other lenses.

Leaking Tanks as a Political Issue

In the early 1980s we discovered that a substantial proportion of the nation's underground tanks were leaking. Politics did not cause the tanks to leak, of course, but preventing future leaks and cleaning up the damage of past and existing leaks rapidly became a political issue. The market value of gasoline was not high enough to ensure self-regulation. Oil companies and tank owners allowed tanks to leak and did little to prevent or clean up tank seepage. If tank leaks had no impact outside the tank owner's property, the issue might have stayed off the political agenda. But because petroleum is easily transported through the ground, it can readily move off the tank owner's property to contaminate other peoples' property and groundwater.

With the contamination of individual property and collective resources, and the failure to develop a private response to those problems, leaking underground tanks became a political issue. The problem had three dimensions that reached the political agenda: the development of standards for new and existing tanks to prevent future leaks; clarification of the specific liability incurred by tank owners for leaks; and methods of assigning responsibility for the payment and execution of cleaning up the damage.

The issue of underground tanks arose amidst the consolidation of the U.S. oil industry and a change in the distribution system for gasoline. Small mom-and-pop grocery stores and auto service stations that also had gas pumps were being replaced by larger gas stations with more pumps and tanks and no auto repair shops. In the mid-1990s these gas stations began to include twenty-four-hour convenience stores. Tank regulation contributed to these trends by increasing the regulatory requirements for underground tanks and thus operational costs as well. As a result, increased costs and complexity drove small operators out of the retail gasoline business.

The politics of tank regulation was relatively low-key by environmental standards. Interest groups representing the oil industry initially and reflexively opposed government regulation in this area when it was first proposed in the early 1980s. Petroleum was excluded from the Superfund's stringent joint, strict, and several liability provisions, and the industry wished to maintain that exclusion (Cohen, Kamieniecki, and Cahn 2005, 164). Eventually the industry came to support some form of tank regulation. Because gasoline contains substances besides petroleum, the Superfund liability provisions could be applied to impacts from other toxic additives, particularly benzene, lead in older tanks, and, in the newer tanks, methyl tertiary butyl ether (MTBE), the antiknock replacement for lead in gasoline. The larger oil companies also saw a benefit in improving the management of their product. By raising the costs of staying in the business, they were able to consolidate the distribution system under their control. When corporate leaders became aware of the size of the leaking tank problem, their posture switched from opposition to a desire to influence and moderate tank regulation. It became clear that some form of tank regulation would simply become part of the cost of doing business in the United States.

While large oil companies saw tank regulation as a necessary evil, the EPA had to be sensitive to the impacts on smaller businesses of excessively stringent or costly regulations. The final regulation governing tank management took fourteen years to finalize and was not issued until 1998. The sheer number of regulated parties created a complex regulatory environment.[1] Unlike the oil industry, which is dominated by a small number of large companies, gasoline distribution includes a large variety of smaller players and franchisees. In this respect, tank regulation could be seen as a subset of the general field of government relations with small businesses. In American political mythology, small business is considered a critical point in the progression from rags to riches and a key part of the American dream. In this scheme, the small business owner is a former worker who has managed, through hard work and good fortune, to become upwardly mobile. With this image in mind, it is politically dangerous for government to treat the small grocery store owner who has a gas pump out front the same way it treats a major oil company. Nonetheless, in the 1980s and 1990s, the gasoline distribution industry was consolidated and tank regulation was combined with a range of other factors that contributed to the demise of many small operators. Tank regulation probably escaped blame for this trend.

The tank issue, of course, is not simply about regulating tanks to prevent leaks; it also involves the cleanup of leaks. Gasoline from a leaking tank is no longer a valuable product but instead is a potential toxic waste. The politics of underground tanks therefore becomes the politics of hazardous waste cleanup. The effect of hazardous waste tends to be severe and extremely localized, making it one of the most volatile and unpredictable issues in environmental politics. The American political system is custom-made to address such issues. With its single-member, winner-take-all districts and its federal and highly decentralized structure, the system responds best to issues with clear, geographic origins and impacts. Representatives to Congress, to state and county legislatures, and to town or city councils are expected to respond to demands for action on issues such as these. The geographic orientation of American politics is well known and accepted, and so a range of rules and customs have been instituted to help politicians respond to the needs of their constituency base. The American tendency toward ad-hoc, nonpartisan, issue-based politics has also led to the creation of hundreds of local organizations lobbying for action on toxic cleanup.

While tank regulation is a low-intensity and relatively noncontentious political issue, the cleanup of tank leaks is a different matter. The politics of hazardous waste cleanup is examined in greater detail in chapter 5, but one point is important to raise here, and that is the relationship between the politics of toxic waste and the sheer complexity and unpredictability of the threat it poses. The chemicals in toxic waste vary widely, as do the pathways leading to human exposure. A leaking tank in one location can quickly contaminate the well that supplies drinking water to a nearby home or a neighbor's basement. In a different location, on the other hand, the leak can go undetected and be contained for decades. One reaction to this complexity is fear and an understandable refusal to gauge the actual risks that toxic releases pose. This leads to a highly intense, often symbolic and contentious political dialogue. One reason is that many of the health effects of toxic substances have a long latency period, and so the absence of an immediate health effect does not

guarantee that the waste is not potentially hazardous to one's health in the future.

The degree to which the politics of tank regulation evolves into the politics of hazardous waste is unpredictable, but it is part of the political side of the tank issue. Although tank policy and management is not typically high on the political agenda, the hazardous waste element involved reminds us that sometimes such an issue can develop a highly volatile political dimension.

Leaking Tanks as an Issue of Science and Technology

Do we have the technology to prevent leaking tanks? We most certainly do. Do we have the technology to clean up leaks from tanks? Not entirely. But we have learned a great deal in the past quarter-century about how to engineer a cleanup. And while the technology to prevent leaks is more readily available than the technology to clean them up, overall I would not characterize leaking tanks as a technical challenge. One might conclude that the problem of leaking tanks was largely caused by the development of the automobile and its effect on our patterns of land use. Still, the technical know-how exists to transport, store, and pump gasoline while minimizing hazardous releases into the environment. Tanks can be built with double walls to minimize the probability of leaks, and leak detection devices can be installed on tanks to quickly determine if the tank's integrity has been breached.

Once a tank has leaked, however, we have the technology to remove the toxins only from certain environments. Some environments make it difficult to detect the presence of gasoline and its additives in the ground. In certain cases it is difficult to actually remove the pollutants from the environment. The common techniques used for toxic waste cleanups here are containing the waste in one area, pumping water through the site while filtering the toxics, and, where necessary, removing the soil and placing it in a designated toxic waste dump. These tasks have been performed before and have varied levels of effectiveness depending on the waste, the local ecology, and the quality of the equipment used to treat the waste (Blackman 2001, 142–189).

Leaking Tanks as a Public Policy Design Issue

The tank problem, in some respects, is a result of the relatively low price of gasoline in the United States. It is sometimes more cost-effective in the short run to let a tank leak than to stop the leak. Effective environmental policy provides incentives for institutions and individuals to alter the behaviors that are contributing to environmental damage. For example, tradable air emission allowances encourage businesses to reduce emissions in order to sell allowances to other firms for cash. What behaviors need to change to resolve the problem of leaking tanks? The efforts early on to create a pattern of decentralized development, which resulted in locating gasoline stations near underground water supplies, led directly to the problem, and it is far too late to influence those behaviors. The issue facing policy designers today is to ensure that the gasoline in underground tanks, pumps, pipes, hoses, automobiles, and gas tanks of trucks stays where it belongs. The desired behavior, when tanks leak, is for the responsible parties to clean up the leak and pay their neighbors for damages.

The EPA approached the problem by working closely with industry and with state and local governments on several initiatives. First, tank standards were set that reduced the probability of leaks in new tanks. Second, tank owners were required to implement a method to detect leaks. And, third, tank owners had to demonstrate that they had the financial capacity to clean up leaking tanks. In the twenty years since tank regulation began, the United States has made significant progress in reducing environmental threats from leaking tanks, as will be demonstrated below.

The Underground Storage Tank (UST) Program has two key indicators of success: the number of tanks leaking and the number of leaks cleaned up. According to EPA estimates, approximately forty-six thousand tanks leaked each year prior to regulation in the early 1980s. Since the inception of the EPA Office of Underground Storage Tanks (OUST), the average annual number of confirmed leaks has been thirty thousand, with fewer over the last few years (U.S. EPA 2002b).

Since 1988, state agencies reported significant results in tank closures and cleanups, with approximately 10,000 to 40,000 cleanups completed each year. As of March 2004, OUST reported that 1.6 million unsafe tanks had been closed since its inception. More than 440,000 UST leaks have also been confirmed. Of this number, more than 317,000 cleanups have taken place and 129,000 cleanups remain (U.S. EPA 2005a). Despite this progress, the problem of leaking tanks persists. The rate of tank leaks has declined, but the problem remains unsolved.

Here we have private parties working together with all levels of government, a policy design that appears to be successful, and apparent progress in solving a societal problem. In short, economics, politics, and environmentalism are in reasonably good alignment, and yet the problem persists. We can solve this puzzle, however, by looking at the problem of leaking tanks as one of organizational management.

Leaking Tanks as a Management Issue

In the late 1980s I attended a meeting chaired by Ron Brand, the first director of OUST, on approaches to leak detection at gasoline stations. One staff person spoke about inventory control as a possible method. The idea was simple: a gas station attendant simply had to read the dial on the pump each day to see how much gasoline had been pumped from the tank and then compare it to the amount of gasoline that had been delivered. To verify the result, a dipstick could be used to measure how much gasoline remained in the tank. In response to this suggestion, Ron described the following scenario: "It's 6:00 in the morning in February, and you work in a gas station in Montana where the wind chill this morning is –34 degrees. What are the chances you'll actually go outside to do anything other than pump gas? In all likelihood, your idea of inventory control is a work of fiction." Demonstrating his keen insight into how organizations function in the real world, Ron pointed out that what looks simple to a policy designer may be entirely unrealistic.

A major problem in regulating underground tanks is the sheer number of them and the multiple actions required to ensure compliance. Small leaks that result from overfilling tanks are one example. If you pump your own gas at a filling station—a behavior encouraged by self-service pumps with a credit card option—you'll notice a sign with this direction: "Do not top off your tank. Please stop pumping when the automatic cut-off engages." A former practice at gas stations was to fill the tank with as much as it could hold, which often resulted in gasoline ending up on the ground. Probably millions of people disregard those instructions every day and overfill their tanks. Although these are obviously very minor leaks, they add up.

The behavior of millions of people needs to change in order to prevent leaks. Among them are people who manufacture, deliver, and pump gasoline; build, install, and repair tanks; drive vehicles and pump their own gas; and insure, inspect, and regulate tanks. The organizational capacity to do this work has been evolving for more than seventy-five years, with many additional new tasks and routines over the past decade. The amount of work involved in these tasks continues to grow, along with the number of miles traveled by vehicles in the United States. The complexity of this work has also increased with the advance in technology and the implementation of many more regulations. The reason tanks continue to leak, in my view, may be found within the vast scope of the effort to distribute and use gasoline for transportation. First, the sheer number of transactions means that there are numerous places within this chain of production for mistakes to occur. Second, some tasks such as leak detection are new, and the organizational capacity to perform them is still in development.

It may seem that the management of these prosaic activities ought to be simple enough to make leaks less common. Case studies of new tank leaks reveal that most leaks are apparently caused by human error that could have been prevented, such as damages that occur during installation or connections between pipes and tanks coming loose (Blackman 2001, 378). Leaks are also sometimes caused by extreme weather conditions. In all cases, the damage can be minimized by detecting leaks early, which requires tank owners to develop the capacity to find and stop leaks quickly. This involves hiring an adequate staff, purchasing needed equipment, developing standard operating procedures, training staff in those procedures and in the use of equipment, and, finally, implementing the procedures. In other words, it is a matter of fundamental management.

A Summary of the Many Dimensions of Leaking Tanks

The relatively high number of leaks must be seen, in my view, as generally a management issue. The policy now in place has resulted in a reduction in the number of tank leaks. Leaking the product into

the ground instead of selling it obviously has no economic benefit, and there is little private-sector lobbying to ease the rules on tanks. Arguably, then, if gasoline were more expensive, people would be more motivated to prevent leaks. This may be true, but when the potential liability tank owners face from third-party damages resulting from leaks is added to the value of gasoline, it is hard to see the tank problem as one of poor regulatory design. Tank owners have plenty of motivation to behave "correctly." Perhaps they simply lack the capacity to do what is in their obvious self-interest.

The number of transactions and behaviors required to protect the environment exacerbates the management issue at the heart of the underground tank dilemma. The fact is that we have chosen to remain a highly mobile society dependent on a specific technology, namely, the internal combustion engine, which requires gasoline, a toxic substance, to run. The management question is this: can we make every driver, every person delivering gas, every gas station attendant aware of the urgency to handle gasoline very carefully? Can we perfect the process of installing tanks and pumps to reduce the probability of leakage? Is it possible to develop a level of skill and technology that prevents most leaks? Can our organizations that extract, refine, deliver, and distribute oil and gasoline develop the capacity to reduce leaks? The answer to most of these questions is yes, as evidenced by the significant reduction in the number of leaks in the past two decades. But a question remains: How much more reduction is necessary and feasible?

In terms of the science and technology dimension of the problem as defined above, do we know how to prevent leaks? The answer is clearly yes. Our inability to develop the organizational capacity to deploy this technology, however, requires that we redefine the technological issue. The question then becomes, do we know how to run vehicles without using toxic substances as fuel? Here the answer is less clear. While electric and hybrid cars do exist and many experiments have been performed with vehicles using alternate fuels, as of 2005 this technology is hardly proven and certainly not yet widely accepted in the marketplace.

Therefore, although the problem of leaking tanks is clearly an issue of organizational capacity—that is, the ability to control individual and group behaviors to reduce the frequency of oil leaks—the solution may lie in the development of a technology that can be used safely even without a high level of organizational capacity. One problem with issues of organizational capacity is that people who know nothing about the problem often assume that a solution can be easily or automatically developed. If the policy design makes sense, they reason, and the politics looks favorable, then the policy can virtually implement itself. Frequently management complexity is underestimated and organizational capacity assumed. The fact is that nothing is self-implementing. People must perform certain tasks, working together in an organizational setting. And if they are to avoid making mistakes, the system must include a high level of expertise and training.

Consider the example of nuclear fuel and waste. The risks of contamination and of illegal sale of fuel to terrorists require that those who manage these materials are extraordinarily skilled and committed to having the resources needed to avoid mistakes. The risk of failure is potentially catastrophic, and its probability at some point is quite high. As we have seen, the safe handling of these materials is most often a management problem, and yet the level of proficiency needed to manage the problem may be beyond human capacity. The issue of nuclear materials is so profound that their very use became a political matter. Ultimately both political and economic factors brought an end to the construction of nuclear power plants in the United States. In effect, the managerial dimension in this case became political. Because it seemed that we were unable to manage nuclear waste, political opponents to nuclear power used the management issue to defeat the use of that power.

Gasoline is obviously not as dangerous as nuclear material, but its use is so widespread that the potential danger it poses, while not as intense in a single location, has a far greater scope. In sum, the issue of leaking tanks can be reduced to three questions: Can we reduce the number of leaking tanks? Yes, we already have. Can we develop a management system that can prevent a leak from ever occurring? Probably not. And what is the minimal risk level we can endure and the pace of cleanup we need to maintain the quality of our groundwater and environment? We do not know.

Conclusions

The problem of leaking underground tanks, as defined by the political and policy process in the United States, is principally a

management problem. Tank legislation and rules have broad political support, and the EPA's approach to implementation has been strategic and effective in reducing the numbers of tank leaks in the past. This reduction of leaks has not resulted in an end to the problem, however, and its persistence should be a cause of real concern. When toxic substances damage aquifers, the damage can be irreversible. Either the technology to clean up the aquifer does not exist, or its use would be so expensive that, for all practical purposes, the technology is unavailable. Underground tank leaks aside, however, we certainly have the technology to transport and pump gasoline without spilling it.

But can we operate and maintain that technology without releasing gasoline into the environment? While we may have problems getting organized for those tasks, at a deeper level the tank problem can be seen as having been created by the technology of the motor vehicle. It would be easy to argue that we are stuck with the automobile culture and its resultant patterns of land use development in the United States and, to a lesser degree, in other developed countries, and, of course, we are. However, we can keep our automobiles and maintain our current lifestyle while changing the fuel that automobiles use. The problem of underground tanks can be truly resolved when we no longer need as many of them.

Leaking underground tanks are a good example of an environmental issue that is easier to understand through the multidimensional framework presented in this book. The value of mobility led to the problem of leaking tanks. It is clearly in the economic self-interest of the regulated community to keep this product from leaking. The failure to prevent leaks is mainly a management issue, but the issue is whether we can simplify the mass behaviors required to manage this problem and reduce the number of errors common to the current system of gasoline distribution. While it may be premature to propose a management solution to this problem, the management problem could be unsolvable. If it is, then the technology that fuels our mobility (excuse the pun) needs to change if we are indeed to solve this problem.

NOTE

1. As of March 2004, approximately 680,000 active underground storage tanks (USTs) were subject to UST technical regulations (U.S. EPA 2004b).