OKLAHOMA'S ENERGY FUTURE

A Strategy for the Next Quarter Century

Presented to
Governor Frank Keating
December 12, 2002

Robert J. Sullivan, Jr.
Secretary of Energy
State of Oklahoma

December 12, 2002

The Honorable Frank Keating
Governor of Oklahoma
212 State Capitol Building
Oklahoma City, OK 73105

Dear Governor Keating:

It is with pleasure and a strong measure of enthusiasm and satisfaction that I submit to you an Energy Strategy for the State of Oklahoma for the next quarter century. As you will recall when we first discussed this matter in March 2002, Oklahoma has never had an energy strategy, or any form of visionary road map, to assist private and public sector decision-makers in the all-important and ongoing process of effectively and efficiently harvesting our state's abundance of natural resources.

The report contains a number of strategic initiatives designed to stimulate thought, discussion and, most importantly, *action* toward the ultimate goal of invigorating our state's economy, thereby improving the quality of life for all Oklahomans. To accomplish this, aggressive action is suggested on three fronts.

First, we must draw on our considerable private sector resources and marry them with existing technology resources housed in our universities to mitigate the inexorable decline of Oklahoma's oil and gas production. The objective here is to drive down finding and production costs, thereby allowing the economic harvesting of Oklahoma's vast known remaining oil and gas reserves. Realistically, the production decline of our hydrocarbon resources cannot be reversed, but the *rate of decline* can be reduced to allow time for alternative fuels to be developed and become economically competitive.

Second, we need to leverage our strong position as an energy leader by presenting and aggressively marketing Oklahoma as the single and best place in the world to come for resolution of virtually any energy related problem. With our extensive knowledge base and experience and our significant reserves of both hydrocarbon and renewable resources, Oklahoma can be presented as a *vast outdoor laboratory* where energy problems are researched, field tested, and solved.

Third, we must launch an all-out effort to bring Oklahoma's unique and extensive renewable resources (wind, solar, biomass) to economic viability. We have the natural and intellectual resources within our state's borders to accomplish this. Although no one can accurately predict when renewables will become truly economic, it is logical for Oklahoma to be in the forefront of their development.

It is my vision that implementation of this aggressive strategy can and should be undertaken *without the need for any significant state funding*, because the main elements of the strategy are already in place (private sector players and knowledge base; research, data and knowledge imbedded in our universities; marketing capability in the Department of Commerce, etc.) What is clearly required is a strong, visible leader of the implementation effort, an effective coordinating program, and public and private leadership's resolve to make it happen.

This report is not intended to be a comprehensive list of answers to energy problems, but rather a stimulus for all of us in public and private positions of leadership to focus on a direction that is logical and achievable, given the resources we are blessed to count as native to Oklahoma. There has been input to this report from over two hundred public and private sector contributors, to whom I am very grateful, as they represent our state's greatest resource—Oklahoma's knowledge of the energy world and the work ethic of our people.

Respectfully submitted,

Robert J. Sullivan, Jr.
Secretary of Energy

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I.
EXECUTIVE SUMMARY

The problems we face today cannot be solved with the level of thinking that existed at the time they were created.

Albert Einstein

The State of Oklahoma has been richly blessed with an abundance of natural resources. Since before statehood, the lands that now comprise Oklahoma have yielded billions of barrels of crude oil and trillions of cubic feet of natural gas. While these two prime energy resources have peaked in production (oil in 1967 and gas in 1990), there remain large quantities of recoverable oil and gas reserves to serve Oklahoma's citizens and our national energy demand as well.

We must recognize, however, that the pattern of declining production for oil and gas is inexorable, and we must strive to replace oil and gas as an economic engine if we are to prosper as a state in the decades to come. Fortunately, Oklahoma is additionally blessed with an abundance of renewable energy sources, as well as the intellectual resources needed to bring these newer energy assets to the marketplace economically. It is critical that the three principal players in this transition process – the private sector, state government, and our higher education institutions – work efficiently together and focus on this transition, because it not only involves a shift from hydrocarbon-based energy to non-hydrocarbon sources, but it will directly affect the economic backbone of the state over the next quarter century, thereby directly affecting the quality of life for every Oklahoma citizen.

Fortunately, we have virtually all the tools available within Oklahoma's borders to effect this transition on a timely and efficient basis. We have an active reservoir of private-sector

knowledge and experience, housed not only in the multitude of energy companies domiciled in the state, but in a growing number of energy company retirees whose experience can be invaluable in maximizing the recovery of remaining oil and gas and the transition to other energy sources. Additionally, Oklahoma is well known for having an energy-friendly governmental environment in which the private sector can work effectively. The cooperative approach well established in the Oklahoma Corporation Commission, the state Legislature, the Governor's office and other relevant agencies is critical to the implementation of the above-described transition of Oklahoma's energy/economic base.

Finally, and most importantly, Oklahoma is well endowed with a deep reservoir of knowledge in our higher education institutions (principally, the University of Oklahoma, including the Sarkey's Energy Center, Oklahoma State University, and the University of Tulsa) that can be brought to bear on both the economic pursuit of remaining hydrocarbon reserves and the development of market-based alternative energy sources. At present, these academic resources are somewhat isolated from the private sector. It will be critical to the task that far more extensive interaction and communication take place among our academic resources, private sector energy companies, and our state government.

If these private sector, governmental, and academic resources can be blended efficiently and directed through an orderly transition of energy bases, Oklahoma can achieve the value creation pattern conceptually depicted in the accompanying graph, to include the following three elements of energy value growth:

1. <u>Remaining Oil and Gas Reserves</u>

Since the first oil discovery was made in Oklahoma over a century ago, over 14 billion barrels of oil and 87 trillion cubic feet of natural gas have been produced. Oil production peaked in 1967, gas in 1990, and the recent blended (oil and gas) annual production decline of about 10% can be expected to continue, if not steepen over the next several years.

Fortunately, Oklahoma can claim an abundance of remaining oil and gas reserves — at least as much as has been produced to date — but the cost of finding and producing these known reserves makes them marginally economic.

The strategy for Oklahoma as to these abundant known reserves is to create an economic, operational and attitudinal climate that will marry the knowledge and experience in our oil and gas industry with similar knowledge sources in our universities to encourage industry's aggressive pursuit of these reserves on an economically attractive basis. The objective is to drive down finding and production costs, thereby allowing the economic harvesting of Oklahoma's known remaining reserves. It is unlikely that we can reverse our state's oil and gas production decline pattern, but we can affect favorably and significantly the *rate of decline*, thereby allowing time for alternative fuels to be developed and become contributors to Oklahoma's energy-derived economic value.

2. <u>Marketing Oklahoma as "The Place" for Energy Answers</u>

Although Oklahoma for decades has enjoyed the economic benefits of produced energy reserves, as a state we have missed the opportunity to leverage our collective knowledge of energy by failing to market ourselves to a world-wide market rife with energy related questions and problems. The strategy point here is to develop in a highly organized manner, a marketing program that presents Oklahoma as the single best place to go for energy related answers. The marketing thrust should include (but not be limited to):

(a) Assurance to a world-wide marketplace that Oklahoma has a deep pool of human resources in the oil and gas industry, in our universities and in our state government who can be accessed for problem solving, advice and joint venturing.

(b) A vigorous effort directed at recruiting out-of-state companies whose value creation process relies on resources and raw materials that originate in Oklahoma. The often-cited example is of the Michigan-based cereal makers who use

Oklahoma's corn, wheat, and natural gas to produce cereal. The value added is all in Michigan. Such firms need to be recruited to domicile in Oklahoma.

(c) The development of a marketing thrust that is based on Oklahoma's unique combination and abundance of renewable natural resources (wind, solar, biomass). Although marginally economic or non-economic at present, Oklahoma would be foolish to ignore this huge combination of renewable natural resources, as they very likely will be important elements in "tomorrow's energy world" — and Oklahoma is loaded with all three. The strategy point here is to focus on the research aspects of these three energy sources, primarily through our universities, so that Oklahoma can be presented to the energy world as a *vast outdoor laboratory* where tomorrow's energy resources are being made economic.

3. <u>Developing Oklahoma's Renewable Resources</u>

Although Oklahoma has been utilizing hydropower (our nation's primary renewable energy source at present) for several decades, it provides only about 4% of the state's generated electricity. The renewables in Oklahoma's energy future are wind power, solar power and biomass related power.

Wind in Oklahoma, by observation and by scientific measurement, is clearly abundant, with the western half of the state offering the best conditions for wind power projects. The main impediment is the lack of an adequate electricity grid to bring wind-generated power to market. Similarly, although Oklahoma can claim over 300 days of sunshine annually, solar energy development in the state presently suffers from grid system access. Solar energy's best use, at least in its early years of development, is likely to be for commercial and residential usage for onsite heating, air conditioning and water heating applications. Biomass has the potential to become a major source of global energy, especially in less developed countries. Given the state's abundance of hydrocarbon reserves, and the potential wind and solar hold for Oklahoma,

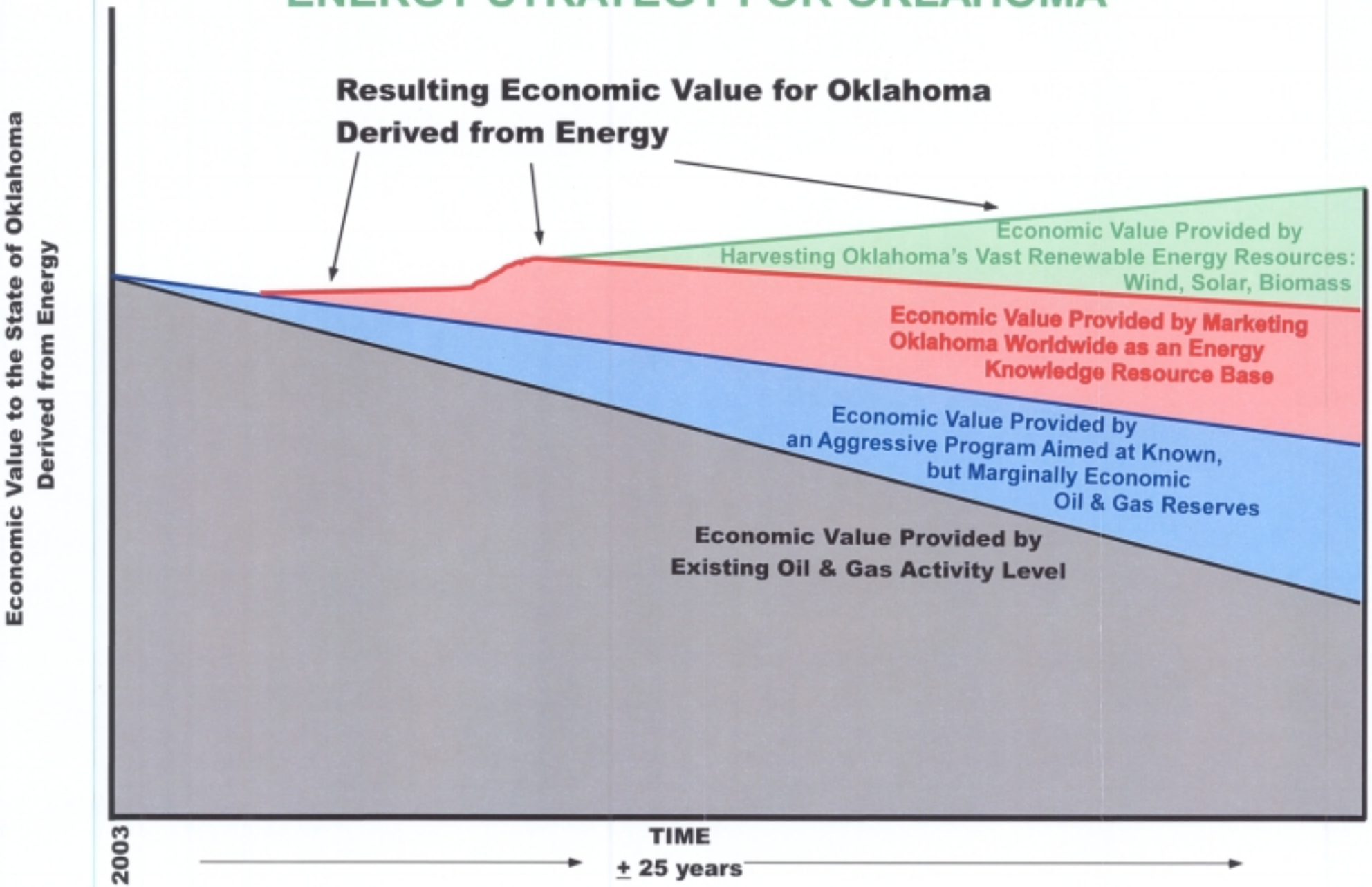
it is questionable whether biomass will ever be a large contributor of energy to Oklahoma consumers. The research and development required to make biomass energy economic, however, can and logically should be a focus of attention by Oklahoma's private sector and universities.

These three energy-based contributors to Oklahoma's future economic value have the potential collectively to reverse the decline pattern we have been experiencing from exclusive reliance on oil and gas production. This reversal of energy related economic fortunes, when added to any economic benefits that are based on non-energy related initiatives, can justify a confident view of Oklahoma's economic future over the next 25 years.

At the heart of any energy strategy should be the economic effect on Oklahoma's cities and towns. Having enjoyed the prosperity associated with our abundant oil and gas reserves for over a century, Oklahoma needs to maximize its remaining hydrocarbon reserve value while aggressively developing tomorrow's energy sources, all to the benefit of Oklahoma's citizenry.

December 2002

ENERGY STRATEGY FOR OKLAHOMA



II.
INTRODUCTION - OKLAHOMA'S VALUED RESOURCES

Oklahoma's most valuable resource is the collective ingenuity, work ethic, and knowledge of its citizenry. Oklahoma's second most valuable asset is its abundance of primary natural resources that are capable of providing its citizens with a reliable supply of energy for a virtually indefinite period of time. Responsibly harvesting these energy resources and delivering them safely and efficiently to Oklahomans and to out-of-state consumers is the important responsibility of the state's private sector, as supported and encouraged by state government and the considerable intellectual resources housed in our public and private education systems.

The purpose of this statement of an energy strategy for Oklahoma is to provide a conceptual, yet practical, roadmap for all those involved in the business of responsibly shepherding Oklahoma's energy resources. The focus of this document is on how best and most efficiently to accomplish that important undertaking. Accordingly, the recommended initiatives contained herein are directed at the primary players involved in the energy equation: decision makers in private sector energy companies, state government leaders, and the energy sectors of our state's universities.

Because the way we will manage our energy resources so dominates the future of Oklahoma society, anything less than full cooperation and coordination among these three sectors will cripple our state's economy and negatively affect its citizenry.

Oklahoma's energy resources rank at the very top of our nation's list of critical resources. Responsible stewardship and development of these unique blessings will inure to the benefit of all Oklahoma citizens and the nation at large.

III.
OVERVIEW – OUR NATION'S ENERGY PICTURE

As a country, the United States has a voracious appetite for energy. Americans are presently consuming energy at a rate of approximately 100 quads (quadrillion BTUs) annually. The Department of Energy estimates that 20 years from now we will be consuming about 175 quads per year. Our domestic supply of energy, including all sources, is growing at a rate of approximately 2.3% per year. About two-thirds of our country's energy consumption is satisfied by oil and natural gas. The conclusion drawn by virtually all forecasters of energy supply and demand is that the gap between energy consumed in this country and energy supplied within the United States will continue to widen, with an increasing amount of imported energy making up the difference.

In the spring of 2001, Vice President Dick Cheney submitted to President George W. Bush the initial draft of a National Energy Policy, as developed by a Cheney-headed task force that had worked for several months on the project. The focus of the National Energy Policy was to take a balanced approach to both the supply side and the demand side of the energy equation for our country. On the supply side, a number of initiatives were recommended to encourage more rapid and efficient development of our traditional fossil-based energy supplies, including oil and gas drilling incentives, initiatives for increasing clean-burning coal as a fuel, and more aggressive exploration of federal lands to develop new reserves. In addition, infrastructure initiatives were suggested involving refurbishing our drilling rig fleet, updating and expanding our oil, refined products, and natural gas pipelines, and increasing the capacity of our electricity transmission grid. Also recommended was a new emphasis on technologies aimed at more efficiently finding, producing, and developing our hydrocarbon resources.

On the demand side, emphasis was placed on common sense conservation. Conservation

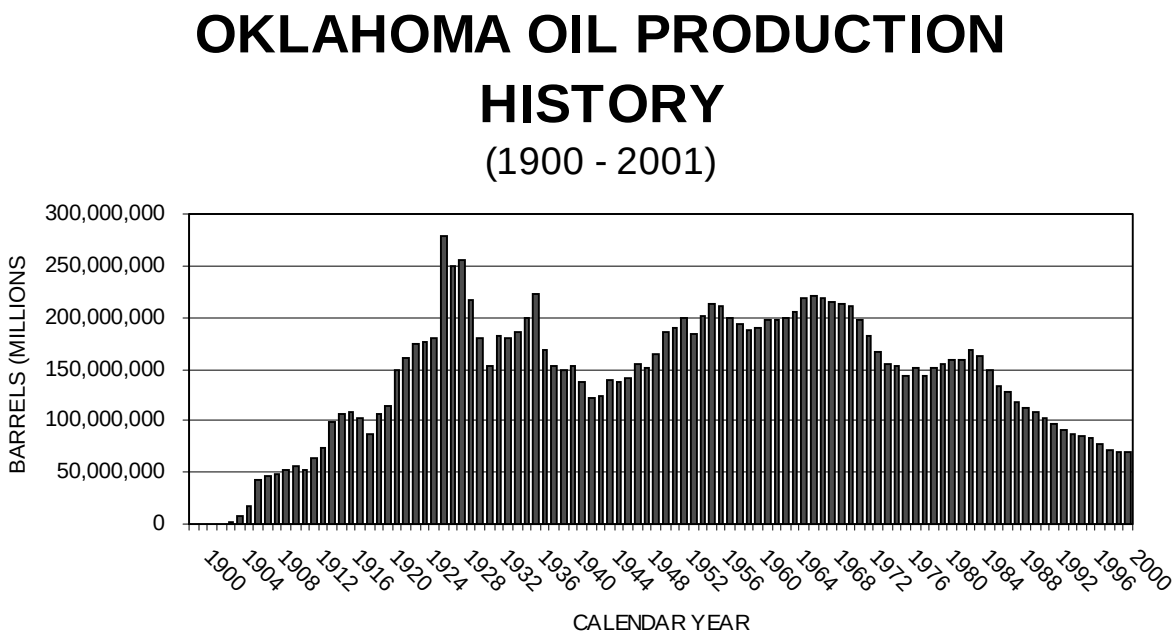
was defined as a means of more efficiently consuming the amount of energy needed by individual, institutional, and industrial consumers of energy, rather than forcing a curtailment of economic activity by those three segments of society. More than half of the 151 recommendations made by the National Energy Policy group dealt with conservation matters. Despite the fact that our nation is consuming vast amounts of energy, we have actually become more efficient since the early 1970s, when the first Arab oil embargo jolted Americans into being more responsible as energy consumers. Over the past 30 years, Americans have actually reduced by 40% the amount of energy spent per dollar of gross domestic product. Energy use per capita has remained about flat.

For at least the next several years, as viewed by many knowledgeable energy forecasters, and as reflected in the Bush/Cheney National Energy Policy report, we can expect our nation to remain heavily dependent on fossil fuels as our primary energy source. During that time period, however, technology should improve the basic economics of several alternative energy sources that will eventually supplant hydrocarbon-based energy sources in our supply profile. The nation's challenge will be to manage the orderly transition, with all its economic and societal stresses, from a hydrocarbon-based economy to one with a much larger role of non-hydrocarbon-based energy sources. While such a transition is inevitable, estimates of the timing and duration of the transition period vary widely. Supplying the energy needs of our nation will necessarily remain a top priority for large segments of private industry, academic institutions, and federal, state, and local public policymakers.

The problem of meeting our country's growing energy needs is ongoing and critically important. Concentrated efforts on both the supply and the demand sides of the problem will be required, and troublesome dislocations resulting in brown outs, price hikes, and spot shortages are likely as this complicated marketplace of energy suppliers and consumers continues to evolve toward efficiency and balance.

IV.
OKLAHOMA'S OIL AND NATURAL GAS RESERVES AND PRODUCTION

Since the late 1890s when oil was first discovered in what is now Oklahoma, our state has been blessed with an abundance of oil and natural gas resources. In the ensuing time period of just over a hundred years, 14 billion barrels of oil and approximately 87 TCF of natural gas have been recovered from Oklahoma reservoirs. While annual oil production reached a modern day production peak of 221.3 million barrels in 1967, gas production peaked much later, in 1990, at 2.3 TCF. Both oil and natural gas have been on a steady decline since achieving those peaks.



The number of companies actively engaged in exploration and production activities in the state has also dropped through corporate consolidations and the departure from the industry of many independents due to the economic booms and busts that have characterized the oil patch for

decades.

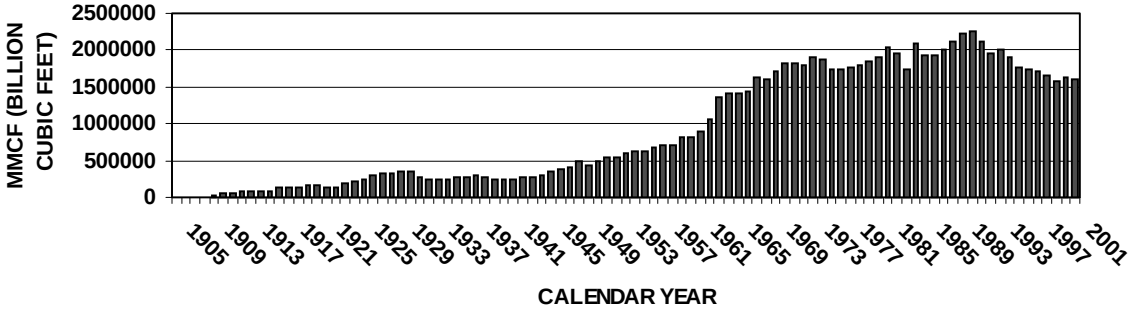
It is encouraging to note that Oklahoma's remaining oil and gas reserves approximate the state's total reserves that have been extracted over the past 100 years, according to Oklahoma Geological Survey estimates. Recovery of these remaining reserves, however, will require economically attractive wellhead oil and natural gas prices as well as improved recovery techniques. Technology will play a key role in developing these new and more efficient production and recovery methods and must necessarily require effective cooperation among industry, government, and educational institution leaders and researchers.

Much of the state's remaining oil reserves will be recovered through secondary and tertiary recovery methods. Many of the enhanced recovery research projects undertaken by major oil companies and in our universities have started and stopped several times over the past few decades due to wide volatility in oil prices and shrinking research budgets. Overall, the trend in such research has been down. If Oklahoma is to benefit from these vast oil reserves, a way must be found for aggressive laboratory and field enhanced recovery research to take place aimed at reducing the costs of bringing these reserves to market.

Oklahoma's natural gas reserves have been the primary focus of most of the state's explorationists over the past two decades. Gas has generally been perceived as somewhat easier to find than new oil reserves and less costly to produce with fewer environmental risks. Our state's natural gas production has been declining over the past 12 years as production from newly discovered reserves has failed to offset natural decline.

OKLAHOMA GAS PRODUCTION HISTORY

(1905 - 2001)



Most of the remaining natural gas reserves in this state must necessarily come from reservoirs at deeper depths than the reserves that have been produced in the past. Other, less conventional sources of natural gas, such as natural gas from coal seams and shale gas, may help flatten the production curve as they come onstream with their characteristically low deliverability but long-lived production patterns. Like oil reserves, however, these deeper and less conventional gas reservoirs can only be accessed at higher finding and producing costs than industry has enjoyed in the past. Accordingly, technology aimed at reducing finding and production costs will be critical to the state's ability to harvest its remaining natural gas reserves.

Other factors will also affect significantly the amount and pace of oil and gas reserve recovery in Oklahoma. An active, true market for the wellhead purchase of crude oil is essential to encourage industry to explore for and produce our remaining reserves. Over the past 25 years, the number of financially stable crude oil purchasers active in the state has fallen due to consolidations and purchasers leaving the business, a condition that is of great concern to all

Oklahoma oil producers. In addition, the state's refining capacity has not grown over the past 30 years and, indeed, is in danger of shrinking as our aging refineries in the state face costly upgrades to comply with changing market needs and environmental regulations.

A large percentage of the state's oil-productive wells fall into the "stripper" or "marginal" well category. These oil wells are economically profitable as long as wellhead oil prices remain at fairly high levels, but become unprofitable at lower price levels. It is essential to preserve these wells, even during periods of low wellhead prices, because they represent primary access into older oil reservoirs that contain the bulk of the remaining oil reserves of our state. Accordingly, they are the access points for most of the future secondary and tertiary recovery projects that will be required to recover these reserves. To plug marginal oil wells is to reduce greatly the economic attraction for future recovery of secondary reserves, because the added cost of redrilling access holes into these reservoirs is likely to be prohibitive.

Oklahoma's natural gas production far exceeds gas consumption within the state. The state is therefore a significant exporter of natural gas to other states, where it is consumed by residential, commercial and industrial end users. Oklahoma would be well served to use this valuable resource as a primary incentive to attract gas-consuming businesses to the state. Rather than export raw materials to other states where they are used in value-added industrial operations to produce other products, Oklahoma should seek to attract those industries to our state so that value creation can occur within our borders, thereby capturing the related benefits of job creation and other social and societal improvements.

In summary, although Oklahoma remains a significant producer of oil and natural gas in the United States, in order for its remaining reserves to reach market places efficiently and economically, a combination of forces must be in place so that those capable of harvesting these reserves will be incentivized to do so. These forces include a generally favorable climate of wellhead oil and natural gas prices, the availability of continually improving technologies aimed

at lowering the finding and recovery costs of these reserves, and an industry-friendly environment that will assure a steady flow of financial and intellectual capital into the state's already attractive mix of these critical capabilities.

Recommended Strategy Initiatives

- ✓ State government should strengthen old incentives and develop new ones for the oil and gas industry to initiate and apply new technologies that will lower finding and producing costs of our extensive known remaining oil and gas reserves.
- ✓ Oklahoma's energy industry, state government, and academic institutions should improve and develop interactive programs that will result in the more effective application of technologies to the pursuit of new oil and gas reserves and production.
- ✓ A critical review of taxes of all kinds should take place with an eye toward ensuring that Oklahoma is a tax-friendly environment for energy companies to pursue the state's energy resources. Tax items such as credits for capital investment on energy projects, accelerated depreciation for energy-related capital expenditures, tax credits for fuel efficiency programs, and a review of ad valorem tax treatment for producing facilities are examples of areas that should be considered for improvement.
- ✓ Strong incentive programs for secondary and tertiary oil recovery projects should be established or improved to encourage the recovery of additional oil reserves known to exist in older reservoirs.
- ✓ The Oklahoma Corporation Commission's exclusive jurisdiction over all oil and gas regulation should be clarified to ensure that producers can interact with a single agency in all regulatory matters that affect their operations.
- ✓ Legislation should be adopted to assure that recently deregulated natural gas gathering facilities are operated in a manner that does not curtail production or penalize gas producers. Producers should have access to gatherers' information that will allow a

review process through the Oklahoma Corporation Commission if producers can demonstrate that gathering rates are punitively high in a specific locale.

- ✓ All plugging and other regulations governing marginally productive oil and natural gas wells should be reviewed to provide, to the extent possible, for the extended lives of these assets so that enhanced oil recovery projects in the future can be encouraged.
- ✓ Creative incentives should be developed to encourage large-scale projects on both state-owned and privately-owned minerals designed to develop exploratory activity on heretofore dormant producing areas.
- ✓ Private sector stakeholder groups (producer associations, royalty groups, and surface owner representatives) should strive to achieve a better understanding of each other's respective needs and concerns in order to reduce potential conflicts in the pursuit of the state's resource development goals.
- ✓ The state should take the lead in resolving a growing number of issues involving water rights so as to reassure the energy industry that such conflicts will not impede the state's private sector resource development goals.

V.
PROTECTING OKLAHOMA'S ENVIRONMENT – RENEWABLE AND ALTERNATIVE ENERGY

Oklahoma has long been recognized for its leadership as an oil and natural gas producing state. Although not widely recognized for its unique, pristine environment, Oklahoma has one of the most diverse landscapes among all of the states in the nation. From the arid, short grass prairies of the panhandle to the swampy lowlands of McCurtain County, Oklahoma's biological and ecological diversity represents a valuable and attractive asset for our citizens.

Many of today's modern environmental movements find their roots in conservation programs that were developed to address problems of the Dust Bowl years of the mid-1930's when Oklahoma landowners were devastated by brutal heat and wind damage. Although Oklahoma is seldom recognized for its environmental accomplishments, conservation and environmental protection have been addressed effectively by industry and state government leaders since Indian Territory first began maturing into the developed and economically successful state Oklahoma is today. The fact that relatively few environmental problems of any scale have arisen in Oklahoma where 550,000 oil and gas wells have been drilled over the past century is a testament to the axiom that sound energy policy and sound environmental policy are not mutually exclusive, but in fact go hand in hand.

To continue the harmonious co-existence of energy development and environmental stewardship in Oklahoma, key players in industry, government, and academe must take leadership roles in the development of environmentally friendly energy initiatives, such as the development of bioenergy, ongoing research and development of wind and solar energy, and the preservation and expansion of hydropower — all naturally occurring, replenishable energy sources. Oklahoma is blessed with an abundance of several of these sources.

Bioenergy

Biomass, or organic matter, presently represents the fourth largest worldwide energy resource after coal, oil, and natural gas. In the future, biomass will be used to produce a combination of electricity, food, feed, fuels, and a wide range of industrial materials. Biomass power is the largest source of non-hydro renewable electricity in the world, with approximately 37 billion kWh of electricity produced each year. Generating this amount of electricity requires around 60 million tons of biomass per year.

Oklahoma is in an enviable position to marry the state's two top economic engines — agriculture and energy — while at the same time providing national and international leadership in the areas of developing clean burning fuels and reducing dependency on foreign oil. Oklahoma's vast biomass resources can serve as a renewable source of energy that is environmentally friendly. Our state's abundant supplies of crop residues, grasses, trees, animal waste and other biomass resources should be exploited as they hold huge economic potential. In addition, Oklahoma has the intellectual resources to serve in a leadership role in developing the bioenergy technologies that will be required to bring biomass energy to the marketplace as a competitive alternative. To accomplish this, Oklahoma's energy sector, including industry, government, and our academic institutions, must work vigorously and effectively with others on a national level to develop effective private sector partnerships and coordinated research and development programs.

Wind Energy

Wind has been a naturally occurring source of energy for thousands of years, from powering ship sails to mill grinding. Oklahoma, where "the wind comes sweepin' down the plain," is well positioned to take advantage of this abundant resource, ranking 8th in the U.S. in wind energy potential, with a projected average of 82,700 megawatts (MW) and 725 billion kWh

annually. Wind energy may be used to generate electricity, pump water, and perform a variety of other tasks. The American Wind Energy Association estimates that by the year 2020, 6% of the nation's electricity needs will be provided by wind energy. Some sources estimate Oklahoma has the potential to produce as much as 9% of the nation's electricity from wind.

Wind can be thought of as the next cash crop for Oklahoma ranchers and farmers who can enjoy royalties from the installation of turbines on their land while suffering minimal disturbance to their traditional farming and ranching activities. Our state is in a position to leverage off of its collective wind energy knowledge that resides in its universities, particularly Oklahoma State University and Oklahoma University, where the basic elements of wind energy application and economics are well established.

At present, however, our state does not have a single large wind energy project (greater than one megawatt), and we are falling behind our neighboring states in the development of wind energy. Oklahoma must adopt a more aggressive policy supporting wind energy development in an effort to tap this largely undeveloped resource so that it can be added to a more diverse, environmentally friendly energy portfolio. The nature of electric power generation by wind lends itself to complementing other more traditional energy sources of electric generation. For example, wind and natural gas are highly complementary for electricity generation as gas can be used to take up the slack during times of low wind production, while wind can serve to reduce the costs and environmental impact of hydrocarbon-generated electricity.

The principal impediment to the development of wind energy in Oklahoma for use in generating electricity is the lack of an adequate electricity power grid in the western half of the state where optimum conditions for wind generation exist. If this problem of adequate access to transmission lines can be solved, Oklahoma stands to be in the forefront of wind-generated power in the nation.

Solar

The sun is another example of an excellent natural energy resource, and Oklahoma has tremendous potential to develop this method of power, with sunshine approximately 300 days per year. Energy from the sun can be used for heating, cooling, and electricity generation.

To access this renewable resource, solar connectors utilizing mirrors to collect heat from the sun are installed to generate heat and electricity. Although the state shows abundant resources for producing solar power, the western half of the state has been judged to be the best region for the development of solar energy within our borders, with a potential of 42.3 million kWh per year — enough to power 4,249 homes.

Because access to transmission lines (same problem as with wind energy) is an impediment to large scale electricity generation, solar energy's use in the state is likely to be confined to satisfying more local energy needs, such as residential water heaters and perhaps residential lighting. If the state is to capitalize on its abundance of sunshine to generate electricity, the transmission grid problem must be solved and Oklahoma must be a significant contributor to the ongoing international effort to make solar energy competitive with other energy sources.

Hydropower

Hydropower accounts for approximately 4% of Oklahoma's electricity generation (about 2 billion kWh), produced from seven of its almost 5,000 dams. Oklahoma is the 21st largest producer of hydropower in the U.S.

According to the Clean Energy Coalition, hydropower is a resource at risk due to the regulatory burdens and costs associated with the federal hydro relicensing process. In the next 15 years, over half of all federally regulated hydro capacity must be relicensed. In Oklahoma, this includes the Markham Ferry and Salina projects, which represent 72% of the state's non-federal hydro capacity. Oklahoma could lose a number of projects in the licensing process. The Energy

Information Administration reports that hydro generation will decline through 2020, "as regulatory actions limit capacity at existing sites."

According to the U.S. Department of Energy, Oklahoma has a "moderate" hydropower resource as a percentage of the state's electricity generation. Oklahoma could produce an estimated 5,032,200 MWh of electricity annually from hydropower.

Alternative Transportation Fuels

Although Oklahoma is fortunate to have fewer air pollution problems than in more populated areas of the country, the state is not free of vehicular fuel-generated pollution problems, particularly in the major metropolitan areas. The sizeable impact of vehicles and other combustion engine generators on air quality cannot be ignored. In addition to increasing its commitment to reducing air pollution from mobile sources by incorporating more alternative fuel vehicles into fleets and emphasizing ride-sharing programs, the state needs to emphasize other Clean Cities Programs in large metropolitan areas. To the extent that the ethanol initiative being pushed nationally is implemented in Oklahoma, our state would have the added benefit of serving as a supplier of grain for the production of ethanol. Ethanol's ability to compete economically with other energy sources is currently the subject of several national studies.

Other Environmental Considerations

Oklahoma can improve its already sound energy conservation program with an effort to encourage stronger participation in EPA's Energy Star program, which is primarily aimed at energy efficiency through environmentally favorable architectural practices and education programs for builders and manufacturers.

Carbon sequestration is a fairly new concept that is beginning to gain momentum in Oklahoma. It involves sequestering carbon close to the point of emission. Oklahoma's enormous agricultural community stands to benefit from this practice, which involves planting certain crops in an effort to more effectively sequester carbon releases and lessen the air quality

impacts of carbon emissions.

Finally, programs such as those developed by the Oklahoma Energy Resources Board can serve as excellent models for the enormous potential for environmental improvements that lies in voluntary and cooperative industry/government joint ventures aimed at maintaining and improving Oklahoma's relatively clean environmental state.

Recommended Strategic Initiatives

- ✓ Encourage the development of the electricity grid system to serve areas of the state where wind energy and solar energy are abundant.
- ✓ Given its vast wind and solar resource base, Oklahoma should encourage and lead research in these fields to make them economically competitive with other energy sources.
- ✓ Private/public consortiums should be developed, with our higher education institutions taking the lead, to accelerate the establishment of Oklahoma as a vast "outdoor laboratory" for wind and solar energy development.
- ✓ The state should establish a competitive incentive package designed to attract and grow wind power companies to Oklahoma.
- ✓ Oklahoma should strive to establish itself as a research base for the growing solar power industry, given the knowledge base housed in the state's universities and our 300+ days per year of solar sourcing.
- ✓ Oklahoma should take an active role in assisting in the federal relicensing process of its seven hydropower plants in the state as they come up for renewal.
- ✓ The state should seek private sector involvement in developing an aggressive plan for capitalizing on the huge state potential for biomass-based electricity generation.
- ✓ An effort should be made to expand Oklahoma's Bioenergy Initiative with an emphasis on forging partnerships with Oklahoma's private energy sector, as well as agriculture

producers, forestry companies, and other natural resource industries to develop effective partnerships with new, coordinated R&D programs.

- ✓ Oklahoma needs to develop a sound strategy for advancing both bioenergy and wind energy projects in Oklahoma with particular emphasis on complementing and augmenting existing electricity generation from coal and natural gas fuels (e.g., co-firing, supplementing and peaking, etc.).
- ✓ The state would be wise to develop an economically based program for increasing demand for alternative fuel vehicles, including the demand for Oklahoma- produced alternative fuels (ethanol).
- ✓ The advent of national, even global, Renewable Energy Credit (REC) programs is imminent. If Oklahoma is to compete in the markets for renewable energy and RECs, we must cause in-state transmission grid upgrades and encourage regional upgrades in transmission connectivity.
- ✓ Oklahoma should pursue and establish a carbon sequestration program to reduce the levels of harmful carbon compounds in the atmosphere.
- ✓ As a state, we need to foster the expansion and creation of organizations that accomplish significant environmental enhancement through voluntary/public-private partnerships, using the Clean Cities programs and the Oklahoma Energy Resources Board as models.

Technology	Location	Owner	Fuel Type	Plant Name	Capacity (kW)
Bioenergy	VALLIANT	WEYERHAEUSER CO.	Timber Residues (Milling & Logging Residues)	WEYERHAEUSER CO. PULP & PAPER	35,000.0
Hydro		USCE-TULSA DISTRICT	Water	BROKEN BOW LAKE	100,000.0
Hydro		USCE-TULSA DISTRICT	Water	EUFAULA LAKE	90,000.0
Hydro		USCE-TULSA DISTRICT	Water	FORT GIBSON LAKE	45,000.0
Hydro		OKLAHOMA MUNICIPAL POWER AUTHORITY	Water	Kaw Hydro	25,600.0
Hydro		USCE-TULSA DISTRICT	Water	KEYSTONE LAKE	70,000.0
Hydro		GRAND RIVER DAM AUTHORITY	Water	MARKHAM FERRY	120,000.0
Hydro		McGEE CREEK AUTHORITY	Water	McGEE CREEK	85.0
Hydro		GRAND RIVER DAM AUTHORITY	Water	PENSACOLA	96,500.0
Hydro		USCE-TULSA DISTRICT	Water	ROBERT S. KERR	110,000.0
Hydro		GRAND RIVER DAM AUTHORITY	Water	SALINA PUMPED STORAGE	288,000.0
Hydro		USCE-TULSA DISTRICT	Water	TENKILLER FERRY	39,100.0
Hydro		USCE-TULSA DISTRICT	Water	WEBBERS FALLS	60,000.0
Photovoltaic	Tulsa		Solar	Harmon Science Center	1.9
Photovoltaic	Lawton	Util	Solar	Lawton EPA	18.0
Photovoltaic	Tulsa	Util	Solar	Tulsa PV-EV Parking	4.0
Wind	NORMAN	BERGEY WINDPOWER CO.	Wind	BERGEY WINDPOWER FACTORY	50.0
Wind		BROWN, J.	Wind	BROWN, J. - RESIDENTIAL WIND SITE	10.0
Wind		DRAPERY MANUFACTURING INC.	Wind	DRAPERY MANUFACTURING INC.	170.0
Wind		L. DUNN	Wind	DUNN, L. - RESIDENTIAL WIND SITE	10.0
Wind		C.W. MILLER, JR.	Wind	MILLER JR., C.W.	10.0
Total #					21
Total Capacity					1,079,558.9

VI.
OKLAHOMA'S COAL AND ELECTRICITY

Coal is a major source of energy in Oklahoma and in the nation. In 2000, coal was the energy source for 64% of the electricity generated in Oklahoma, with natural gas providing 31.6%.[1] Nationally, 52% of electricity is produced by coal[2] and 16% by natural gas.[3]

Oklahoma produced about 1.72 million tons of bituminous coal from 12 mines in six counties in 2001. Coal consumption in Oklahoma for 2001 was approximately 15,000,000 million tons. [4] Most of the non-Oklahoma coal used in the state comes from Wyoming. The subbituminous Wyoming coal is low in sulfur content (0.4%) compared to Oklahoma coal with a sulfur content of approximately 2.5%. There are six coal fired utility plants in Oklahoma.

Oklahoma coal production has declined from its peak of 5.73 million tons in 1981, to a low of 1.59 million tons in 2000. Between 1989 and 2001, annual coal production varied from a high of 1.91 million tons to a low of 1.59 million tons. In 2001, the tonnage increased to 1.72 million tons.[5]

The reasons for the relatively flat production rate of Oklahoma coal are numerous: reduced demand for metallurgical coal, the loss of cement markets in Dallas, increased demand for low sulfur coal to meet emissions regulations, lower prices for coal, high transportation costs, lack of financial incentives, lack of available local investment capital, and lower prices for natural gas.

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[1] Center for Energy and Economic Development, 2002

[2] Coal Age, Aug. 1, 2002

[3] Center for Energy and Economic Development, 2002

[4] Robert Cooper, Farrell-Cooper Mining Company

[5] Oklahoma Department of Mines, 2002

Until recent years, the major consumption of Oklahoma coal had been by out-of-state utilities. Major in-state use of Oklahoma coal has been by the cement and lime industry, and utilities.

The use of Oklahoma coal at the Applied Energy Services Cogeneration Plant (AES) near Shady Point, Oklahoma, has been vital to the industry. In 2000, AES used more than 1,000,000 tons of Oklahoma coal to generate electricity and provide food-grade carbon dioxide.[6] The AES plant is a coal-fired, fluidized-bed combustion power plant, which uses Oklahoma high-sulfur bituminous coal and limestone to generate electricity in an environmentally safe manner. The average purchases on an annual basis by AES Shady Point is 65% of the total state coal production.[7]

Commercial coal mining began in Oklahoma in 1873 with the removal of bituminous coal from underground mines in eastern Oklahoma. Surface mining began in 1915. Like the oil and gas industries, the coal industry has experienced production cycles. Since 1969, the coal industry has had as few as eight active mines and as many as sixty. There is potential for Oklahoma's coal resources to provide the basis for economic growth; only the apex of coal resources has been exploited. Large bituminous and metallurgical deposits remain to be produced, but require large capital investments by sophisticated mining companies.

Identified coal resources are present in an area of approximately 8,000 square miles in eastern Oklahoma. The coalbeds are of Middle and Late Pennsylvania age, 0.8 to 10 feet thick, 0.4% to 6.5% in sulfur content, coking or noncoking, and contain 11,500 to 14,500 BTU. Oklahoma contains 8.09 billion tons of coal classified as identified coal resources determined by

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[6] Robert Cooper, Farrell-Cooper Mining Company

[7] Robert Cooper, Farrell-Cooper Mining Company

the Oklahoma Geological Survey. The amount of economically recoverable coal resources is estimated to be 1.58 billion tons of which 343 million tons are strippable.[8]

Production and market issues affect whether or not some coal reserves are economical to produce. Regulations concerning mining and reclamation requirements also play a role in limiting coal production. Federal regulations under development include a variety of measures requiring reductions in emissions of nitrogen oxide, sulfur dioxide, and mercury.

Future production of Oklahoma coal will hinge on development of additional markets for high sulfur coal and the increased use and development of clean coal technology at coal fired utilities both within the state and in the surrounding area. State incentives will greatly enhance the present and future production of Oklahoma coal.

Recommended Strategic Initiatives

- ✓ Oklahoma's state leaders should work with the Department of Mines and private mining companies to encourage market development of high sulfur coal uses.
- ✓ State officials should provide assistance to Oklahoma coal producers to mitigate several federal regulations that presently curtail the state's coal production.

[8] Oklahoma Geological Survey, 1998

VII.
OKLAHOMA ENERGY POLICY INFRASTRUCTURE:
REBUILDING AN AGING FRAMEWORK

One of the greatest challenges facing Oklahoma in the near term is the need to rebuild an aging energy infrastructure. The energy infrastructure is comprised of a wide variety of components, each of which plays a role in the finding, producing, transporting and consumption of energy sources. Infrastructure includes not only such tangibles as pipelines and refineries, but also the basic human skills required for identifying and producing these resources.

The energy industry in Oklahoma has undergone massive changes in the past 20 years. The industry itself has seen a wild roller coaster ride of price changes, regulatory restructuring, acquisitions, mergers, bankruptcies and changing consumption habits. Yet the fundamental elements of the energy infrastructure have not kept pace with the increased need to get various forms of energy to its marketplace for consumption on a timely and efficient basis when it is needed.

For example, Oklahoma, like the rest of the country, has not been able to add oil-refining capacity to match domestic demand. The result has been the loss of market share to imported refined products. The electricity market has undergone radical changes as a result of partial deregulation. Natural gas has gone from a tightly regulated energy source to a largely deregulated commodity. Coal has come and gone in favor of other fuel sources.

It is important that as Oklahoma considers its energy future it takes into account the infrastructure improvements and expansions required to make energy available to its residents and consumers in other states.

Oil and Natural Gas - Pipelines

The infrastructure for Oklahoma's oil and natural gas industry is as old as the industry itself, which dates back to 1897 when the first commercial well was completed in the state. Oil and gas travel by pipelines and trucks from widely scattered points of production through a series of refining, or purifying, steps. The consumer-ready product ultimately travels again by truck, rail or pipeline to the point of consumption.

In many Oklahoma fields where oil and gas originate, production has been ongoing for decades. In some of these older fields, the primary production comes from marginally economic wells. As profit margins have grown thinner and thinner, maintenance budgets have been squeezed. There are continual challenges in ensuring the integrity of pipelines and other facilities. These systems themselves are a complex web of pump stations or compressor stations, control systems and thousands of interconnections, owned primarily by an army of small independent producers. Maintaining and ensuring the security of this complex structure will be an ongoing challenge.

In addition, oil producers face the prospect of increases in demand and changes in the destinations where petroleum must be delivered. Pipelines are inherently less flexible than other forms of oil transport. They are fixed assets that cannot be adjusted easily for capacity or changes in points of delivery. However, they are essential to the efficiency of the oil production industry. Pipelines are very efficient ways to move petroleum and petroleum products. They are relatively inexpensive to operate and are generally quiet and safe. Insufficient domestic pipeline capacity has caused peak load problems in moving oil and petroleum products such as gasoline from one region of the country to another.

Similarly, natural gas pipelines in some instances are insufficient to handle delivery of

the growing demand for natural gas. Virtually all natural gas in the United States is moved by pipeline. As Oklahoma strives to sustain and encourage economic development, the question of energy availability will become increasingly important. The state's private and public sectors must work together to ensure that the natural gas pipeline infrastructure is sufficient to meet not only Oklahoma's consumption needs but our need to export large volumes of gas to out-of-state markets. The future very well may require that new pipelines be sited in Oklahoma.

A variety of state and local government offices, as well as the federal government, may control parts of pipeline siting. In some cases, siting a pipeline can take years to accomplish as a myriad of environmental, regulatory, and public perception challenges are addressed. Despite some of the difficulties in siting, these functions are best regulated by the states, which are more closely aligned with local interests.

Recommended Strategic Initiatives

- ✓ It is suggested that the governor initiate efforts to organize and expedite the activities of all state and local pipeline permitting entities for the purpose of coordinating and monitoring the permitting process and encouraging prompt approvals.
- ✓ The state should consider a lead agency that would have authority to monitor permit processing schedules.
- ✓ The state's Department of Commerce should be involved with the coordination effort and recommendations to streamline permitting processes.
- ✓ The state should consider establishing a special task force of environmental experts to focus and coordinate all environmental issues stemming from a proposed major pipeline.
- ✓ The state should encourage research spending, including public and private dollars, to improve and develop pipeline installation techniques that cause minimal surface damage, and are safer and quicker.

- ✓ The state should encourage increased education and information sharing with the public regarding pipeline issues.
- ✓ The state should support research and development efforts directed at issues of pipeline maintenance and safety, such as corrosion prediction, protection and mitigation; inspection methods and tools; defect detection; and pipeline data management, integration and analysis.
- ✓ The state should review pipeline ad valorem taxes with an eye toward providing incentives for pipeline owners and operators to maintain and modernize this key infrastructure system in Oklahoma.

Oil and Natural Gas - Refineries

The U.S. demand for refined petroleum products, such as gasoline and heating oil, currently exceeds the domestic capacity to produce. Refineries in the state are running at or near full capacity during times of peak demand. Still, domestic refiners cannot fully supply the market. As a result, excess demand has been met by increased exports.

Refineries in the state are subject to significant environmental regulation and will face new clean air requirements over the next decade. Requirements for lowering sulfur content in gasoline have caused substantial capital investments, thereby endangering the economic viability of these facilities.

For example, Conoco announced the decision to invest $146 million in its Ponca City refinery to comply with new clean-air standards for fuel that take effect in 2004. Under rules adopted by the U.S. Environmental Protection Agency, the sulfur content in gasoline must be lowered to 30 parts per million (ppm) from about 300 ppm. The construction project will create as many as 600 jobs. Conoco said it secured $ 20 million of a tax-exempt bond allocation from the Oklahoma Economic Development Bond Oversight Commission, which will lower the

project's financing costs.

Due to low profitability and rates of return, there have been no major refineries built anywhere in the country for the past 25 years. Growth in refinery capacity has increased less than two percent per year, as a result of de-bottlenecking and incremental expansion of existing facilities.

Recommended Strategic Initiatives:

- ✓ The state should work toward providing more regulatory certainty for refinery operators and streamline permitting processes where possible.
- ✓ The state should assist the refining industry when appropriate in educating the public regarding the critical natural of refinery operations in providing energy products for the country.

Oil and Natural Gas - Research and Development

It is vitally important for the domestic oil and gas industry to maintain a significant level of research and development to remain competitive in the world marketplace. This effort is an investment in the state's and the industry's future. In fact, technological advances might be the most important factor in ensuring America's non-renewable resources are fully developed.

Unfortunately, the oil and gas field services sector ranked last in R&D expenditures as a percentage of sales among 19 industries surveyed in 2001 by Schonfeld & Associates, Inc.

Oil field service companies and others are concentrating much of their research efforts on technology that make exploring for oil and gas more cost effective. At the present time, however, there is a lack of research focused on innovative ways to increase production from existing wells and reservoirs. This is of particular significance to Oklahoma because it ranks second nationally in both the number of and production from wells that produce 10 barrels of oil

per day or less. At year-end 2001, there were more than 55,000 of these oil wells in the state.

In addition, Oklahoma ranks sixth in the number of gas wells that produce 60,000 cubic feet (mcf) or less per day. The state ranks third in the total gas produced from these low volume, marginally profitable wells.

Conventional, secondary and tertiary recovery technologies have improved recovery rates over the years. However, nearly two out of every three barrels of oil discovered in the United States remain trapped underground after conventional recovery operations. This staggering amount of remaining oil – approximately 200 billion barrels nationwide – can be one of the state's best sources for additional production.

New technologies are required to recover oil left behind because it is difficult to access or is held tightly in place within tiny rock pores.

Programs that create technology to improve recovery rates and lower finding and production costs translate into reasonable energy costs for consumers. However, R&D cannot be turned on and off, but is a continuous process that builds upon its previous successes and failures. If the United States is to maintain its ability to produce its domestic supplies of oil and natural gas at a reasonable cost to consumers, state government, working with our universities and interested private companies, must fill some of the void left by major oil-producing and service companies, in particular the large multi-national companies, who have left the domestic oilfields.

Recommended Strategic Initiatives:

- ✓ Re-energize the research and development component of the oil and gas industry in Oklahoma by playing a leadership role in finding appropriate R&D funds, promotion and provision of tax incentives.
- ✓ The state should encourage cooperative private-public research and development to

address reserve recovery issues is the oilfield.

- ✓ The state should consider supplying seed or matching monies for projects that encourage maximizing oil-recovery rates or minimize production costs for marginal wells.
- ✓ Through the university system, Oklahoma should encourage applied research on oil and gas production challenges and cost barriers.

Oil and Natural Gas - Manpower

In the past 20 years, the oil and gas industry has faced great difficulties in finding and retaining adequate manpower to function safety and efficiently. The difficulty is traced to the uncertain nature of the industry itself. Boom and bust cycles have resulted in uncertain employment prospects even for the most skilled oilfield workers. Research cutbacks have eliminated many of the scientists associated with oil and gas exploration and production.

Competition in technical fields such as geology, geophysics, and engineering has resulted in a dramatic decline in the number of students pursuing petroleum engineering degrees.

These challenges and others have made it difficult for companies to find and retain the quality employees necessary for efficiently exploring for, producing and refining oil and gas.

The issue has grown too complex and too critical for the industry to solve on its own. Solving the problem will require more than simplistic solutions aimed only at finding workers.

Recommended Strategic Initiatives:

- ✓ As part of a broader energy strategy, the governor should consider creation of a blue-ribbon task force to study the personnel situation in Oklahoma and develop ways to combat the effects of the industry's cyclical nature upon the workforce.
- ✓ The state should encourage the industry to implement non-traditional programs to generate interest in careers in the energy industry.
- ✓ Our major universities must find ways to encourage the creation of research opportunities

for students who are interested in the petroleum sector by creating meaningful internship programs at our universities.

Security

There are thousands of miles of unguarded pipelines crisscrossing Oklahoma. There are several, well-lit refineries and oil-storage facilities in the state. There are in fact billions of dollars in assets at risk.

Since the Sept. 11, 2001 attacks, the industry has implement heightened security procedures that restrict access to certain facilities, increasing surveillance at key facilities, increasing the use of employee access cards and control and stepped up the dialogue with appropriate law enforcement agencies. On the other hand, some energy producers have no security measure whatsoever. Protecting the infrastructure of the energy industry is fundamental to energy security.

Recommended Strategic Initiatives:

- ✓ Oklahoma must develop cooperative efforts to improve the security of energy facilities by working with appropriate law enforcement agencies and industry.
- ✓ We must create a heightened sense of awareness among the public concerning the threats to energy facilities and providing appropriate response mechanisms.

Public Education

At the risk of redundancy, a key to the state's energy future is a citizenry well educated in the issues surrounding the oil and gas industry and other slices of the total energy pie. Energy is the single largest contributor to the state's economy and has been a cornerstone of the state's development for more than 100 years.

It would be difficult to "over-educate" the public on the challenges facing the state in terms of retaining its leadership position in the nation's oil and gas industry. Oklahoma can ill

afford to lose the billions of dollars that oil and gas pump into cities and town, farms and schools and trickle down to virtually every retail sector in the state. Constantly educating the public is essential to the task of implementing any strategic energy initiatives.

Ensuring that Oklahomans of all ages recognize the value of a vital oil and gas industry is good for the state.

Recommended Strategic Initiative

- ✓ Public/private education efforts, such as those presented by the Oklahoma Energy Resources Board, should be created and encouraged. Private sector leadership is critical to the success of these efforts.

Electricity

The electricity infrastructure includes a number of generating facilities located throughout the state and a grid of transmission lines that move electricity intrastate and to the national grid for regional delivery. Oklahoma generating plants are fueled by natural gas, coal, oil and hydropower. Fossil fuel-powered plants need a reliable transportation system that permits the delivery of fuels as necessary. A transportation network for waste disposal is also necessary for power plants that create by-products.

Major restructuring has occurred within the electricity industry over the past 20 years. Vertically integrated electric utilities that provided generation, transmission and distribution services to distinct areas have begun to change. In many parts of the country, utilities have "unbundled" the generation, transmission and distribution services. The result has been the creation of competition and uncertainty in an industry that had been tightly regulated. More electricity is being shipped longer distances over a transmission system that was initially designed only to provide limited power and reserve sharing among neighboring utilities. Independent power producers have stepped into the market and now compete with established

generating facilities operated by utility companies.

Oklahoma appears to be well positioned as a location for independently owned, gas-powered generating facilities. Within the past two years, there were 16 gas-fired power plants either under construction or in the permitting process, although construction on only six is being continued.

These plants were intended to convert some of Oklahoma's abundant supply of natural gas to electricity for export to out-of-state markets. These options seemed viable as long as energy traders such as Enron were present in the marketplace to link generators with end-users. Independent generators have recently had to rethink business strategies and subsequently have cut back on aggressive plans for adding generating capacity. Until stability returns to the electricity industry, there will be little incentive to build additional generating capacity.

Recommended Strategic Initiatives:

- ✓ Oklahoma needs to continue to work toward establishing an electricity regulatory climate that is stable, considers the needs of industry and consumers, and fits the regional and national picture.
- ✓ We should promote Oklahoma's strength in terms of gas supply for potential new generating facilities.
- ✓ We should reexamine the status of deregulation nationally and its impact on Oklahoma's generating capacity.

Electricity - Transmission

Electricity transmission constraints have led to power disruptions at several locations in the country. With deregulation have come questions about transmission reliability and the impacts on a society that has become increasingly dependent on electricity at both work and home.

Power availability and reliability are very important concerns for the state's economic development. Transmission facilities are a key to reliability and flexibility. Under current law, the siting of transmission facilities is a function of state and local government entities where the views of local citizens can be raised. These facilities must be adequate not only to provide intrastate electric power delivery, but also permit exports to other states.

Recommended Strategic Initiatives:

- ✓ State leaders need to be certain that Oklahoma is moving toward increased transmission line reliability.
- ✓ Oklahoma must work with neighboring states on the issue of interstate connectivity and compatibility.
- ✓ We must preserve the state's authority over siting issues.

VIII.
STATISTICAL COMPENDIUM –
STATE OF OKLAHOMA

- Population: 3,460,097 (2001), ranked 28th
- Per Capita Income: $24,787 (2001), ranked 41st
- Total Energy Consumption: 1.4 quadrillion BTU (1999), ranked 25th
- Per Capita Energy Consumption: 410 million BTU, ranked 14th
- Total Petroleum Consumption: 10.8 million gallons (1999), ranked 28th
- Gasoline Consumption: 5.0 million gallons per day (1999), ranked 27th
- Distillate Fuel Consumption: 2.6 million gallons per day (1999), ranged 24th
- Liquefied Petroleum Gas Consumption: 1.1 million gallons per day (1999), ranked 13th
- Jet Fuel Consumption: 800,000 gallons per day (1999), ranked 28th
- Major Pipelines:
    - Crude Oil – Sun, Shell, Ozark, Koch, Duke, Conoco, Amoco, Seaway, Natural Gas Clearinghouse, Arco, Texaco, Mobil, Ultramar Diamond Shamrock, Jayhawk, Farmland
    - Product – Williams, Conoco, Explorer, Citgo, Phillips, Emerald
    - Liquefied Petroleum Gas – Conoco, DSE, Exxon, Koch, Phillips, PDIM, Trans Texas
- Ports and Waterway Systems: Catoosa (Port)
- Refineries: Distillation capacity of 482,053 barrels per calendar day (BCD) (2002)
    - Conoco Inc. (Ponca City @ 194,000 BCD)
    - Sinclair Oil Corp. (Tulsa @ 65,695 BCD)

- Sunoco Inc. (Tulsa @85,000 BCD)
- TPI Petro Inc. (Ardmore @84,858 BCD)
- Wynnewood Refining Co. (52,500 BCD)

- Gasoline Stations: 2,600 outlets (2002), or about 1.5 percent of U.S. total

IX.
LIST OF ALL RECOMMENDED STRATEGY INITIATIVES

1. State government should strengthen old incentives and develop new ones for the oil and gas industry to initiate and apply new technologies that will lower finding and producing costs of our extensive known remaining oil and gas reserves.

2. Oklahoma's energy industry, state government, and academic institutions should improve and develop interactive programs that will result in the more effective application of technologies to the pursuit of new oil and gas reserves and production.

3. A critical review of taxes of all kinds should take place with an eye toward ensuring that Oklahoma is a tax-friendly environment for energy companies to pursue the state's energy resources. Tax items such as credits for capital investment on energy projects, accelerated depreciation for energy-related capital expenditures, tax credits for fuel efficiency programs, and a review of ad valorem tax treatment for producing facilities are examples of areas that should be considered for improvement.

4. Strong incentive programs for secondary and tertiary oil recovery projects should be established or improved to encourage the recovery of additional oil reserves known to exist in older reservoirs.

5. The Oklahoma Corporation Commission's exclusive jurisdiction over all oil and gas regulation should be clarified to ensure that producers can interact with a single agency in all regulatory matters that affect their operations.

6. Legislation should be adopted to assure that recently deregulated natural gas gathering facilities are operated in a manner that does not curtail production or penalize gas producers. Producers should have access to gatherers' information that will allow a review process through the Oklahoma Corporation Commission if producers can demonstrate that gathering rates are punitively high in a specific locale.

7. All plugging and other regulations governing marginally productive oil and natural gas wells should be reviewed to provide, to the extent possible, for the extended lives of these assets so that enhanced oil recovery projects in the future can be encouraged.

8. Creative incentives should be developed to encourage large-scale projects on both state-owned and privately-owned minerals designed to develop exploratory activity on heretofore dormant producing areas.

9. Private sector stakeholder groups (producer associations, royalty groups, and surface owner representatives) should strive to achieve a better understanding of each other's respective needs and concerns in order to reduce potential conflicts in the pursuit of the state's resource development goals.

10. The state should take the lead in resolving a growing number of issues involving water rights so as to reassure the energy industry that such conflicts will not impede the state's private sector resource development goals.

11. Encourage the development of the electricity grid system to serve areas of the state where wind energy and solar energy are abundant.

12. Given its vast wind and solar resource base, Oklahoma should encourage and lead research in these fields to make them economically competitive with other energy sources.

13. Private/public consortiums should be developed, with our higher education institutions taking the lead, to accelerate the establishment of Oklahoma as a vast "outdoor laboratory" for wind and solar energy development.

14. The state should establish a competitive incentive package designed to attract and grow wind power companies to Oklahoma.

15. Oklahoma should strive to establish itself as a research base for the growing solar power industry, given the knowledge base housed in the state's universities and our 300+ days per year of solar sourcing.

16. Oklahoma should take an active role in assisting in the federal relicensing process of its seven hydropower plants in the state as they come up for renewal.

17. The state should seek private sector involvement in developing an aggressive plan for capitalizing on the huge state potential for biomass-based electricity generation.

18. An effort should be made to expand Oklahoma's Bioenergy Initiative with an emphasis on forging partnerships with Oklahoma's private energy sector, as well as agriculture producers, forestry companies, and other natural resource industries to develop effective partnerships with new, coordinated R&D programs.

19. Oklahoma needs to develop a sound strategy for advancing both bioenergy and wind energy projects in Oklahoma with particular emphasis on complementing and augmenting existing electricity generation from coal and natural gas fuels (e.g., co-firing, supplementing and peaking, etc.).

20. The state would be wise to develop an economically based program for increasing demand for alternative fuel vehicles, including the demand for Oklahoma-produced alternative fuels (ethanol).

21. The advent of national, even global, Renewable Energy Credit (REC) programs is imminent. If Oklahoma is to compete in the markets for renewable energy and RECs, we must cause in-state transmission grid upgrades and encourage regional upgrades in transmission connectivity.

22. Oklahoma should pursue and establish a carbon sequestration program to reduce the levels of harmful carbon compounds in the atmosphere.

23. As a state, we need to foster the expansion and creation of organizations that accomplish significant environmental enhancement through voluntary/public-private partnerships, using the Clean Cities programs and the Oklahoma Energy Resources Board as models.

24. It is suggested that the governor initiate efforts to organize and expedite the activities of all state and local pipeline permitting entities for the purpose of coordinating and monitoring the permitting process and encouraging prompt approvals.

25. The state should consider a lead agency that would have authority to monitor permit processing schedules.

26. The state's Department of Commerce should be involved with the coordination effort and recommendations to streamline permitting processes.

27. The state should consider establishing a special task force of environmental experts to focus and coordinate all environmental issues stemming from a proposed major pipeline.

28. The state should encourage research spending, including public and private dollars, to improve and develop pipeline installation techniques that cause minimal surface damage, and are safer and quicker.

29. The state should encourage increased education and information sharing with the public regarding pipeline issues.

30. The state should support research and development efforts directed at issues of pipeline maintenance and safety, such as corrosion prediction, protection and mitigation; inspection methods and tools; defect detection; and pipeline data

management, integration and analysis.

31. The state should review pipeline ad valorem taxes with an eye toward providing incentives for pipeline owners and operators to maintain and modernize this key infrastructure system in Oklahoma.

32. The state should work toward providing more regulatory certainty for refinery operators and streamline permitting processes where possible.

33. The state should assist the refining industry when appropriate in educating the public regarding the critical natural of refinery operations in providing energy products for the country.

34. Re-energize the research and development component of the oil and gas industry in Oklahoma by playing a leadership role in finding appropriate R&D funds, promotion and provision of tax incentives.

35. The state should encourage cooperative private-public research and development to address reserve recovery issues is the oilfield.

36. The state should consider supplying seed or matching monies for projects that encourage maximizing oil-recovery rates or minimize production costs for marginal wells.

37. Through the university system, Oklahoma should encourage applied research on oil and gas production challenges and cost barriers.

38. As part of a broader energy strategy, the governor should consider creation of a blue-ribbon task force to study the personnel situation in Oklahoma and develop ways to combat the effects of the industry's cyclical nature upon the workforce.

39. The state should encourage the industry to implement non-traditional programs to generate interest in careers in the energy industry.

40. Our major universities must find ways to encourage the creation of research opportunities for students who are interested in the petroleum sector by creating meaningful internship programs at our universities.

41. Oklahoma must develop cooperative efforts to improve the security of energy facilities by working with appropriate law enforcement agencies and industry.

42. We must create a heightened sense of awareness among the public concerning the

threats to energy facilities and providing appropriate response mechanisms.

43. Public/private education efforts, such as those presented by the Oklahoma Energy Resources Board, should be created and encouraged. Private sector leadership is critical to the success of these efforts.

44. Oklahoma needs to continue to work toward establishing an electricity regulatory climate that is stable, considers the needs of industry and consumers, and fits the regional and national picture.

45. We should promote Oklahoma's strength in terms of gas supply for potential new generating facilities.

46. We should reexamine the status of deregulation nationally and its impact on Oklahoma's generating capacity.

47. State leaders need to be certain that Oklahoma is moving toward increased transmission line reliability.

48. Oklahoma must work with neighboring states on the issue of interstate connectivity and compatibility.

49. We must preserve the state's authority over siting issues.

50. Oklahoma's state leaders should work with the Department of Mines and private mining companies to encourage market development of high sulfur coal uses.

51. State officials should provide assistance to Oklahoma coal producers to mitigate several federal regulations that presently curtail the state's coal production.

X.
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Michael H. Bernard
Hon. Denise Bode
Arthur Breipohl, Ph.D.
David Brown
F.W. "Pete" Brown
Tod Bryant
Robert P. Cooper
William J. Cooper
Hon. Tom Daxon
Shirley Dickinson
Rhonda Dossett
Liz Fajen
Larry Fiddler
Alicia Fitts
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Rick Frederick
John Godwin
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Chris Knowles
Julie Kruger
R. Dobie Langenkamp
Charles J. Mankin, Ph.D.
Charles McNamara
Mark Meo, Ph.D.
Dennis J. O'Brien, Ph.D.
Stephen M. Oxley
Hon. W. Arthur "Skip" Porter
Mary Ann Pritchard
Rama Ramakumar, Ph.D.
Larry Regens, Ph.D.
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Lou Volberding
W. Bland Williamson, Jr.

Commission on Marginally Producing Oil & Gas Wells
Energy Information Agency
Environmental Verification and Analysis Center
Grand River Dam Authority
Independent Petroleum Association of America
Interstate Oil and Gas Compact Commission
Kansas Energy Policy Report
Mid-Continent Oil and Gas Association
National Association of Royalty Owners
National Energy Policy Report
"New Mexico's Energy, Present and Future"
Oklahoma Corporation Commission
Oklahoma Department of Environmental Quality

Oklahoma Department of Mines
Oklahoma Energy Resources Board
Oklahoma Geological Survey
Oklahoma Independent Petroleum Association
Oklahoma State University
Oklahoma Tax Commission
Sarkey's Energy Center
Southern States Energy Board
U.S. Department of Energy
University of Oklahoma
University of Tulsa