

Energy Research Survey and Database for Kansas

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Executive Summary

The overall objectives of this project are (1) to provide a useful, detailed database of energy research in Kansas and (2) to identify areas of energy-related research that would enhance economic development in the state of Kansas. In September 2005, survey instruments were developed and mailed to 933 addresses of energy-related businesses in Kansas, and the response rate was 50.3 percent. Survey results led to the following conclusions.

- A large and significant number of Kansas businesses are currently involved in energy research. This survey identified a core group of 76 businesses that are actively involved in energy research. This group has the capacity to provide to the state of Kansas a large amount of valuable research in energy-related fields.
- Involvement, interest, and demand for energy-related research in Kansas are heavily concentrated among engineering firms, crude petroleum and natural gas extraction firms, and businesses that provide architectural services. Firms in these areas comprise an area of *core competency*, given the large amount of the Kansas economy devoted to engineering, petroleum extraction and refining, and natural gas.
- Within Kansas, *key areas of research* are currently being conducted in fossil fuels, including petroleum and natural gas, and renewable and sustainable resources, including wind energy, solar energy, biomass, ethanol, and methane recovery. Technological advance could increase energy production in these core areas. Kansas appears to have a *core competency* in these areas; and *collaborative research* would provide opportunities for federal funding to continue to find more efficient practices for extracting fossil fuels, and to investigate and bring into production alternative energy sources in the state of Kansas.
- Energy research in Kansas is a growth industry and is likely to experience a high level of growth in the future as an increasing interest in energy leads to a higher level of public and private investment in energy research and development. If university and private researchers take advantage of this *core competency*, the Kansas economy would benefit and additional research would likely be forthcoming.
- Surveyed firms reported 56 instances of current renewable and sustainable research (33 percent of all reported current research areas). The same group of surveyed firms reported interest in conducting future research in 220 instances of renewable and sustainable research (49 percent of all reported future research areas). These survey results demonstrate a strong and increasing interest in the renewable and sustainable research area. The renewable and sustainable energy research area is a *key area of research*, and is likely to be characterized by a significant rate of growth.

- The current trend of wanting, and possibly needing, to shift away from fossil fuels into alternative energy sources on a national basis could potentially result in a major increase in research and development of alternative energy sources in Kansas in the future.
- There is a high interest in energy-efficiency research in Kansas in the future.
- The number of firms responding with a demonstrated interest in state-sponsored, energy-related research is approximately double the number of such firms that reported current research. This result reflects private benefits to business to be gained from research and development in energy research.
- The survey provides strong evidence of a large demand for state-sponsored research in renewable and sustainable energy research, particularly in the areas of wind energy, solar energy, and energy efficiency.
- Kansas Regents institutes have a large number of active research projects related to energy over the past five years. The University of Kansas identified 58 research projects related to energy, and Kansas State University has 38 ongoing projects. Wichita State University reported 27 energy-related research projects. Some of these projects are interrelated, and the possibility of collaborative research across universities is large and potentially productive.

Introduction/Background

Two recent reports have noted a close tie between energy production and the Kansas economy. The *Statewide Economic Revitalization Plan*, a result of the Kansas Prosperity Summit, and the Kansas Energy Council's *Kansas Energy Report 2006* both emphasized the important impact of energy production on economic prosperity within the state of Kansas.

The Kansas Energy Council has initiated several actions to review and make recommendations to the *Plan*. Kansas, Inc.'s Board of Directors is reviewing potential actions that would fit into its research agenda with energy. These actions include (1) an inventory of Kansas energy activities with the intent to improve coordination and cooperation between researchers and various entities, increase research effectiveness, and reduce redundancy, and (2) a review of options and development of recommendations for organizational approaches to meet state energy-policy-planning needs.

The Kansas Energy Plan 2004 further stated that Kansas is now a net energy *importer*, due largely to continued depletion of the state's oil and gas fields and increasing demand for electricity. The *Statewide Economic Revitalization Plan* revealed a growing recognition that Kansas needs better energy policy and planning to enhance economic development. Further, it identified a lack of coordination between state agencies and lack of program awareness among departments and agencies as one area that needs to be improved.

Project Objectives

The overall objective of this project is to provide a useful, detailed database of pertinent energy research in Kansas, and to identify areas of energy-related research that would enhance economic development in the State of Kansas.

Objective 1: Develop a database of public and private energy researchers, their contact information, and areas of research in Kansas including universities, private industry, non-profits, etc. Develop an Excel-based database suitable for presentation on the Kansas, Inc. Website. This format will allow the database to be easily updated and edited in the future.

Objective 2: Using data from objective 1, identify areas of energy-related research where the state has core competencies that could lead to economic development at both the local and state level. This could include such areas as coal-bed methane research, biomass, wind, and solar energy, and tertiary oil-recovery potential. Identify key areas of research where advances could increase production of energy, keeping in mind environmental sustainability, jobs, local and state revenue, and/or community population retention. In addition, collaborative research areas and opportunities to obtain federal funding will also be identified to increase state research activities.

This report will include the following sections: introduction/background, literature review, survey development and implementation, results, and conclusions. A list of references and literature cited will also be presented. Continuing investments in energy research and development (R&D) provide the foundation for better state-level energy policy in Kansas. Results from previous studies of public and private investments in R&D are reviewed in the next section.

Literature Review: The Impact of Research and Development

Public and private investments in research and development (R&D) yield enormous economic benefits that continue into the future. Basic research has provided the foundation and catalyst for economic growth and the development of the United States (US) economy for a long period of time (Innovation and Opportunity 2004). Economic returns on investments in basic and applied research are very high according to the Committee on Economic Development, which stated in a 1999 report, “Basic research performed in major universities (and in other public and private labs) often has a large indirect impact on the economy of the regions where the universities are located.” The Council of Economic Advisors (CEA) and the National Research Council (NRC) have promoted research and development as a catalyst for national economic growth.

Investments in research contribute to employment and economic growth in areas where the research takes place. Innovations, discoveries, and ideas that result from research and development are often commercialized, resulting in large contributions to both producers and consumers of research-based goods and services. The economic and societal impact of energy research is large, crucial, and increasingly urgent as petroleum products become scarce. Our global society’s future ability to survive and flourish is dependent on our ability to convert from an oil-based economy to other sources of energy.

A large amount of previous research has investigated the economic impacts of research and development in the energy sector, and R&D policy in general. Margolis and Kammen (1999a and 1999b) concluded, “There has been a significant and sustained pattern of underinvestment in the U.S. energy sector, and that meant declines in energy R&D exacerbate this situation” (p. 575). The literature confirms that estimates of the social rate of return on R&D investments are approximately 50%, and private rates are typically 20-30% (p. 577). Margolis and Kammen summarize this extensive literature by stating that “the clear message... is that the spillovers from R&D are real and often large” (p. 577).

Economic incentives for energy innovations and research are often undertaken at the state level. For example, the Database of State Incentives for Renewable Energy (DSIRE) is a comprehensive source of information on state, local, utility, and selected federal incentives that promote renewable energy. DSIRE includes (1) financial incentives; (2) outreach and voluntary programs; and (3) rules, regulations, and policies administered by state governments, local governments, and utilities to promote the use of renewable energy technologies. In Kansas, these incentives include the Renewable Energy Property Tax Exemption and State Energy Program Grants. However, little has been done to further understand the economic impacts of state-level public and private investments in energy research.

Given the main conclusion that a large body of evidence supports the idea that public and private investments in energy R&D provide high rates of return to society, more information is needed to document and utilize energy research currently being conducted in Kansas. This project used a mailed survey to collect and analyze data on energy research, as explained in the following section.

Energy-related Research at Kansas Regents Institutes

A request was made of each of the six Kansas Regents institutes (Kansas State University, the University of Kansas, Wichita State University, Fort Hays State University, Emporia State University, and Pittsburg State University) regarding the type of energy-related sponsored-research their faculty and staff had received from 2001 through fall 2005. Each institute was provided a list of key words with which to search their sponsored research database. The list included the following key words:

- ◆ Biomass
- ◆ Ethanol
- ◆ Wind
- ◆ Solar
- ◆ Biodiesel
- ◆ Hydrogen
- ◆ Energy efficiency
- ◆ Oil
- ◆ Coal
- ◆ Petroleum
- ◆ Natural gas
- ◆ Methane
- ◆ Anaerobic digestion
- ◆ Fission
- ◆ Nuclear
- ◆ Fusion
- ◆ Hydropower
- ◆ Carbon
- ◆ Energy
- ◆ Renewable energy
- ◆ Geothermal

Kansas State University, the University of Kansas, Wichita State University, and Emporia State University had at least one energy-related sponsored research project associated with at least one of the key words. Fort Hays State and Pittsburg State universities did not have any energy-related sponsored research as it pertained to one or more of the keywords. A complete listing of all energy-related sponsored research grants by each regent institute within this time frame is provided in Appendix Three. Sponsored research has been and is presently being conducted in 17 of the 21 key word areas

(research related to hydropower, fusion, fission (nuclear), and anaerobic digestion are not) although there may be more current activity at the time of this report.

Most of these research grants were concerned with basic and applied research (as would be expected within an academic institute), and very few were directed at providing assessment or support or for energy policy development. It is expected the trend of regents institutes applying for and obtaining energy-related research grants will continue and more than likely rise, due to urgency of the current energy situation.

Survey Development and Implementation

To produce a detailed and useful database of energy research in Kansas other than at the regents institutes, a short mailed survey was developed. To maximize the response rate and thus gain the most complete picture of energy research within the state, careful consideration was given to the following characteristics: (1) population of surveyed businesses; (2) survey length; (3) survey format: mail, phone, internet; and (4) mailing details, including postage-paid return envelopes and repeat mailings.

Development of the appropriate population of business firms to survey concerning energy research in Kansas utilized the 2002 Economic Census conducted by the United States Census Bureau. Business firms are classified by the Census Bureau using the North American Industry Classification System (NAICS) codes. Business firms were selected to be included in the population of Kansas businesses to be surveyed based on their potential relationship to energy-related research. As such, all firms listed in NAICS categories related to energy research were included in the survey group. These NAICS categories are listed in table 1 and are described in detail in Appendix One.

The included categories are (1) oil and gas extraction; (2) utilities; (3) food manufacturing; (4) petroleum and coal products; (5) chemical manufacturing, and (6) professional, scientific, and technical services. The appropriate subcategories provide a comprehensive list of 933 business firms in Kansas potentially involved in and/or interested in energy research. Of these, 373 firms (40 percent) were involved in engineering services, 253 firms (31 percent) were listed as engineering services, and 176 (19 percent) were in architectural services. The remaining 10 percent of the firms in the population to be surveyed were distributed across several categories listed in Table 1.

Survey length was considered to be a crucial determinant of the response rate, since experience shows that a shorter survey would result in a higher response rate. As a result, the survey instrument was limited to one side of a single page (Appendix Two).

Several considerations led to the choice of a mailed survey. In the modern business environment, it is increasingly difficult to reach busy people via telephone. This is particularly true when asking for survey responses. Given the large amount of unsolicited phone calls, many individuals and businesses do not respond well to phone surveys. As a result, the survey questions were distributed via mail, with a cover letter explaining the project and the reason for the survey (Appendix Two). The Internet

provides a useful survey instrument format but was ruled out due to a lack of e-mail addresses for energy-related firms.

To lower the cost of responding to the survey, a postage-paid return envelope was included with each mailed survey instrument. Also, a second survey was mailed to all energy-related business firms to increase the response rate. In September 2005, survey instruments were mailed to 933 addresses of energy-related businesses in Kansas. A second mailing was sent in October 2005. Surveys were returned by 479 businesses. Of these, 469 provided useable (complete) surveys, resulting in a response rate of 50.3 percent.

The overall objective of this project is to provide a useful, detailed database of all energy research in Kansas, and to identify areas of energy-related research that would enhance economic development in the state of Kansas. Therefore, questions were included to elicit responses on (1) the amount and type of energy research currently conducted, (2) the likelihood of different types of energy research being conducted in the future, (3) the areas of energy research likely to lead to benefits for energy-related business firms in Kansas, and (4) the areas of energy research that business firms would like to see targeted for state-sponsored research in the future. The specific questions appear in the survey instrument in Appendix Two.

To provide a complete survey of all energy-related research being conducted in Kansas, the public universities were contacted and asked to provide a complete listing of all research on energy topics. The Kansas Regents universities provided information on all ongoing energy research projects at Kansas Universities. These institutions include the University of Kansas, Kansas State University, Ft. Hays State University, Emporia State University, Wichita State University, and Pittsburg State University. The research offices at each university complied with the request for information.

Results of the survey are described and discussed in the next section, followed by a section on conclusions and implications.

Results

A detailed accounting of the survey responses is reported in Table 1. Almost all (98 percent) of the returned surveys were from four NAICS classifications: (1) engineering services (42 percent), (2) crude petroleum and natural gas extraction (31 percent), (3) architectural services (18 percent), and (4) environmental consulting services (7 percent). This distribution of responses closely mirrors the distribution of surveys mailed to each category. Several additional surveys were returned from business firms in other categories, as detailed in Table 1.

The first major conclusion of this survey is that involvement, interest, and demand for energy-related research in Kansas are heavily concentrated among engineering firms, crude petroleum and natural gas extraction firms, and businesses that provide architectural services. As such, the most productive categories of energy-related firms to

identify and utilize are in these categories. The response rate of more than 50 percent is considered to be exceptionally high for a survey of this type. Typically, a response rate of approximately 30 percent is considered excellent. This provides evidence of the high level of interest in the survey topic, energy-related research in Kansas.

The first survey question was used to identify which firms were currently engaged in energy research. The question asks, “Is your business currently involved in energy research?” (Q1, Appendix Two). The question seeks additional information on the type of energy research being conducted by the firms currently conducting energy research: “If yes, then check all fields of energy research that apply.” Overall survey results from question 1 are reported in Table 2 and indicate that among the responding firms, 76 firms (16 percent of the number of responding firms) are currently involved in energy research, whereas the remaining 393 (84 percent) are not currently involved in energy research.

This leads to a second major conclusion of this survey: a large and significant number of Kansas businesses are currently involved in some type of energy research. This survey identified a core group of 76 businesses actively involved in energy research. This group provides a “critical mass” of capacity to provide a large amount of valuable research in energy-related fields in Kansas.

Table 3 lists the areas of energy research currently being undertaken in Kansas. Within the state, fossil fuels dominate current research activities, and renewable and sustainable resources have a significant level of research activity. The most frequent response was petroleum research, with 44 responses (26 percent, Table 3). This was followed closely by natural gas research, reported by 37 firms (22 percent, Table 3). Energy-efficiency research is currently being conducted by 18 firms (11 percent), and wind energy is being studied by 15 firms (9 percent). Categories with fewer, but still significant, responses include solar energy (6 percent), ethanol (5 percent), biomass (5 percent), coal (4 percent), methane recovery (4 percent), other (4 percent), biodiesel (2 percent), hydropower (2 percent), and nuclear energy (1 percent).

The survey results provide evidence that within Kansas, a significant amount of research is being conducted in the areas of fossil fuels, including petroleum and natural gas; and renewable and sustainable resources, including wind energy, solar energy, biomass, ethanol, and methane recovery. These results demonstrate Kansas is well positioned to continue to find more efficient practices for extracting fossil fuels, and to investigate and bring into production alternative energy sources.

Tables 4 and 5 report the survey results of question 2, “Is your business interested in conducting energy research in the future?” (Q2, Appendix Two), and, “If yes, then check all fields of energy research that apply.” One of the most significant results of this survey is that over twice as many responding firms reported they were interested in conducting energy research in the future (176 firms, 38 percent, Table 4) than those who are currently conducting energy research (76 firms, 16 percent, Table 2). Restated, energy research in Kansas has great potential for growth in Kansas, and could exhibit a large and

continuing increase in the future, as an increasing interest in energy research leads to a higher level of public and private investment in energy research and development.

A comparison of Tables 3 and 5 demonstrates a significant interest in increasing all categories of energy research in Kansas. Most significant is the high interest in future renewable and sustainable energy research. Currently, 56 firms (33 percent) are engaged in renewable and sustainable energy research, whereas 220 firms (49 percent) expressed an interest in conducting energy research in this area in the future. This area, therefore, is likely to be characterized by a significant rate of growth.

Wind energy has the greatest amount of interest in the renewable category, with 57 firms (13 percent) responding that they are interested in conducting wind energy research in the future (table 5). Solar energy is also a category of high interest: 48 firms (11 percent) reported an interest in pursuing solar energy research in the future (table 5).

Perhaps the most striking result of the survey is the keen interest and likely shift into renewable and sustainable energy research. Currently, 52 percent of all Kansas energy research among responding firms is in fossil fuels, compared to one-third in renewable and sustainable energy (table 3). However, 154 firms (34 percent) report a desire to conduct research in fossil fuels in the future, and 220 firms (49 percent) report an interest in future research in the area of renewable and sustainable energy (Table 5). This major conclusion of the survey suggests that the necessity of shifting out of fossil fuels and into alternative energy sources will result in a major increase in research and development of alternative energy sources in Kansas in the future. Another result that reflects this trend is the large interest in energy-efficiency research reported in Table 5 (52 firms, 12 percent).

Questions 3 and 4 of the survey investigated the possibility of the state of Kansas sponsoring energy research in targeted areas. Question 3 asks, "If the state were to sponsor energy research in targeted areas, which areas would most benefit your business (Q3, Appendix Two, reported in Table 6). Question 4 asks, "...which areas would you like to see targeted, regardless of whether the research would benefit your business?" (Q4, Appendix Two, reported in Table 7).

Results of survey question 3 in Table 6 indicate a very large and significant level of reported benefits from State-sponsored energy research, reflecting the large amounts of benefits of public and private investments in research R&D reported in previous literature. While only 170 business firms in Kansas reported they currently conduct energy research (Table 3), 977 firm responses reported that energy research was beneficial to Kansas business firms (Table 6). Categories most frequently considered beneficial were natural gas (17 percent), petroleum (16 percent), wind energy (11 percent), and solar energy (10 percent).

Interestingly, the number of categories of state-sponsored, energy-related research reported as beneficial are approximately double the number of categories that were reported as currently undertaken. This result reflects the expected private benefits to

business gained from research and development in energy research. The last question reflects large and significant perceived benefits to society from state-sponsored energy research in Kansas.

Table 7 reports the huge interest of targeted, state-sponsored energy research in Kansas. A comparison of Tables 6 and 7 demonstrates a large interest in renewable and sustainable energy research: 1024 categories (63 percent) were reported as desirable for the State to target sponsored research in, compared to 446 categories (45 percent) reported as providing direct benefits. This result provides strong evidence of a large demand for State-sponsored research in renewable and sustainable energy research, particularly in the areas of wind energy, solar energy, and energy efficiency.

Survey results show that Kansas business firms report direct benefits from energy research. Specifically, firms report benefits in natural gas, petroleum, energy efficiency, wind energy, and solar energy (Table 6). However, survey results also indicate the potential benefits from State-sponsored energy research could be enormous. A large number of business firms indicate a desire to see energy research sponsored by the state of Kansas. In fact, a greater number of firms report a desire for state-sponsored research in wind energy (229 responses, 14 percent), solar energy (183 responses, 11 percent), and ethanol (146 responses, 14 percent) than the fossil fuel categories of natural gas (142 responses, 9 percent) and petroleum (136 responses, 8 percent). These survey results reflect the important and necessary shift out of fossil fuels and into alternative energy sources.

During fall 2005, the Kansas Regents institutes have a large number of active research projects related to energy. The University of Kansas identified 58 research projects related to energy, and Kansas State University has 38 ongoing projects. Wichita State University reported 27 energy-related research projects. Emporia State University had one ongoing research project related to energy, while Pittsburg State University and Ft. Hays State University did not have any ongoing projects. The large number of ongoing energy projects at the three largest regents universities are interrelated, and the possibility of collaborative research across universities is large and potentially productive.

A complete database with all entities surveyed and their responses can be viewed at www.kansasinc.org/energysurvey.html.

Conclusions and Implications

The overall objective of this project is to provide a useful, detailed database of public and private energy research in Kansas, and to identify areas of energy-related research that would enhance economic development in the state of Kansas. In September 2005, survey instruments were mailed to 933 addresses of energy-related businesses in Kansas. Surveys were returned by 479 businesses. Of these, 469 provided useable (complete) surveys, resulting in a response rate of 50.3 percent. Survey results led to the following conclusions and implications.

A large and significant number of Kansas businesses are currently involved in energy research. This survey identified a core group of 76 businesses that are actively involved in energy research. This group provides the capacity to provide a large amount of valuable research in energy-related fields to the state of Kansas.

Involvement, interest, and demand for energy-related research in Kansas are heavily concentrated among engineering firms, crude petroleum and natural gas extraction firms, and businesses that provide architectural services. Firms in these areas comprise an area of *core competency*, given the large amount of the Kansas economy devoted to engineering, petroleum extraction and refining, and natural gas.

Within Kansas, *key areas of research* are currently being conducted in the areas of fossil fuels, including petroleum and natural gas; and renewable and sustainable resources, including wind energy, solar energy, biomass, ethanol, and methane recovery. Technological advances could increase energy production in these core areas. Kansas appears to have a *core competency* in these areas, and *collaborative research* would provide opportunities for federal funding to continue to find more efficient practices for extracting fossil fuels, and to investigate and bring into production alternative energy sources in the state of Kansas.

Energy research in Kansas is a growth industry and is likely to experience a high level of growth in the future, as an increasing interest in energy research leads to a higher level of public and private investment in energy research and development. If university and private researchers take advantage of this *core competency*, the Kansas economy would benefit and additional research is likely to be forthcoming.

Surveyed firms reported that they are currently involved in 56 areas of renewable and sustainable research (33 percent of all reported current research areas). The same group of surveyed firms reported interest in conducting future research in 220 areas of renewable and sustainable research (49 percent of all reported future research areas). These survey results demonstrate a strong and increasing interest in the renewable and sustainable research area. The renewable and sustainable energy research area is a *key area of research*, and is likely to be characterized by a significant rate of growth. The current trend of wanting, and possibly needing, to shift away from fossil fuels into alternative energy sources on a national basis could potentially result in a major increase in research and development of alternative energy sources in Kansas in the future. Also, there is a high interest in energy-efficiency research in the future.

The number of firms responding with a demonstrated interest in state-sponsored energy-related research is approximately double the number of respondents that reported current research. This result reflects the many private benefits to business to be gained from research and development in energy research.

The survey provides strong evidence of a large demand for state-sponsored research in renewable and sustainable energy research, particularly in the areas of wind energy, solar energy, and energy efficiency.

Kansas Regents institutes have a large number of active research projects related to energy. The University of Kansas identified 58 research projects related to energy, and Kansas State University has 38 ongoing projects. Wichita State University reported 27 energy-related research projects. These projects are interrelated, and the possibility of collaborative research across universities is large and potentially productive.

Recommendations for Future Action with Respect to Energy Research

Based on survey outcomes conducted in both the public and private sectors of Kansas, following is a partial list of potential recommended actions that the state of Kansas should consider and may wish to undertake to further interest and support of energy-related research.

- Establish a Kansas Energy Office that has a viable energy research component.
- Survey energy related strengths and expertise in state departments and build upon or expand on expertise in state government so that Kansas can grow those areas. Within each applicable state agency, determine their willingness and ability to fund energy-related research activities to both the public and private sector, and the potential areas of energy-related research each would be willing to consider.
- Have each Regents institute make an annual presentation to select state and federal legislative committees on currently funded research and its practical importance to the Kansas economy.
- Have a consortium of state agencies, where applicable, invest/support in the performance of select technical viability and economic feasibility analyses concerning current and future energy trends to quantify potential energetic, environmental, and economic benefits to the state of Kansas and also present how a “roadmap” to attain certain goals associated with investment in energy technologies and sources.
- Target a small, but technically viable number of energy research areas in which Kansas is already strong or emerging, and target that area for research grants or seed money.
- Consider an initiative much like the bioscience initiative to target for greater industry development in Kansas.
- From the results of this study, target one or two broad areas of energy research that are currently strengths in Kansas and perform a more-detailed survey of companies and institutions that have expressed a focus or future interest in that area to determine where Kansas could thrive in the future.

- Once an area for future research has been targeted, work with Regent institutions to help develop similar expertise at the university level with a major focus area being the potential “payback” to the state for an investment. Success in nurturing private industry research in any area will come much easier if similar expertise exists in our universities.

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Table 1. Number and Percent of Surveys Mailed and Returned by NAICS Code.¹

NAICS Code	Business Type	Mailed (%)	Returned (%)
3112	Grain and Oilseed Processing	2 (0)	0 (0)
32411	Petroleum Refineries	7 (1)	3 (1)
54131	Architectural Services	176 (19)	86 (18)
54133	Engineering Services	373 (40)	199 (42)
54162	Environmental Consulting Services	61 (7)	32 (7)
211111	Crude Petroleum and Natural Gas Extraction	293 (31)	149 (31)
211112	Natural Gas Liquid Extraction	1 (0)	1 (0)
221112	Fossil Fuel Electric Power Generation	2 (0)	1 (0)
221210	Natural Gas Distribution	11 (1)	5 (1)
311222	Soybean Processing	4 (0)	2 (0)
311225	Fats and Oils Refining and Blending	1 (0)	0 (0)
325414	Biological Product Manufacturing	2 (0)	1 (0)
Total		933 (100)	479 (100)

¹The total number of usable responses was equal to 469, resulting in a response rate of 50.3 percent.

Table 2. Is your business currently involved in energy research? (Q1)¹

	Frequency	Percent Return	Percent Mailed
Yes	76	16	8
No	393	84	42

¹The survey response rate is equal to 50.3 percent (= 469/933). “Percent Return” is the frequency divided by the number of returned surveys (= 469). “Percent Mailed” is the frequency divided by the number of mailed surveys (= 933).

Table 3. Is your business currently involved in energy research?
 If yes, then check all fields of energy research that apply: (Q1)¹

	Total Affirmative Responses	Percent
<i>Fossil Fuels</i>		
Coal	7	4
Petroleum	44	26
<u>Natural Gas</u>	<u>37</u>	<u>22</u>
Subtotal: Fossil Fuels	88	52
<i>Renewable and Sustainable Resources</i>		
Biomass	9	5
Hydrogen	0	0
Ethanol	8	5
Biodiesel	4	2
Methane Recovery	7	4
Wind Energy	15	9
Hydropower	3	2
<u>Solar Energy</u>	<u>10</u>	<u>6</u>
Subtotal: Renewable	56	33
<i>Potentially Sustainable</i>		
<u>Nuclear energy</u>	<u>1</u>	<u>1</u>
Subtotal: Nuclear	1	1
<i>Other Energy Categories</i>		
Energy Efficiency	18	11
<u>Other</u>	<u>7</u>	<u>4</u>
Subtotal: Other	25	15
<hr/>		
<u>Total</u>	<u>170</u>	<u>100</u>

¹The survey response rate is equal to 50.3 percent (= 469/933), Number of affirmative responses to question 1 (N1) = 76.

Table 4. Is your business interested in conducting energy research in the future? (Q2)¹

	<u>Frequency</u>	<u>Percent Return</u>	<u>Percent Mailed</u>
Yes	176	38	19
No	293	62	31

¹The survey response rate is equal to 50.3 percent (= 469/933). “Percent Return” is the frequency divided by the number of returned surveys (= 469). “Percent Mailed” is the frequency divided by the number of mailed surveys (= 933).

Table 5. Is your business interested in conducting energy research in the future?
 If yes, then check all fields of energy research that apply: (Q2)¹

	Total Affirmative Responses	Percent
<i>Fossil Fuels</i>		
Coal	15	3
Petroleum	70	16
<u>Natural Gas</u>	<u>67</u>	<u>15</u>
Subtotal: Fossil Fuels	152	34
<i>Renewable and Sustainable Resources</i>		
Biomass	24	5
Hydrogen	17	4
Ethanol	25	6
Biodiesel	15	3
Methane Recovery	23	5
Wind Energy	57	13
Hydropower	11	2
<u>Solar Energy</u>	<u>48</u>	<u>11</u>
Subtotal: Renewable	220	49
<i>Potentially Sustainable</i>		
<u>Nuclear energy</u>	<u>3</u>	<u>1</u>
Subtotal: Nuclear	3	1
<i>Other Energy Categories</i>		
Energy Efficiency	52	12
<u>Other</u>	<u>21</u>	<u>5</u>
Subtotal: Other	73	17
<hr/>		
<u>Total</u>	<u>448</u>	<u>100</u>

¹The survey response rate is equal to 50.3 percent (= 469/933). Number of affirmative responses to question 1 (N2) =176.

Table 6. If the State were to sponsor energy research in targeted areas, which areas would most benefit your business? (Q3)¹

	Total Affirmative Responses	Percent
<i>Fossil Fuels</i>		
Coal	31	3
Petroleum	161	16
<u>Natural Gas</u>	<u>165</u>	<u>17</u>
Subtotal: Fossil Fuels	357	36
<i>Renewable and Sustainable Resources</i>		
Biomass	29	3
Hydrogen	36	4
Ethanol	71	7
Biodiesel	47	5
Methane Recovery	39	4
Wind Energy	109	11
Hydropower	13	1
<u>Solar Energy</u>	<u>102</u>	<u>10</u>
Subtotal: Renewable	446	45
<i>Potentially Sustainable</i>		
<u>Nuclear energy</u>	<u>18</u>	<u>2</u>
Subtotal: Nuclear	18	2
<i>Other Energies</i>		
Energy Efficiency	131	13
<u>Other</u>	<u>25</u>	<u>3</u>
Subtotal: Other	156	16
<hr/>		
Total	977	100

¹The survey response rate is equal to 50.3 percent (= 469/933).

Table 7. If the State were to sponsor targeted research, which areas would you like to see targeted, regardless of whether the research would benefit your business? (Q4)¹

	Total Affirmative Responses	Percent
<i>Fossil Fuels</i>		
Coal	42	3
Petroleum	136	8
<u>Natural Gas</u>	<u>142</u>	<u>9</u>
Subtotal: Fossil Fuels	320	20
<i>Renewable and Sustainable Resources</i>		
Biomass	88	5
Hydrogen	130	8
Ethanol	146	9
Biodiesel	108	7
Methane Recovery	88	5
Wind Energy	229	14
Hydropower	57	4
<u>Solar Energy</u>	<u>183</u>	<u>11</u>
Subtotal: Renewable	1029	63
<i>Potentially Sustainable</i>		
<u>Nuclear energy</u>	<u>71</u>	<u>4</u>
Subtotal: Nuclear	71	4
<i>Other Energies</i>		
Energy Efficiency	183	11
<u>Other</u>	<u>21</u>	<u>1</u>
Subtotal: Other	204	12
<hr/>		
<u>Total</u>	<u>1624</u>	<u>100</u>

¹The survey response rate is equal to 50.3 percent (= 469/933).

APPENDIX ONE
INDUSTRY DESCRIPTIONS

211 Oil and Gas Extraction

Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.

Establishments in this subsector include those that operate oil and gas wells on their own account or for others on a contract or fee basis. Establishments primarily engaged in providing support services, on a fee or contract basis, required for the drilling or operation of oil and gas wells (except geophysical surveying and mapping, mine site preparation, and construction of oil/gas pipelines) are classified in Subsector 213, Support Activities for Mining.

211111 Crude Petroleum and Natural Gas Extraction

This U.S. industry group comprises establishments primarily engaged in the following: the exploration, development, and/or the production of petroleum or natural gas from wells in which the hydrocarbons will initially flow or can be produced using normal pumping techniques or the production of crude petroleum from surface shales or tar sands or from reservoirs in which the hydrocarbons are semisolids. Establishments in this industry operate oil and gas wells on their own account or for others on a contract or fee basis.

211112 Natural Gas Liquid Extraction

This U.S. industry comprises establishments primarily engaged in the recovery of liquid hydrocarbons from oil and gas field gases. Establishments primarily engaged in sulfur recovery from natural gas are included in this industry.

221 Utilities

Industries in the Utilities subsector provide electric power, natural gas, steam supply, water supply, and sewage removal through a permanent infrastructure of lines, mains, and pipes. Establishments are grouped together based on the utility service provided and the particular system or facilities required to perform the service.

221112 Fossil Fuel Electric Power Generation

This U.S. industry comprises establishments primarily engaged in operating fossil fuel powered electric power generation facilities. These facilities use fossil fuels, such as coal, oil, or gas, in internal combustion or combustion turbine conventional steam process to produce electric energy. The electric energy produced in these establishments are provided to electric power transmission systems or to electric power distribution systems.

221210 Natural Gas Distribution

This industry group comprises: (1) establishments primarily engaged in operating gas distribution systems (e.g., mains, meters); (2) establishments known as gas marketers that buy gas from the well and sell it to a distribution system; (3) establishments known as gas brokers or agents that arrange the sale of gas over gas distribution systems operated by others; and (4) establishments primarily engaged in transmitting and distributing gas to final consumers.

311 Food Manufacturing

Industries in the Food Manufacturing subsector transform livestock and agricultural products into products for intermediate or final consumption. The industry groups are distinguished by the raw materials (generally of animal or vegetable origin) processed into food products. The food products manufactured in these establishments are typically sold to wholesalers or retailers for distribution to consumers, but establishments primarily engaged in retailing bakery and candy products made on the premises not for immediate consumption are included.

Establishments primarily engaged in manufacturing beverages are classified in Subsector 312, Beverage and Tobacco Product Manufacturing.

3112 Grain and Oilseed Milling

This industry group comprises establishments primarily engaged in one or more of the following manufacturing activities:

- ◆ milling flour or meal from grains or vegetables;
- ◆ preparing flour mixes or doughs from flour milled in the same establishment;
- ◆ milling, cleaning, and polishing rice; and
- ◆ malt from barley, rye, or other grains.

311222 Soybean Processing

This U.S. industry comprises establishments engaged in crushing soybeans. Examples of products produced in these establishments are soybean oil, soybean cake and meal, and soybean protein isolates and concentrates.

311225 Fats and Oils Refining and Blending

This U.S. industry comprises establishments primarily engaged in one or more of the following manufacturing activities:

- ◆ shortening and margarine from purchased fats and oils;
- ◆ refining and/or blending vegetable, oilseed, and tree nut oils from purchased oils; and
- ◆ blending purchased animal fats with purchased vegetable fats.

324 Petroleum and Coal Products Manufacturing

The Petroleum and Coal Products Manufacturing subsector is based on the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining that involves the separation of crude petroleum into component products through such techniques as cracking and distillation.

In addition, this subsector includes establishments that primarily further process refined petroleum and coal products and produce products, such as asphalt coatings and petroleum lubricating oils. However, establishments that manufacture petrochemicals from refined petroleum are classified in Industry 32511, Petrochemical Manufacturing.

32411 Petroleum Refineries

This industry comprises establishments primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following manufacturing activities:

- ◆ fractionation;
- ◆ straight distillation of crude oil; and
- ◆ cracking.

325 Chemical Manufacturing

The Chemical Manufacturing subsector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This subsector distinguishes the production of basic chemicals that comprise the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry groups.

This subsector does not include all industries transforming raw materials by a chemical process. It is common for some chemical processing to occur during mining operations. These beneficiating operations, such as copper concentrating, are classified in Sector 21, Mining. Furthermore, the refining of crude petroleum is included in Subsector 324, Petroleum and Coal Products Manufacturing. In addition, the manufacturing of aluminum oxide is included in Subsector 331, Primary Metal Manufacturing; and beverage distilleries are classified in Subsector 312, Beverage and Tobacco Product Manufacturing. As in the case of these two activities, the grouping of industries into subsectors may take into account the association of the activities performed with other activities in the subsector.

325414 Biological Product (except Diagnostic) Manufacturing

This U.S. industry comprises establishments primarily engaged in manufacturing vaccines, toxoids, blood fractions, and culture media of plant or animal origin (except diagnostic).

541 Professional, Scientific, and Technical Services

Industries in the Professional, Scientific, and Technical Services subsector group establishments engaged in processes where human capital is the major input. These establishments make available the knowledge and skills of their employees, often on an assignment basis, where an individual or team is responsible for the delivery of services to the client. The individual industries of this subsector are defined on the basis of the particular expertise and training of the services provider.

The distinguishing feature of the Professional, Scientific, and Technical Services subsector is the fact that most of the industries grouped in it have production processes that are almost wholly dependent on worker skills. In most of these industries, equipment and materials are not of major importance, unlike health care, for example, where "high tech" machines and materials are important collaborating inputs to labor skills in the production of health care. Thus, the establishments classified in this subsector sell expertise. Much of the expertise requires degrees, though not in every case.

54131 Architectural Services

This industry comprises establishments primarily engaged in planning and designing residential, institutional, leisure, commercial, and industrial buildings and structures by applying knowledge of design, construction procedures, zoning regulations, building codes, and building materials.

54133 Engineering Services

This industry comprises establishments primarily engaged in applying physical laws and principles of engineering in the design, development, and utilization of machines, materials, instruments, structures, processes, and systems. The assignments undertaken by these establishments may involve any of the following activities: provision of advice, preparation of feasibility studies, preparation of preliminary and final plans and designs, provision of technical services during the construction or installation phase, inspection and evaluation of engineering projects, and related services.

54162 Environmental Consulting Services

This industry comprises establishments primarily engaged in providing advice and assistance to businesses and other organizations on environmental issues, such as the control of environmental contamination from pollutants, toxic substances, and hazardous materials. These establishments identify problems (e.g., inspect buildings for hazardous materials), measure and evaluate risks, and recommend solutions. They employ a multi-disciplined staff of scientists, engineers, and other technicians with expertise in areas such as air and water quality, asbestos contamination, remediation, and environmental law. Establishments providing sanitation or site remediation consulting services are included in this industry.

APPENDIX TWO
MAILED SURVEY INSTRUMENT

September 19, 2005

Hello from K-State!

K-State Engineering Extension needs your input! K-State Engineering Extension has received a grant from Kansas Inc. in Topeka to assess current and future energy research directions and needs in Kansas. Kansas, Inc.'s mission is to build a strong and diversified economy that promotes new and existing industries. By concentrating on being as efficient as possible with the limited research funds available, Kansas Inc. can help private industry, public research institutions, and the state achieve maximum results without duplication of effort that will benefit all Kansans.

Engineering Extension is conducting a very short survey of energy-related research in Kansas to help Kansas Inc. achieve their goal. With these survey results, Kansas Inc. hopes to determine whether Kansas entities could benefit from focusing their efforts on certain sponsored energy research activities in areas that could provide for economic development and increased and diversified energy resources that benefit both Kansas and the nation.

We take the ideas, opinions, and needs of all Kansans seriously and your input on this short survey is important to Kansas Inc. and the state of Kansas because

We would greatly appreciate it if you would take just a minute to complete the short survey on the following page and return it to us in the enclosed self-addressed stamped envelope. Information returned to us in this survey will be used only by Kansas Inc. and will be posted on their website subject to password protection.

Thanks for assisting and helping us with this important need. If you have any questions or concerns, please contact Richard Nelson at 785-532-4999.

Sincerely,

Richard Nelson
Director, Engineering Extension Programs
KSU College of Engineering

ABC Business
Anytown, KS 66699
211212

1) Is your business currently involved in energy research?

___ No ___ Yes: please check () all categories of energy research that apply:

- | | | | |
|--|---|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Biomass | <input type="checkbox"/> Ethanol | <input type="checkbox"/> Wind Energy | <input type="checkbox"/> Solar Energy |
| <input type="checkbox"/> Hydrogen | <input type="checkbox"/> Biodiesel | <input type="checkbox"/> Petroleum | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Coal | <input type="checkbox"/> Methane Recovery | <input type="checkbox"/> Hydropower | <input type="checkbox"/> Nuclear |
| <input type="checkbox"/> Energy Efficiency | <input type="checkbox"/> Other: _____ | | |

2) Is your business interested in conducting energy research in the future?

___ No ___ Yes: please check () all categories of energy research that apply:

- | | | | |
|--|---|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Biomass | <input type="checkbox"/> Ethanol | <input type="checkbox"/> Wind Energy | <input type="checkbox"/> Solar Energy |
| <input type="checkbox"/> Hydrogen | <input type="checkbox"/> Biodiesel | <input type="checkbox"/> Petroleum | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Coal | <input type="checkbox"/> Methane Recovery | <input type="checkbox"/> Hydropower | <input type="checkbox"/> Nuclear |
| <input type="checkbox"/> Energy Efficiency | <input type="checkbox"/> Other: _____ | | |

3) If the state were to sponsor energy research in targeted areas, what areas would most benefit your business?

___ No ___ Yes: please check () all categories of energy research that apply:

- | | | | |
|--|---|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Biomass | <input type="checkbox"/> Ethanol | <input type="checkbox"/> Wind Energy | <input type="checkbox"/> Solar Energy |
| <input type="checkbox"/> Hydrogen | <input type="checkbox"/> Biodiesel | <input type="checkbox"/> Petroleum | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Coal | <input type="checkbox"/> Methane Recovery | <input type="checkbox"/> Hydropower | <input type="checkbox"/> Nuclear |
| <input type="checkbox"/> Energy Efficiency | <input type="checkbox"/> Other: _____ | | |

4) If the state were to sponsor targeted energy research, which areas would you like to see targeted, regardless of whether the research would benefit your business?

___ No ___ Yes: please check () all categories of energy research that apply:

- | | | | |
|--|---|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Biomass | <input type="checkbox"/> Ethanol | <input type="checkbox"/> Wind Energy | <input type="checkbox"/> Solar Energy |
| <input type="checkbox"/> Hydrogen | <input type="checkbox"/> Biodiesel | <input type="checkbox"/> Petroleum | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Coal | <input type="checkbox"/> Methane Recovery | <input type="checkbox"/> Hydropower | <input type="checkbox"/> Nuclear |
| <input type="checkbox"/> Energy Efficiency | <input type="checkbox"/> Other: _____ | | |

APPENDIX THREE
ENERGY-RELATED SPONSORED RESEARCH GRANTS AT KANSAS
REGENTS INSTITUTES

Kansas Regents Institute	Sponsor	Title
Kansas State University		
Bajorek,Stephen M	US Department of Energy	Enhancement of Nuclear Safety and Reactor Thermal-Hydraulic Studies
Walawender Jr,Walter P	Ford Motor Company	Absorbed Natural Gas Storage
Simons,Gale	Western Resources, Inc.	Kansas Wind Energy Assessment
Nelson,Richard G	US Department of Energy	Carbon Sequestration and Methane Mitigation, and the Potential for Economic Enhancement
Snead,Bruce C	US Environmental Protection Agency	School Construction Workshops - Building It Right for Indoor Air Quality and Energy Efficiency
Simons,Gale	Kansas Corporation Commission	Cost-Effective Solar Power in the Heartland
Chapman,Kirby S	US Department of Energy	Virtual Pipeline System Testbed to Optimize the U. S. Natural Gas Transmission Pipeline System
Chapman,Kirby S	Kansas Technology Enterprise Corporation	Natural Gas Transmission Commercialization Opportunities for Kansas
Nelson,Richard G	US Department of Energy	Kansas Biomass Energy Resource Assessment
Chapman,Kirby S	US Environmental Protection Agency	Follow-On Study to Demonstrate Cost-Effective Directed Inspection and Maintenance at Natural Gas Processing and Upstream Exploration and Production Facilities
Wang,Donghai	SolviGen LLC	Development of Model Study on Ethanol and Lactic Acid Production
Nelson,Richard G	US Environmental Protection Agency	Tall Tower Wind Data Collection
Aiken,Robert M	US Department of Energy	Field Evaluation of Cool Season Oilseeds for Biodiesel Feasibility Analysis
Whaley,Paul M	Electric Power Research Institute	EPRI/DOE/KSU Nuclear Engineering Education Program
Nelson,Richard G	US Department of Agriculture	USDA Biodiesel Fuel Education Grant Program
Aiken,Robert M	Blue Sun Biodiesel	Dormant-Seeding for Cool Season Oilseeds, Supporting Biodiesel Feasibility Analysis
Dunn,William L	National Academy for Nuclear Training	National Academy for Nuclear Training Fellowship
Rezac,Mary E	US Department of Agriculture	Membrane Reactor Technology for the Production of Partially Hydrogenated Vegetable Oil with a Low Trans-Fatty Acid Content
Chapman,Kirby S	US Department of Energy	Performance, Efficiency, and Emissions Characterization of Reciprocating Internal Combustion Engines Fueled with Hydrogen/Natural Gas Blends
Aiken,Robert M	US Department of Energy	Field Variety Evaluation and Dormant-Seeding of Cool Season Oilseeds, Supporting Biodiesel
Dunn,William L	National Academy for Nuclear Training	National Academy for Nuclear Training Fellowship
Meyer,Gene M	Kansas Corporation Commission	Kansas Energy Extension Services
Snead,Bruce C	US Environmental Protection Agency	School Construction Workshops - Building It Right for Indoor Air Quality and Energy Efficiency
Edgar,James H	US Department of Energy	Epitaxial Growth of Icosahedral Boride Semiconductors for Novel Energy Conversion Devices
Meyer,Gene M	US Department of Energy	Continuing Efforts to Achieve Building Energy Code Compliance in Kansas
Edgar,James H	Kansas Technology Enterprise Corporation	Epitaxial Growth of Icosahedral Boride Semiconductors for Novel Energy Conversion Devices
Nelson,Richard G	Kansas Corporation Commission	Energy-Profit Ratio Analysis for Kansas Agriculture and Bioenergy Crops
Whaley,Paul M	US Department of Energy	Energy-Related Laboratory Equipment - X-ray System Faxitron
Whaley,Paul M	US Department of Energy	Energy-Related Laboratory Equipment - Hand Foot Monitor
Meyer,Gene M	Kansas Corporation Commission	Kansas Energy Extension Service
Meyer,Gene M	US Department of Energy	Continuing Efforts to Achieve Building Energy Code Compliance in Kansas
Meyer,Gene M	Kansas Corporation Commission	Kansas Energy Extension Service
Rahman,Talat S	US Department of Energy	Controlling Structural, Electronic, and Energy Flow Dynamics of Catalytic Processes through Tailored Nanostructures
Chapman,Kirby S	Gas Research Institute	Port Flow Design to Enhance Energy Mixing
Nelson,Richard G	Kansas Corporation Commission	Kansas Energy Extension Service
Nelson,Richard G	Kansas Department of Commerce	Renewable Energy Economic Impact Analysis for Kansas - Phase 1
Nelson,Richard G	US Department of Energy	Renewable Energy and Environmental and Pollution Trading Credits - Effect on Kansas Renewable Energy Development
Madl,Ronald L	Abengoa Bioenergy R&D, Inc.	Fixed Price Services Agreement between Kansas State University and Abengoa Bioenergy R & D, Inc.

Kansas Regents Institute	Sponsor	Title
Wichita State University		
Rillema, D. Paul	US Department of Energy	Mixed-Metal Photocatalysts for Solar Energy Conversion
D'Souza, Francis	North Atlantic Treaty Organization	Studies on Electrochemical Storage of Hydrogen in Carbon Nanotubes
Egbert, Robert	Kansas Corporation Commission	Development of a Beam Pump Energy Audit Tool through Kansas' State Energy Program
Locke, James E.	US Department of Energy/Sandia	Braided Composite Design Concepts for Adaptive Wind Turbine Blades
Jewell, Ward T.	Western Resources, Inc.	Support for the Electric Power Systems Engineering Program
Jewell, Ward T.	Western Resources, Inc.	Support for the Electric Power Systems Engineering Program
Locke, James E.	US Department of Energy/Sandia	Braided Composite Design Concepts for Adaptive Wind Turbine Blades
Jewell, Ward T.	National Science Foundation	Evaluation of Distributed Electric Energy Storage and Generation
Locke, James E.	US Department of Energy/Sandia	Design and Analysis of Twist-Coupled Wind Turbine Blades
Locke, James E.	US Department of Energy/Sandia	Design and Fabrication of 9-m Carbon Hybrid Wind Turbine Rotor Blades
Locke, James E.	US Department of Energy/Sandia	Static Testing of Composite I-Beams
Locke, James E.	US Department of Energy/Wetzel	Carbon Fiber Composite Aeroelastically Tailored Rotor Blades for Utility-Scale Wind Turbines - Phase I
Locke, James E.	US Department of Energy/Sandia	Carbon-Hybrid Blade Development Project
Jewell, Ward T.	National Science Foundation	Investigation of Electric Transmission Line Routine Using a decision-Landscape Based Methodology
Jewell, Ward T.	National Science Foundation	Supplement to Evaluation of Distributed Electric Storage and Generation
Parcell, William C.	US Department of Energy/University of Alabama	T-R Cycle Characterization and Imaging: Advanced Diagnostic Methodology for Petroleum Reservoir and Trap
Locke, James E.	US Department of Energy/Sandia	Detection and Delineation
Locke, James E.	Wetzel & Company	Composite Fabrication, Testing and Verification
Locke, James E.	Wetzel & Company	Composite Materials Test Panel Tooling
Locke, James E.	US Department of Energy/Wetzel	Static and Fatigue Testing and Material Requirements
Jewell, Ward T.	National Science Foundation/Cornell University	Carbon Fiber Composite Aeroelastically Tailored Rotor Blades for Utility-Scale Wind Turbines - Phase II
Jewell, Ward T.	National Science Foundation/Cornell University	Power System Engineering Research Center Projects
Jewell, Ward T.	National Science Foundation/Cornell University	A Novel Approach for Prioritizing Maintenance of Underground Cables
Jewell, Ward T.	National Science Foundation/Cornell University	Evaluation of Various Inverter Designs Associated with the Interconnection of Distributed Energy Resource to
Parcell, William C.	US Department of Energy/University of Alabama	Electrical Power Systems
Locke, James E.	US Department of Energy/Sandia	T-R Cycle Characterization and Imaging: Advanced Diagnostic Methodology for Petroleum Reservoir and Trap
Locke, James E.	Global Energy Concepts	Detection and Delineation
Locke, James E.	Wetzel & Company	Composite Fabrication, Testing and Verification
Locke, James E.	Wetzel & Company	Static Structural Testing and Fatigue Testing of Thick coupon
Locke, James E.	Wetzel & Company	Wind Turbine Blade Fabrication
Emporia State University		
Sleezer, Richard	NCRA (National Cooperative Refinery Assoc.),	Three-dimensional analysis of soil, vadose zone, and aquifer stratigraphy affecting contaminant transport at the
		NCRA refinery in McPherson County, Kansas

Kansas Regents Institute	Sponsor	Title
Fort Hays State University		
None		
Pittsburg State University		
None		
University of Kansas		
Allison, M Lee	Kansas, Inc.	Kansas Energy Council Fiscal Year 05 Budget (addition to)
Baringer, Philip S	NSF - Mathematical & Physical Sciences (MPS)	High Energy Physics Research with Collider Experiments
Baringer, Philip S	NSF - Mathematical & Physical Sciences (MPS)	High Energy Physics Research with the DO Experiment
Besson, David Z	US Civilian Research & Development Foundation	RADICAL - Radio-wave Detection of Ultra-High Energy Neutrinos in Antarctic Ice and ANITA Calibration
Bhattacharya, Saibal	Murfin Drilling Company	Characterization and Simulation of Minneola Field, Clark County, Kansas
Bhattacharya, Saibal	American Energies Corporation	Subcontract to: Waterflood Design & Implementation in a South-Central Kansas Mississippian Carbonate Reservoir...
Bishop, Kenneth A	University of Illinois Foundation	Chemical and Petroleum Engineering Applications of the CACTUS Software
Bishop, Kenneth A	University of Illinois - Champaign	Development of a Habanero-based Collaborative Environment for Chemical and Petroleum Engineering
Borovik, Andrew S	NIH - General Medical Sciences	Hydrogen Bonding Cavity Motifs About Metal Ions
Byrnes, Alan P	US Dept - Energy	Evaluating the Influence of Pore Architecture and Initial Saturation on Wettability and Relative Permeability in...
Byrnes, Alan P	US Dept - Energy	Field Demonstration of Carbon Dioxide Miscible Flooding in the Lansing-Kansas City Formation, Central
Camarda, Kyle V	Kansas Soybean Commission	Molecular Design of Soybean Oil Products
Carr, Timothy R	Kansas Corporation Commission	Cooperative Oil and Gas Database Project Among the Kansas Corporation Commission, the Kansas Department of...
Carr, Timothy R	Various oil companies	Hugoton Basin Consortium Initiative: An Industry - University - Government Study of the Gas and Oil Resources of SW KS
Carr, Timothy R	US Dept - Energy	Mid-Continent Interactive Digital Carbon Atlas and Relational DataBase (MIDCARB)
Carr, Timothy R	Lafarge Canada	Preliminary Investigation of the Potential of Integrated Subsurface Carbon Sequestration and Enhanced Coalbed Methane Re
Carr, Timothy R	US Dept - Energy	Preparation of a Northern Mid-Continent Petroleum Atlas
Carr, Timothy R	Grand Mesa Operating Company	Subcontract to: Improved Approaches to Design of Polymer Gel Treatments in Mature Oil Fields: Field Demonstration...
deNoyelles, Jerry	Kansas Corporation Commission	A Pilot Program for the Remediation of Soils at Abandoned Exploration/Production Oil Field Sites in Kansas
Dobson, Jerome E	Zilkha Renewable Energy	Kansas Windpower
Dubois, Martin K	Various Corporations	Hugoton Asset Management Project: An Industry-University Study of Reservoir Systems in Southwest Kansas Hugoton...
Dunn, Robert C	kumc	Nuclear CA2+ Regulates Structure/Function of the Pore Complex
Harrison, William E	Southern Methodist University	Geothermal Heat Flow Map of North America
Heppert, Joseph A	Dept - Agriculture	High Value Fuel Additives and Chemicals from Soybean Oil
Liang, Jenn-Tai	DOE	Using Biosurfactants Produced from Agriculture Process Waste Streams to Improve Oil Recovery in Fractured
Logan, Brad R	City of Eskridge, Kansas	Cultural Resources Survey of Designated Portions of the Eskridge Natural Gas System Improvements
Medina, Mario A	San Diego State University Foundation	Phase-Change Frame Walls (PCFWs) for Peak Demand Reduction, Load Shifting, and Energy Conservation in California
Moore, Richard K	Oregon State University	Kansas Participation in Sea Winds Instrument Activities
Murray, Michael J	US Dept - Energy	States of the Vacuum - Research in Relativistic Heavy-Ion Nuclear Physics and BRAHMS
Newell, K David	Colt Energy	Acquisition of Continuous Cores and Geophysical Logs to Evaluate Coalbed Methane

Kansas Regents Institute	Sponsor	Title
Newell, K David	US Dept - Energy	Investigation of Integrated Subsurface Processing of Landfill Gas and Carbon Sequestration, Johnson County, Kansas
Newell, K David	Woolsey Petroleum Corporation	Optimizing Fracture Treatment in a Mississippian "Chat" Reservoir, South-Central Kansas
Nguyen, Trung V	NSF - Engineering (ENG)	Optimized Catalyst Layer Structure for PEM Fuel Cells
Nissen, Susan E	US Dept - Energy	Improving Geologic and Engineering Models of Midcontinent Fracture and Karst-Modified Reservoirs Using New 3-D...
Nissen, Susan E	Murfin Drilling Company	Shallow Evaporite Imaging Solutions (SEIS) Consortium: An Industry-University Study of Using 3-D Seismic Attributes to..
Olafsen, Jeffrey S	American Chemical Society	Mixing, Diffusion and Energy Distribution in Driven Granular Media
Ostermann, Russell D	Green Earth Industries	Effects of Hydrolyzed Proteins on Production of Methane Gas from Coal at Ambient Temperatures
Park, Choon Byong	Barr Engineering Company	Seismic Characterization of Wind Turbine Sites by the MASW Method in Southeastern Kansas
Park, Choon Byong	Barr Engineering Company	Seismic Characterization of Wind Turbine Sites near Lawton, Oklahoma by the MASW Method
Reynolds, Rodney R	Petroleum Technology Transfer Council	North Mid-Continent Region Resource Center
Rogers, Jennifer R	American Chemical Society	Mineralogic Controls on Subsurface Microbial Ecology in a Petroleum-Contaminated Aquifer
Sanders, Stephen J	US Dept - Energy	Research in Heavy-Ion Nuclear Physics
Subramaniam, Bala	Engelhard Corporation	A Novel SCF Technology for Platinum Recycling from Spent Fuel Cells
Suppes, Galen J	Kansas Soybean Commission	Molecular Design of Soybean Oil Products
Suppes, Galen J	MidContinental Chemical Corporation Inc.	Scale-Up and Market Testing of Cetane Improvers Based on Soybean Oil
Thompson, Ward H	American Chemical Society	Understanding the Molecular Mechanisms of Energy Transfer: Vibrational Relaxation in Clusters
Vander Velde, David G	NIH - Center for Research Resources	Acquisition of 400 MHz Nuclear Magnetic Resonance Spectrometer
Vander Velde, David G	kumc	Kansas Biomedical Research Infrastructure Network (K-BRIN) Core Facility Support - Nuclear Magnetic Resonance Lab
Watney, Willard L	US Dept - Energy	Geo-Engineering Modeling Through Internet Informatics (GEMINI)
White, Scott W	Kansas Corporation Commission	Renewable Energy and Environmental and Pollution Trading Credits--Effect on Kansas Renewable Energy Development
White, Scott W	Kansas Corporation Commission	The Kansas Energy Network
Willhite, G Paul	Stripper Energy Consortium	Control of Water Production Using Disproportionate Permeability Reduction in Gelled Polymer Systems
Willhite, G Paul	US Dept - Energy	Development of Polymer Gel Systems to Improve Volumetric Sweep and Reduce Producing Water/Oil Ratios
Willhite, G Paul	US Dept - Energy	Increased Oil Recovery from Mature Oil Fields Using Gelled Polymer Treatments
Williams, Susan M	Office of Naval Research	Fabrication of Selective Oxygen Permeable Membranes with Increased Oxygen Flux
Williams, Susan M	NSF - Engineering (ENG)	Precision Fabrication of Multi-Component, Multi-Functional Catalytic Membranes Using Photolithography
Wilson, Blake B	Kansas GIS Policy Board	Migrating the Water Information Management and Analysis System (WIMAS) to the World Wide Web using ArcIMS and ColdFusion
Xia, Jianghai	Earth Resources Technology	Feasibility of Using MASW Method to Locate Voids at Calvert Cliff Nuclear Power Plant, Maryland

KANSAS, INC.

Created by the Legislature in 1986, Kansas, Inc. is an independent, objective, and non-partisan organization designed to conduct economic development research and analysis with the goal of crafting policies and recommendations to insure the state's ongoing competitiveness for economic growth. To attain our mission, Kansas, Inc. undertakes four primary activities: 1) Developing and implementing a proactive and aggressive research agenda; 2) Identifying and promoting strategies and policies from the research; 3) Conducting evaluation reviews and oversight of economic development programs; and 4) Collaboration and outreach with economic development entities and potential partners.

Co-Chaired by the Governor, Kansas, Inc. is governed by a 17-member Board of Directors. Board members, as mandated by legislation, include four members of Legislative leadership, a representative from the Board of Regents, the Secretary of Commerce, the Commanding General of the Kansas Cavalry, a representative from labor, and eight other members from the private sector representing key Kansas industrial sectors. Private sector members are appointed by the Governor and confirmed by the Kansas Senate.

Through analysis and open dialogue, Kansas, Inc. identifies policy options and builds the consensus essential for concerted action on vital economic issues. Kansas, Inc. is designed to be a public-private partnership with expectations that state investments are leveraged with other funds to maintain a strong research portfolio.

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