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# THE NATIONAL ENERGY STRATEGY—AN ILLUSIVE QUEST FOR ENERGY SECURITY

*by*
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## I. ENERGY POLICY - A BRIEF HISTORY

In terms of historical perspective, the United States, with less than five percent of the world's population, is far and away the world's largest energy consumer. The United States uses nearly twenty-five percent of the total world energy consumption every day.[1] Every person in the United States uses a daily average of nearly three gallons of petroleum products, more than one-fourth of all the petroleum consumed worldwide.[2] In spite of its own considerable reserves, 26.5 billion barrels of crude oil, and 7.8 billion barrels of natural gas liquids as of December 1989,[3] the U.S. has been and continues to be extraordinarily vulnerable to both foreign supply interruptions and sudden price increases. A decade and a half of "reacknowledging" the problem, restructuring the options, and recrafting the solution has not brought the United States measurably closer to energy independence or economic security.

### *A. The Early Plans*

Although largely forgotten, the first semi-comprehensive analysis of our national energy condition appeared in January 1939 as "Energy Resources and National Policy," the report of the Energy Resources Committee of the U.S. National Resources Committee. Additional studies appeared on a sporadic basis between 1939 and 1977[4] with most being prepared after the Arab

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1. ENERGY INFORMATION ADMIN., ANNUAL ENERGY OUTLOOK, DOE/EIA-0383(90) (1990).

2. The exact figures for 1990 showed that the U.S. consumed 81.7 quadrillion BTUs (quads) per day out of a total worldwide consumption of 344.21 quads. ENERGY INFORMATION ADMIN., PETROLEUM. AN ENERGY PROFILE, DOE/EIA 0545 (1991).

3. *Id.* at 13.

4. *See Resources for Freedom*, President's Materials Policy Commission (1952); U.S. Atomic Energy

oil embargo of 1973-74.

This embargo converted what most believed would be a temporary "energy crisis" into a continuing national issue. President Jimmy Carter, calling the energy crisis the moral equivalent of war, issued the fullest assessment of the nation's energy predicament within three months of taking office. "The National Energy Plan," published by the Executive Office of the President in April 1977, stated that the nation's "three overriding energy objectives" were:

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| Immediately— | reduce dependence on foreign oil and vulnerability to supply interruptions; |
| Medium term— | keep U.S. imports low in anticipation of time when world oil production approached its limited capacity; |
| Long term— | have renewable, inexhaustible energy sources for sustained economic growth.[5] |

To achieve these objectives, President Carter advocated a proactive government taking a tough leadership role in addressing energy problems through a heavy dose of price and allocation regulations and mandatory conservation measures.[6] During the spring of 1977, Carter was successful in gaining Congressional approval for the Energy Organization Act, which, *inter alia*, established the Department of Energy (DOE).[7] Carter expected the Department, which began operations on October 1, 1977, to provide the leadership he believed necessary to solve the energy problem.

In an effort to come to grips with what had now become an unavoidable concern, and partially in response to the Arab oil embargo of 1973-74, Congress required the President to prepare and submit, every two years, a proposed National Energy Policy Plan that would:

> (1) consider and establish energy production, utilization and conservation objectives. . .paying particular attention to the needs for full employment, price stability, energy security, economic growth, environmental protection. . .and the efficient utilization of public and private resources. . .(2) identify the strate-

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Commission, WASH-1281, *The Nation's Energy Future: A Report to Richard M. Nixon, President of the United States* (1973); *Project Independence: A Summary*, FEDERAL ENERGY ADMIN. (1974); *A National Plan for Energy Research, Development and Demonstration:* ENERGY RESEARCH AND DEVELOPMENT ADMIN., A NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION: CREATING ENERGY CHOICES FOR THE FUTURE, ERDA-48 (1975); ENERGY RESEARCH AND DEVELOPMENT ADMIN., A NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION: CREATING ENERGY CHOICES FOR THE FUTURE, ERDA-76-1 (1976).

5. EXECUTIVE OFFICE OF THE PRESIDENT, THE NATIONAL ENERGY POLICY PLAN, at ix (1987).

6. By contrast, the Reagan Administration "charted a course for federal energy policy markedly different from that which preceded it, by emphasizing support of a healthy, unencumbered private sector economy to produce and distribute adequate supplies of energy, rather than maintaining a large governmental apparatus directly managing our energy markets." The Administration intervention into energy management is . . . supportive, not managerial; cooperative, not adversarial and directive." R. Tenney Johnson, *National Energy Policy—The Department of Energy's Perspective*, 3 ENERGY L.J. 331 (1982).

7. The Department was structured to allow for the continuity of programs and functions from predecessor organizations including the Federal Energy Administration and the Energy Research and Development Administration. The Federal Energy Regulatory Commission was established, inheriting most of its functions and personnel from the Federal Power Commission, established in 1920. *See* DEP'T OF ENERGY, THE UNITED STATES DEPARTMENT OF ENERGY: A HISTORY, DOE/ES-0004 (1982).

> gies. . .to achieve such objectives, and (3) recommend legislative and administrative actions (to achieve the objectives).[8]

In the DOE Organization Act, as well as in all subsequent policies, plans and strategies, the phrase "energy security," by whatever definition, appears as one of the most prominent objectives.

Each subsequent administration dutifully complied and formulated its own energy policy plan. Without exception the primary goal of each, although sometimes phrased differently, was to achieve a state of "energy security." Some plans were guided by wishful thinking, while others were driven by drastically changed economic or political conditions. However, not one plan has been either fully or successfully implemented. Against the background of these well intentioned plans, our dependence upon imported oil continues to climb, and our vulnerability to supply disruptions continues to exist.

### *B. The Bush National Energy Strategy*

Soon after his election, President George Bush, often described as an "oil man" who understood the problem, directed that a National Energy Strategy (NES) be crafted and made its creation one of his more visible Presidential priorities. It has yet to become a reality.[9] The objective of the NES, as stated by President Bush in July, 1989, is . . .

> achieving balance among our increasing need for energy at reasonable prices, our commitment to a safer, healthier environment, our determination to maintain an economy second to none, and our goal to reduce dependence. . .on potentially unreliable energy suppliers.

The four pillars of the Bush NES, price maintenance, environmental enhancement, economic efficiency, and supply security will be forged in the "free market" crucible wherever possible. Government intervention, a term largely undefined, will be reserved for those instances where necessary to remove or overcome barriers to an efficient market operation, and when justified by rigorous cost-benefit analyses.[10] Energy security, still the paramount objective, is to be approached not by reducing the IMPORTS of foreign oil, thereby imposing high economic and environmental cost, but by reducing the IMPORTANCE of foreign oil by offering a host of cost-effective and environmentally sound alternatives.[11]

There appears to be no empirical precedence of the realistic options available for inclusion in any energy strategy. Depending upon the philosophical bent of the administration in power, or the severity of the public reaction to the latest supply disruption or price spike, the five most often used options,

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8. Department of Energy Organization Act, 42 U.S.C. § 7321 (1977).

9. The first meeting of the Energy Bill Conference Committee, held on Thursday, September 10, 1992, and chaired by Sen. Bennett Johnston illustrated the significant differences between the House version, H.R. 776, and the Sen. Johnston's bill, S. 2166. *Inside F.E.R.C.*, September 14, 1992. Indications are that the respective conference staffs are having a difficult time resolving even minor differences, and the likelihood of a compromise bill emerging is becoming more doubtful.

10. DEP'T OF ENERGY, NATIONAL ENERGY STRATEGY, POWERFUL IDEAS FOR AMERICA, (1st ed. 1991/1992).

11. *Id.* at 4.

conservation and energy efficiency, increased production, development of alternative fuels, regulatory reform, and increased research and development; have been regularly re-ordered.[12] These options are interdependent and cannot be addressed singly since movement in one direction necessarily impacts the others. Although somewhat unscientific, the perceived importance of the individual options in any plan, or strategy, can probably best be determined either by (1) calculating the amount of supporting rhetoric or (2) examining the amount of funding directed toward each.

## II. THE CONTINUING GOAL - ENERGY SECURITY

### *A. Limited Options for Limited Security*

The continuing national objective set forth in every energy plan, regardless of its form, is "energy security." The contents of each such plan reveal that the number of practical options available to achieve this condition is limited. A matrix, Appendix A, was constructed to demonstrate how the various options have been ranked in the first eight energy policy plans. It is interesting to note how the Carter, Reagan, and Bush Administrations have structured the available options both between and within political reigns.[13] All this is to suggest that there is no "right" way to approach the goal of energy security, just different ways, by using the same options in different combinations. The measurable results of all past plans suggest that regardless of the options chosen or their ranking, the predicament of foreign oil dependency appears to be beyond the influential ability of the government.

While energy security, which by definition includes reasonable price maintenance, historically tops every administration's list of national objectives, the methods of achieving this nirvana have constantly shifted. For nearly 20 years, various administrations have sought to juggle the domestic economic benefits of using low-cost foreign oil with the foreign policy risks and security costs of ensuring its continued free flow. On several occasions this act has been interrupted by sudden, dramatic changes in world oil prices and the domestic economy has taken a beating. Still, the country's dependence upon foreign oil continues to increase.[14]

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12. In the first two National Energy Plans submitted by President Carter and the Department of Energy, April 29, 1977, and May 7, 1979, respectively, research for and development of new technologies received lowest billing. The Bush NES, on the other hand, ranks this option much higher. Similarly, conservation and fuel efficiency are mentioned as the "cornerstone" of the first two Carter Plans, while "production" gets top billing in the first Reagan administration plan. DEP'T OF ENERGY (1981) THE NATIONAL ENERGY POLICY PLAN: SECURING AMERICA'S ENERGY FUTURE. *See also* Appendix A.

13. Even though the Clinton/Gore campaign does not have any "official" energy policy document, its position represents yet another reordering of available options. According to a Clinton campaign energy advisor, Gov. Clinton's focus embodies three simultaneous strategies, (1) conservation and energy efficiency, (2) Research and Development into alternative sources and renewables, and (3) maximum possible use of domestic natural gas. The use of natural gas is said to be the "lynch pin" in Gov. Clinton's energy strategy. Lori A. Burkhart, *Bill Clinton's Energy Policy*, No. 5, 130 PUBLIC UTILITIES FORTNIGHT. 25 (Sept. 1, 1992).

14. In the nature of perspective, net imports (imports minus exports) currently account for more than 4 out of every 10 barrels of crude oil and petroleum products used in the United States and could account for 6-7 out of every 10 barrels by the year 2010. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK,

The Bush NES declares that the country's vulnerability to price shocks is not determined by how much oil we import, but rather by the following: (1) the extent of our economy's oil dependency; (2) our capacity for switching to alternate fuels; (3) the extent of reserve oil stocks around the world; and (4) the spare worldwide oil production capacity that can be quickly brought on line.[15] While this may have some empirical truth, in practical terms it may well be irrelevant in our continued national attempt to achieve energy security. The fact is that the productivity of U.S. oil wells has been declining since 1972,[16] demand for petroleum based fuels is growing, and volume of imported oil continues to climb. Measured by any yardstick, the United States remains vulnerable.

Regardless of the extent of our dependence on imported oil, any increase in the world price of oil will have an immediate and resounding effect upon our domestic economy. Volatile oil prices cause instability throughout the U.S. economy. It is an economic fact that volatile (cyclical) oil prices do more economic harm than persistent but gradual (trend) increases.[17] As long as foreign oil is cheaper than domestically produced oil there will be unavoidable economic pressure to use it. As long as we use large quantities of imported oil, or perceive we HAVE to use it for economic reasons, we will be vulnerable to supply interruptions and price increases. While no combination of domestic or international policy options has, in the past, effectively provided the U.S. with the measure of energy security for which it yearns, the Bush Administration does believe that the first Bush NES,[18] if fully implemented, will make the country less prone to, but not free from, the economic damage caused by violent fluctuations in either the supply or price of oil.[19]

### *B. Strategy Implementation Actions*

In its attempt to achieve greater energy security, the Bush NES relies upon a broad array of initiatives, some legislative and some administrative. These include the maintenance of adequate strategic reserves, the increase in the overall energy efficiency of our transportation and construction systems, increasing domestic production in an environmentally sensitive manner, some natural gas and hydroelectric deregulation, and the encouragement of conservation measures and development of alternative fuels. With some subtle dis-

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DOE/EIA-0383(91), at 20 (1991). In absolute terms, this translates into the import, in 1990 alone, of slightly less than 3 billion barrels, contributing to more than one-half of the $101 billion U.S. trade deficit the same year. Bureau of Census, U.S. Dep't of Commerce, FT-900, U.S. Merchandise Trade press release (1990). When viewed from the overall national security standpoint of which energy security is a critical element, this is not an entirely comforting thought.

15. U.S. DEP'T OF ENERGY, *supra* note 10, at 3.

16. ENERGY INFORMATION ADMIN., *supra* note 2, at 21.

17. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 1991 WITH PROJECTIONS TO 2010, DOE/EIA-0383(92) at 143 (1992). In several oil price models developed by the Energy Information Administration, the negative cyclical (volatile) effect on the GNP is more than twice the size of the trend (gradual) effect.

18. It is of passing interest to note that the publication date of the Bush NES (1991-1992) spans two years. The exact date of publication (February 20, 1991) can only be determined from collateral sources.

19. U.S. DEP'T OF ENERGY, *supra* note 10, at 3.

tinctions, these are the same elements upon which previous strategies were based, yet the methods of accomplishing these goals are quite different.

Rather than intervening in the free market with resuscitated regulatory schemes of comprehensive price and allocation controls or forced conservation measures, the intent of the Bush NES is to remove needless regulations and restrictions and harness the market's strengths. More regulation would be replaced with more competition, hopefully increasing fuel choices and reducing consumer costs. Greater market opportunities coupled with increased federal research and development investments in innovative technologies should pass both the economic and environmental need tests as well as the consumer acceptance test. As conservation is an important element in the NES, the Secretary of Energy, James D. Watkins, has publicly rejected the claim that the NES is overly focused on increased supply to the detriment of energy conservation.[20] The Administration believes that energy efficiency (conservation) is best advanced through steady investment in new technologies and products by producers and consumers rather than through the imposition of onerous government mandates. Hence, the NES's heavy emphasis on incentives to stimulate such investment.[21]

## III. THE BUSH RECIPE FOR SUCCESS

### *A. Research and Development of New Technologies*

Assuming Congress concurs, the DOE proposes to invest $3.5 billion in researching and developing new technologies between 1992 and 1996. The DOE has proposed $725 million in FY 1993 alone. This research and development (R&D) effort is one of the major elements of the Bush NES. To a large extent these R&D initiatives will be carried out in the form of joint public-private partnerships, with industry fully participating in the planning, execution and financing of the selected projects. A glimpse at some of these possibilities is fascinating:

> Significant breakthroughs are expected in electric battery design. The DOE (as well as General Motors, Ford and Chrysler) is involved in a $300 million effort to advance the state of battery technology, and by the end of this decade we should see electric vehicles with ranges in excess of 150 miles.
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> In terms of new technologies, the emergence of automotive gas turbines is extremely promising. These power plants will be 30-40 percent more efficient than conventional internal combustion engines, and will reduce both petroleum dependence and tailpipe emissions. In the next century, we should see highly efficient diesel engines equipped with temperature resistant ceramic parts; and before 2010, the use of fuel cells in automobiles, with the potential to improve fuel economy 70-80 percent and reduce pollution virtually to zero.[22]

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20. Linda G. Stuntz, Deputy Secretary of Energy, has stated that the "complaint . . . that this administration is soft on conservation" is wrong . . . budget spending on conservation and renewable energy . . . has gone up dramatically in this administration . . . . INSIDE ENERGY/WITH FEDERAL LANDS, at 7 (August 17, 1992).

21. Secretary James D. Watkins, at the National Energy Resources Organization Awards Dinner (May 1, 1991).

22. *See supra* note 10.

Other promising technologies include the development of:

(1) Cost-competitive alcohol fuels by 2000;
(2) More energy-efficient aircraft construction techniques and more effective air recovery techniques;
(3) Enhanced oil recovery techniques;
(4) A standardized design for the advanced light-water nuclear reactor;
(5) High-temperature gas-cooled and liquid-metal reactors;
(6) Alternative modes of transportation for long-distance automobile and short-haul air travel such as high-speed rail and magnetic levitation;
(7) More efficient active and passive solar systems for commercial and residential buildings;
(8) New processes for direct coal liquefaction; and
(9) Development of bacteria that remove iron and sulphur from coal.[23]

### *B. Regulatory Reform*

Another important approach of the NES to energy security is the proposed reform in existing regulations. It is argued that the removal, or alteration, of the most onerous regulations would encourage greater efficiency and competition in the energy markets. DOE estimates that extant regulatory barriers depress natural gas use by some 1 trillion cubic feet annually. Upon the enactment of NES's regulatory reform measures, increased natural gas consumption could displace up to 600,000 barrels of oil per day by 1995 and 117 million barrels by 2000.[24]

With the adoption of NES reform measures, natural gas consumption should grow to the point where it displaces 300,000-400,000 barrels of oil a day by 1995. Similarly, hydroelectric capacity could increase by about 16 gigawatts by the year 2030.[25] Further regulatory reforms would affect nuclear plant licensing, high-level waste storage, and standardized reactor design.[26]

There are only two mechanisms available to implement the NES options: legislative action by Congress or administrative action by the President. The ultimate success of the Bush NES depends upon Congress and the Administration acting in concert to achieve the greatest possible good. That, however, may be wishful thinking. As of mid-September 1992, Congress has yet to act and the NES legislative package is mired down in the Conference Committee. Recognizing the urgency of the problem, and cognizant of the risk of awaiting Congressional action,[27] the Secretary of Energy directed the Department to implement every administrative action possible. Of special importance are those that did not depend upon any companion action by Congress.[28] Some of

23. *Id.*

24. U.S. DEP'T OF ENERGY, *supra* note 10, at 87.

25. *Id.* at 121.

26. *Id.* at 110-116.

27. Sen. Bennett Johnson, Chairman of the conference committee, hopes to get a conference report on the energy bill to the floors of both the House and Senate by September 25, 1992. INSIDE ENERGY/WITH FEDERAL LANDS at 7 (September 14, 1992). Assuming that schedule is met, the fate of the legislation is unknown.

28. In the year following the release of the Bush NES, the Administration moved to implement more than 90 NES initiatives that did not require any companion legislative action. U.S. DEP'T OF ENERGY, NATIONAL ENERGY STRATEGY, POWERFUL IDEAS FOR AMERICA, ONE YEAR LATER, at 2 (1992).

the actions undertaken are:

(1) Increased funding by $46 million for advanced transportation fuels from biomass;
(2) Agreement signed between DOE and NASA enhancing commercialization of jointly-developed technologies;
(3) Funding of thirty one new federal laboratory-private industry technical personnel exchanges for 1992;
(4) Establishment of two Photovoltaic Centers of Excellence by DOE at the University of Delaware and the Georgia Institute of Technology;
(5) Nationwide program launched to help commercial swimming pool operators reduce energy costs through use of solar-based heating systems;
(6) Issuance of Proposed Rulemaking ("Mega-NOPR") on Natural Gas Pipeline Regulatory Reform.[29]

## IV. DOE - A CHANGING MISSION FOR A CHANGING WORLD

Responding to dramatic changes in the world's geopolitical structure, principally the demise of Communism and its attendant nuclear threat, DOE's missions and responsibilities have undergone a fundamental change. No longer is its principal mission the research and development of nuclear weapons. The extensive capabilities of R&D laboratories can now be safely and partially redirected toward the development of commercial goods and services while still continuing to pursue their historic roles. In order to capitalize upon a portion of the new mission of DOE, the Secretary reinvigorated its technology transfer (tech-transfer) program.

### *A. Tech-Transfer - An Element of Energy Security*

Although the nexus between tech-transfer and energy security may not be readily apparent, it is, nonetheless, consequential. The Bush NES reflects a "commitment" to achieving greater efficiency in every aspect of "energy production and use." Furthermore, the document itself states that "[g]reater energy efficiency can . . . increase our . . . energy security."[30] The more efficiently we use a given amount of energy, the further that amount will stretch. The further we can stretch a set amount of energy, the less we will need to achieve the same end. The less energy (in absolute terms) we need, the more we can rely on domestic energy sources, and the less we will have to rely upon foreign sources. The less we have to rely upon foreign sources, especially unreliable ones, the more energy secure we will be. Increased energy efficiency will promote a greater, but far from total, degree of energy security.

It is an uncontrovertible fact that greater energy efficiency can be achieved through the application of newly developed technologies. When applied to energy usage in the utility, industrial, construction, and transportation sectors the results can be dramatic. Significant new technologies have been, and are constantly being developed either by the federal government or by government funding. Only by transferring them to the private sector for

29. For additional examples of administrative initiatives, *see, Remarks delivered by Deputy Secretary of Energy*, Linda G. Stuntz before the National Energy Resources Organization, Washington, D.C. (September 15, 1992).

30. U.S. DEP'T OF ENERGY, *supra* note 10, at 6.

production and application can their advantages be fully realized. The system of National Laboratories is a treasure trove of new and promising technologies relating to increased energy efficiency, among other disciplines, which can be spun off to the private sector.[31]

An illustration of the benefit of transferring federally developed technology to the private sector involves the transmission of electric power. The United States is becoming increasingly electrified and the Department estimates that in order to meet the electrical needs of the economy in 2010 the country will need about 200,000 megawatts more than we presently use.[32] Continuing federal research into cables constructed from high temperature superconducting materials holds the promise of developing more efficient electric power transmission and distribution facilities.[33] Sharing this technology with the utility industry will guarantee that it enters the marketplace in the most expeditious time frame possible.

Ongoing experiments at Sandia National Laboratory (another DOE facility) have proved that a commercial utility-scale solar thermal power plant, using molten salt for heat transfer and energy storage, could produce electricity at a cost that is competitive with existing coal-fired plants. This type of plant could operate cost-effectively more than sixty percent of the time without using fossil fuel as a backup feed stock.[34]

Tech-transfer has, in varying degrees, long been a feature of the DOE's R&D programs. Initially mandated by Congress in 1980, the DOE continuously expanded its reach by joining forces with a greater portion of private industry to combine their manufacturing and marketing expertise with the DOE's scientific and technical capabilities. The object is to provide even greater opportunities for private industry to commercialize new, federally funded, technological advances that flow from the R&D efforts at the national laboratories.[35]

The research and development programs of the DOE, including the scaled down defense programs, are carried out by seven major DOE offices through both the system of national laboratories operated by the DOE and

31. DEP'T OF ENERGY, DOE NEW TECHNOLOGY, SHARING NEW FRONTIERS, DOE/ER-0535P (1992). Contained in this publication is an extensive list of DOE developed technologies, all of which are available for transfer to private industry and can have a positive impact on increased efficiency in energy production and use. Among some of the more exciting developments are those relating to: petroleum geology and production; nuclear isotopic power supplies; biomass fuel production; solar energy conversions and thermal power systems; energy storage batteries; thermionic converters; thermoelectric generators; ceramic, cermet and refractory production; photo and electrochemistry; biomedical science research; external combustion engines; fusion power plant technology; and meteorological instrumentation.

32. U.S. DEP'T OF ENERGY, *supra* note 10, at 6.

33. U.S. DEP'T OF ENERGY, DOE/CH 10093-84, *Conservation and Renewable Energy Technologies for Utilities* (1992).

34. DEP'T OF ENERGY, TECHNOLOGY '91 at 21 (1992).

35. DEP'T OF ENERGY (1991) SEE TECHNOLOGY FOR U.S. INDUSTRY. This publication highlights 36 new technologies, each recognized by an R&D 100 award. These technologies represent the fields of analysis and instrumentation, manufacturing and materials, energy technologies, biology and medicine and computers and communications. From 1963-1988, 45 percent of DOE-developed technologies have been commercialized as 78 new products, 33 new processes, and 14 services. Twenty-nine new companies were formed from DOE-funded technologies.

DOE funded scientific investigation at universities and industrial research centers. A major benefit of the enhanced tech-transfer program is increased access for United States businesses to the talent and work of the 23,000 scientists and engineers at the DOE labs. Through the medium of Cooperative Research and Development Agreements (CRADAs), made possible by a series of laws and policies enacted and issued between 1980 and 1989, DOE's laboratories can now grant title or licenses for federal inventions to private sector companies, waive ownership rights to intellectual property in advance, and receive royalties.[36]

Listed below are the various DOE offices involved in the tech-transmission and a sampling of their area-specific responsibilities:

CONSERVATION AND RENEWABLE ENERGY: Commercialization of wind power; Photovoltaic manufacturing process; Vehicle fuel efficiency; Geothermal and ocean power.

DEFENSE PROGRAMS: Advanced manufacturing and precision engineering; Microelectronics and photonics; Computational architecture and environments.

ENERGY RESEARCH: High-energy physics; Nuclear physics; Magnetic fusion energy; Superconducting super collider; Physical, biological and mathematical sciences.

FOSSIL ENERGY: Coal conversion and utilization; Power generation from fossil fuels; Hazardous spill responses; Emissions control.

CIVILIAN RADIOACTIVE WASTE MANAGEMENT: Site restoration advances.

NUCLEAR ENERGY: U.S. power generation industry.

### *B. National Technology Initiative - A Cooperative Effort*

A new endeavor, undertaken as an independent administrative initiative,

36. The history of technology transfer legislation is fairly extensive. Stevenson-Wydler Technology Innovation Act of 1980, Pub. L. No. 96-480, 94 Stat. 2311 (1980) (Focused on dissemination of information and required federal laboratories to take active role in technical cooperation); Bayh-Dole Act of 1980, Pub. L. No. 96-517, 96 Stat. 3015 (1980) (Permitted universities, etc. to obtain title to inventions developed with government support and allowed government laboratories to grant licenses to patents); Small Business Innovation Development Act of 1982, Pub. L. No. 97-219, 96 Stat. 217 (1982) (Required federal agencies to fund R&D expenses of small companies connected to the agency's mission); Cooperative Research Act of 1984, Pub. L. No. 98-462, 98 Stat. 1815 (1984) (Eliminated some antitrust concerns of pooled research efforts); Trademark Clarification Act of 1984, Pub. L. No. 98-620, 98 Stat. 3335 (1984) (Permitted patent royalties and licensing); Federal Technology Transfer Act of 1986, Pub. L. No. 99-502, 100 Stat. 1785 (1986) (Made technology transfer a responsibility of all federal laboratories); Exec. Order 12591, 52 Fed. Reg. 13414 (1987) and Exec. Order 12618, 52 Fed. Reg. 48661 (1987) (Promoted the commercialization of science and technology); Omnibus Trade and Competitiveness Act of 1988, Pub. L. No. 100-418, 102 Stat. 1107 (1988) (Placed emphasis on need for public/private cooperation and established centers for transferring manufacturing technology); Water Resources Development Act of 1988, Pub. L. No. 100-676, 102 Stat. 4012 (1988) (Authorized Army Corps of Engineers' laboratories and research centers to enter into CRADAs with private industry); National Competitiveness Technology Transfer Act of 1989, Pub. L. No. 101-189, 103 Stat. 1674 (1989) (Allowed federal laboratories to enter into CRADAs with private industry and protected from disclosure all information and innovations developed through CRADAs); Defense Authorization Act for FY 1991, Pub. L. No. 101-510, 104 Stat. 1485 (1991) (Established model program for national defense laboratories to work with private industry.

is currently under way to publicize and share with the private sector federally funded technological advances. The National Technology Initiative (NTI), a Presidential initiative involving the Departments of Transportation, Commerce, and Energy, and NASA showcases existing laboratory technology and capabilities in multiple disciplines, through a series of conferences held at various universities, with the goal of executing cooperative R&D agreements with United States industry. Beginning with the opening conference held February 12, 1992, and concluding on December 1, 1992, the NTI agenda dealt with such topics as: biotechnology; systems integration; advanced manufacturing; aerospace technology; and natural resources.

### *C. High-Tech Research and Development*

Developing advanced technology and fully exploiting its commercial capabilities in products, processes, and services is essential to ensuring that U.S. businesses can survive in an increasingly competitive world market.[37] The President's FY 1993 budget proposes more than $1.1 billion for increased investments in support of the administration's energy R&D initiatives, but unless Congress appropriates funds for those measures, we will lose our momentum. Already the DOE has budgeted $40 million for the initial geologic studies in the Advanced Oil Recovery Program. In a $6 billion government and industry co-funded effort, a new generation of innovative coal processes is underway at 42 locations in 21 states. Also, $40 million is being spent on a newly refocused program relating to the full spectrum of natural gas technologies. All the Administration can do is to propose various options of achieving the elusive goal of energy security. Acting unilaterally it can only achieve a half measure of success. Congress must carry its water if the overall strategy is to be successful.

All the described initiatives, R&D efforts, and technology transfer endeavors[38] are attempts to solve the key, continuing problem: extreme vulnerability to oil supply interruptions and vicious price spikes. This vulnerability can take on any number of sinister forms. For example, the Bureau of Labor Statistic estimates that since 1982, 429,000 jobs have been lost in the oil industry, with 401,000 of those in the exploration and production segment.[39] Refining employment fell by over 48,000 jobs since February 1982. Sixty-three thousand jobs were lost in the industry last year alone.[40] Even though some think the domestic petroleum industry should be on the endangered spe-

37. In terms of the importance of our high-tech industries, it is interesting to note that in 1990 the U.S. posted a $34.1 billion surplus in overall high-technology trade. At the same time, it posted huge deficits in all other fields, primarily because of the enormity of U.S. petroleum imports.

38. The Department of Energy, in concert with industry groups, states and universities, is creating a new national technology transfer organization, The Exploration and Production Technology Organization, to help independent oil and gas producers remain in operation. INSIDE ENERGY/WITH FEDERAL LANDS at 3 (September 21, 1992).

39. William O'Keefe, chief operating officer of the American Petroleum Institute, was quoted in THE CHRISTIAN SCIENCE MONITOR, September 3, 1992, as saying the federal government's policies of "discouraging domestic exploration" has contributed to an 80 percent drop in the number of Americans employed in oil exploration and production, and a 30 percent drop in the number of refinery workers.

40. BUREAU OF LABOR STATISTICS, PETROLEUM INDUSTRY EMPLOYMENT (1992).

cies list, the government, with Congress and the President apparently bowing to environmental pressure, declared huge sections of offshore public lands off limits, thereby precluding for some time any exploratory drilling and the attendant jobs that would be created. Drilling and production, in the Arctic National Wildlife Refuge, now appears to be a national taboo.

In spite of all the words and efforts expended in support of the NES and in light of the current and continuing Congressional inaction, we have done precious little to achieve our goal of national energy security. In spite of some surprising efficiencies that have been achieved in the use of transportation energy since 1974,[41] little of a promising nature will be available in the market in the short term to replace gasoline as the primary transportation fuel of choice. Even though R&D expenditures for alternative fuel vehicles are increasing,[42] under the best-case scenario only about three million vehicles fueled by something other than gasoline will be on the highways by 2010. That number pales in comparison with the 189 million petroleum-powered automobiles and light trucks operating in 1990.[43]

There is no visible answer to this dilemma. No one can agree on the most effective, or politically acceptable, method of addressing the huge dependency on gasoline powered vehicles. CAFE[44] standards have been opposed by both the Bush Administration[45] and the automobile industry while being embraced by some in Congress and by the environmentalists. Ditto for any proposed "carbon" or import tax. Adding to the confusion, the Clinton/Gore ticket has split on this issue, with Clinton opposing the import tax idea, but Gore supporting the "carbon" tax as an environmental panacea.[46]

The current NES attempts to strike a balance between government direction and government coordination, between the economy's need for petroleum at a reasonable economic cost and the environmental cost of opening up heretofore undrilled sites. It attempts to "lay the foundation for a more efficient, less vulnerable and environmentally sustainable energy future."[47] This is a laudable goal to be sure, but one that does not differ in any significant respect from the goal expressed in any of the preceding national plans and strategies which is energy security. Available options have been reordered and funding requests have been changed to reflect new priorities. Budgetary emphasis has been shifted from old to promising new programs. Nonetheless, no one is

41. "The average new car travels more than 12 miles further on a gallon of fuel, commercial aircraft fly the same number of passengers on 30% less fuel, and trucks and trains transport the same amount of freight on 20% less fuel." DEP'T OF ENERGY, CONSERVATION AND RENEWABLE ENERGY TECHNOLOGIES FOR TRANSPORTATION, DOE/Ch10093-84 (1990).

42. U.S. DEP'T OF ENERGY, *supra* note 10, at 138.

43. U.S. DEP'T OF ENERGY, *supra* note 39.

44. Corporate Average Fuel Economy.

45. Vice President Dan Quayle estimated that one Democratic proposal mandating an increase in fuel efficiency for U.S. automobiles would result in the loss of 250,000 jobs in the industry. THE WASHINGTON POST, April 8, 1992, at A1.

46. Sen. Al Gore has issued a public warning that unless U.S. emissions of carbon dioxide and other global warming chemicals are curbed, sea levels will rise, food production will be disrupted and sensitive plant and animal species will become extinct. THE NATIONAL JOURNAL, August 8, 1992, at 1864.

47. U.S. DEP'T OF ENERGY, *supra* note 10, at 2.

sanguine enough to predict that the adoption of all, or even most, of the proffered options will affect any significant short-term reduction in our dependence upon imported oil. Energy security, however defined, still appears to be an illusory goal.

## V. CONCLUSION

The sad truth is that the United States, certainly in the short term, is just as vulnerable to supply interruptions and sudden price spikes as it was fifteen years ago. If President Bush should lose the election, and Congress has not enacted any energy legislation in the meantime, it is almost inevitable that the Clinton Administration will reexamine the national energy situation[48] and propose a newly crafted strategy of its own design. It is also safe to say that the Clinton Administration's goal will be "energy security," however that term is defined, and that its ranking of options available to achieve that goal will be reordered, reemphasized, and refunded. It is also quite probable that the "free market" approach, in effect for the past twelve years, might be significantly changed. Even if Congress does enact some kind of energy legislation this session, it remains to be seen how closely it will track the essential elements in the President's NES.

No one in this Administration has claimed that its NES is the ultimate "answer." No one has alleged that the total implementation of all the various options, both legislatively and administratively, will achieve complete energy security. No one has suggested that there is a "golden bullet" cure-all. Least of all, no one has claimed in this NES that "energy independence" is likely to happen any time in the near future, if ever. What this NES has done has been to reacknowledge the existence of a pressing problem and pose a series of options to address it, not radically different options, but options with a different emphasis. This NES has begun to implement these options at every available opportunity. Realizing that it still takes two to tango, even in Washington, the Administration has moved to the dance floor and has taken a number of steps by itself. Congress is still fidgeting on the sidelines. Regardless of what happens in the next few months, the quest for energy security will in all likelihood continue to be the goal of all future national energy plans and strategies, even though it may be virtually impossible to achieve.

48. The timing of this re-examination is uncertain, as Patrick Crow, OIL AND GAS JOURNAL, WATCHING WASHINGTON (July 20, 1992), reports that "the Democratic nominee for the White House, has shown no particular interest in energy issues."

## NATIONAL ENERGY POLICIES — TABLES OF CONTENTS COMPARISON APPENDIX A

| Table of Contents Order | 1977 CARTER | 1979 CARTER | 1981 REAGAN | 1983 REAGAN | 1985 REAGAN | 1987 REAGAN | 1990 BUSH | 1991 BUSH |
|---|---|---|---|---|---|---|---|---|
| 1 | Conservation and Energy Efficiency | Conservation and Energy Efficiency | Increased Production | Regulatory Reform | Increased Production | Increased Production | Conservation and Energy Efficiency | Conservation and Energy Efficiency |
| 2 | Alternate Fuels Development and Use | Regulatory Reform | Regulatory Reform | Increased Production | Research and Development | Conservation and Energy Efficiency | Increased Production | Research and Development |
| 3 | Research and Development | Alternate Fuels Development and Use | Conservation and Energy Efficiency | Conservation and Energy Efficiency | Regulatory Reform | Regulatory Reform | Research and Development | Regulatory Reform |
| 4 | Regulatory Reform | Research and Development | Alternate Fuels Development and Use | Research and Development | Conservation and Energy Efficiency | Research and Development | Alternate Fuels Development and Use | Alternate Fuels Development and Use |
| 5 | Increased Production | Increased Production | Research and Development | Alternate Fuels Development and Use | Alternate Fuels Development and Use | Alternate Fuels Development and Use | Regulatory Reform | Increased Production |

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