FINAL REPORT OF THE

ENERGY STUDY COMMISSION

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 27

COMMONWEALTH OF VIRGINIA
DIVISION OF PURCHASES AND SUPPLY
RICHMOND
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Report of the

Energy Study Commission

To

The Governor and the General Assembly of Virginia

Richmond, Virginia

December, 1978

To: Honorable John N. Dalton, Governor of Virginia

and

The General Assembly of Virginia

I. DOMESTIC ENERGY TRENDS

Domestic energy demand has been growing rapidly since the turn of the century. The demand has kept pace with growing population, increasing industrialization, and greater affluence. During the last decade U.S. demand for energy has grown at an annual rate of four to five percent. Today U.S. per capita energy consumption is eight times the average of the rest of the world.

Through 1950 the U.S. was totally energy-sufficient. The nation easily met its growing need for energy with cheap and abundant domestic fuels: coal, oil, gas, and hydroelectric power. By 1960, however, imports of crude oil and petroleum products accounted for 15 percent of the total U.S. petroleum consumption. This growing dependence was the result of increasing demand, cheap imports, and a steadily deteriorating domestic supply situation.

Among the salient points of the U.S. domestic energy situation are:

(1) Coal production has not increased appreciably since 1943.

(2) Exploration for crude oil peaked in 1956; domestic crude oil production levelled off in 1970 and has been declining ever since.

(3) Since 1968, we have been consuming natural gas faster than we can discover it.

(4) Nuclear power, the dream of the 1960's, has been plagued by technical and regulatory difficulties.

This nation now relies on oil for nearly 50 percent of its energy and on natural gas for about 30 percent. Coal, providing only about 15 percent of our energy consumption, represents over 95 percent of our total domestic energy resources. As contrasted with the more than 800 years of coal supply available at the current rate of consumption, the U.S. has about 25 years of proven uranium reserves and only about 10 years of proven oil and gas reserves. It must be noted that the figure for proven oil and gas reserves reflects "committed" reserves. This figure is less than known reserves and consideraly less than the estimated reserves.

Our growing dependence on foreign oil was considered a blessing by many because cheap foreign oil meant lower consumer prices and a more competitive domestic industry in world markets. As U.S. dependence on foreign oil was growing, the world oil market came to be

dominated by a few Middle East countries with massive reserves and production costs of pennies per barrel. Disadvantages of this dependency were at least hinted at when an oil embargo was imposed in 1967 as a result of international tension in the Middle East. The short duration of the embargo resulted in little domestic economic impact and no impact at all on U.S. energy policies. It was not until some Middle East countries cut back production and exports and imposed a total embargo on crude oil shipments to the U.S. and other countries in the winter of 1973 that the full impact of dependence became apparent.

Imposed in October, 1973, the embargo was slow to take effect. By January, 1974, imports were down by 2.7 million barrels per day, reducing total petroleum supply 14 percent below expected consumption. Although massive unemployment, blackouts, and other major disruptions were avoided, the embargo still had an appreciable impact. In addition to the inconvenience of long gasoline lines, it is estimated that:

(1) G.N.P. dropped by $10 to $20 billion during the embargo.

(2) Unemployment caused by the embargo amounted to 500,000 workers.

(3) Of the 9.8 percent increase in consumer prices, a third was due to the higher world oil prices.[1]

In addition to its domestic impact, the embargo and the rapid increase in the price of oil had major international implications. The embargo made obvious the need to reevaluate our domestic and international energy policies and to fashion a new energy program to hold our vulnerability to acceptable levels. The embargo thus focused critical examination on national and statewide energy policies.

II. THE VIRGINIA ENERGY STUDY COMMISSION

The General Assembly of Virginia sought to reexamine the state's energy policies. Pursuant to Senate Joint Resolution No. 128 in 1973, the Assembly created the Commission to Study the Energy Crises. The Resolution noted the conflict between increasing energy demands and the Commonwealth's ability to provide that energy. The General Assembly directed the Commission to study the dimensions and consequences of the energy crisis, and to examine existing and future demands for energy-producing fuels in the Commonwealth. The Commission was also mandated to study the amounts and types of needed fuel supplies, the cost to future consumers of energy in Virginia, and the environmental consequences of extracting and utilizing such fuels.

In the course of their study, the Commission realized that the search for new and expanded sources of energy and the development and production of these sources was not keeping pace with growing consumption. This mismatch in supply and demand and all its related problems threatened to be long-term in duration. The energy problem warranted continued research and examination.

Therefore, the Commission, in addition to submitting legislation on conservation of existing energy supplies and development of new recovery means for existing natural resources, recommended in 1975 that the Commission's study be continued, that their name be changed to the Energy Study Commission, and that their focus be shifted to the formulation of long-range energy objectives for Virginia.

The General Assembly accepted these recommendations and passed Senate Joint Resolution No. 97. By this Resolution, the Commission was directed to study ways in which the state could take action on energy problems. House Joint Resolution No. 296, passed by the 1977 General Assembly, continued the Commission for the purposes of continuing to apprise the Governor, the General Assembly and the public of the changing state and national energy situation and recommending measures to alleviate present and future energy problems. (See Appendix A.)

The members of the present Commission who have served since 1973 are: Delegate C. Don Dunford, Chairman, Tazewell; Claiborne D. Gregory, Doswell; Delegate George W. Jones, Bon Air; Delegate Glenn B. McClanan, Virginia Beach; Delegate Lewis W. Parker, Jr., South Hill; Stanley Ragone, Richmond; and Eugene M. Scheel, Waterford. Present members appointed to serve on the Commission in subsequent years are Delegate James F. Almand, Arlington; Senator Charles J.

Colgan, Manassas; Senator Virgil H. Goode, Jr., Rocky Mount; W. S. Kerr, Appomattox; Senator Madison E. Marye, Shawsville; and Frank T. Sutton, III, Richmond. The members elected Delegate Dunford to serve as Chairman in 1976.

III. FINDINGS OF THE COMMISSION

A. COAL

The nation's coal industry began in the 18th century with bituminous coal mined in Virginia and anthracite in Pennsylvania. Coal production increased steadily throughout the 19th century. By the turn of the century, coal supplied 90 percent of the U.S. energy consumption.

During the first half of this century, however, coal consumption grew less rapidly than total energy consumption because more convenient and competitively priced domestic oil and natural gas became available. New uses of oil (e.g., automobiles) expanded rapidly. By 1950, coal dropped to 38 percent of national energy consumption.

Since 1950, coal's declining role in the U.S. energy structure has been accelerated by government actions. The stimulation of nuclear electric power reduced coal's role in generating electricity. The elimination, in 1966, of oil import quotas for residual oil on the east coast resulted in many large coal users converting to cheaper and more convenient foreign oil. The implementation of the Clean Air Act during the early 1970's has created significant uncertainties as to how much coal will be permitted to be burned, and has resulted in more large coal users converting to oil. By 1972, coal accounted for only 17 percent of the U.S. energy consumption. A recent report on U.S. self-sufficiency noted that coal is "dirty, environmentally undesirable, more difficult to use than other fossil fuels - and abundant."[2]

Another government action, the Surface Mining Control and Reclamation Act of 1977, will have a significant impact on Virginia's coal industry. U.S. coal production has been increasing steadily since the early 1960's. The role of underground coal in total national production, however, has been declining. By 1975, surface mining accounted for nearly 60 percent of the total coal production. In the eastern U.S., the number of small surface mines has increased dramatically. In Appalachia, 91 percent of all surface mines produce 100,000 tons or less annually.

The federal surface mining act comes at a time when the coal industry in general, and the surface mining industry in particular, is characterized by a high degree of competitiveness and instability. Competition is apparent in the large number of small independent operators who exhibit a tremendous proclivity to enter and exit the market in response to coal price changes. Surge capacity, the ability to expand production rapidly, is also related to the competitiveness of the coal industry. A considerable short-run surge capacity presently exists in both the underground and surface mining industries.

The large number of small operators may also be viewed as a destabilizing factor, as may the volatile labor force within the industry. Regional production and market variances also suggest instability, especially in Appalachia.

Much of the instability is due to the contour mining method practiced in Appalachia. The equipment used in this method of surface mining makes for a low unit cost in comparison to that used for area or underground mining. This equipment is available for immediate or short-wait delivery, making for virtually no immediate production limit. Therefore, the contour mining industry can respond to rapid increases in market demand.

The small operators deliver their production through coal brokers to the spot market. Because they use the spot market their output often responds to that market, increasing when demand and price are high and decreasing with less favorable price and demand. President Carter has stated as a national goal the doubling of coal production by 1985. To achieve this goal and to meet the fuel needs of American industry and electric utilities, the coal production industry must be stable and capable of assuring long-term high volume delivery. A spot market broker cannot do this, nor can the small short-term contour strip mine operator.

The Surface Mining Control and Reclamation Act will, perhaps inadvertently, have a long-term

stabilizing effect on the coal industry.[3] It will also lead to higher coal and energy prices. The means to that end will likely be the demise of many small surface mine operations. Many small operators may be forced to close because they cannot comply, or cannot afford to comply, with government regulations.

In 1977, Virginia was the tenth greatest producer of surface mined coal in the nation. A great majority of the strip mining operations produced less than 100,000 tons of coal per year. The impact of the federal permanent regulatory program will likely be greatest on operations producing less than 10,000 tons annually. It is conceivable that nearly all such operations in Virginia may close. If so, the closure rate for small operators in the state could reach 50 percent.

This assumption is supported by the close scrutiny Virginia operators are receiving by federal inspectors. Thus far this year, Virginia ranks fourth in the nation in the number of inspections. The state is third in the number of notices of violations received, and, with the exception of Kentucky, Virginia has received more shutdown orders than any other state.

The federal Office of Surface Mining (O.S.M.) shows a concentrated pattern of inspections in Appalachia, with much of the effort being directed toward Virginia. The state ranks tenth nationally in strip mined coal production, accounting for four percent of the total national production. While producing only four percent of the total national amount of surface mined coal, Virginia has received 11 percent of the O.S.M. inspections, 13 percent of the violation notices, and 18 percent of the shutdown orders. If the intensity of federal activity in Virginia coal fields continues, surface mining production may ultimately be concentrated among only the largest operations.

The picture is also bleak for coal consumption in Virginia. In the state, only 15 percent of energy demand is filled by coal.[4] Most coal produced in Virginia is shipped to other states or exported to foreign countries. Clearly, the state would be more energy self-sufficient if coal could be used to fill more of our energy demands.

B. OIL

The nation's oil industry began in the late 19th century with oil discoveries in Pennsylvania. With the advent of the automobile and airplane, along with the conversion of rail transportation from coal to oil, oil requirements of the U. S. have grown rapidly in the 20th century.

Since the late 1960's U. S. oil production has been less than the nation's consumption, with major importation of oil required in the 1970's. The nation's dependence on foreign oil has increased from about 15 percent of our needs in the late '60's to over 40 percent in 1978.[5] The indications are that the import needs will go even higher in the early '80's, creating major problems with balance of trade deficits and dependence on foreign supply. The price of crude oil affects all refinery products such as aviation fuel, gasoline, kerosene, and house heating oil. The recent OPEC announced price rise of almost 15 percent by the end of 1979 will have a major impact on the public. There is a need to conserve oil products through better insulation of buildings, more efficient engines (both aircraft and automobile) and better home furnace maintenance and design.

The Commonwealth has recognized the need to enforce the 55 mph speed limit to reduce gasoline consumption, but even with the new model improved gas mileage cars on the highways, gasoline consumption in the Commonwealth was up almost 3.5% in the first nine months of 1978 as compared to the same period a year ago.[6] Continued emphasis on improved gas mileage and minimization of wasteful use of oil in all forms is essential.

C. NUCLEAR POWER

Nuclear fuel production capability in the U.S. was initiated by the Manhatten Project, and spurred in the late 1940's by the demand for fissionable materials for nuclear weapons. Production capability was further increased in the 1950's as a result of the nuclear submarine program, and in the 1960's by the commercialization of nuclear electric power operation.

Early nuclear fuel production operations were sponsored by the U.S. government, with some private involvement. After enactment of the Atomic Energy Act in 1954, private initiatives occured in all phases of fuel production with the exception of enrichment and permanent disposal of high-level radioactive wastes. The government continues to be responsible for regulation of nuclear

operations, storage, and permanent disposal of wastes, and has a major role in the development of nuclear fuels.

Public acceptance of nuclear power is an important factor in overcoming the current problems constraining the use of nuclear energy. Utility planning, site availability, licensing, schedules, and implementation of measures to shorten the construction period are all influenced by public acceptance. Nuclear power generation has, however, important advantages in being relatively insensitive to location of fuel sources because of low nuclear fuel transportation costs. Nuclear power may also be more environmentally acceptable than coal, providing that fears of nuclear accidents can be alleviated.

In meeting the nation's and the Commonwealth's energy needs, nuclear power has become increasingly important as it reduces the need for oil in the generation of electricity. However, nuclear-powered plants require larger capital investments than do fossil-fueled power plants. Setbacks in construction schedules due to engineering problems, difficult quality control, equipment delays, lower-than-expected labor productivity, and licensing and regulatory delays have slowed nuclear growth. At present, it takes about ten to twelve years to bring most nuclear generating plants into production, compared to about five to six years for a fossil fuel steam generator and two to three years for a gas turbine generator. With recent environmental requirements established in 1978, the lead time for coal fired stations is now six to eight years.

D. SOLAR ENERGY

Solar energy has long caught man's attention as a potential source of limitless and clean energy. But the commerical development of solar energy has been impeded by storage problems, high capital cost requirements, and government policy. The intermittent nature of sunlight and wind creates a storage requirement because most consumers want energy when they need it and not necessarily when the basic ingredients that produce it are available. In addition, the diffuse nature of most forms of solar energy requires very large collectors, or heat exchangers to capture useful quantities of energy. Also, solar energy systems are highly capital intensive compared with those for fossil fuels.

Recent technological advances and the significantly higher prices of alternative fuels may, however, make solar energy economically more competitive, enabling it to become a commercial energy source for water and space heating. Recognition of this change is reflected in the increased support for solar research and development within the legislative and executive branches of government, by industry, and by the general public.[7]

The acceptance of solar systems by consumers, which is difficult to predict, will clearly have a direct effect on production. User acceptance of new technology has traditionally been a lengthy process.

IV. RECOMMENDATIONS

(1) Adopt legislation granting the Division of Engineering and Buildings statutory authority to set minimum lighting standards and thermal efficiency standards for all state-owned, county-owned, and city-owned public buildings.

This option is a conservation measure, designed to reduce energy waste. It would also make state government a leader in energy conservation in Virginia, thus possibly having a positive impact in promoting conservation measures among the citizens of the Commonwealth.

(2) Study the Uniform Statewide Building Code to suggest possible changes to reflect the most effective enforceable energy standards available.

Technological advances in efficient energy use should be reflected in the Building Code. If the Code is outdated in this matter, it should be revised. If the Code is sufficient, it should be so declared.

(3) Adopt legislation for the creation of a single, unified energy agency, capable of administering and implementing state and federal energy programs.

This cabinet-level energy agency should have broad authority in energy programs and policy development. The adoption of this option would help the Commission meet the mandate of House Joint Resolution No. 296 as passed by the 1977 General Assembly.

(4) Develop tax incentives to promote private installation of solar devices.

Several states have adopted tax provisions in order to improve the attractiveness of solar thermal systems. To the potential solar user, the high first-cost of installing a solar system as compared to a conventional heating and cooling system remains a significant obstacle.

The primary value of tax incentives regarding solar devices is to reduce first-costs. Many states are considering the tax mechanism as a means of promoting solar energy. In 1975, 35 states had solar tax incentive and/or exemption bills before their legislatures. Ten states (Colorado, Illinois, Maryland, Massachusetts, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, and Texas) enacted solar bills in 1975. Arizona and Indiana had previously enacted similar legislation.

The main tax programs now pending before the states include sales and property tax exemptions, and income tax deductions and credits.

(5) Increase funding for the Virginia Center for Coal and Energy Research.

The Center was created by an Act of the General Assembly in 1977 and has a total of eleven statutory duties and functions. During its first year of operation, the Center has conducted research in energy modelling, coal science, solar heating and cooling, and industry modelling. The Center has conducted a workshop in solar heating and cooling, and has conducted extension activities on small dams and coal combustion.

With adequate funding, the Center could be a national leader in coal and energy research, and could be a valuable component of a statewide energy policy.

(6) Encourage the State Board of Housing and Community Development to increase insulation standards for all buildings other than one- and two- family dwellings.

The Commission finds that adequate minimum insulation standards, measured in Resistance to Heat Loss values (R-values), are as follows: ceilings, R-30; external walls, R-19; and floors over unheated areas, R-19. Such standards would provide for further energy conservation, and would reduce heating costs.

(7) Encourage the State Office of Emergency Services to establish within its Energy Division a Technology Information Clearinghouse on Energy Conservation.

The Clearinghouse would periodically make available to all builders and architects in the Commonwealth information on new energy-saving devices and technological improvements or developments in energy conservation. This would assure the proper dissemintion of energy conservation information among those persons centrally involved in the construction of buildings in the state.

(8) Encourage the increased use of coal in commercial heating, industrial activities, and electric power generation in the Commonwealth.

Coal consumption in Virginia has been declining since 1960. Consumption of coal for commercial and household heating has decreased by 72 percent, industrial activity coal consumption has declined by 45 percent, and the use of coal in generating electric power has fallen by 25 percent. Overall coal consumption in the state has declined by 37 percent since 1960, and Virginia is the only Appalachian coal-producing state to experience such decreases. During the same period, coal consumption by other Appalachian states increased as follows: Alabama, 93 percent; Tennessee, 45 percent; Kentucky, 143 percent; West Virginia, 136 percent; and Pennsylvania, 36 percent.

Coal is a plentiful natural energy resource in Virginia and should be utilized wherever possible for the conservation of other energy sources and to the economic betterment of the citizens of the Commonwealth.

Respectfully submitted,

C. Don Dunford, Chairman

James F. Almand

Charles J. Colgan

Virgil H. Goode, Jr.

Claiborne D. Gregory

George W. Jones

W. S. Kerr

Madison E. Marye

Glenn B. McClanan

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Frank T. Sutton, III

APPENDIX A

HOUSE JOINT RESOLUTION NO. 296

Continuing the Energy Study Commission.

WHEREAS, the Commonwealth and the nation experienced an energy crisis in the winter of 1973-1974; and

WHEREAS, the General Assembly created the Commission to Study the Energy Crisis in the Commonwealth pursuant to Senate Joint Resolution No. 128 in 1973; and

WHEREAS, the Commission to Study the Energy Crisis in the Commonwealth was continued and renamed the Energy Study Commission pursuant to Senate Joint Resolution No. 97 by the 1975 General Assembly; and

WHEREAS, the Energy Study Commission has recommended to the Governor and the General Assembly in its 1976 report that the responsibility for the study, administration and implementation of Statewide energy programs be consolidated in one centralized authority; and

WHEREAS, the General Assembly and the public need to be apprised of the constantly changing energy picture in the Commonwealth and the nation; and

WHEREAS, although the Commission worked diligently and completed its legislative mandate, work remains to be done; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Energy Study Commission is hereby continued. The Commission shall continue to apprise the Governor, General Assembly and the public of the changing State and national energy situation and make such recommendations as the Commission deems advisable to alleviate present and future energy problems.

The Commission shall also review and study present energy programs being conducted by various State agencies with the ultimate goal of developing legislation which would create a single, unified energy agency which would be capable of administering and implementing State and federal energy programs.

The present fourteen members shall continue to serve on the Commission. If a vacancy occurs for any reason, successors shall be appointed by the appropriate person or persons pursuant to the method of appointment specified in Senate Joint Resolution No. 97 of the 1975 General Assembly.

Members of the Commission shall serve without compensation but shall be reimbursed for the expenses incurred by them in the performance of their duties in the work of the Commission. For such other expenses as may be required, including secretarial and other professional assistance, the balance of the funds previously allocated to the Commission from the contingent fund of the General Assembly are hereby allocated for the purposes of this study. All State agencies shall assist the Commission in its work.

The Commission shall submit to the Governor and the General Assembly an interim report no later than October one, nineteen hundred seventy-seven, and a final report no later than October one, nineteen hundred seventy-eight, of its findings along with specific recommendations and legislation, if any.

FOOTNOTES

[1] Federal Energy Administration, *Project Independence* , Washington, D. C., 1974.

[2] John F. O'Leary, "Coal-Energy of the Past or Future?" in *The Northern States Confront the Energy Crisis* , 1976.

[3] David S. Castle, "Federal Regulatory Activity and the Virginia Surface Mining Industry," Division of Legislative Services, Richmond, Virginia, 1978.

[4] Leonard M. Cutler, et al, eds., *The Northeastern States Confront the Energy Crisis* , 1976.

[5] *Monthly Energy Review* , DOE/EIA - 0035/8

[6] Virginia Petroleum Industries Report, November 20, 1978.

[7] Robert M. Eisenhard, *A Survey of State Legislatures Relating to Solar Energy* , 1976.

COMMENTS UPON AND DISSENTS AS TO PORTIONS OF

THE FINAL REPORT OF ENERGY STUDY COMMISSION

SENATOR VIRGIL H. GOODE, JR.

In the area of nuclear power, I do not agree that it is environmentally more acceptable than coal. It is cleaner if there are no accidents, but if there are any nuclear accidents then you could have a real tragedy and much damage to the environment.

The concerns about the high capital cost of solar energy systems are not always accurate. We heard testimony in 1978 from two well qualified and knowledgeable individuals about particular solar heating systems in homes which they were familiar with. Both made statements indicating that these systems could be available right now for people who wanted to install them at a reasonable cost. Dr. Bier's solar home, which had no other source of heat besides a wood stove, was very impressive. The solar heating device in the home of the vice-mayor of the City of Lexington also brought significant energy cost savings to the owner. Both of these homes are examples of solar space heating at a low cost.

I do not concur in having the Division of Engineering and Buildings to set the standards for county-owned public buildings. The division could make recommendations but the decision to adopt the standards should be up to the locality. If they are cost effective, they will probably be adopted. However, I do not think such standards should be mandated.

With respect to the cabinet level agency proposal, I would want to know what other costs would be eliminated and whether any additional cost would be incurred before endorsing that proposal.

While I favor adequate insulation, I cannot state categorically that the R-values listed under recommendation six should be that way in every case.

MR. FRANK T. SUTTON

Natural gas and propane supply over 50% of the energy consumed by industry in America. More households in Virginia are healed by gas than any other fuel. H.J.R. 296, included in the report as Appendix A, states on Line 27 that "The Commission shall continue to appraise the Governor, General Assembly, and the public of the changing State and national energy situation." Two significant developments currently under way are demethanizaiton of coal mines and coal gasification. Demethanization is currently being encouraged by the Bureau of Mines and whereas the methane vented off used to be burned in the atmosphere, in many installations this gas is now collected and put into gas distribution mains for general use. With the vast coal reserves in Virginia this technology holds great promise for supplying energy to our state.

The gasification of coal to make a clean environmentally acceptable fuel has made great strides in this country. Fuel for Virginia's homes and industry can be easily generated within our state by utilization of our vast coal reserves in coal gasification plants.

The recent trend toward electric heating of households is most wasteful when compared with oil and gas. An oil or gas burner delivers approximately 75 percent of the BTU's burned inside a boiler to heat the space desired. An electric power plant can only burn fuel and convert it into electricity at 33 percent efficiency. Thus, despite the 100 percent use of the electricity in the home, the two systems have basic efficiencies of 75 percent versus 33 percent.

In addition, electric heat for space heating is several times more capital intensive than the direct use of oil or gas. The large electric power plants required to burn fuel in one form to convert it into another form cost hundreds of millions of dollars. The existing underground pipeline system supplying natural gas for home heating is quite adequate and provides efficient transportation of this most environmentally desirable fuel.

For each 100 cubic feet of natural gas produced at the well head, 7 percent is used as a fuel to move the gas through compressor stations along America's vast pipeline system with the resulting 93

percent being delivered to the customer's burner tip.

Three-fourths of all space heating degree days occur in the winter months of December, January and February. Vast amounts of oil and gas are easily stored ahead of time to meet these heating demands. One such natural gas storage area is currently planned for Highland County, Virginia. Unfortunately, there is no technology available to store electricity in any appreciable amounts. If the electric space heating load is allowed to grow, large electric plants with their vast capital outlay will have to be built to meet winter heating needs which can be much more efficiently served by the oil and gas industries.

America needs to use all of our energy in the most efficient manner possible.