

# **MAKING THE IMPOSSIBLE POSSIBLE**

**LEADING EXTRAORDINARY PERFORMANCE**  
**— THE ROCKY FLATS STORY —**

**LESSONS FROM THE CLEANUP  
OF AMERICA'S MOST DANGEROUS  
NUCLEAR WEAPONS PLANT**

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An Excerpt From

***Making The Impossible Possible:  
Lessons From The Cleanup of America's Most Dangerous Nuclear  
Weapons Plant***

by Kim Cameron and Marc Lavine  
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# **Explaining the Impossible— Positive Deviance and the Abundance Approach**

In March of 1951, the U.S. government's Atomic Energy Commission publicly reported that it would build a highly secure nuclear weapons plant in Colorado. The facility would be located on former ranching land just 16 miles northwest of downtown Denver, at the base of the beautiful Flatirons, on the eastern slope of the Rocky Mountains. The site was known for its rocky but flat terrain. The Cold War was escalating, and stockpiling a nuclear arsenal was considered the primary means for keeping the world safe for democracy. The threat of a retaliatory attack with nuclear weapons was seen as the major defense against Soviet aggression. The site—labeled Rocky Flats—is owned by the U.S. Department of Energy (DOE) and was managed by a series of weapons contractors during its years of active operation: Dow Chemical (1952–1975), Rockwell International (1975–1990), EG&G (1990–1995).

The facility began active operation in 1953, producing triggers for nuclear weapons. The site functioned at peak capacity and was known as, arguably, the most productive and efficient facility in the world until 1989, when it was abruptly closed. Seeking evidence of environmental violations, the FBI raided the facility on June 6 and shut down production on the spot. A subsequent grand jury investigation found no evidence of the feared widespread environmental contamination, but the contractor at the time (Rockwell International) agreed to an \$18.5 million fine nevertheless, principally for

failure to maintain adequate records. In the wake of the FBI raid and shutdown, a new contractor was brought in to manage Rocky Flats. Between January 1990 and June 1995, that firm (EG&G) focused primarily on keeping the site secure and maintaining the facility in a safe configuration. A search for a new contractor was initiated in 1995, and in July of that year Kaiser-Hill was awarded a five-year contract to clean up Rocky Flats.

Kaiser-Hill was initially a joint venture between ICF Kaiser Engineers and an environmental engineering firm, CH2MHill. After ICF Kaiser declared bankruptcy in 1999, Kaiser-Hill became a wholly owned subsidiary of CH2MHill. We recount the story of how Kaiser-Hill, facing enormous challenges and obstacles, made the impossible possible.

## **Challenges**

Kaiser-Hill was awarded the contract to clean up and decommission the Rocky Flats nuclear production facility, an ominous task. First, this project represented the first cleanup and closure of a nuclear weapons production facility anywhere in the world. No one in the industry knew how to accomplish this task. No one had ever taken down a plutonium production facility before. Moreover, the parent company of Kaiser-Hill—CH2MHill—was an engineering and environmental firm, had little experience in nuclear cleanup, and it possessed no experience on a project of this scale. Taking on this task represented an enormous risk for the company as well as for the federal government. According to the former CEO of Kaiser-Hill and a DOE executive:

If you would have asked me two months after I signed the contract, would I realistically have imagined the outcome that's occurred, I would have said "no." I hoped it would happen, and I wanted the contract to support it, but I wouldn't have bet you a nickel that it could have been done.

Contributor 23—Senior Executive, DOE

Second, the majority of the workforce on site was represented by three unions—steelworkers, building trades, and security guards—which had a history of antagonistic relationships with the management of the previous contracting firms. Grievances were common—in

fact, 900 unresolved grievances had been filed by the time Kaiser-Hill took over the project in 1995—expectations of lifelong employment were the norm, and a high degree of pride existed among the workforce regarding the skilled work they performed. Multiple generations of employees worked at Rocky Flats—grandparents, parents, and children—and it was expected that the project would continue for several more generations. The facility represented as close to a guarantee of lifelong employment as it was possible to find. Changing procedures was likely to foster serious dissent among a proud, closely knit workforce, not to mention strong resistance to any major alteration of the organization's mission. The arrival of a completely new management team onsite was not likely to produce immediate cooperation and collaboration; rather, obstinacy and recalcitrance were the most likely reactions.

Third, the site included a 385-acre production area surrounded by more than 6,000 acres of open space called the buffer zone. During its operation, the production areas were surrounded by three razor wire fences, prisonlike watch towers, and security guards toting M-16 rifles to prevent entry by those on a suicide mission or other subversives. Several buildings had installed inhibitors to prevent air attack via helicopter landings and theft of dangerous materials. Visitors entering the facility passed through four security stations and received a "Q" clearance (requiring a full investigation of at least the past 10 years of their personal lives). A culture of secrecy, protection, and concealment was dominant at the facility. Employees were prohibited from describing of their work to outsiders, so they became socially isolated and largely dependent on coworkers for social support.

Fourth, the site was one of the most polluted nuclear facilities in America. More than 21 tons of weapons-grade nuclear material was present. At least 100 tons of high content plutonium residues existed on the site without a treatment or disposal path. At least 30,000 liters of plutonium and enriched uranium solutions were stored in tanks and pipes, some of them leaking and some buried in unmarked locations. More than 500,000 cubic meters of low-level radioactive waste and nearly 15,000 cubic meters of transuranic waste were stored in 39,500 containers. The national press had labeled the site the most dangerous place in America because of its radioactive pollution and the possibility of a major nuclear accident. Several rooms in production facilities had been permanently sealed because of the high levels of radioactivity, which exceeded "infinity" on the meter-

ing devices. With a plutonium half-life of more than 24,000 years, the rooms were likely to be polluted forever. Unknown levels of contamination were present not only in the buildings—walls, floors, ceilings, and ductwork—but also in surrounding soil and, potentially, groundwater. Cleaning up such a site in any reasonable amount of time was highly improbable.

Fifth, long-running battles had been fought between Rocky Flats contractors and government regulatory agencies, environmental groups, community representatives, and concerned citizens. Broad public sentiment was that the facility was a danger to surrounding communities, and countless demonstrations by numerous groups had been staged from the 1960s through the 1980s to protest nuclear proliferation, pollution, secrecy, and environmental endangerment. A demonstration involving more than 10,000 people occurred in 1969, for example, after the worst industrial fire in history exposed the possibility of plutonium residues escaping into a wide area of surrounding terrain. The facility was almost in a state of siege by outside agencies and a concerned citizenry in 1995 when Kaiser-Hill was given control.

Sixth, for years, Rocky Flats had argued that it was regulated by the Atomic Energy Commission, and therefore the project was not subject to the inspection and oversight of the Environmental Protection Agency (EPA). In fact, because of national security provisions, EPA inspectors had to be blindfolded when visiting specific parts of the facility because they were not allowed to see certain top-secret weapons materials. As might be expected, this treatment led to suspicion of rules violations and secret pollution. Litigation and con-



Protesters at Rocky Flats



gressional pressure led to the EPA's obtaining partial jurisdiction over Rocky Flats, and a surprise raid by the FBI in 1989 led to an immediate suspension of work. In the public's eye, employees were transformed overnight from patriotic heroes engaged in winning the Cold War to polluting criminals threatening the safety and health of the surrounding communities. They were completely barred from continuing production work and from accomplishing the organization's mission. From 1989 to 1995, no production work was accomplished at the facility as employees waited for permission to resume operation but had no authorization to do so. The workforce actually doubled in size during that period because of the requirement to produce an overwhelming number of documents verifying pollution levels, procedures, and new nuclear compliance guidelines.

In 1992 President George H. W. Bush announced the permanent closure of the facility as a result of the abandonment of the W-88 nuclear warhead program, but no action was taken to change the work scope from what had been outlined since 1989. Hence, the workforce was without a mission, thwarted in its desire to restart the production facility, uncertain if an alternative use for the facility would be specified, and closely scrutinized by regulatory agencies that required large numbers of environmental reports and safety studies. Employees produced documents, monitored conformity, and created reports, but they had no meaningful work objectives.

Seventh, the federal government was skeptical of the ability of any firm to successfully complete the cleanup, and the ability to receive the necessary funding to accomplish closure was dependent on the confidence of Congress and other federal agencies. In 1995, it was not at all certain that the necessary support would be provided. According to one of the DOE regulators on the site:

There was nervousness in Congress about giving this project a big pot of money. They were asked: What kind of controls are we going to have?

Contributor 19—Senior Executive, DOE

The Government Accountability Office (GAO) also was skeptical that the cleanup and closure could be completed, and as recently as 2001, a GAO report estimated the probability of completing the project by the end of 2006 at less than 15 percent. Cost overruns and missed deadlines were highlighted as problematic. In the state of

Colorado, similar doubts were expressed. After the agreement with Kaiser-Hill was signed, a senior official in the Colorado Department of Public Health and Environment (CDPHE) reported:

I had staff in the division who really felt we had sold out the project.  
Contributor 27—Senior Manager, CDPHE

## **The Contract**

The Department of Energy awarded a contract to clean up the site to Kaiser-Hill in 1995, after a competitive bidding process. This was the first performance-based contract issued by the Department of Energy to encourage work toward closure rather than merely to manage ongoing operations. This contract ran for five years, allowing the Department of Energy an opportunity to evaluate Kaiser-Hill's performance. In 2000, Kaiser-Hill was awarded a no-bid closure contract—in which the goal of closing the facility was added to the goal of cleaning it up—as a result of its performance in the previous five years. The rationale was that the bidding process was too costly and too time-consuming, so the contract was awarded based on the merits of the first five years' performance. That contract was to extend through the end of 2006.

In 1995, the U.S. Department of Energy's Office of Environmental Management issued a Baseline Environmental Management Report, titled *Estimating the Cold War Mortgage*, which provided a detailed estimate of the cost of closing facilities involved in Cold War weapons research, production, and storage. This report covered 13 facilities located throughout the United States. With reference to Rocky Flats, this analysis produced an estimate of a minimum of 70 years and a cost of more than \$36 billion to close and clean up the Rocky Flats facility. Completion was estimated, optimistically, to occur in the year 2065. One high-ranking DOE official commented that 70 years was a gross underestimate and predicted that the more realistic number was 200 years to completion.

## **Extraordinary Results**

In light of these ominous challenges, the prospects of a successful closure and cleanup of Rocky Flats within 70 years were by no means guaranteed. What makes this story worth telling is that the

entire project was completed 60 years early and at almost \$30 billion savings in taxpayer funds. Other DOE clean-up projects in the United States—with similar estimates of time frame and budget—have not come close to the success achieved at Rocky Flats either in terms of time frame or budget.

As the world's first nuclear production facility to be cleaned up, Rocky Flats represents a one-of-a-kind example of extraordinary success. The facility was closed and cleaned up, and will become a wildlife refuge, in a fraction of the estimated time. All structures were demolished, all surface waste was removed, and the soil and water were remediated to better than initial federally mandated standards by October 10, 2005. The estimated cost for the project is \$3.9 billion (approximately \$7 billion in total, including the expenditures in the years before Kaiser-Hill took over the project), a small fraction of initial federal estimates. The entire site will be transformed into a wildlife refuge a year sooner than even the most optimistic estimates as recently as 2003.

Many critics from citizen action groups, the environmental community, local and state governments, city administrations, and regulating agencies went from being protesters and adversaries to being advocates, lobbyists, and partners. (Appendix 1 highlights some exceptions, identifying contrary points of view regarding Rocky Flats success.) Relations with the three unions (steelworkers, security guards, building trades) improved from 900 grievances to a mere handful per year, and the leadership of the steelworkers union described union-management relations as the best they had seen in their careers. A culture of lifelong employment and employee entitlement was replaced by a workforce that enthusiastically worked themselves out of their jobs as quickly as possible. Remediated pollution levels surpassed initial federal standards by a multiple of 13, and safety performance exceeded federal standards twofold and the construction industry average fourfold. A \$300,000 rebate in workers' compensation insurance premiums was received because of the excellent safety record. More than 200 technological innovations were produced in the service of faster and safer performance. The theme of the facility, "making the impossible possible," represents performance that exceeded even the most optimistic estimates by a wide margin.

After the first five years of Kaiser-Hill's management, one former DOE regulator, on a return visit to the Rocky Flats facility, commented:

The radiation was so high in [Building] 771 that we couldn't even measure how high the radiation was in there. Yet, I was in that building this morning! It was so exciting to me; because that was the vision we had when I was here. Now to drive around the rest of the site and see all these other buildings that are pads now—there is nothing but grass where there were buildings and laboratories of plutonium—to see the progress that we made the last five years is just absolutely astounding. No one said we could do it. But they're doing it. They're doing it. The workers are doing it!

Contributor 21—Manager, DOE

Figure 1.1 summarizes key performance changes that occurred from the time Kaiser-Hill initiated the project in 1995 until 2005. It highlights the dramatic success achieved on a variety of criteria—timeliness, budget, productivity, labor relations, safety, and outcomes—over the 10-year period after Kaiser-Hill began managing the facility.

## **Summary of Outcomes**

Despite the unusually difficult environment that characterized Rocky Flats at the outset of 1995, the extraordinary results achieved by a remarkable organization are summarized in figure 1.1. The project was completed in one-sixth the time and at less than one-sixth the cost compared with the original estimates. Pollution was mitigated from the most dangerous levels in America to a condition safe enough for a wildlife refuge and nature center. Despite a work scope in which the slightest error could have been disastrous, as well as a set of tasks that had never been completed before, safety performance improved from levels worse than industry and federal averages to more than twice as good as those benchmarks. Safety improved fivefold, in fact, compared with the safety records previous to 1995, when absolutely no cleanup or closure work was being done.

Employee layoffs and downsizing are likely to create bitterness, resistance, and deteriorating performance in organizations (see Cameron, 1994, 1998). Yet, at Rocky Flats the workforce was incrementally reduced over the 10-year period from over 7,000 employees to zero with no strikes, a dramatic reduction in grievances, and labor

**Figure 1.1 ROCKY FLATS BEFORE AND AFTER THE CH2MHILL CONTRACT**

Performance Criteria	Beginning (pre-1995)	Conclusion (2005)
<i>Estimated time for completion of closure</i>	70 years	10 years
<i>Estimated closure budget</i>	\$36 billion	Just over \$6 billion
<i>Pollution levels</i>	“Most dangerous rooms in America” DOE standard = 651 pCi/gm	Safe enough for a wildlife refuge. Residual Soil Action Levels = 50 pCi/gr
<i>Safety</i> TRC = Total Recordable Case rate (# of occupationally related incidents requiring more than basic first aid)	TRC Jan. 1996 = 5.0 (construction industry avg. 4.5)	TRC July 2004 = 1.0 (construction industry avg. 4.0, DOE avg. 2.0)
LWC = Lost Workday Case rate (restricted days away from work)	LWC July 2004 = 0.2 (construction industry avg. 4.0, DOE avg. 0.8)	LWC July 2004 = 0.2 (construction industry avg. 4.0, DOE avg. 0.8)
Statistic is calculated by rate for 100 FTE = # injuries/illnesses × 200,000 man hours		\$300,000 workers comp insurance rebate
<i>Number of employees</i>	3,500 during production, approximately 8,000 after shutdown and before cleanup	Steadily declining, with consistent layoffs through completion in 2005

*continued*

Performance Criteria	Beginning (pre-1995)	Conclusion (2005)
<i>Labor relations</i>	900 employee grievances in 1998	“A handful a year.” A union steward reported: “The best labor-management relations I’ve seen.”
<i>Relations with communities</i>	10,000 protests; mistrust and little information flow to communities	Model stakeholder dialogue structure Frequent collaboration
<i>Relations with the state of Colorado</i>	Adversarial. Asserted that the Atomic Energy Act shielded Rocky Flats from state oversight	Cooperative and positive. State government officials were instrumental in securing federal support and helping regulators and contractor work collaboratively
<i>Relations with federal regulators: DOE and EPA</i>	EPA requested FBI raids that shut down the facility in 1989.	Site is a pioneer and a benchmark within DOE and EPA for cleanup and closure
<i>Productivity</i>	Between shutdown and closure announcement, almost no work was carried out	Exceeded the accelerated closure schedule in terms of both time and cost
<i>Organizational culture</i>	Secrecy, highly compartmentalized, assumptions of lifelong employment, low morale after shutdown	Collaborative, pride in closure, increased transparency, optimistic vision with a meaningful purpose

relations rated by both union and management as the best in their careers. External constituencies—including citizen groups in the surrounding communities, Colorado state officials, regulators such as the EPA, and the supervisory DOE—became partners, collaborators, and contributors to the success of the project. This situation represents a dramatic transformation from a history of 10,000-person protests, lawsuits, an FBI raid, court battles, and the legislative pressures that characterized these relationships in 1995.

Rocky Flats represents a story of almost unbelievable performance in the face of serious adversity, and it would represent extraordinary performance even if the circumstances had been benevolent. This book recounts how these remarkable outcomes occurred, that is, the leadership principles and the key enablers that accounted for them. Exceeding almost every expected level of performance makes Rocky Flats an *extreme case*—an example so different from the norm that examining its features brings into stark relief particular features that may be hidden in normal organizations and under usual circumstances. The remainder of this chapter explains how this positively deviant performance occurred and the abundance approach that accounted for it.

## **The Abundance Approach**

As mentioned in the Introduction, the fundamental explanation for extraordinary performance at Rocky Flats was the adoption of an *abundance approach to change*. An abundance approach refers to an emphasis on achieving the best of the human condition, striving for positive deviance, and working to fulfill the highest potential of organizations and individuals. It focuses on thriving outcomes and on virtuousness, and it stands in contrast to a problem-solving or deficit approach to change. The latter approach focuses on identifying and solving problems, addressing deficits and weaknesses, and overcoming challenges and obstacles.

For example, most leaders of change have been trained to recognize and define problems. They usually assume that leading change means overcoming obstacles that stand in the way of achieving a new vision (Kotter, 1996). A well-known national problem-solving approach to change is widely applied (Burke, 2002; March, 1994; Mitroff, 1998). This classic problem-solving model—taught almost

universally in management development programs, change programs, and decision-making training—relies on four fundamental steps.

First is identifying and defining a problem accurately. When attempting to understand an organization, for example, typical questions might include What are the major challenges being faced? What are the competitive threats? Where are the problems? What key obstacles must be addressed? The second step relies on generating alternative solutions to the problem—based on root causes, if possible—so that convergence on a solution is not premature. Brainstorming techniques and group participation methods are often used to ensure that more than one alternative solution to a problem is considered. The third step focuses on evaluating and selecting the best alternative. Such evaluation addresses whether or not the chosen alternative really does solve the problem, achieves stated goals, does not create unwanted latent effects, and will be accepted by the individuals involved. The fourth step involves implementing the chosen alternative solution and following up to ensure that the problem or obstacle is really resolved.

This problem-solving approach relies on the assumption that an important job of the change leader is to identify and resolve problems and challenges that stand in the way of progress. The goal is to achieve a successful change, usually defined as effective, efficient, or advantageous performance. A large majority of leaders' time and attention is usually focused on this approach when they are attempting to lead change.

In contrast, the abundance approach—which does not *substitute* for the problem-solving approach but *supplements* it—focuses on closing the gaps between acceptable performance or even successful performance, and spectacular performance or even virtuous performance. It emphasizes positively deviant accomplishment rather than normal or expected accomplishment. It focuses on positive possibilities rather than deficits. In the Introduction, we showed a deviance continuum, with illness, problems, and difficulties on the left-hand side and normal, expected, and successful performance in the middle. We labeled the gap between the left side—problems or challenges—and the middle point—successful performance—as a *deficit gap*. Closing deficit gaps refers to solving problems and overcoming obstacles. Most academic research and most leadership focus are aimed at these kinds of gaps.



**Figure 1.2 A PROBLEM-SOLVING APPROACH TO CHANGE COMPARED WITH AN ABUNDANCE APPROACH**

Problem-solving Approach	Abundance Approach
<p><i>Identify Problems and Challenges</i></p> <ul style="list-style-type: none"> <li>• Identify key problems and challenges</li> </ul>	<p><i>Identify Extraordinary Success</i></p> <ul style="list-style-type: none"> <li>• Describe peak experiences</li> </ul>
<p><i>Identify Alternatives and Cause Analysis</i></p> <ul style="list-style-type: none"> <li>• Generate alternative solutions based on root causes</li> </ul>	<p><i>Conduct an Analysis of Enablers</i></p> <ul style="list-style-type: none"> <li>• Identify enabler of the highest past performance</li> </ul>
<p><i>Select Optimal Solution</i></p> <ul style="list-style-type: none"> <li>• Evaluate and select the most optimal alternative</li> </ul>	<p><i>Identify How to Create Sustainability</i></p> <ul style="list-style-type: none"> <li>• Identify what could be continued and replicated in the future</li> </ul>
<p><i>Implementing and Following Up</i></p> <ul style="list-style-type: none"> <li>• Implement the solution and follow up to ensure problem solution</li> </ul>	<p><i>Designing a Positive Future</i></p> <ul style="list-style-type: none"> <li>• Design interventions that create an ideal future with extraordinary performance</li> </ul>
<p><i>Basic Assumption</i></p> <ul style="list-style-type: none"> <li>• Our job is to overcome major problems and challenges</li> </ul>	<p><i>Basic Assumption</i></p> <ul style="list-style-type: none"> <li>• Our job is to embrace and enable our highest potential</li> </ul>

On that same deviance continuum, the right-hand side represents a virtuous condition—that which is positively deviant, flourishing, and life-giving. Working to achieve this kind of extraordinary performance was referred to as closing *abundance gaps*. An abundance approach to change focuses on achieving positive deviance, or the best of the human condition. It means not only doing well, it means creating goodness that extends beyond the immediate and beyond tangible achievement (Cameron, 2003). Figure 1.2 provides another way to summarize the differences between these two approaches to

change (Cooperrider & Whitney, 1999). The basic assumption of the problem-solving approach to change is *Our job is to overcome major problems and challenges*. The basic assumption of the abundance approach is *Our job is to embrace and enable our highest potential*.

An abundance approach to change is similar to, and relies on, some of the same assumptions as Appreciative Inquiry (AI), a change tool introduced and made popular by David Cooperrider (for example Cooperrider & Whitney, 1999). It also draws on the strengths-based work being produced by the Gallup Organization (e.g., Buckingham & Clifton, 2001), the virtue ethics literature (Caza, Barker, & Cameron, 2004), the positive emotions work of Fredrickson (2003), and the broad field of positive psychology (e.g., Seligman, 2002b). It is a central part of the research agenda in the *Positive Organizational Scholarship* movement (Cameron, Dutton, & Quinn, 2003). The abundance approach offers its own unique perspective in these research streams, as will be illustrated in the chapters that follow.

One main message of this book is that focusing on abundance gaps produces a *heliotropic effect* (Cooperrider, 1990; Darwin, 1989) which, in turn, produces *amplifying* and *buffering* benefits. Emphasizing abundance gaps, in other words, unleashes positive potential that leads to extraordinary performance. It explains how the impossible was made possible at Rocky Flats. We explain why this occurs in the following section.

## **The Heliotropic Effect of Abundance**

To explain the heliotropic effect, let us pose a question: What happens over time when you put a plant in a window? The answer, of course, is that the plant begins to lean toward the light. That is, a natural tendency exists in every living system to be inclined toward positive energy—toward light—and away from negative energy or from the dark. The reason is that light is life-giving and energy-creating. All living systems are inclined toward that which gives life.

The heliotropic effect is evident in many ways within individuals and organizations—physiologically, psychologically, emotionally, visually, socially, and so forth (see Cooperrider, 1990; Cameron, 2003; Bright, Cameron, & Caza, 2006). In the section that follows, we illustrate the heliotropic effect as it affects individuals, and in the

one after that, we review evidence of the heliotropic effect in organizations. Several scientific studies are summarized with the intent of explaining how an abundance approach helps produce positively deviant outcomes. These examples serve as the explanation for how an abundance approach created extraordinary performance at Rocky Flats. The chapter concludes with a brief discussion of the amplifying and buffering benefits of an abundance approach to change.

**Individuals.** At the individual level, the heliotropic effect may be manifested physiologically as the *placebo effect*. That is, if a person believes a medication will be effective, it will, in fact, produce the desired effect about 60 percent of the time. One classic example involved a woman who entered the hospital suffering from uncontrolled vomiting. Her muscle contractions couldn't be halted, and she continued to regurgitate over and over. The medical professionals gave her medication designed to stop the vomiting, but nothing was effective. Finally, she was offered a new "miracle drug," just developed, which the doctor claimed to be 100 percent effective for her specific symptoms. Within 20 minutes of taking the drug, her vomiting stopped completely. The surprising part of this incident, however, is that the drug given to her was ipecac syrup, a medication designed to *induce* vomiting. The power of the placebo effect overcame not only her physiological symptoms—which she couldn't control—but also the effects of the medication itself (Ornstein & Sobel, 1987).

Psychologically, the heliotropic effect is manifested as the *Pygmalion effect*. That is, our systems respond not only to our own positive expectations, but also to the expectations of others. Literally hundreds of studies have confirmed the Pygmalion effect in individuals ranging from airline pilots and welders to preschoolers and high school athletes. The best-known studies have been conducted with elementary school children. To illustrate, assume that we have a normal group of students and three teachers who are naïve to the experiment. The first teacher is told that he or she will be assigned to a classroom filled with extraordinary performers who have very high IQs and a history of success in the classroom. The second teacher is told that he or she will be assigned to a classroom of students with enormous diversity in ability and experience—some extremely bright, some who have struggled a great deal in the classroom, and some who are normal. The third teacher is told that he or she will be

assigned to a classroom of challenged students who come from underprivileged backgrounds, and have a history of failure and difficulties in the classroom. We allow the three teachers to teach for a year, and then we give all of the students a standardized exam. Statistically significant differences appear in the results. The students taught by the first teacher score above average; the students taught by the second teacher have average scores; the students taught by the third teacher score below average. The expectations of the teacher account for the differences in performance, and those expectations are more powerful than any other single factor, including actual IQ scores (Rosenthal & Jacobsen, 1968). If the teacher thinks that the children are bright, then they are.

The heliotropic effect is also manifested *emotionally*. That is, many studies have documented the fact that people with positive emotional states and optimistic outlooks experience fewer illnesses and accidents and, in fact, enjoy a longer and higher quality of life. Depressed, anxious, or angry people get sick more often than happy, joyful, upbeat people, even when exposed to the same cold virus, and they tend more often to be in the wrong place at the wrong time and to experience accidents. One of the most intriguing studies illustrating the emotional manifestations of the heliotropic effect was a study of Alzheimer's disease among 678 elderly nuns who were members of the School Sisters of Notre Dame and ranged in age from 75 to 104. What was especially intriguing about the study was a finding based on the journals and diaries kept by 180 of these women when they entered the convent 60 years earlier. Some of the women recorded thoughts like this: "I am so grateful to enter the convent. This is a dream come true for me. What a wonderful blessing." Other women recorded thoughts like this: "This will be a sacrifice. It's going to be difficult, but I have committed myself, and I'll follow through." The first group displayed "positive emotional content," whereas the second group did not. Six decades later there was a significant difference in the numbers of nuns alive in each group. Two and a half times more nuns had died in the second group than in the first, and in every decade there was a significant and increasing difference in mortality rates. Positive emotions simply predicted longer life spans (Snowden, 2002; Danner, Snowden, & Friesen, 2001).

The heliotropic effect can manifest itself in *visualization*. When people visualize themselves as succeeding—they see themselves hit-

ting the ball, clearing the bar, making the shot, getting the right answer, or recovering from illness—they tend to succeed significantly more than otherwise. For example, assume that we wanted to help a group of people improve their bowling scores. We could promise everyone a reward—say \$100—if they could improve their scores by an average of, say, 10 pins over several weeks. To conduct the experiment, we would have each person bowl three games while we videotaped the games. Then, for half the group we would show them videotape of the frames when they made strikes or spares—that is, when they knocked down all the pins. For the other half of the group we would show them videotape of when they did not make strikes or spares. Each person would watch the videotape, practice for several weeks, and then come back and bowl three more games. The results of the experiment would reveal significant differences between the two groups. Those who watched themselves succeed would improve significantly more than the other group; in fact, improvement among the weakest bowlers would exceed 100 percent (Kirschenbaum, 1984). Visualizing success leads to success.

Still another set of studies shows the heliotropic effect that occurs when individuals are exposed—even briefly—to *virtuous, optimistic, positive behaviors* (see Ryff & Singer, 1998; Emmons, 2003; Seligman, 2002a). For example, let us assume that we wanted to divide a group of people in half. We would ask each person to keep a daily journal. One group would be asked to write down each day three things for which they were grateful. The other group would be asked to write down three things for which they were not grateful, or three things they wished had not happened that day. Alternatively, we could ask one group to record the three best things that happened to them that day and the other group to record the three worst things that happened to them that day. We would then expose them to several experimental conditions. For example, we would give everyone a flu shot, and a week later we test for the number of antibodies in their systems. The first group—exposed to gratitude and optimistic conditions—would be healthier than the second group. When confronted with a difficult mental problem, the first group would remember longer, use more information, display more mental acuity, and express more creativity than the second group. A significant difference would also exist in the amount of illness experienced by the members of each group as well as in their productivity at work. That

is, exposure to a virtuous condition such as gratitude—even briefly—tends to unlock the heliotropic effect (Emmons, 2003).

The heliotropic effect also occurs through *positive energy*. Most people have been exposed to someone who is energizing, uplifting, and life-giving. We tend to flourish in their presence. We also have encountered people who are the opposite—they drain our energy and are life-depleting. Baker, Cross, & Wooten (2003) found that network maps could be produced for groups and organizations that diagram the energy networks among individuals. The results look like an airline system map, with some people being like hubs, having a large number of positive energy connections, and others being more peripheral. The results of this research show that people who are positive energizers—they uplift, strengthen, and encourage others—are much higher performers at work than normal people. Moreover, a person's position in an energy network is four times more important in accounting for performance than position in the information network or the influence network. It is more important to be a positive energizer than to have a title or a senior position in the hierarchy. Moreover, organizations that are high performing have three times more positive energizers than normal organizations. Positive energy, simply stated, unlocks the heliotropic effect.

Additional evidence could be cited to confirm the association between a positive or abundance approach and the heliotropic effect within individuals—including the strengths-based findings of the Gallup Organization (Buckingham & Clifton, 2001), the high-quality connections research of Dutton and Heaphy (2003), and the positive emotions work of Fredrickson (2003). Each of these streams of research confirms the conclusion that emerged from the studies cited above: namely, that a focus on the positive and on abundance unlocks the heliotropic effect. People do better physically, mentally, socially, and emotionally when exposed to abundance.

**Organizations.** The trouble is, organizations are not the same as individuals. Many findings that apply to individuals do not apply to organizations, and one cannot automatically draw the conclusion that just because something applies to a person, it will also apply to an organization. In fact, skeptics might appropriately raise questions such as: Aren't most organizations fraught with problems? Can any leader afford to ignore difficulties? Is an abundance approach to change just a whitewash of serious challenges? Won't any organiza-

tion fail if it fails to focus on its weaknesses and liabilities? In light of major challenges faced by most organizations and most leaders, what is the relevance of an abundance approach?

Several studies have been conducted by Cameron and colleagues (for example, Cameron, 2003; Cameron, Bright, & Caza, 2004; Bright, Cameron, & Caza, 2006; Gittell, Cameron, & Lim, 2006) which do, in fact, support the impact of a positive, abundance orientation on organizational performance. That is, an abundance approach does appear to be associated with high levels of performance in organizations. A few of these studies are summarized in order to provide additional evidence for the association between abundance and the heliotropic effect.

One investigation was conducted by Marcial Losada (Losada & Heaphy, 2004) in which 60 top management teams came together for their annual planning-budgeting-evaluation meeting. Their work was performed in a setting where investigators could observe and code their communication events. Unknown to the team members, each organization's performance was categorized on the basis of productivity, profitability, and other outcome data. On these various outcome measures, if the organization scored above average, it was classified as high performing. If the organization scored below average, it was classified as low performing. There were 19 high performing, 26 medium performing, and 15 low performing organizations observed.

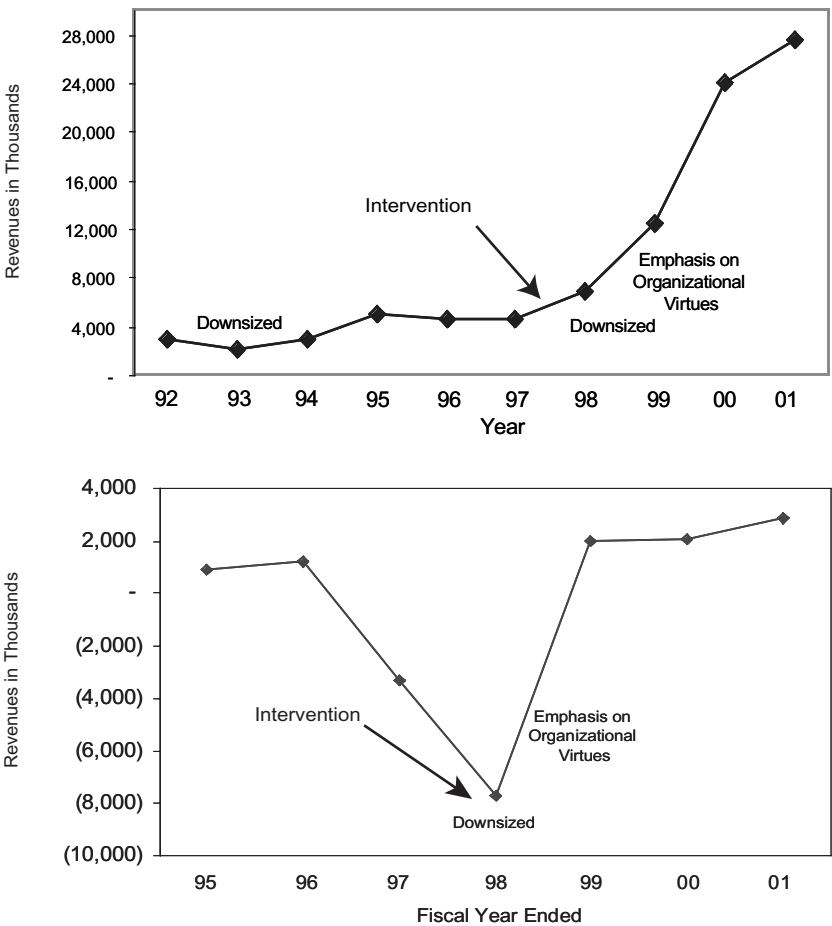
One category used to code teams' communication was the number of positive statements made, versus the number of negative statements, as they were engaged in their work. A positive statement expressed approval, support, appreciation, agreement, and so on. A negative statement expressed disapproval, contradiction, disagreement, anger, and so on. Executives in high-performing firms made five times as many positive statements as negative statements. Executives in low-performing firms made three times as many negative statements as positive statements. As a nonlinear dynamics study, the pattern of positive communication unfolding over time in the high-performing firms was significantly different from what emerged in low-performing firms, so the results did not occur merely because people tend to talk more positively when things go well. The study's conclusion was that this positive-to-negative communication ratio is by far the strongest predictor of organizational performance.

Coincidentally, a study conducted by John Gottman (1994) of recently married couples produced similar results. Couples who had been married between one and five years held a conversation in which they discussed a controversial topic in their relationship—child rearing, finances, time at work, or whatever. The conversation was recorded for 15 minutes. Gottman then followed the couples over a period of ten years and could predict with 95 percent accuracy who was still married and who was happily married, based on that 15-minute conversation a decade earlier. The predictive ratio in the interaction was five positive statements for every negative statement. The key message in these two studies is that positive communication tends to produce positive outcomes, and in the Losada study, the outcomes generalize to the entire organization. An abundance approach to change puts its greatest emphasis on the positive, and positivity produces the heliotropic effect.

Another set of studies investigating the impact of the abundance approach was conducted among organizations that had recently downsized (see Cameron, 2003). The problem with organizational downsizing is that it almost always produces negative effects—most notably, the destruction of interpersonal relationships, shared values, trust, loyalty, and commonality of culture and values; reduced information-sharing and increased secrecy, deception, and duplicity; increased formalization, rigidity, resistance to change, and conservatism; increased conflict, anger, vindictiveness, and feelings of victimization; and increased selfishness and voluntary turnover, as well as deterioration in teamwork and cooperation (Cole, 1993; Cameron, Kim, & Whetten, 1987). As a result, most downsizing firms experience a deterioration in performance. (It was expected, based on these findings, that Rocky Flats would deteriorate in performance as the layoff activities associated with closure began.)

The studies summarized below do not examine causal relationships between abundance and high performance, but they do produce evidence that is suggestive of such a relationship (see Cameron, 2003). For example, in one study, two organizations (one in health care and the other in engineering) that had recently engaged in downsizing experienced a major intervention focused on enhancing an abundance orientation. Fostering organizational virtuousness—as indicated by an emphasis on compassion, integrity, optimism, trust,

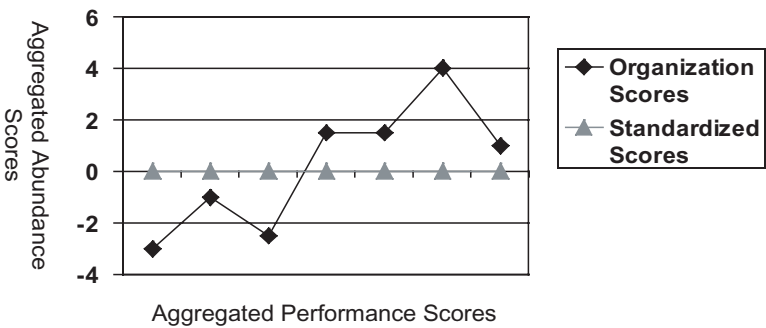




**Figure 1.3 INTERVENTIONS TO FOSTER AN ABUNDANCE CULTURE**

forgiveness, and kindness—was implemented by the senior leadership team, and measures were taken of various indicators of an abundance approach. Figure 1.3 summarizes the results of the leadership interventions. Both organizations dramatically improved their financial performance. These results do not prove that abundance caused a heliotropic effect in organizational outcomes, but the results are suggestive.

Another study was conducted among seven organizations competing in the same industry. In each of these firms, performance measures were gathered—productivity, profitability, quality, customer



**Figure 1.4 RELATIONSHIPS BETWEEN ABUNDANCE AND PERFORMANCE**

satisfaction, and employee loyalty—as were scores of the extent to which an abundance approach typified the firms. Abundance was indicated primarily by high scores on certain organizational virtuousness factors—for example, fostering compassion, integrity, optimism, trust, forgiveness, and kindness. Figure 1.4 illustrates that the relationships between abundance and performance are quite strong. The higher the abundance scores—as indicated by organizational virtuousness—the higher the performance.

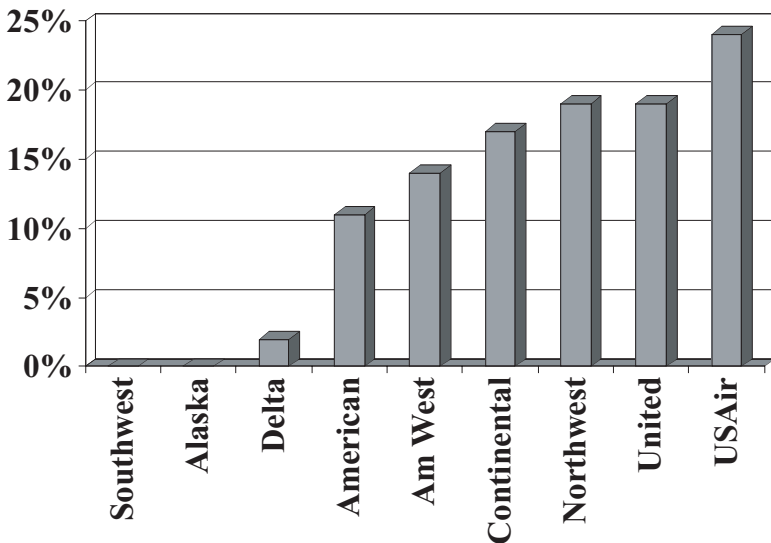
A third study used the same outcome measures and the same indicators of abundance, but this study was conducted with a large sample of organizations across 16 industries (for example, retail, automotive, consulting, financial services). Large multinational firms were represented as well as medium, small, and even not-for-profit organizations. All of these organizations had been engaged in recent downsizing, so all were predicted to show a deterioration in performance. Statistical results revealed, in fact, that when controlling for all other factors, downsizing did lead to deteriorating organizational performance. However, statistically significant relationships were found between organizational virtuousness and profitability. Organizations scoring higher in virtuousness were more profitable, and, when compared with competitors, industry averages, goals, and past performance on perceptual measures, virtuousness mitigated the negative effects of downsizing. Higher abundance (virtuousness) scores were associated with higher performance.

Again, no one of these studies can claim to prove that virtuousness produces higher organizational performance, or that abundance

causes a heliotropic effect in organizations. However, taken as a group, they are suggestive that such a relationship may be present.

A study of the U.S. airline industry after the September 11 tragedy adds to the evidence that positivity, virtuousness, and abundance produce higher levels of performance for organizations. Gittel, Cameron, and Lim (2006) studied the reactions of the nine major U.S. carriers after the terrorist attacks in 2001. Ridership fell to zero for the first week or so after the event, of course, but when people were permitted to fly again, only about 80 percent of previous passenger levels were attained in the subsequent year. The major airlines found themselves with 20 percent too many gate agents, flight attendants, mechanics, pilots, and planes. The logical strategy was to downsize. This was the strategy implemented by almost all of these airlines, as illustrated in figure 1.5.

In particular, short-haul routes were the hardest hit during the first year after the tragedy, since many people preferred to drive or take a bus or train rather than to board an airplane. The hassle factor associated with stepped-up security was a key reason why more short flights were canceled than long-haul flights. The two airlines that



**Figure 1.5 DOWNSIZING AMONG U.S. AIRLINES AFTER SEPTEMBER 11, 2001**

were most affected—since they relied most heavily on short flights—were Southwest Airlines and US Airways.

The difference between these two firms was marked, however, in the extent to which they relied on an abundance approach. US Airways laid off more than 20 percent of its workforce and imposed force majeure, which allowed it to avoid paying severance benefits to laid-off employees. Southwest Airlines, on the other hand, decided to not lay off a single employee. Despite losing several million dollars a day, CEO Jim Parker said:

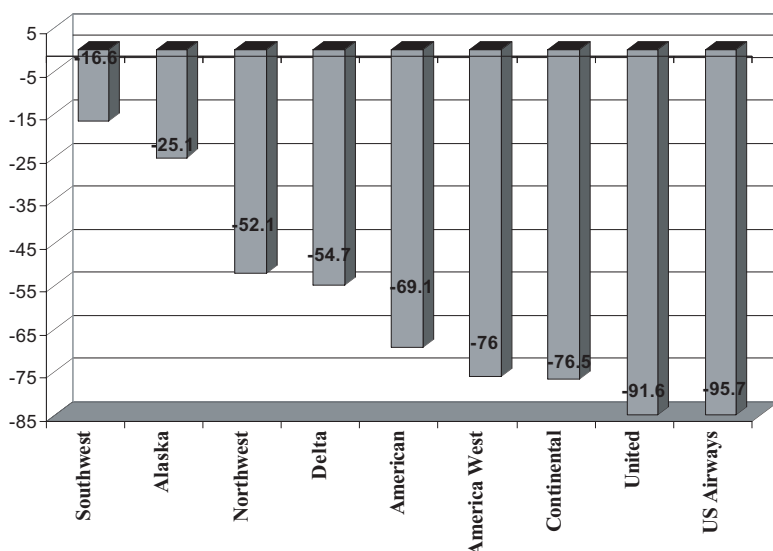
Clearly we can't continue to do this indefinitely, but we are willing to suffer some damage, even to our stock price, to protect the jobs of our people.

The reason given for this approach represents an abundance-oriented approach—virtuousness, focusing on the good, and aiming at producing human flourishing.

We could have furloughed at various times and been more profitable, but I always thought that was shortsighted. You want to show your people that you value them, and you're not going to hurt them just to get a little more money in the short term. Not furloughing people breeds loyalty. It breeds a sense of security. It breeds a sense of trust.

CEO, Southwest Airlines

The problem with an abundance approach to change in the airline industry (or any industry), of course, is that Wall Street doesn't care. Shareholder value and a return to stockholders are the key benchmarks of success. Whether an abundance approach is used or not is largely irrelevant to investors. In fact, an abundance approach to change, or fostering virtuousness in organizations, seems a bit too syrupy and saccharine for most senior leaders who are pressured to produce short-term financial results. As illustrated in figure 1.6, however, it was the abundance approach that produced the highest financial payoff in the airline industry. In fact, this study found that the correlation between increases in shareholder value and the use of an abundance approach was 0.86 in the first year after the tragedy,



**Figure 1.6 SHAREHOLDER VALUES, SEPTEMBER 2001–SEPTEMBER 2002**

and it remained that way through 2005. Wall Street rewarded abundance and virtuousness the most.

## **Amplifying and Buffering Benefits**

One reason that organizations do better when exposed to abundance and virtuousness—that is, a reason that the heliotropic effect works in organizations as well as with individuals—is its *amplifying* and *buffering benefits*. Simply stated, when an abundance approach is implemented in organizations, positive consequences are amplified, and they become self-reinforcing. Similarly, the organization becomes buffered from negative consequences and develops hardiness (see Cameron, 2003; Bright, Cameron, & Caza, 2006). There are at least four explanations for why these benefits occur: *the generation of positive emotions, the formation of social capital, the demonstration of prosocial behavior, and the creation of resiliency.*

**Positive emotions.** An abundance approach to change and the facilitation of virtuousness in organizations produce positive emotions in individuals which, in turn, lead to an amplifying effect. When organization members observe compassion, experience love,

or witness spectacular performance, for example, they are inspired, increase their pride in the organization, enhance their enjoyment of the work, and elevate their satisfaction with the job, and thereby they experience “love, empathy, verve, zest, and enthusiasm . . . the sine qua non of managerial success and organizational excellence” (Fineman, 1996:545). Several studies (George, 1995; Fineman, 1996; Seligman, 2002a) have demonstrated that this amplifying effect is emotionally disseminated throughout an organization by way of a contagion effect. That is, the entire organization is influenced positively when an abundance approach is pursued, especially by individuals in leadership positions.

***Social capital.*** A second reason for the amplifying benefits of an abundance approach is its association with the formation of social capital. Social capital refers to the development of positive relationships among employees. Building social capital reduces transaction costs, facilitates communication and cooperation, enhances employee commitment, fosters individual learning, strengthens relationships and involvement, and, ultimately, enhances organizational performance (Adler & Kwon, 2002). Experiencing an abundance approach, with its emphasis on virtuousness, creates a sense of attachment and attraction toward virtuous actors (Bolino, Turnley, & Bloodgood, 2002), which in turn helps members of an organization experience an urge to join with and build upon the contributions of these others (Sethi & Nicholson, 2001). Organizations function better when members know, trust, and feel positively toward each other, and an abundance approach creates the conditions for that to occur.

***Prosocial behavior.*** An abundance approach tends to foster prosocial behavior or behaviors that benefit other people. Several authors have pointed out that individuals engage in prosocial behavior because of an intrinsic motivation toward helping others, among other factors (e.g., Batson, 1994). “Evidence on impulse helping suggests that . . . individuals may be genetically disposed to engage in impulsive acts of helping” (Krebs, 1987:113). Observing and experiencing virtuousness helps unlock the human predisposition toward behaving in ways that benefit others. Studies reported by Cialdini (2000) and Asch (1952) support the idea that when people observe exemplary or moral behavior, their inclination is to follow suit. Positive spirals of prosocial behavior tend to flow from abundance-oriented behavior.

**Resilience.** An abundance approach also buffers organizations from harmful events by fostering resiliency. Seligman and Csikszentmihalyi (2000) pointed out, for example, that the development of abundance and virtuousness serves as a buffer against dysfunction and illness at the individual and group levels of analysis. They reported that the positive dynamics associated with abundance were found to be prevention agents against psychological distress, addiction, and dysfunctional behavior. Learned optimism, for example, prevents depression and anxiety in children and adults, roughly halving their incidence over the subsequent two years (Seligman, 1991).

Similarly, at the group and organization levels, an abundance approach enhances the ability to absorb threat and trauma and to bounce back from adversity (Dutton, Frost, Worline, Lilius, & Kanov, 2002). It serves as a source of resilience and “toughness” (Dienstbier & Zillig, 2002) that fosters a sense of collective efficacy, thus helping the organization absorb misfortune, recover from trauma, and maintain momentum in difficult circumstances. Abundance helps replenish or renew organizations. That is, observing or experiencing the abundance approach fosters positive energy and, hence, replenishes the human capital needed to capably absorb or recover from damage (Dutton & Heaphy, 2003).

## Summary

In this chapter we addressed the question *How did extraordinary performance occur at Rocky Flats?* We provided more detail regarding why this case represents an instance of making the impossible possible—achieving levels of performance well beyond normal. Never had such a task been undertaken. The obstacles and difficulties at the facility were enormous, so just meeting expectations for a 70-year, \$36 billion cleanup would have represented a remarkable success. However, the fact that success was achieved 60 years early, \$30 billion under budget, and with significantly better quality standards than originally required would be unbelievable if it hadn’t actually happened. The primary reason for this success was the implementation of an abundance approach to change—a positive emphasis, or an emphasis on achieving the best of the human condition, striving for positive deviance, and working to fulfill the highest potential of organizations and individuals. Adopting an abundance approach to change unlocks the heliotropic effect in individuals and

organizations. The heliotropic effect not only produces elevated performance but also provides amplifying benefits—escalating, self-reinforcing performance—and buffering benefits—the development of resiliency and the ability to absorb negative influences. Subsequent chapters illustrate these effects at Rocky Flats.

Among the conclusions to be drawn from this explanation are the following:

- *The impossible is made possible by the abundance approach to change.*
- *An abundance approach to change helps produce the heliotropic effect.*
- *Unlocking the heliotropic effect in organizations, and among employees, leads to extraordinary performance.*
- *Adopting an abundance approach produces amplifying and buffering benefits, so an upward spiral of improvement can be created as a result of abundance leadership.*



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