

**DRAFT**



# **Organizational Sustainability: A New Direction for DOE**



**Office of Health, Safety and Security**





The vitality of the nation's economy forms the foundation of our high quality of life, our national security, and the hope that future generations will inherit ever-greater opportunities. That vitality is derived largely from the productivity of well-trained people and the steady stream of scientific and technical innovations they produce. Without high-quality, knowledge-intensive careers and the innovative enterprises that lead to discovery, our economy will suffer and we will lose our leadership position among the world's industrialized powers.

Today, a substantial portion of our workforce finds itself in direct competition for employment with lower-wage workers around the globe. A greater percentage of leading-edge scientific and engineering work is being accomplished in other parts of the world. This competition is fueling a growing concern

by Congress, the National Academies of Science, and numerous other professional organizations that the United States is losing its lead in economic global competitiveness.

### Discussion Topics

- Issues Facing the Nation
- How DOE Fits in the Resolution of these Issues
- Problems Impacting DOE's Ability to Resolve Issues
- Definition of Sustainability
- Intent of Sustainability Pilot Study
- Economic Vitality as the Nation's Foundation

Throughout history, the implementation of new technology has always been at the root of our leadership in the global market. Today, technology development is the focus of eight national strategic initiatives that all play a significant role in supporting our global economic strategy. While the U.S. will likely never have labor costs less than developing nations, the initiatives suggest we must compensate with speed and efficiency in production supported by new and innovative technology. The initiatives address national issues and identify what is needed to resolve them. They influence much of the work being performed by the U.S. Department of Energy (DOE), its contractors, and private industry. The resolution requirements described in the initiatives help shape DOE's mission, which sets in motion the planning, research, and evaluation activities necessary for the development of new technology required to improve our economic competitiveness. Research activities include both basic and applied research and it is understood that some research efforts may not yield desired results in all instances. However, undesirable results for one project may inadvertently contribute desired results for others. Due to this uncertainty, it is recognized that private industry alone cannot bear the financial risk of research activities in support of technology development and therefore, through collaborative efforts, DOE and private industry are working in tandem towards common technological goals.

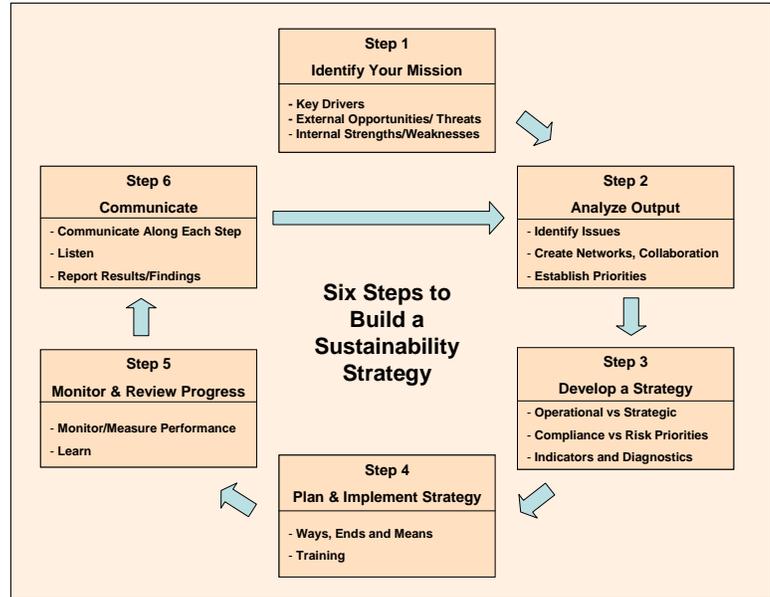


# Organizational Sustainability

**Sustainability is an initiative pursued by DOE to ensure the health of the nation, implement DOE's mission in support of that objective, and enable contractor communities to support DOE in its mission.**

Unfortunately, DOE, along with most of the Federal government, has no effective evaluation system in place to assess whether its programs are generating desired results (GAO 08-93SP). In some instances, budgets may be prematurely cut, stalling research efforts on the brink of breakthrough while funding nonproductive activities. Therefore, implementing an effective evaluation process is crucial to the future prosperity of the nation.

Large complex organizations have successfully used sustainability as an approach to propel business to greater success or to turn around struggling business units. DOE is exploring the use of sustainability to capture a full and integrated view of performance allowing a clear understanding of the most crucial issues such that appropriate actions can be taken. It is an organized approach for developing, implementing, and evaluating strategies for optimizing the impact of DOE's mission relative to its resources. The figures to the right represent sustainability, its components and benefits. The remainder of this document discusses the details of the condition of the nation, DOE, and why sustainability should be seriously considered as a management approach within the Department.



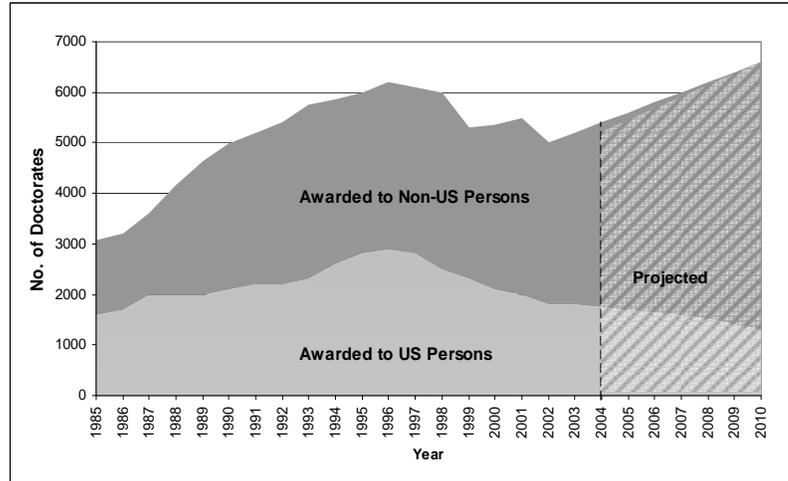
- DOE Sustainability Elements**
- Infrastructure
  - Environmental Stewardship
  - Leadership and Organizational Transformation
  - Stewardship, Good Governance and Reputation
  - Acquisition, Procurement and Supply Chain Management
  - Science, Technology and Innovation
  - Human Capital
  - Safety
  - Legal and Licensing
  - Security
  - Mission and Markets
  - Business Systems

- Sustainability's Benefits**
- Provides good construct for looking at the issues of governance within public/private partnerships
  - Identifies critical information needed to assess performance
  - Assures management of performance
  - Develops smart samplings
  - Identifies and removes hindering constraints



## The Ability of the U.S. to Achieve Innovative Scientific Technological Breakthroughs Crucial to Global Competitiveness Could Seriously Erode

The National Academies Committee on Prospering in the Global Economy of the 21<sup>st</sup> Century reports 85% of measured growth in the U.S. income per capita is due to technological advancement. Recently however, corporate, government, and national scientific and technical leaders have expressed concern that pressures on the science and technology enterprise could seriously erode this past success. Reflecting this trend is the movement overseas not only of manufacturing jobs, but also of jobs in finance, engineering, and research. Further, members of the National Academies of Science and the National Academy of Engineering Councils expressed concern that a weakening of science and technology in the U.S. would inevitably degrade national social and economic conditions. Among those concerns:



Engineering/Mathematics/Computer Science doctorates awarded by US institutions by citizenship status. Since the mid-1990s, a decreasing percentage of engineering doctorates were awarded to US citizens and permanent residents.\*

- Foreign firms are more adept at taking the results of scientific research and producing commercially-viable products.
- If current trends continue, by 2010 more than 90% of all engineers and scientists in the world will be living in Asia.
- Increased management and manufacturing costs in the U.S. are causing companies to move outside the U.S.
- The U.S. will import 65% - 75% of its oil by 2020, a time when there is ever higher competition for this resource.

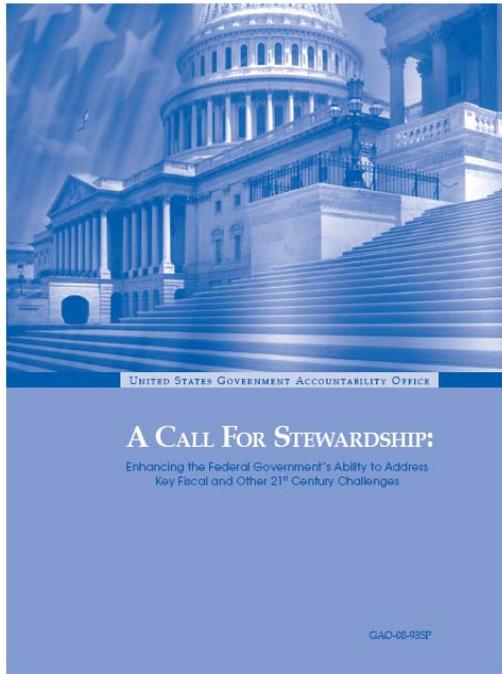
As a result of globalization, driven by modern communications and other advances, workers in virtually every sector must now face competitors who live just a mouse-click away in China, India, Ireland, Finland, or dozens of other nations whose economies are growing.

In addition to the Committee's findings, the Government Accountability Office published a report in December 2007 that identifies many fiscal and other challenges to the Federal government in the 21<sup>st</sup> century.

\* Source: Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. The National Academies Press. Washington DC. 2007.



## Effective Evaluation is Absent from Many Federal Programs



*“We do not know whether many of today’s federal programs, policies, functions, and activities are generating real, desirable, and sustainable results.”*

*David M. Walker, GAO, Comptroller General, December 2007*

The Government Accountability Office (GAO) reports that the government’s current long-range fiscal path is clearly imprudent and fiscally unsustainable (*A Call for Stewardship: Enhancing the Federal Government’s Ability to Address Key Fiscal and other 21<sup>st</sup> Century Challenges*). As noted in the report, much of the government’s conditions and priorities are reflective of the conditions that date back to the 1940s through the 1970s. Finite taxpayer dollars are spent on activities that may be of questionable value and are a lower priority today. There is no effective mechanism in place that allows us to determine if today’s federal programs “are generating real, desirable, and sustainable results”.

The GAO’s findings are alarming, given the range of current and emerging problems that require attention: health care, energy dependence, environmental protection, and homeland security, to name a few. Program executives should have the capability at their fingertips to clearly answer the five questions below. In some cases this is not possible without significant research. What is needed is a more long-term, comprehensive, and integrated approach to help capitalize on related opportunities and manage related risks within current and expected resource levels. A top-to-bottom review of federal programs and policies is essential.

The GAO suggests the development of a system of key national outcome-based indicators which will help the nation to set objectives, measure

- Five Essential Questions**
- **Direction** - *What do we want to achieve?*
  - **Analysis** - *What is our current situation?*
  - **Choice** - *What options and resources do we have?*
  - **Implementation** - *How are we going to make it happen?*
  - **Measurement** - *How do we know when we are successful?*

progress, assess conditions and trends, and communicate more effectively on complex issues. However, it is only when such individual measures reflect the outcomes sought and are combined into a larger system of indicators that one can begin to see the big picture and understand one’s true position and progress. The desired outcomes must be clearer, and there must be more high-quality information and public engagement describing the nation’s position and progress in achieving the outcomes.

Much of the findings in the above referenced reports are fully addressed by eight national strategic initiatives which are designed to increase the nation’s global economic competitiveness through the 21<sup>st</sup> century.



## Technology is Key to the Nation’s Competitiveness in the Global Market

The eight national initiatives listed are interrelated through technology development and together directly impact the nation’s ability to:

1. Be less reliant on foreign sources of oil,
2. Be more secure,
3. Advance American manufacturing processes, and
4. Grow the nation’s economy.

Failure to effectively support these initiatives could significantly jeopardize the long-term strength of the nation.

### DOE Contributes to the Sustainability of the Nation

DOE’s strategic plan is designed to ensure that the nation meets its energy, scientific, environmental, and national security goals. The Department invests in high risk/high-payoff research and development in direct support of technological breakthroughs that would be too financially risky for the private sector to undertake on its own.

The Committee on Prospering in the Global Economy in the 21<sup>st</sup> Century in their report, *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, examined the question: What is likely to happen if we do not change our current approach to science and technology? The Committee’s report, as well as several others from the government, industry, and think tanks provides data showing that the relative position of the U.S. is declining in science and technology education and high tech industry. All of this leads to a few simple extrapolations:

National Initiatives

- 1. American Competitiveness Initiative**  
*Drives scientific community and strategic investment in research for technology*
- 2. Advanced Energy Initiative**  
*Constructs a plan for energy independence/security*
- 3. National Security Initiative**  
*Builds alliances, deters hostile actions, and identifies technology and infrastructure needs for both*
- 4. Economic Strategy**  
*Long-term plans for maintaining productivity, U.S. leadership, and dominant market share*
- 5. Manufacturing Initiative**  
*Assesses and provides strategies to restore, to full strength, the U.S. industrial base to include addressing technology and liability costs*
- 6. Defense Industrial Base**  
*Assesses and provides strategies to maintain war fighter and first responder technologies, a national security workforce, heavy industries, and viable production rates*
- 7. Educational Initiative**  
*Revitalizes the U.S. educational system and standards, and ensures access to the best minds from across the globe.*
- 8. Nanotechnology Initiative**  
*Supports responsible development, applies technology to material science, communications, biotech, etc., establishes a means for public and private benefits*

**DOE is a key contributor to each of these initiatives**

**Assuming we change nothing in our approach to science and education:**

- *The U.S. ability to support R&D spending will continue to decline*
- *The U.S. share of world scientific output will continue to decline*
- *The U.S. share of scientists and engineers will continue to decline*
- *Our ability to attract the best international researchers will continue to decline*

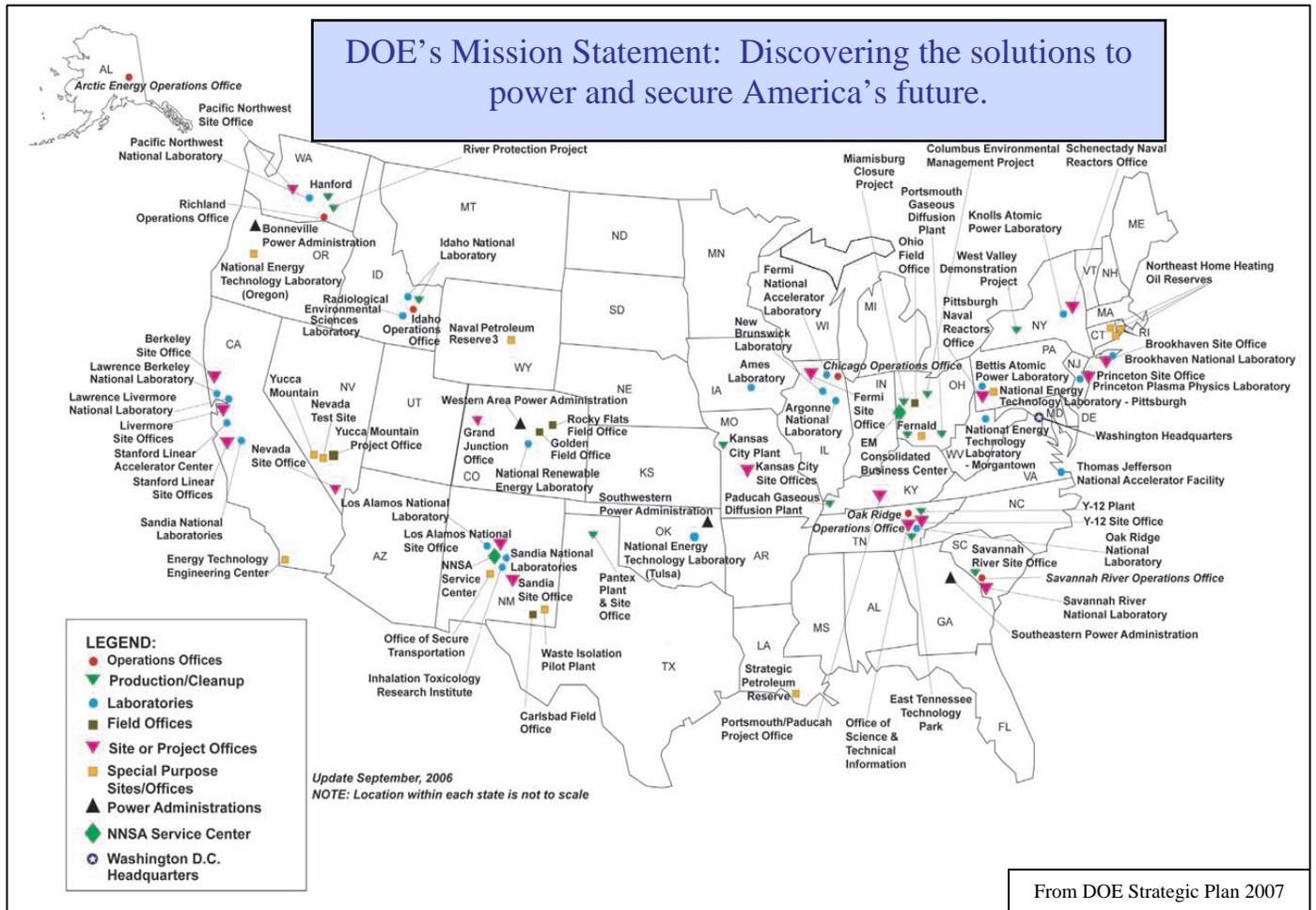
DOE’s contribution to the development of new technology adds a significant component to the sustainability of the nation. However, to better optimize its resources, DOE needs to improve its ability to effectively link performance results from its numerous programs such that a clear understanding can be obtained of what changes need to be implemented to better support DOE’s mission.



# DOE Obstacles to Progress



The Department of Energy is a diverse and complex organization consisting of eight Program Offices, six Operations Offices, over twenty national laboratories and technical centers, and approximately fifty other field facilities spread out over the entire nation. Thousands of employees are performing a myriad of tasks in nearly all engineering and science disciplines utilizing multibillion dollar budgets funded by the taxpayer.



The challenges to effectively manage an operation this complex are obvious. Information transfer from one organizational level to the next must be organized in such a way that enables effective governance and strategic decision-making while also optimizing limited financial resources. Executive level decisions must be based on sound information such that more dollars can be funneled to good science and research and less money spent on needless bureaucracy. Today DOE, as well as other Federal agencies, are not optimizing this balance.

**Raw performance data from so many facilities makes it difficult to ascertain how well the Department is executing its mission and supporting strategic initiatives.**



## Sustainability Defined



Currently within DOE, basic research may touch upon a number of vital areas in support of the strategic initiatives; however, the connection is sometimes not readily understood at the individual budget development level. Additionally, decisions surrounding budget constraints may inadvertently cut crucial research on the brink of a breakthrough that could assist in the development of new generation technology. We do not have to look far into DOE's past to see this has already occurred relative to biotechnology and computing power. Further, there are only fragmented mechanisms in place that look far enough into the future to ensure a sustainable operation.

Other factors that further complicate this condition are requirements that are compliance-driven. For example, there is a requirement for reporting the number of small-business contractors employed rather than focusing on the value added by these contractors supporting DOE's mission. The first is an easy measure and is something that can be counted, but provides little insight into whether the actual desired outcome is being achieved.

**A vision of sustainability enhances the innovative strength of an organization through operational efficiency and strategic depth.**

As envisioned for DOE, sustainability is an organized management approach for developing, implementing, and evaluating strategies for optimizing the impact of DOE's mission relative to its resources. The sustainability process requires analysis of program performance of both contractor and DOE activity lending insight to program specifics such that executives can optimize the budget towards research showing good potential and eliminate non-productive bureaucratic activities. For this to occur, management must be able to accurately assess the value derived from ongoing programs. Using the sustainability approach, management will be able to discern which activities remain priorities, which should be overhauled, and which have simply outlived their usefulness – thereby optimizing the use of limited resources. Sustainability allows an organization to not only assess current performance but long-term impact on future success. It is a good analysis tool that can provide information that should cross the threshold between the contractor and DOE to support an assurance model of performance, management, and governance. It will also allow the operating organizations and DOE access to information regarding what governing constraints negatively impact successful mission completion.

There are many pressures placed on complex organizations (Figure 1), and a sustainability approach looks at these pressures and provides an integrated picture of their impact on performance. Some constraints originate from the outside, such as stakeholder concerns and regulations. Other constraints may originate from within an organization, such as limited training of human resources and aging infrastructure. Some examples of constraints within DOE are:

- *Technology* - Budget constraints may inadvertently underfund scientific research. True value of scientific research is not often immediately detectable and may not be readily demonstrable to management, Congress, and stakeholders.
- *Infrastructure* – Today, DOE decisions for allocating resources to replace or repair aging infrastructure are often based on across-the-board markers of percentages, rather than considering future competitive placement within the marketplace.

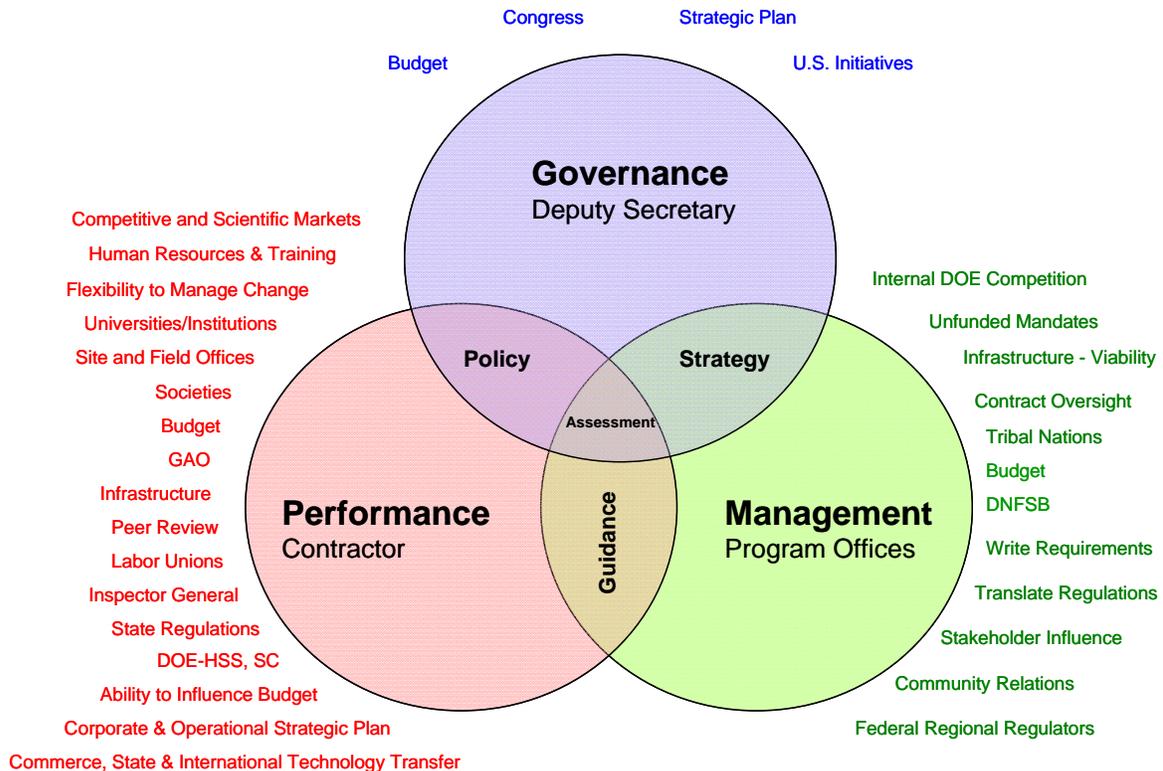


# Sustainability Defined



- *Human Capital* – By tracking hiring, placement of employees, aging personnel approaching retirement and success of their productivity; sustainable organizations have ongoing plans in place to address future skill needs versus current skill mix. As a scientific organization, DOE is critically affected by the loss of scientific/technical personnel and lacks the ability to effectively implement solutions to address its own human capital needs against the global demand for trained personnel. Additionally, DOE’s intellectual property today also resides with those performing crafts work. As this important sector ages, an effective mechanism to translate their years of experience to other employees is crucial to maintain reliable operations.

An effective process used to help ease these pressures and constraints is to gain the collective intelligence from the public and private sector, which can be brought together as dynamic collaborators. For DOE, this involves creating partnerships with industry, academia, or other Federal agencies. Through this process, collaborative relationships are built to satisfy the strategic needs of today’s national objectives. Key to this effort is not only the strengthening of mutual creativity and innovation in support of common technology development goals but also understanding how other organizations have successfully addressed problems currently common to DOE. DOE is an organization born out of collaboration with industry, academia, and sister agencies and today must revitalize the efficacy of this process to support the strategic needs of the nation.



**Figure 1: Organizational Pressures Acting Upon the DOE Complex**



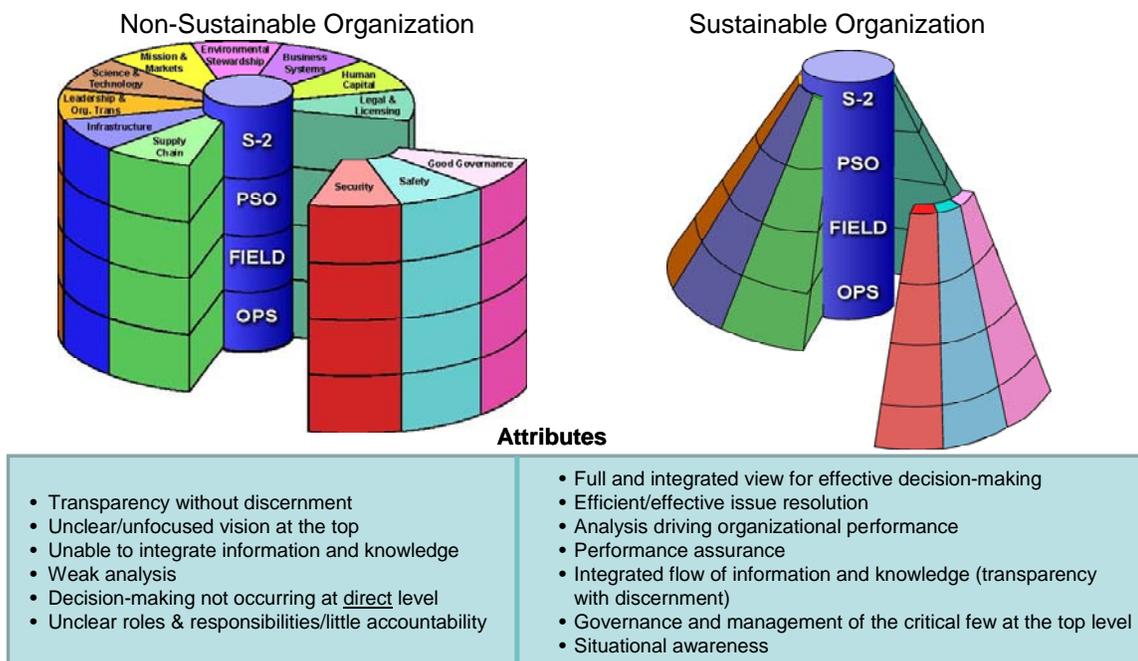
## Sustainability Pilot Study Intent



DOE’s Office of Health, Safety and Security (HSS) recognizes that organizational sustainability is a complex initiative and believes the concept should first be tested through a pilot study following the scientific approach rather than forcing a fit Department-wide. HSS has developed a preliminary sustainability model that is ready for testing through a pilot study. The goal of the pilot study is to participate in a collaborative effort with DOE and contractor personnel for testing the sustainability model’s ability to analyze DOE and contractor business activities and point to solutions toward improved performance.

During the pilot, best management practices utilized by both the contractor and DOE will be benchmarked, particularly those involving performance evaluation and data analysis. These techniques can then be assessed for application in areas where appropriate analysis is not occurring. Areas that cannot be improved with existing practices will be recorded for further study by the DOE and contractor team.

A sustainability initiative implemented at this time can help develop a clear understanding of the most crucial issues impacting performance such that a realistic assessment can be made on the viability of research and development efforts. Figure 2 compares a non-sustainable organization to that of a sustainable one. The non-sustainable organization represents raw data from each of the sustainability elements (contained in DOE’s sustainability model) traveling through the performance, management and governance levels of an organization with little analysis in between. In this instance data at the top level it is too diverse for effective organization-wide decision-making. The sustainable organization represents raw data from each of the same elements being effectively integrated and analyzed as it travels through the various levels. The inward sloping figure on the right represents raw data from various programs appropriately linked to a set of higher level indicators that filter out irrelevant data such that only the most crucial facts rise to the top for appropriate decisions to be made.



**Figure 2: Non-sustainable Organization vs. Sustainable Organization**

