NEW PERSPECTIVES

ON

ENERGY EMERGENCY PREPAREDNESS

by

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Today, ten years after President Reagan ended oil price and allocation controls and set the stage for extensive deregulatory changes in the natural gas and electric power industries, a review of our current domestic and international energy situation may yield some important insights about what we can expect regarding our future energy security.

Important and sweeping changes have taken place in both energy markets and the energy industries over the past decade that require fresh, new perspectives on our nation's energy emergency preparedness if we are to be capable of dealing with the emerging domestic and international energy problems of the 1990s. We need to look back at what we did right in order to improve our energy emergency strategy for the future. The energy emergency preparedness activities of the past decade were the result of the Reagan Administration's energy security strategy. This strategy and its supporting implementation relied then, and President Bush's current strategy essentially continues to rely on the free market; on a strengthening of the domestic energy industry; on cooperative international energy agreements; and on the construction of an energy emergency response framework centered on the Strategic Petroleum Reserve.

This strategy has proved effective for dealing with past energy emergencies. However, today the central question for government, industry, and the American public in 1990 is: Will the existing energy preparedness strategy and its response programs be adequate to deal with the rapidly emerging problems of the next decade?

The Forces of Change and Market Dynamics

Henson Moore, the Deputy Secretary of Energy, recently told a group of senior state energy officials from around the country that "We see tremendous problems ahead for energy. Domestic oil production declined 500 barrels per day in 1989, and forecasts indicate it will be down another 350 in 1990. This means more imported oil, more tankers and more risk of oil spills."

As the present level of United States dependency on imported oil continues to rise, both consumers and producers are anxiously studying what the eventual outcome will be through the 1990s. Moore also warned of future electric power shortages, noting that "the United States will need more than 110 gigawatts of new power by the year 2000, but one-third of those are not even on the drawing board. If we do nothing, we will be far short of new needed capacity." Obtaining a perspective on our emerging energy problems requires an understanding of market dynamics, international cooperative response measures, and the government's energy preparedness programs. The following are the key areas affecting market dynamics:

The Free Market. Past experience with energy supply disruptions has shown that government regulation of energy markets is a liability rather than an asset. Markets operate best when they are free of intrusive government regulation in emergencies as well as during normal periods. The Bush Administration has made sure that they preserved the cornerstone of United States energy emergency response planning: reliance on the free market—supported by appropriate government response mechanisms to ensure adequate energy supplies.

Due to its reliance on a flexible, decentralized response, a market strategy is more capable of dealing with the uncertainties and irregularities posed by an energy emergency. For example, when considering the uncertainty of an energy emergency, the length and severity of a disruption is usually not known at the outset, and the impact of a disruption may not be uniform across economic sectors and geographic regions. The free market strategy can accommodate these uncertainties by allowing energy consumers to make autonomous decisions based on individual situations. Few economists would disagree with the fact that market mechanisms have demonstrated an effective response in every instance of an energy disruption that has been encountered since the end of price and allocation controls ten years ago.

OPEC: "The Cartel Rejuvenates." As the United States and other countries import more oil through the 1990s, OPEC's production and market share will rise. About three-fourths of the world's currently known oil reserves (800 billion barrels) are in OPEC countries. Not only are most of the world's proven oil reserves in OPEC, but nearly all of the world's excess production capacity is also concentrated there, mainly in the Persian Gulf States of Saudi Arabia, Iran, Iraq, Kuwait and the UAE. This dependence will extend into the longer term and become even more critical as the opportunities to find additional large deposits of oil decrease, and the reserves of the rest of the world are rapidly depleted.

Approximately 40 percent of the entire free world's oil now comes from OPEC, of which 25 percent comes from the Persian Gulf members. By 1995, barring major changes in supply sources, around 65 percent of the free world's oil imports are likely to come from OPEC with 35 percent from the Persian Gulf. Overall, the outlook is for a United States that will be more dependent on the Persian Gulf and potentially more vulnerable to world oil supply disruptions.

Because of its vast oil reserves, the Persian Gulf region will continue to be strategically important to the United States Conversely, as its largest market, the United States is also strategically critical to the Gulf OPEC states. The huge economic investments by OPEC countries in Gulf business and infrastructure have fostered an insatiable and continuing need for revenues. These funds are needed to fuel continued economic growth as well as to finance expansion of their petroleum operations to meet future supply needs. This need for revenue has contributed to a mixed posture within OPEC with disputes about quotas and upward pressure on oil prices by some members, and a desire for market stability from others.

OPEC members have invested heavily in "downstream" operations with the development of petrochemical facilities that can use their own crude oil for feedstock and their marketing of

refined product through commercial outlets in major consumer regions such as the United States, Europe and Asia.

The Diversification of United States Oil Supply and the NON-OPEC Producers. In response to the high prices that OPEC was charging in the early 1980s, NON-OPEC countries quickly moved to take advantage of this situation and develop new sources of oil production. These NON-OPEC producers from the North Sea, Mexico, Egypt, Oman, Angola, Cameroon, Brazil, Colombia, China, India, and Malaysia temporarily gained important market share and influence. At the same time, there was a dramatic shift in the sources of oil imports by the United States, and the majority of its purchases of imported oil was diversified to NON-OPEC countries.

In 1986, however, this trend began to reverse with OPEC price cuts and declining NON-OPEC production eventually helping OPEC to gradually return to the same level of United States market dominance that it had in 1979. It is expected that the declining influence of NON-OPEC oil supplies in the world market will continue into the 1990s, thus contributing to the reemerging prominence of OPEC.

Demand Growth. The gains brought about in reducing oil demand and consumption in the United States in the early 1980s as a result of the embargo and higher prices were eventually lost in the mid-1980s as oil prices fell. These low oil prices may have put an additional $40 billion into the United States economy, but the resultant economic growth also stimulated an increase in United States consumption of petroleum which accelerated the demand for cheap imported oil. The low prices also encouraged the large industrial customers with fuel switching capability to use oil instead of other energy sources. Two of the most serious long term consequences for energy security brought about by low oil prices was the discouragement of investment in energy efficiency and the decline of domestic oil exploration and production.

Dependency and Vulnerability. As the United States presently moves toward importing 50 percent or more of its petroleum requirements, the question of our vulnerability must be considered and understood. For example, vulnerability is a a function of risk to the source of supply, the economic relationship involved, routes of transportation and supply to the consumer, and the operation, safety, and the security of the system's infrastructure. As we begin to import ever increasing amounts of oil from the Persian Gulf, the strategic relationship of the United States with this region and our dependence on its oil resources will take on a central importance in our Middle East foreign policy.

The Environment as a Major Factor. One of the largest changes in market dynamics over the past few years has been the addition of environmental considerations to the traditional focus on price and security of supply. Environmental issues have come to dominate the national debate over energy policy. The environmental problems have raised important questions concerning the extent to which environmental consideration should affect energy development, such as defining the specifics of the problem, obtaining consensus on what to do about it, understanding how much it will cost, and who will pay the cost? Specific environmental issues include the global warming effect, clean air (acid rain, auto emissions, and the smokestack industries), siting of

powerplants and refineries, electro-magnetic radiation, protecting public lands, clean water, toxic wastes, etc.

The emerging consensus in public opinion about the need for action to resolve environmental problems will be a driving force in shaping the energy planning landscape in the 1990s. Cambridge Energy Research Associates recently conducted a nationwide public opinion survey on environmental issues which has some significant findings. One of the most significant for energy emergency preparedness was that public concerns about our dependence on foreign oil still register very strongly. In fact, energy dependence is one of the few issues that has the potential to challenge the environmental consensus. The survey points out that Americans register deep concerns over rising imports, and favor various steps to bolster United States production—even at the expense of environmental concerns. At the bottom line most of the public opposes restrictions on off-shore drilling "if it means importing more foreign oil." In fact, a majority (64 percent) of Americans would even be willing to accept a refinery in their community if it reduces dependence on foreign oil.

One of the most startling responses was that some of the environmental issues with the most sweeping implications for energy security policy—global warming, acid rain, and nuclear waste—do not rank high among the national priorities that the public is willing to spend huge amounts of money to resolve. According to the survey, the highest priority environmental issues on the public's agenda include protecting wilderness lands, cleaning up water pollution and disposing of toxic wastes and chemicals.

Electric Power. Cheap, abundant electric power has been a significant factor in the recent unprecedented record period of United States economic growth. However, during December 1989, sub-freezing temperatures increased electricity demand so fast and so high in the South that cities such as Houston and Tampa had to institute rolling blackouts to keep the entire system from crashing. John Easton, the DOE official in charge of energy emergencies, stated that what happened regarding electricity supply in December 1989, "may be a barometer for some parts of the country. We have been seeing for some time that there are some areas of the country, such as Florida where we feel the reserve margins are not adequate for the 1990s. We think we will see more of this type of situation happening."

The electric generating industry has been warning the country that unless present barriers to construction of sufficient capacity are lifted, there will not be enough electricity to support economic growth over the next decade. For example, coal is responsible for producing 57 percent of our nation's electricity, but pending environmental legislation could curtail its use and increase its cost. The hydro electric industry which provides 9 percent of our nation's electricity, is having a difficult time maintaining its situation, much less expanding. Nuclear power already supplies 29 percent of our electric power, but no more nuclear power plants are planned in the United States. Thomas Kuhn, Executive Director of the Edison Electric Institute, an association of investor-owned utilities, says present plans "are not sufficient to meet our needs over the next decade." According to the North American Electric Reliability Council, some

parts of the country, such as New England, the Middle Atlantic states, and the Pacific Northwest could have severe power shortages as soon as 1993.

One initial operating response to this problem by industry is to reduce voltage. In past instances, power delivered to customers was cut by 5 percent, causing minor inconveniences for residential users but major headaches for businesses depending on steady secure sources of electricity for sophisticated equipment. In Massachusetts alone, the Boston Chamber of Commerce estimated that power brownouts in 1988 cost businesses $87 million in lost productivity. In this regard, John Easton points out an emerging trend when he states, "Too often businesses don't think much about energy and therefore don't get involved to do much about it. Business people should also be active in their trade associations to make their voices heard whenever there is legislation or rule-making at any level of government that might have an adverse impact on energy."

International Cooperative Efforts

The Interdependence of World Oil Markets. One of the important lessons learned over the past ten years was that world energy markets—especially international oil markets—are extremely interdependent. Individual nations cannot "go it alone." They are inevitably affected by the decisions, linkage, and reactions of all other market participants, both in normal and in emergency situations. Oil is fungible. This means that a barrel of oil that is produced or saved anywhere in the world can contribute to world energy security. Similarly, a loss, or even a shortage of supply anywhere, can affect markets everywhere.

Fortunately, some of the world's major suppliers presently have interests that coincide with those of the United States. It is in our national security interest to reinforce those common objectives and to enhance the overall security and welfare of these oil producing countries, especially if they are in unstable areas of the world.

The International Energy Agency. Recognizing the interdependence as well as the independence of other nations, the United States seeks a stable and secure energy environment in which free markets and free people can determine price and production levels.

The United States participates actively in the International Energy Agency of the Organization of Economic Cooperation and Development. The IEA is the principal international forum for the industrialized countries' cooperation on energy security. The IEA has proved its usefulness as a vehicle for sharing information and for coordinating policies in regard to oil stocks, free trade in energy, limiting dependence on Soviet gas, and joint cooperation on R&D for emerging energy technologies.

The United States Department of Energy works closely with the IEA's critically important Standing Committee on Emergency Questions (SEQ). The SEQ is responsible for the IEA's

emergency preparedness activities, including the emergency sharing and strategic reserve systems.

NATO. While the future of NATO is a present issue of concern, the United States Department of Energy has been, and still is, heavily involved in planning for allied oil security. NATO's approach to emergency oil sharing by civilian authorities has been to maintain a standby organization called the NATO Wartime Oil Organization (NWOO) that the military could approach for assistance in obtaining oil supplies.

The spectrum of contingencies NWOO is designed to meet range from pre-war periods of crisis to post-war reconstruction. Although an oil supply disruption would not by itself warrant the implementation of NWOO plans beyond routine monitoring, NATO could choose to activate parts of NWOO during a crisis short of war if the defense petroleum needs of member countries were either threatened or not being met. NWOO has considerable operational flexibility since its activation can be triggered by political, military, or oil shortage considerations.

International Tests and Exercises. The best training instruments for an effective international energy strategy are tests and exercises. Various exercises are conducted to test both the IEA and each NATO member's response to international oil supply disruptions. In the IEA for example, an Allocation Stock Test (AST) is conducted every two years to test the Emergency Sharing System among the 21 member countries. In 1989, the sixth of these international oil disruption tests, AST-6, was held, and it had significant participation by State energy offices. Earlier, DOE completed an initial test of the IEA's Coordinated Emergency Response Measures Test (CERM). This oil supply exercise was conducted to train personnel in a new IEA procedure that deals with disruptions that are less than those requiring implementation of the cumbersome IEA Emergency Sharing System.

IEA tests involve exercising stock draw procedures, either alone or in combination with demand restraint measures. One of the United States' major exercise response actions has been to test the drawdowns of the Strategic Petroleum Reserve which now has over 580 million barrels of crude oil in reserve with the present goal to reach 750 million barrels stored.

Domestic and International Threats to Energy Security

Developing an effective energy emergency preparedness program demands an understanding of domestic and international energy threats that could affect the United States—the nature of the threats, how they develop, their dynamics, their various categories, and what we can do about them.

Severe energy crises are not new phenomena. The United States oil industry has experience sharp peaks and valleys in the price of oil since oil was first discovered in this country in the mid-nineteenth century. In the 1960s, we had a major electricity failure in New York City; and in the

1970s, in addition to two "oil crises" in 1973 and 1979, we had a severe natural gas supply shortage, a crippling coal strike and extensive sabotage to our electric power systems. Just last year, 1989 was a watershed year for the sheer amount of energy-related accidents and problems, such as the Exxon Valdez oil spill, petroleum industry accidents, hurricanes, earthquakes and severe winter cold temperatures over much of the country.

The Spectrum of Threats to our Domestic Energy Security. Past experience has shown that natural and manmade events can disrupt our energy supply system. Some emergencies, such as equipment failures or acts of vandalism, are routinely handled by industry while large regional problems (e.g., the destruction caused by earthquakes, hurricanes, or tornadoes) may require immediate action by a state government along with industry. If the situation is beyond the local response capacity, Federal emergency assistance may be required in addition to the existing state and energy industry's response.

Natural Disasters. Natural disasters and their potential impacts on our energy infrastructure present a critical problem for emergency planners throughout the nation. During 1989 a record 34 major natural disasters occurred in the United States—hurricanes, earthquakes, floods, tornadoes, hailstorms and the like—causing almost $25 billion in damage, killing more than 200 people and injuring at least 4,500.

Most of the general public is not aware that earthquakes are a threat to much of the country, not only California. Severe earthquakes have taken place in Charleston, South Carolina, and the New Madrid Fault is a potential problem to a number of southeast states. Floods occur in the United States about every three days. Tornadoes strike anywhere; in 1989, there were 790 of them. Today's top hurricane prediction experts think we are in for a 20 year period of more intense hurricanes such as Hugo and Gilbert, and that the occurrence of these more dangerous hurricanes will create more damage to beachfront populations and the heavily developed hurricane-prone coastlines.

These natural disasters and the emergencies they create can cause serious disruptions of our energy infrastructure. This can adversely affect the three major industrial components of our national economic strength and well being—communications, transportation, and water. For example, electric power is vital to the entire communications industry, including radio, television, telephones, computers, banking, information management systems, air control systems, automated control of petroleum pipelines, electric transmission lines, and water transportation systems.

Our transportation system relies on the energy infrastructure for the fuel and electricity to energize the motors that provide the mobility to our cars, trucks, buses, trains, ships, and aircraft. Without energy we will have great difficulty pumping the gasoline and diesel fuels into vehicles from our service stations and bulk fuel terminals.

Water also shares an interactive relationship with the nation's energy infrastructure. Water provides 9 percent of our national energy needs through hydroelectric power. Electricity is

required to pump and distribute water for residential use, sewage treatment, agriculture, industrial processes, and for cooling electric power generating plants.

The following is a review of the energy impacts of the major natural disasters of 1989 and the lessons learned from them:

Hurricane Hugo. Hurricane Hugo ranks as one of the most destructive storms in United States history. On September 17, 1989, Hurricane Hugo hit the Virgin Islands and Puerto Rico; and then on September 21, it arrived at the South Carolina coast with winds of 138 miles per hour. The storm blew inland with unexpected force, causing extensive damage not only to the lowcountry of South Carolina, but also to the Piedmont and Charlotte, North Carolina regions. Early estimates of mainland economic losses exceeded $8 billion, and when the total costs are tallied, it will probably be well over $10 billion.

The electric power infrastructure was especially hard hit. In an extraordinary display of technical competence and operational response, the electric utility companies restored a majority of customers to service within ten days. These electric power utilities and cooperatives demonstrated the "can do" spirit of their industry—a trait which this country needs more of.

In addition to Hugo, on October 15, 1989, a hurricane of lesser proportions hit the Galveston, Texas area, and a late summer snowstorm hit six states in the Midwest that same week, causing massive power outages.

Hurricane Hugo taught us valuable lessons in energy emergency preparedness, many of which have implications for those involved in the broader area of emergency preparedness planning. The main lesson learned from Hurricane Hugo is that it is possible for government and industry to work together efficiently and effectively in mitigating the effects of such a massive natural disaster. Indeed, those involved in planning for the recovery from this hurricane can take pride in their performance in responding to the widespread devastation caused by this storm.

The larger perspective requires us to continue efforts to review this experience and the lessons learned from it in an effort to improve formalized working relationships between and among affected agencies from the Federal, state and local governments. We also need to improve coordination and planning with the energy industry for and coping with disasters of this type and magnitude. In brief, we need an integrated strategy and a new perspective on energy emergency preparedness.

The Loma Prieta Earthquake. On October 17, 1989, an earthquake registering 7.1 on the Richter scale occurred in the San Francisco Bay Area. The earthquake disrupted electric and natural gas service to Pacific Gas and Electric (PG&E) customers for several days, as a result of damage to electrical generation, transmission and distribution systems.

Following the earthquake, natural gas leaks from ruptured pipelines posed safety hazards, necessitating house-by-house inspections by utility personnel. Closure of petroleum pipelines

products to the impacted areas of San Francisco, Santa Cruz, Monterey, the South Bay and the East Bay. Fortunately, with this modest level earthquake, there was little or no damage to Bay Area refineries.

In a more severe earthquake, such as in the planning scenarios for a 7.5 magnitude quake along the Hayward fault, widespread power outages and fires caused by natural gas leaks, chemical spills, and petroleum project pipeline ruptures would have been commonplace.

Loma Prieta taught us that an earthquake requires coordination of energy emergency planning and response training of federal, state, and industry officials. Coordination at the state level, and with the state's utilities and fuel suppliers was effective, largely due to training, advanced planning, and the cooperation of private industry. The electric and natural gas utilities demonstrated that they have the technical knowledge and operational response capability to deal with massive energy recovery operations.

The December Freeze. During the record breaking cold spell of December 1989, severe shortages of heating oil, natural gas and propane were compounded by a series of events connected to weather: temporary shutdowns of major Gulf Coast refinery units and offshore gas platforms (at least 13 refineries and hundreds of gas platforms). This reduced the Nation's overall refinery runs by 10 percent and our Gulf Coast gas production by a third. Amidst the high consumer demand brought on by the cold weather, the ice-choked rivers and ports limited oil delivery barge availability and schedules. In Louisiana, frozen canals and waterways hindered the attempts of repair crews to get their boats to the offshore facilities and placed heavy demands on the use of helicopters. To make matters worse, low water on the Mississippi River forced a reduction in oil barge traffic, putting additional pressure on pipeline deliveries.

Additional energy problems unrelated to the cold weather contributed to the array of cascading events adversely affecting our energy supply. There was an unprecedented rash of accidents affecting our energy supplies, both here and abroad. Some of the problems in the United States included:

- The December 24, 1989, explosion and fire at Exxon's Baton Rouge refinery, the second largest in the United States.

- Fires and explosions at several smaller refineries around the country, such as at an Amoco facility at Casper, Wyoming, and a fire that closed down a 10,000 to 20,000 barrel per day crude oil processing plant at Sweeny, Texas.

- A break in the Colonial Pipeline north of Fredricksburg, Virginia spilled 132,000 gallons of jet fuel into the local water supply and temporarily shut down the pipeline.

- Several leaks of hundreds of thousands of gallons of crude oil at Exxon's Arthur Kill facility in New York Harbor caused a temporary halt to tanker and oil barge traffic.

- A runaway barge spilled 10,000 gallons of gasoline into the Monangahela River. The barge was among 55 that were ripped from their moorings by chunks of ice that sunk 30 of the barges.

Internationally, there was a series of unusual energy events which contributed to the overall tightening of supply: simultaneous closure of both the Panama Canal from the United States invasion and the Suez Canal from a sunken ship; oil worker unrest in Brazil and Algeria; and the shutdown of a major North Sea oil platform because of underwater leaks.

The coincidental problems exacerbated the stress on the energy system caused by the intense cold. With the nation's refineries, pipelines, barges and electric utilities—all operating at maximum sustainable capacity—there was little flexibility or spare capacity to absorb the disruptions caused by the breakdowns and accidents.

The explosion and gas fire at Consolidated Edison Company's Hellgate Station along the East River on December 30 in New York City was a prime example of this. Caused by a construction worker accidentally digging into a gas line, the result was one death, seven injured, several hundred thousand customers without power, trains and traffic stopped, and a tremendous dislocation of people and businesses. The energy emergency problems of December, 1989 underline the overall complexity and vulnerability of our energy supply to unpredictable events.

They also give some indication of the "X-Factors" that we can expect to affect our energy situation in the future. Defined by energy contingency planners as a pattern of unpredictable energy events, the "X-Factor" is attributed to aging equipment, a tighter supply-demand balance, and the increasing frequency of unplanned incidents. The use of the "X-Factor" in contingency planning is an indicator of our energy infrastructure's diminished tolerance for even minor disruptions.

There were three important lessons learned during the extreme cold of December 1989. First, the free market, combined with industry's operational response, demonstrated that adequate energy supplies can be provided during a limited disruption. Second, cold weather operational procedures and equipment that are routinely used in northern climates to maintain oil and gas systems must be kept in a state of readiness, where appropriate, for the production, transportation and storage of oil and gas in subfreezing weather in southern states. Third, the electric power industry's generating capacity can be vulnerable to unusually high peak demands in winter, as well as summer.

Terrorism and Sabotage. Although only 35 sabotage and terrorism attacks were directed against United States energy systems last year, over a thousand attacks take place every year around the world. Those foreign terrorists are "only a plane ride away!"

An international framework for terrorist action exists throughout the world. The objectives and criminal acts of worldwide terrorist organizations pose a potential treat to our national security as well as our energy security. Our nation's vulnerability to attacks has been

security as well as our energy security. Our nation's vulnerability to attacks has been demonstrated, yet we have domestic "home-grown" terrorists who, while fairly active, have not as yet operated against energy targets on a scale that could adversely affect national security. Nevertheless, a review of the overall energy terrorism situation indicates that sabotage must be seriously considered as a potential cause of an energy emergency in the United States.

World-wide terrorism is rising about 10 to 15 percent per year. In the United States, multisite sabotage and terrorist incidents represent potential threats, but the number of sabotage incidents involving our electric power systems has not reached a level of severity to cause a major sustained outage. Today, the two most troublesome domestic terrorist organizations for the energy sector are the radical environmentalists and the Puerto Rican separatists. In May 1989 the FBI arrested several members of the Evan Mecham Eco-Terrorist International Conspiracy who were planning an attack on a DOE nuclear facility. This group was also responsible for recent attacks against electric power systems in the western region of the United States. In addition, Puerto Rican pro-independence movement groups such as the Macheteros have targeted electric power systems in the past and were responsible for eight separate attacks in June-July, 1989. Today the FBI considers the Puerto Rican terrorists to be our most significant domestic terrorist threat.

Many third world countries, such as El Salvador, Peru, Chile, Columbia, Mozambique, Afghanistan, and Guatemala, have experienced substantial power and petroleum system disruptions because of terrorism. Terrorist organizations have also attacked electric power and oil facilities in Western Europe. In the past, these attacks generally were poorly designed and executed, but today recent attacks by the same organizations are executed using a higher level of technology and are much better planned. This may portend more effective attacks against European energy systems in the future, and an increasing potential threat for the United States.

Energy-related terrorism can be a particularly significant threat in a time of national defense mobilization. However, even in the absence of a superpower confrontation, it is possible that potential third-world adversaries could sponsor attacks on the energy infrastructure in the United States. Hence, it is important for the Federal and state governments to work closely with industry to mitigate these potential threats.

Energy Industry Related Accidents. In addition to the problems associated with the December freeze, the following is a brief review of some of the more significant accidents that took place in 1988-89 to our energy infrastructure:

- The Exxon Valdez oil spill of 250,000 barrels of crude oil into Prince William Sound, Alaska.

- The main pipeline carrying gasoline, diesel, and jet fuel from Los Angeles refineries to Las Vegas exploded in San Bernadino, California, injuring a number of people destroying a nearby neighborhood.

- An explosion and fire in the 90,000 barrel per day fluid catalytic cracking unit at Shell Oil Company's Norco, Louisiana facility killed seven employees, destroyed major plant components, caused widespread damage to the community, and caused a shortage of refined product as industry was preparing for the summer driving season.

- A cloud of hydrofluoric acid was released at Marathon Petroleum Company's 69,500 barrel per day Texas City refinery when a crane dropped its load on the HF tank, forcing evacuation of about 3,000 persons from nearby residential areas.

- About 750,000 gallons of Number 2 fuel oil spilled into the Monongahela River when an Ashland Oil Incorporated storage tank collapsed at Floreffe, Pennsylvania.

- A Panamanian vessel carrying soda ash ran aground after colliding with the Chevron Louisiana tanker carrying 262,000 barrels of an asphalt/diesel mix on the Columbia River in Washington State, but fortunately neither lost its cargo.

- A fire and series of explosions at a New Cassel, Long Island, propane plant forced the evacuation of 10,000 people, killed one plant worker, and injured another.

- A large fishing boat struck a natural gas underwater pipeline off Texas' Sabine Pass in the Gulf of Mexico causing an explosion and a large fireball visible 25 miles away, resulting in 11 crewmen's death.

- Fires and explosions at the Phillips Petrochemical plant near Houston resulted in extensive damage and loss of life. This was the largest domestic industrial accident since World War II.

This list is not meant to cast any aspersions on the energy industry's safety programs. They have moved safety and environmental protection to the forefront of their operations with the adoption of formal risk assessment and safety management programs that go far beyond their past efforts. The fundamental lesson that should be understood is that parts of our energy infrastructure have basically dangerous processes, and that accidents will happen when conducting operations of this kind. Industry's objective is to reduce the potential risk of these type of accidents, and if they occur, to limit the damage as much as possible.

International Threats to Energy Security. A major threat to our energy security is the disruption of our oil supply that could be caused by political events such as the closing of the Straits of Hormuz. With the exception of the limited amounts of natural gas and electricity that the United States obtains from Canada, the major international energy concern must focus on oil. Oil price shocks and supply security pose the dominant threat to international energy security. As oil is a vital resource for fueling the United States and our industrial trading partner's economies, oil prices and supplies have important implications for international trade. The lower oil prices have brought immediate economic benefits to sections of the United States economy, but the downside

is that they also have contributed to a higher level of imports with increasing vulnerability to disruptions.

World oil supplies have been interrupted about 15 times since 1950, all of which occurred because of political events in the Middle East. Although the risk of a significant disruption may appear remote, many of the political, social, cultural and military factors that led to past disruptions in the Persian Gulf continue to exist. For example, the Iran-Iraq confrontation is still unresolved. There is a strong spirit of Islamic revivalism. Aging leadership throughout the Gulf presents problems of succession. Divisions still remain among the Gulf states. More and more destructive weapons are being stockpiled including chemical weapons, missiles, rockets, and, in some cases, nuclear weapons.

History has shown that relatively small changes in world oil supply and demand can produce dramatic swings in oil prices. Market turbulence can be caused by stress on the supply system, market expectations, inventory movements, the circumstances of the disruption, and the responses of both producing and consuming countries. Another important factor in international oil demand is the rapidly-growing requirements of lesser developed countries that put, upward pressure on worldwide demand for the global supply of oil. In addition, as United States production decreases, we will become increasingly dependent on imports from OPEC, particularly from the politically volatile Persian Gulf.

Summary

The United States energy infrastructure has little flexibility to absorb severe price and supply dislocations that can arise from international disruptions, natural disasters, accidents, and extreme weather. The situation does not appear to be improving as we move into the 1990s. This situation demands that contingency planning, a national energy strategy such as being developed by DOE, and the responses for energy emergencies among Federal, state, and industry organizations, all need to be coordinated and integrated. This should involve government-industry cooperation, stringent readiness tests and exercises, and the application of adequate resources.

Risk of future oil supply disruptions will vary with market conditions. At present, there are adequate world oil supplies, making a severe disruption unlikely over the short term, but the United States can expect to experience local shortages from incidents, such as with the Exxon Valdez's Alaskan oil spill and December 1989s extreme cold. This necessitates a flexible energy policy, on-going market monitoring, and expert situation analysis. Responses to international threats of an oil disruption should include the buildup of strategic stocks, coordinated plans for early drawdowns of stocks, alternative delivery routes, and fuel switching capabilities.

Domestic energy security requires an understanding of the complex energy infrastructure that underpins the United States economy, its security, and our basic societal energy needs. This understanding can lead to sound energy emergency preparedness programs. These programs should be supported by a full range of Federal, state and industry crisis response organizations

that have adequate resources to perform the necessary planning, training and operations to prevent or mitigate future energy disruptions.

Energy emergency preparedness must be integrated into the national emergency planning processes. Too often crisis management teams are not adequately prepared to deal with the technical, legal, and regulatory aspects of an energy emergency. Yet, the severe energy impacts of various emergencies have been the central theme and common denominator of most of our recent national disasters.

Many actions have been begun over the past several years to develop a national energy emergency preparedness program—the most notable are outreach programs to reinstill a spirit of government-industry cooperation during energy emergencies; vertical integration of energy emergency planning with the states; and training exercises in energy preparedness within the FEMA emergency management framework.

To have available energy preparedness program, much more needs to be done if we are to be ready for the potential problems of the 1990s. We need to move into the next decade with the requisite tools and resources to deal with clearly emerging potential energy problems. The adequacy of our present emergency response structure should be periodically reviewed. For example, the Federal government's Department of Energy spends less than one-half of one percent of its total annual budget on the Office of Energy Emergencies. Yet, it is not so much a question of allocating large amounts of additional government money and personnel as it is a requirement for management, organization, and leadership. The energy emergency preparedness challenges of the 1990s will test our ability to provide that management, organization, and leadership.