Preliminary Policy Recommendation 1: Encourage federal funding of research and development of generation technologies that can provide base-load power while achieving reduced CO_2 emissions.

Topic/Issue Description

In general, electric power plants are differentiated by whether they are designed and built to meet base-load or peaking demand. Base-load units produce electricity at an essentially constant rate and run continuously; they are operated to maximize system mechanical and thermal efficiency and minimize system operating costs. Costs are minimized by operating units with the lowest fuel costs for the most hours in the year (i.e. at a high capacity factor). Generally, base load units include nuclear, coal-fired, geothermal and waste-to-energy plants. Some plants may operate as a "spinning reserve" during off-peak or on-peak periods. Peaking units are normally reserved for operation during the hours of highest daily, weekly, or seasonal loads—that is, they are turned on or "dispatched" as demand increases above the normal base demand or load. Peaking plants are expensive to operate, often fueled by refined oil products, or natural gas, and have a fuel cost per kWh higher than a baseload plant. Intermediate units, another type of power plant, serve the load in between base load and peak load. Older, less-efficient base load units or newer, more-efficient units that burn natural gas are often used as intermediate resources. Hydropower plants can operate in base and/or peaking mode. Wind and solar power plants are referred to as intermittent resources. They may supply power during peak and off-peak periods depending on the availability of their energy source, but cannot be counted on during any period.

According to the most recent data, Kansas utilities generated 45.5 million megawatthours (MWh) of electricity in 2006, in response to total annual retail demand of 39.7 million MWh.[1] Seventy-five percent of the electricity generated between July 2006 and July 2007 came from coal-fired power plants.[2] Some utilities generate considerably more of their electricity from coal than others. The total carbon dioxide (CO_2) emissions associated with electricity generation in 2006 was 35,639 thousand metric tons.[3]

A recent report—prepared by the Electric Power Research Institute (EPRI), Energy Technology Assessment Center—suggests that the U.S. electrical power industry has the potential to reduce annual CO_2 emissions by roughly 45% by the year 2030 (relative to projection in the Energy Information Administration's *2007 Annual Energy Outlook*). According to this report, achieving these reductions will require an aggressive implementation of a diverse portfolio of advanced technologies, which include end-use energy efficiency, renewable energy sources, advanced nuclear technologies, advanced coal (including pulverized and gasification technologies), CO_2 capture and sequestration, plug-in hybrids and utilization of distributed energy resources. Development of this group of technologies will require significantly expanded research and

[1] Energy Information Administration (EIA), 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html
[2] KEC, 2008, Kansas Net Electrical Generation, Kansas Energy Chart Book: http://www.kec.kansas.gov/chart_book/ (accessed September 2008).
[3] EIA, 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html

development (R&D) efforts, which the report estimates such funding needs to be on the order of $1.4 to $2 billion annually through 2030.[4]

According to a 2007 EIA summary, total federal subsidies within the energy markets are estimated at $16.6 billion (more than double in real terms what it was in 1999).[5] Tax expenditures increased from $3.2 billion in 1999 to over $10.4 billion in 2007 (but U.S. energy production was virtually unchanged since 1999). Roughly $6.7 billion or 41% of total energy subsidies are directed towards electricity production. Electricity production subsidies and support per unit of production vary widely by fuel; refined coal, solar, and wind power receive by far the highest amount of subsides, ranging from $23 to $30 per megawatt hour (MWh). Past support for some electricity sources—nuclear, coal, oil, and natural gas—may have aided them in reaching their current role in electricity production.

Most economists agree that in order to significantly reduce greenhouse gas emissions, the U.S. will need to implement a federal cap-and-trade policy or carbon tax, either of which will place a price on emitting carbon. In conjunction with federal carbon regulation, the U.S. should also fund basic research and development. As Yale economist William Nordhaus writes: "It is economically appropriate to subsidize activities such as invention, innovation, and education ... through government funding or tax credits."[6]

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[4] EPRI Energy Technology Assessment Center , 2007, The Power to Reduce CO2 Emissions: The Full Portfolio: www.epri.com (under product number 1015461).
[5] Federal Financial Interventions and Subsidies in Energy Markets 2007: Executive Summary, Energy Information Administration (EIA), 2007: www.eia.doe.gov.
[6] William Nordhaus, 2008, A Question of Balance: Weighing the Options on Global Warming Policies, Yale University Press p. 22.

Preliminary Policy Recommendation 2: Encourage the Kansas Bioscience Authority to allocate some of their funds to R&D related to biomass-fueled electric generation, including the analysis of carbon footprint.

Topic/Issue Description

According to the most recent data, Kansas utilities generated 45.5 million megawatthours (MWh) of electricity in 2006, in response to total annual retail demand of 39.7 million MWh.[7] Seventy-five percent of the state's electricity currently comes from coal-fired power plants.[8] The total carbon dioxide (CO_2) emissions associated with electricity generation in 2006 was 35,639 thousand metric tons.

In general, electric power plants are differentiated by whether they are designed and built to meet base-load or peaking demand. Base-load units produce electricity at an essentially constant rate and run continuously; they are operated to maximize system mechanical and thermal efficiency and minimize system operating costs; and they generally include nuclear, coal-fired, geothermal and waste-to-energy plants. New biomass facilities and the co-firing of electric power plants with biomass waste materials may hold promise.

Biomass waste, as defined by the U.S. Department of Energy, Energy Information Administration (EIA), is organic non-fossil material of biological origin that is a byproduct or a discarded product. This includes municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural crop byproducts, straw, and other biomass solids, liquids, and gases. This does not include wood and wood-derived fuels (including black liquor), biofuels feedstock, biodiesel, and fuel ethanol. According to EIA, energy crops grown specifically for energy production are also included in their "biomass waste" data.[9]

The Kansas Bioscience Authority (KBA) was created by the Kansas Economic Growth Act (KEGA) in 2004, is tasked with providing research and development funding to government and private organizations investing in Kansas bioscience.[10] With funding of $580 million over fifteen years, the KBA administers programs providing funding for researchers at research institutions as well as programs giving tax incentives and other help to bioscience companies in Kansas.

KBA currently administers four programs relevant to electrical generation: (1) Heartland BioVentures, which facilitates risk capital investment in Kansas bioscience companies; (2) Kansas R&D Voucher Program, which provides funding of research and development programs within Kansas bioscience companies; (3) Kansas Bioscience Attraction and Retention Program, which helps bioscience companies retain and expand bioscience job opportunities within Kansas;

[7] Energy Information Administration (EIA), 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html
[8] KEC, 2008, Kansas Net Electrical Generation, Kansas Energy Chart Book: http://www.kec.kansas.gov/chart_book/Chapter3/01_KansasNetElectricalGeneration.pdf (accessed September 2008).
[9] EIA, 2008, Glossary: http://www.eia.doe.gov/glossary/glossary_b.htm.
[10] Kansas Bioscience Authority, 2008, KBA web site (http://www.kansasbioauthority.org/).

and (4) Bioscience Tax Investment Incentive Program, which helps with start-up costs, by giving direct payments in the amount of 50 percent of a bioscience company's net operating loss within the state, up to $1 million annually.

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Preliminary Policy Recommendation 3: Endorse collaborative development of advanced generation technologies in Kansas that can provide base-load power while reducing greenhouse gas emissions. Such collaboration could be between Kansas utilities, between Kansas utilities and regional utilities, or between Kansas utilities and other investors.

Topic/Issue Description

Although base-load power plants generally are less expensive to operate than peaking and intermediate plants,[11] they cost more to build and require years of planning and construction. Due to costs and time requirements, the decision to build a new base-load generating unit is looked at as a major undertaking by every utility company.

In Kansas, electrical demand is projected to grow at an average rate of roughly 1.5% to 2% annually for the next 20 years.[12] To meet expected demand, Kansas utilities will have to build new power plants or buy capacity through purchase power agreements with other utilities. In addition it is expected that certain of the currently utilized electric generating resources will necessarily be replaced by 2028. Utility collaboration is one approach to building new base-load capacity.

A report recently prepared by the Electric Power Research Institute (EPRI) Energy Technology Assessment Center suggests that the U.S. electrical power industry has the potential to reduce annual CO_2 emissions by roughly 45% by the year 2030 (relative to projection in the Energy Information Administration's *2007 Annual Energy Outlook*). According to this report, achieving these reductions will require an aggressive implementation of a diverse portfolio of "advanced technologies," of which advanced nuclear and advanced pulverized coal, with CO_2 capture and sequestration, are base-load technologies.[13]

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[11] Base-load units produce electricity at an essentially constant rate and run continuously; they are operated to maximize system mechanical and thermal efficiency and minimize system operating costs. Peaking units are normally reserved for operation during the hours of highest daily, weekly, or seasonal loads. Intermediate units, another type of power plant, serve the load in between base load and peak load. Definitions from EIA's Energy Glossary: http://www.eia.doe.gov/glossary/glossary_i.htm; accessed May 2008.

[12] Based on preliminary data compiled by KEC staff for forecast load and capacity summaries. Finalized versions will be posted on the web site in coming months. According to the EIA, overall U.S. demand is expected to increase 1.1% annually: Annual Energy Outlook with Projections to 2030: http://www.eia.doe.gov/oiaf/aeo/electricity.html (accessed September 2008).

[13] EPRI Energy Technology Assessment Center ,2007, The Power to Reduce CO2 Emissions: The Full Portfolio: www.epri.com (under product number 1015461) [MD: please include link to version we reference.]

Preliminary Policy Recommendation 4: Endorse policies that promote declines in greenhouse gas emissions, not policies that merely shift emissions within or between regions.

Topic/Issue Description

The U.N. Intergovernmental Panel on Climate Change (IPCC)[14] has determined that global mean surface air temperature have increased about 1.44°F (0.76°C) during the 20th century[15] and that it is "very likely" (at least 90% probability) that human activities—primarily, the combustion of fossil fuels and release of carbon dioxide—are causing the warming.[16] Many policy makers in the U.S. and around the world advocate implementation of policies to reduce emissions of CO_2 and other greenhouse gases.

Because greenhouse gas emissions cause equal harm to the global atmosphere no matter where they are emitted, controlling these emissions will require an international, collective solution. In a global economy in which nations and companies are increasingly forced to compete on cost, unilateral attempts to implement costly carbon regulation are unlikely to be successful in the long run. Moreover, unlike other pollutants, local greenhouse gas emissions do not cause local environmental or health problems.[17]

In the absence of federal regulation, state-level efforts may simply cause GHG emitters to avoid doing business in carbon-regulated states—that is, simply shift emissions elsewhere rather than resulting in a net reduction. Although regional initiatives—such as the Midwestern Greenhouse Gas Accord, the Climate Registry, the Western Climate Initiative, and Regional Greenhouse Gas Initiative—are likely to be more effective than unilateral state actions, they still run the risk of merely shifting emissions rather than reducing them.

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[14] The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988. Its role "is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation." (http://www.ipcc.ch/about/about.htm).

[15] Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner, and P.A. Stott, 2007: Understanding and Attributing Climate Change, *in* Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, p. 683. [add URL]

[16] Experts generally focus on six major greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Water vapor is also an important greenhouse gas, but its atmospheric concentration is not generally affected by human activity.

[17] Congressional Budget Office (CBO), 2003, The Economics of Climate Change—A Primer: CBO Study, April 2003 (www.cbo.org).

Preliminary Policy Recommendation 5: In addition to demand-side management, the Kansas Legislature and KCC should encourage utility investments in base-load generation plants' energy conservation and efficiency and carbon capture experiments and technologies.

Topic/Issue Description

According to the most recent data, Kansas utilities generated 45.5 million megawatthours (MWh) of electricity in 2006, in response to total annual retail demand of 39.7 million MWh.[18] Seventy-five percent of the electricity generated between July 2006 and July 2007 came from coal-fired power plants.[19] The total carbon dioxide (CO_2) emissions associated with electricity generation in 2006 was 35,639 thousand metric tons.[20]

In addition to investments in electric generation technologies that will be less carbon-intensive than the current pulverized coal power plants, utilities have also established so-called "demand-side management" or "demand response" programs to either reduce overall demand or shift demand to different times. Reducing demand is one way to reduce CO_2 emissions.

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[18] Energy Information Administration (EIA), 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html
[19] KEC, 2008, Kansas Net Electrical Generation, Kansas Energy Chart Book: http://www.kec.kansas.gov/chart_book/ (accessed September 2008).
[20] EIA, 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html

Preliminary Policy Recommendation 6: If a cap-and-trade policy or carbon tax is passed, it should be done at the federal level.

Topic / Issue Description

The issue of global warming and the role of anthropogenic (human-caused) greenhouse gas emissions continues to be discussed by scientists, policymakers, and interested citizens in the U.S. and around the world.[21]

According to the U.N. Intergovernmental Panel on Climate Change (IPCC),[22] global mean surface air temperature increased about 1.44°F (0.76°C) during the 20th century.[23] Surface temperature data from around the world show an "especially pronounced warming trend during the past 30 years," with 9 of the 10 warmest years on record occurring in the past decade.[24] Moreover, the IPCC report states that the warming is "very likely" (at least 90% probability) to be caused by human activities—primarily, the combustion of fossil fuels and release of carbon dioxide.[25] Although projections of impacts from climate change are highly uncertain, historical and statistical evidence suggest that a warmer global climate could produce both harmful and beneficial effects, and these effects will vary by region. People in developing countries are likely more vulnerable to damaging effects than those in developed countries, largely because they have fewer resources for coping with impacts and also because some of these countries have large populations concentrated regions vulnerable to a rise in sea level or flooding or in marginal agricultural lands vulnerable to drought. Warming would probably increase natural range of insect-borne diseases and also disrupt deep ocean currents that strongly influence global climate (thermohaline circulation). Very rapid changes in climate could have drastic impacts on plants, animals. [26]

As the scientific community continues to work towards better understanding of climate change and its potential impacts, policymakers in the U.S. and around the world aim how best to respond

[21] In response to a mandate from Congress, the National Academy of Sciences has established a Climate Change Study Committee that will "investigate and study the serious and sweeping issues relating to global climate change and make recommendations regarding what steps must be taken and what strategies must be adopted in response to global climate change, including the science and technology challenges thereof." [add URL]

[22] The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988. Its role "is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation." (http://www.ipcc.ch/about/about.htm).

[23] Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner, and P.A. Stott, 2007: Understanding and Attributing Climate Change, *in* Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, p. 683. [add URL]

[24] National Research Council, 2008, Understanding and Responding to Climate Change: Highlights of National Academies Reports: http://dels.nas.edu/basc/climate-change/basics.shtml (accessed August 2008).

[25] Experts generally focus on six major greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Water vapor is also an important greenhouse gas, but its atmospheric concentration is not generally affected by human activity.

[26] Congressional Budget Office (CBO), 2003, The Economics of Climate Change—A Primer: CBO Study, April 2003 (www.cbo.org).

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to the issue and balance the costs of mitigating emissions with the benefits of avoiding potential damages. There is widespread agreement that market-based policies such as a cap-and-trade or carbon tax provide the best "incentives to find low-cost ways to reduce emissions through behavioral changes and innovative technologies."[27]

There is also widespread agreement that climate change is a problem of international scope. Because greenhouse gas (GHG) emissions cause equal harm to the global atmosphere no matter where they are emitted, controlling these emissions will require an international, collective solution. In a global economy in which nations and companies are increasingly forced to compete on cost, unilateral attempts to implement costly carbon regulation are unlikely to be successful in the long run. Moreover, unlike other pollutants, local greenhouse gas emissions do not cause local environmental or health problems.[28] Establishing the framework and institutions for a truly global approach will be challenging and require a high level of political cooperation.[29] Among the many issues complicating the international approach are the widely varying costs of achieving GHG reductions and the dramatically different cost and benefit implications of climate change for different countries around the world.[30]

U.S. policymakers are considering federal regulation of GHG emissions. A federal approach would provide uniformity and a "level playing field," so that GHG regulation would not create competitive disadvantages among the states nor strictly among U.S. companies. Many U.S. industries and businesses appear supportive of a national approach. Although the importance of an international approach is broadly accepted, many view U.S. regulation of GHG emissions as a necessary first step towards the establishment of a global framework, in part because the U.S. is responsible for roughly 21% of the annual global GHG emissions (China recently passed the U.S. and is now the country with the largest annual emissions).[31]

In advance of federal regulation, many states have taken steps, such as implementing "climate action plans," in an effort to show leadership on the issue.[32] However, in the absence of federal regulation, state-level efforts may simply cause GHG emitters to avoid doing business in carbon-regulated states—that is, simply shift emissions elsewhere rather than resulting in a net

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[27] CBO, 2003.
[28] CBO, 2003.
[29] CBO, 2003, p. 25: "In sum, policymakers may be faced with the extraordinarily complicated task of managing a resource that no one owns, that everyone depends on, and that provides a wide range of very different—and often public—benefits to different people in different regions over very long periods."
[30] CBO, 2003, Chapter 5, International Coordination of Climate Policy, provides a good overview of the issues association with international cooperation.
[31] A recent Congressional white paper highlights incentives in U.S. policy to encourage China and India to curb their emissions: *Climate Change Legislation Design White Paper: Competitiveness Concerns/Engaging Developing Countries*, prepared by the Committee on Energy and Commerce Staff, January 2008: http://energycommerce.house.gov/Climate%5FChange/ (accessed August 2008).
[32] In Executive Order 08-03, Governor Sebelius created the Kansas Energy and Environmental Policy Advisory Group, to develop and deliver a state-level climate action plan to the Governor no later than January 1, 2010. The group is "supported by a number of state agencies that are sharing responsibility for this effort, and by the Center for Climate Strategies (CCS), a nonprofit service organization with substantial experience working directly with public officials and their stakeholders to facilitate the development of state climate action plans": http://www.ksclimatechange.us/ (accessed August 2008).

reduction. Regional initiatives—such as the Midwestern Greenhouse Gas Accord, the Climate Registry, the Western Climate Initiative, and Regional Greenhouse Gas Initiative—are also underway and are likely to be more effective than unilateral state actions, though still plagued with inefficiencies and potential to merely shift emissions (the problem of leakage).

As noted above, that market-based policies and methods are much more efficient—that is, they achieve the same amount of reduction at a lower cost—than non-market mandates and standards.[33] In fact, non-market approaches—for example, Renewable Portfolio Standards or Renewable Fuels Standards—can cost ten times more to achieve the same reduction in GHG emissions.[34]

Because a tax or a cap on CO2 emissions directly target the problem (instead of targeting favored solutions), they produce a wider range of solutions that can be optimized for different situations. Market-based GHG reduction policies, such as a cap-and-trade system and a GHG tax, reduce emissions at a lower cost than mandates and standards. Of the two, the GHG tax can reduce greenhouse gases at a lower cost than a cap-and-trade system.

Although estimates of economic impact of GHG regulation vary, most economists concur that the benefits of acting today to mitigate greenhouse gas emissions are greater than the costs.[35] In summary, market-based policies that focus on the problem of all GHG emissions, instead of a few politically advantaged solutions, are most likely to prompt effective solutions to reduce greenhouse gas emissions across all economic sectors. In the U.S. such policies should be implemented at the federal level to ensure that GHG emissions are actually reduced, not simply shifted to another state or region.

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[33] Unless noted otherwise, information comes from KEC staff review, Greenhouse Gas Emissions—Policy and Economics: A Report Prepared for the Kansas Energy Council, by Trisha Shrum, August 3, 2007: http://www.kec.kansas.gov/reports/GHG_Review_FINAL.pdf.

[34] Regulatory mandates that focus on particular solutions increase demand for targeted products, which creates even higher prices for consumers and a possible subsidy for producers.

[35] Nobel laureate Kenneth J. Arrow concluded that even without the absurdly high rates of future discounting (as in Stern Review), the benefits of acting today outweigh the costs; see Arrow, 2007, Global Climate Change: A Challenge to Policy: Economist's Voice: www.bepress.com/ev (accessed April 2008).

Preliminary Policy Recommendation 7: Reduce maximum speed limit from 70 to 65 mph on Kansas Highways.

Topic/Issue Description

According to the U.S. Department of Energy, reducing driving speeds from 70 to 65 mph is expected to increase fuel efficiency—and reduce amount of fossil fuel combusted and, thus, the quantity of carbon dioxide emitted for driving similar distances—by 7% to 23%. Although many factors affect fuel economy and emissions rates (including vehicle size, age, and condition, as well as driver behaviors and road conditions), studies have shown that fuel economy drops at speeds greater than 55 mph, with each 5-mph increase over 60 mph being associated with a 7% to 23% increase in fuel consumption.[36]

Research has also shown a strong relationship between speed and emissions of traditional pollutants. In particular, emission rates of nitrous oxide, volatile organic compounds (VOCs), and carbon monoxide have been shown to increase steadily with speeds over 35 mph, with VOC and carbon monoxide emissions rising sharply at speeds greater than 55 mph.[37]

In 1973 the federal government enacted a National Maximum Speed Limit (NMSL) of 55 mph as a means of conserving fuel during the Arab oil embargo. Despite successfully reducing fuel consumption by almost 2%, and lowering traffic fatalities significantly, the 55 mph NMSL also resulted in drivers spending an estimated extra 1 billion hours driving each year. As oil prices fell, public opposition to the NMSL increased, and the NMSL was raised to 65 mph on interstate highways in 1987. In 1995, the NMSL was repealed, and the power to set speed limits returned to the states. Most states, including Kansas in 1996, raised interstate speed limits to 70 mph in the years following the 1995 repeal.[38]

In the Midwest, Illinois and Ohio have 65-mph speed limits on Interstate highways. Speed limits on other, two-lane highways vary across the Midwest, with Nebraska, Missouri, Indiana, Iowa, Illinois, and Ohio having speed limits of 55 or 60 mph.[39]

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[36] U.S. Department of Energy, 2008, Driving More Efficiently: http://www.fueleconomy.gov/feg/drivehabits.shtml (accessed August 19, 2008)

[37] Victoria Transport Policy Institute (VTPI), May 2007, Transportation Cost and Benefit Analysis — Air Pollution Costs: http://www.vtpi.org/tca/ (accessed August 22, 2008)

[38] National Highway Traffic Safety Administration (NHTSA), February 1998, The Effect of Increased Speed Limits in the Post-NMSL Era: http://www-nrd.nhtsa.dot.gov/Pubs/808-637.pdf (accessed August 2008). Most states use the 85th percentile speed of free-flowing traffic to determine safe speed limits, under the assumption that most drivers will choose speeds that are safe for given conditions; adjustments are also made for roadway geometry, pedestrian activity, crash history, and other outside factors (see NHTSA, October 2007, Field Test of the Impact of Setting and Enforcing Rational Speed Limits in Gulfport, Mississippi: http://www.nhtsa.dot.gov/portal/nhtsa_static_file_downloader.jsp?file=/staticfiles/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/hs810849.pdf (accessed August 2008)

[39] National Motorists Association, 2008, State Speed Limit Chart: http://www.motorists.org/speedlimits/home/state-speed-limit-chart/.

The Kansas Department of Transportation (KDOT) estimates that lowering the speed limit from 70 to 65 mph would require changes in approximately 900 speed limit signs. KDOT estimates the cost of the least-expensive approach, hanging revised speed limit numbers over existing signs, at $75 per sign, bringing the total cost to $72,000.[40]

In addition to reducing emissions of traditional pollutants and CO2, slowing down the speed of traffic on Kansas highways could also improve safety and reduce accident and fatality rates. In particular, increased speed reduces the time drivers have to react to emergencies and increases the distance required to stop a vehicle; increased speed also increases the energy exerted in a crash.[41] In the eight years after the removal of the national maximum speed limit in 1996, states that increased speed limits beyond 65 mph saw an average of 9 percent increase in total traffic fatalities compared to the eight years prior to 1996.[42] Improved safety features now standard in today's vehicles—seat belts, airbags, and improved front crumple zones–have reduced the likelihood of serious injury or death in accidents.[43]

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[40] David Church, Kansas Department of Transportation (KDOT), personal communication, August 2008
[41] Insurance Institute for Highway Safety, January 2008, Q&As: Speed and speed limits: http://www.iihs.org/research/qanda/speed_limits.html (accessed August 2008).
[42] Iowa Department of Transportation, 2006, A Study of Speed Limit Increases, Traffic Fatalities, and Fatal Crashes in Iowa and Surrounding Midwestern States: http://www.iowadot.org/mvd/ods/ (accessed August 2008).
[43] National Highway Traffic Safety Administration (NHTSA), Department of Transportation, July 2008, Consumer Information; New Car Assessment Program: http://www.nhtsa.gov/staticfiles/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/NCAP_Final_Notice_July_08.pdf (accessed September 9, 2008). The average probability of injury within a frontal crash under crash-test conditions of model year 2008 vehicles is 15%, down from 30% in 1995.

Preliminary Policy Recommendation 8: Increase fines for speeding by 50%.

Topic/Issue Description

According to the U.S. Department of Energy, fuel economy drops at speeds greater than 55 mph. At speeds greater than 60 mph, each 5-mph increase in speed increases fuel consumption, and greenhouse gas emissions, by 7% to 23%.[44] Currently, many drivers in Kansas exceed the 70-mph speed limit by at least 8 miles an hour on four-lane rural highways. Speeding is also common on four-lane divided rural highways with 65-mph speed limits, with many drivers exceeding the limit by at least 10 miles an hour.[45]

Given that it is a violation of state law (K.S.A. 9-1558) to exceed the posted speed limit by as little as one mile per hour, increasing fines may encourage greater compliance with posted speed limits. The uniform fine schedule for speeding violations is laid out in K.S.A. 8-2118, which stipulates that fines are doubled in school and constructions zones (see table below).

Speeding Violation (mph above limit)	**Current Fine**	**Proposed Fine (50% increase)**
1 – 10 mph	$30	$45
11 mph	$36	$54
12 mph	$42	$63
13 mph	$48	$72
14 mph	$54	$81
15 mph	$60	$90
16 mph	$66	$99
17 mph	$72	$108
18 mph	$78	$117
19 mph	$84	$126
20 mph	$90	$135
21 mph	$99	$148.50
22 mph	$108	$162
23 mph	$117	$175.50
24 mph	$126	$189
25 mph	$135	$202.50
26 mph	$144	$216
27 mph	$153	$229.50
28 mph	$162	$243
29 mph	$171	$256.50
30 mph	$180	$270
31 mph	$195	$283.50

[44] U.S. Department of Energy, 2008, Driving More Efficiently: http://www.fueleconomy.gov/feg/drivehabits.shtml (accessed August 19, 2008)
[45] David Church, Kansas Department of Transportation (KDOT), personal communication, August 2008.

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Preliminary Policy Recommendation 9: Reduce "exemption" for speeding violations to 5 mph over limit.

Topic/Issue Description

According to the U.S. Department of Energy, fuel economy drops at speeds greater than 55 mph. At speeds greater than 60 mph, each 5-mph increase in speed increases fuel consumption, and greenhouse gas emissions, by 7% to 23%.[46] Reducing the so-called "10-mph exemption" for speeding violations to 5 mph may encourage more compliance with posted speed limits.

Although it is a violation of state law (K.S.A. 9-1558) to exceed the posted speed limit by as little as one mile per hour, K.S.A. 8-1560(c) states that speeding violations of 10 mph or less on roads with posted speed limits between 55 and 70 mph will not be counted as a moving violation on an individual's driving record (the exemption is reduced to 5 mph or less on roads with posted speed limits between 30 an 54 mph).

Furthermore, K.S.A. 8-1560(d) also prohibits the state entities from reporting any non-moving violations in public inquires, as well as prohibiting insurance companies from using any non-moving violations when determining rates and whether or not to drop insured drivers from their insurance plan.

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[46] U.S. Department of Energy, 2008, Driving More Efficiently: http://www.fueleconomy.gov/feg/drivehabits.shtml (accessed August 19, 2008)

Preliminary Policy Recommendation 10: Undertake statewide initiative (public-private sector) to encourage more energy-efficient driving.

Topic/Issue Description

Various factors affect the fuel economy and emissions rates of individual vehicles. Driver behavior, particularly aggressive driving—jackrabbit acceleration, hard braking, and speeding—can increase fuel consumption by 33% at highway speeds and 5% at lower speeds.[47] Proper maintenance—including changing dirty air filters, keeping the engine properly tuned, maintaining proper tire inflation and, using the proper grade of motor oil—has also been shown to reduce fuel consumption by as much as 18.5%.[48]

Examples of initiatives encouraging more energy efficient driving habits include the "Drive Smarter Challenge," undertaken by the Alliance to Save Energy and the SmartRide initiative launched by the Nationwide Mutual Insurance Company.[49] These public outreach programs use pamphlets and the internet to provide information on ways to reduce fuel consumption (and increase safety). Similarly, the U.S. Department of Energy has an informational web site that provides tips and suggestions as to ways to reduce fuel consumption, and information regarding federal tax credits for hybrids and other high fuel efficient vehicles.[50] In addition to these private sector initiatives, California Governor Arnold Schwarzenegger and Colorado Governor Bill Ritter teamed up with The Alliance of Automobile Manufacturers—an automotive trade group representing General Motors, Toyota, Ford, and seven other automakers—to create the EcoDriving campaign educate both individuals and state/local lawmakers on simple steps that can reduce fuel consumption and CO_2 emissions.[51]

Finally, the U.S. House of Representatives on June 6, 2007 introduced the Safe and Fuel Efficient Driving Act of 2007 (H.R. 2594). Citing national concerns such as dependence on foreign oil and environmental concerns as the driving motive, H.R. 2594 allocated $20 million the Secretaries of Transportation and Energy to jointly develop a multi-year public relation and education campaign seeking to promote fuel-efficient driving habits within the US.

In addition to these and other public education efforts, higher gasoline and diesel prices in late 2007 and throughout 2008 have likely prompted drivers to adopt more fuel-efficient practices. According to the Department of Energy, U.S. gasoline consumption during 2007 was 3.9% less than total gasoline consumption during 2006.[52] Further, according to the Federal Highway

[47] U.S. Department of Energy (DOE), 2008, Driving More Efficiently: http://www.fueleconomy.gov/feg/drivehabits.shtml (accessed August 19, 2008)
[48] Keeping Your Car In Shape: http://www.fueleconomy.gov/feg/maintain.shtml (accessed August 19, 2008)
[49] Alliance to Save Energy, 2008, The Drive Smarter Challenge: http://drivesmarterchallenge.org (accessed August 2008); Nationwide Mutual Insurance Company, 2008, Drive Smarter Challenge: www.nationwidesmartride.com (accessed August 2008).
[50] DOE, 2008: www.fueleconomy.gov.
[51] The Alliance of Automobile Manufacturers, 2008, EcoDriving: www.ecodrivingusa.com.
[52] EIA (Energy Information Administration), 2008, Refiner Motor Gasoline Sales Volumes: http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_marketing_annual/pma.html (accessed September 9, 2008)

Administration, total U.S. vehicle miles traveled decreased 3.7% for May 2008 as compared with May 2007.[53]

Diesel consumption has also declined in response to higher prices. Con-way Freight, a trucking company based in Ann Arbor, Michigan, recently lowered the top speed of its 8,400 trucks by 3 mph (from 65 mph to 62 mph) and estimates this reduction in speed will improve gas mileage by two-tenths of a mile per gallon, resulting in a savings of 3.2 million gallons of diesel fuel saved per year, or $1.2 million per month.[54]

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[53] U.S. Department of Transportation, Federal Highway Administration, 2008, Traffic Volume Trends: http://www.fhwa.dot.gov/ohim/tvtw/08maytvt/08maytvt.pdf (accessed September 2008).
[54] Adrian Burns, 2008, Truckers slow down to speed up savings, Business First of Columbus, June 20, 2008: http://columbus.bizjournals.com/columbus/stories/2008/06/23/story1.html (accessed August 25, 2008)

Preliminary Policy Recommendation 11: Establish minimum energy efficiency standard for all majority State-funded new construction (standards under consideration include LEED Platinum, 20% above IECC 2006).

Topic/Issue Description

Many publicly owned buildings require large amounts of energy to power lighting and run heating, ventilation, and cooling systems, the costs of which are ultimately borne by Kansas taxpayers. Clearly, increasing the energy efficiency of these structures makes economic sense, and the State should ensure that any new buildings constructed with State funds meet reasonable energy efficiency standards. As Governor Sebelius noted, the State of Kansas should be "at the forefront of appropriate and effective energy and environmental practices."[55]

Although K.S.A. 75-3783 specifies that the Secretary of Administration may adopt rules and regulations establishing standards for the planning, design, and construction of buildings, to date, no such standards for energy conservation and efficiency have been promulgated.

During the 2008 session, the Kansas Legislature discussed Senate Bill 452, which required (among other things) that all new construction projects by state agencies achieve energy consumption levels at least 25% below those set out by the International Energy Conservation Code (IECC) 2006.[56] In July 2007, the Kansas legislature passed K.S.A. 66-1227, which requires all new commercial and industrial construction to meet IECC 2006. K.S.A. 66-1228 requires builders or realtors to disclose energy efficiency information about new homes; the disclosure form uses IECC 2006 as a baseline for comparison.[57]

IECC 2006 is a comprehensive energy conservation code regulating most aspects of energy loss within commercial and residential buildings. These regulations differ by climate region within the United States, and include minimum insulation levels, solar heat gain coefficients on windows, and regulation of lighting, heating, air-conditioning and ductwork.[58] Because the measures within IECC 2006 reduce energy consumption, renovations pay for themselves over time. A Nevada study estimated that the average cost to renovate a commercial building to comply with IECC 2006 was $1.60 per square foot and resulted in annual energy savings of $0.68 per square foot; in other words, the renovations were estimated to pay for themselves in as little as two and a half years.[59]

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[55] Executive Directive on Energy Conservation and Management (07-373): http://www.da.ks.gov/ps/subject/arc/executivedirectives/2007/ExeDir%2007%20373.pdf (accessed September 8, 2008)
[56] Senate Bill 452: http://www.kslegislature.org/bills/2008/452.pdf (accessed September 8, 2008)
[57] The Kansas Energy Efficiency Disclosure form is available online: http://www.kcc.state.ks.us/energy/energy_efficiency_disclosure.pdf.
[58] U.S. Department of Energy Building Energy Codes Program, October 2007, Residential Requirements of the 2006 International Energy Conservation Code: http://www.energycodes.gov/training/pdfs/2006_iecc.pdf (accessed September 8, 2008)
[59] U.S. Environmental Protection Agency, 2007, Building Codes for Energy Efficiency: http://www.epa.gov/cleanrgy/documents/buildingcodesfactsheet.pdf (accessed September 8, 2008)

Another standard that could be adopted for all new state-funded construction is the Leadership in Energy and Environmental Design (LEED) standard, promulgated by the U.S. Green Building Council (USGBC). Under LEED, newly constructed buildings and renovations receive an audit, in which energy efficiency and overall "environmental friendliness" is evaluated. The USGBC then gives the building a rating—certified, silver, gold, and platinum—based on the score it receives in categories related to sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.[60]

Four states and at least 26 cities currently require publicly funded buildings to meet LEED standard (most require LEED silver).[61] Often these standards are limited to LEED silver, with a few municipalities requiring LEED gold. Currently, no states require public buildings to obtain greater than a LEED silver rating.[62] As might be expected, the costs of building to LEED standard vary, depending on the project. Depending on the study's methodology, additional costs are estimated to be negligible to perhaps 6% to obtain a level of energy efficiency and "environmental friendliness" equivalent to standards such as LEED silver. Achieving higher LEED standards is often associated with higher costs, but data is limited due to small number of buildings currently built to those levels.[63] The costs associated with the certification process through the USGBC are often considered expensive, requiring rigorous documentation and studies. This has led many jurisdictions to simply require buildings to be "certifiable" under a particular LEED level of Certification, without being actually certified.[64]

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[60] U.S. Green Building Council, October 2005, LEED for New Construction & Major Renovations: http://www.usgbc.org/ShowFile.aspx?DocumentID=1095 (accessed July 23, 2008)
[61] The American Institute of Architects (AIA), 2008, Green/High-Performance Building Resources: http://www.aia.org/adv_st_green_highperformance (accessed August 5, 2008). In addition to the four states requiring a particular level of LEED certification, eight states require environmental impacts of publicly funded buildings to be evaluated based on LEED standards. Implementation in these eight states is determined by cost effectiveness.
The American Institute of Architects (AIA), July 2008, List of Cities Requiring LEED: http://files.harc.edu/Sites/GulfCoastCHP/Publications/CitiesRequiringLEEDList.pdf (accessed August 5, 2008)
[62] The American Institute of Architects (AIA), 2008, Green/High-Performance Building Resources: http://www.aia.org/adv_st_green_highperformance (accessed August 5, 2008)
[63] Peter Morris and Davis Langdon, Summer 2007, What Does Green Really Cost?, PREA Quarterly
[64] Allyson Wendt, April 2008, Navigating Incentives and Regulations for Green Buildings, Environmental Building News, vol. 17, no. 4, p.1-19

Preliminary Policy Recommendation 12: Encourage State agencies and managers to develop guidelines for telecommuting for appropriate state employees, giving broad discretion to managers on how such an option would be applied.

Topic/Issue Description

In 2007, about 12 million U.S. employees "telecommuted" at least 8 hours weekly, double the 6 million employees who telecommuted in 2000.[65] This increase is the result of employees increasingly looking for more flexible work schedules, as well as employers looking to reduce costs associated with office rental and information technology (IT). Additionally, telecommuting has consistently shown a 10% to 15% increase in employee productivity over non-telecommuting employees. By eliminating or decreasing employee commutes, it also reduces emissions of carbon dioxide and other pollutants.[66] For example, over 56% of Sun Microsystems' employees telecommute to some degree. Management claims this has saved the company $387 million in IT and real estate expenses, while reducing annual CO_2 emissions by 28,000 tons.[67]

The State of Kansas currently has no regulations or statutes specifically addressing telecommuting; individual agencies have complete discretion in determining whether or not to provided telecommuting opportunities for their individual employees.[68] To date, only the Department of Revenue and the Department of Education have drafted policies related to telecommuting.

With regard to future telecommuting policies, the Department of Administration's (DOA) Division of Personnel Services is working with agency human resources directors to craft telecommuting policies as a means to retain talented workers and to quickly implement social distancing of employees in the case of a continuity of operations event such as a Pandemic Influenza outbreak. DOA finds that such factors as the nature of a job, the personal characteristics and work habits of an employee, and the management style of the supervisor should all be taken into account in decisions regarding telecommuting.[69]

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[65] Eve Tahminciogul, The quiet revolution: telecommuting, MSNBC.com, October 5, 2007: http://www.msnbc.msn.com/id/20281475 (accessed July 2008)
[66] Diane Stafford, Emphasize the work in teleworking, Kansas City Star, July 9, 2008: http://www.kansascity.com/business/story/699018.html (accessed July 2008)
[67] Eve Tahminciogul, 2008
[68] George Vega, Department of Administration Division of Personnel Services, personal communication, July 28, 2008
[69] George Vega, 2008

Preliminary Policy Recommendation 13: Urge Congressional delegation to include agricultural sequestration as an offset in any federal cap-and-trade policy.

Topic/Issue Description

In recent years, a number of policies have been introduced in the U.S. House and Senate that aim to reduce greenhouse gas emissions. Nearly all of the proposals are centered around a cap-and-trade approach, in which total emissions are limited by governmental regulations (the cap) and emissions permits (or allowances), which equal the total quantity of the cap, are either given away or sold to the emitters; emitters are then required to hold one permit for every ton of emissions they produce. Those who can make cost-effective reductions will have excess permits to trade (sell at a price determined by the market) to others for whom buying a permit is less expensive than reducing emissions.

The U.S. has previous experience with a cap-and-trade approach to reducing pollutants. Under the 1990 Clean Air Act, the acid rain trading program was implemented to reduce emissions of sulfur dioxide (SO_2). This program, which continues today, is widely considered a success: not only have emissions been reduced to the targeted levels, but the actual cost of reductions was only half of what was estimated when the program was enacted.[70]

Some cap-and-trade policies proposed by Congress include an additional option, which involves the purchase of an emissions offset from an entity not covered by the cap. The idea is that it may be cheaper for the regulated entity to pay someone else to reduce their emissions. Agricultural practices—in particular, the sequestration of carbon dioxide in soil—have received much attention as potential offsets.

U.S. cropland has been estimated to have the potential to sequester 275 to 760 million metric tons of carbon per year, with U.S. grazing land having the ability to sequester an additional 66 to 330 million metric tons of carbon per year.[71] Combined, this amounts to fully 20% to 30% of annual U.S. carbon emissions by 2025.[72] The Chicago Climate Exchange, a voluntary carbon offset market, currently awards credits to agricultural producers for soil carbon sequestration, methane capture, and reforestation. Depending on the soil type, soil carbon sequestration is awarded at a rate of 0 to 0.6 metric tons of carbon per acre under continuous conservation tillage, while cropland planted to continuous grass cover is awarded 0.4 to 1 metric tons of carbon per acre.[73] This amounts to annual payments equal to $2.83 per acre under continuous conservation tillage and either $1.89 or $4.73 per acre planted to continuous grass cover.[74]

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[70] Unless otherwise noted, information comes from the KEC staff review, Greenhouse Gas Emissions—Policy and Economics, prepared by Trisha Shrum, August 3, 2007: http://www.kec.kansas.gov/reports/GHG_Review_FINAL.pdf.

[71] Charles W. Rice and Debbie Reed, 2007, Soil Carbon Sequestration and Greenhouse Gas Mitigation: A Role for American Agriculture

[72] Charles Rice, Kansas State University Research and Extension, personal communication, 2008

[73] Chicago Climate Exchange (CCX), 2008, Agricultural Soil Carbon Offsets: http://www.chicagoclimatex.com/content.jsf?id=781 (accessed September 8, 2008)

[74] Numbers calculated using a value of $4.73 per metric ton of carbon—average daily closing value of the CFI 2003 from January 1, 2008 to September 5, 2008.

Based on the EPA's economic modeling of the Lieberman-Warner cap-and-trade policy, offsets and international credits have the potential to lower carbon prices from $70 to $40, while reducing volatility. However, concerns have been raised about the validity of carbon offset programs, centering around the need to make sure that any activities that are funded as offsets result in additional reductions that are verifiable and permanent.[75]

Kansas and other Midwestern states are currently discussing the inclusion of carbon offsets as part of the Midwestern Greenhouse Gas Accord, which calls for the implementation of a regional cap-and-trade.[76] Considerable disagreement exists about the need for offsets, particularly those from agricultural practices. Some favor agricultural offsets as short-term, low-cost carbon mitigation options that will buy some time while low-carbon technologies are developed. Others suggest that most agricultural offsets are already economical and, thus, require no additional economic incentives (subsidies). Some suggest that even though the benefits of agricultural offsets are unknown, inaction has no benefit and, thus, some sort of compromise must be made in order to obtain a working regional cap-and-trade program.[77]

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[75] Recent problems with the United Nation's Clean Development Mechanism (CDM) highlight some of the difficulties associated with offset programs. The CDM was established by the UN as part of the Kyoto Protocol to enable emitters in developed nations to invest in low-cost emission reduction strategies in developing countries and promoted as a "win-win" solution. Unfortunately, 28% of the offset programs within the CDM are programs designed to exploit a loophole in the CDM's approach to reducing the greenhouse gas HFC 23. These programs are collectively valued within the CDM in excess of $6.5 billion, while the simple technology needed to capture HFC-23 would cost less than $150 million. See Michael Wara and David Victor, April 2008, A Realistic Policy on International Carbon Offsets, Freeman Spogli Institute for International Studies at Stanford University: http://pesd.stanford.edu/publications/a_realistic_policy_on_international_carbon_offsets/ (accessed 2008); see also Michael Wara, 2007, Is the global carbon market working?: Nature, vol. 445, p. 595-596. Numbers converted from Euros at a rate of 1.4195 Dollars per Euro.

[76] MGA, 2007, Midwestern Greenhouse Gas Accord 2007—Midwestern Energy Security & Climate Stewardship Summit: http://www.midwesterngovernors.org/Publications/Greenhouse%20gas%20accord_Layout%201.pdf.

[77] Ray Hammarlund, Kansas Corporation Commission Energy Programs Division: personal communication, August 29, 2008

Preliminary Policy Recommendation 14: Increase state agency and private sector efforts to educate farmers (and agricultural landowners) about the benefits—reduced CO_2 emissions, energy and dollar savings—associated with no-till agriculture and existing state and federal conservation programs.

Topic/Issue Description

For centuries farmers have tilled their land in order to aerate the soil, remove moisture-robbing weeds, and bury crop residual for fertilization purposes. However, tillage also increases soil erosion, causing the removal of precious topsoil and pollution of waterways from the runoff of fertilizers and pesticides.

No-till agriculture (NT), as its name suggests, is an agricultural practice that minimizes soil disruption, leaving crop residue on the surface to act as a mulch. In addition to decreasing soil erosion,[78] NT increases soil fertility and its ability to retain moisture and nutrients and decreases runoff of most fertilizers and pesticides which often leach into ground water supplies.

Within agriculture, the easiest way to increase profits is by increasing crop yields or reducing per-bushel costs. Because NT often increases crop intensity (shortening the time a field is left fallow), it allows for additional harvests of a diverse portfolio of crops, which, in turn, reduces risks stemming from price instability and crop failure and spreads fixed costs over more crop acres.[79] NT also reduces the usage of heavy machinery, resulting in a savings of approximately two gallons of diesel fuel per acre,[80] a significant savings with diesel prices higher than $4.00 a gallon. In central Kansas, NT farms have lower total expense ratios—indicating greater cost efficiency—as well as higher profit margins and assets turnover ratios.[81] NT's increased retention of rainwater also reduces costly irrigation expenses. In addition to these economic benefits, NT reduces emissions of carbon dioxide and other pollutants associated with diesel fuel combustion.

NT may also increase the ability of the soil to sequester carbon. Of the 9.6 billion tons of carbon per year emitted into the atmosphere, only 40% remains in the atmosphere primarily due to vegetation absorbing carbon dioxide in photosynthesis and sequestering it underground in terrestrial sinks. Soil tillage disrupts these natural carbon sinks, and cultivated soils are estimated to contain 25% to 50% less carbon than undisturbed soil, though actual rates of sequestration

[78] Annual soil erosion of U.S. cropland decreased 43% from 1982 to 2003, with much of this reduction coming from conservation tillage practices such as NT. John P. Reganold and David R. Huggins, 2008, No-Till: How Farmers Are Saving the Soil by Parking Their Plows, Scientific American, June 30, 2008: http://www.scjam.com/article.cfm?id=no-till (accessed July 2008)
[79] Kansas State University Agricultural Extension, 1999, Kansas No-Till Handbook: http://www.oznet.ksu.edu/library/crpsl2/sections/No-Till.pdf (accessed July 2008)
[80] Kansas State University Agricultural Extension, 2006, Terry Kastens et. al., Energy Use in the Kansas Agricultural Sector: http://kec.kansas.gov/reports/FinalReport_EnergyInAg_6_15_06.pdf (accessed July 2008)
[81] Agmanager.info, 2008, Michael Langemeier, The Relative Cost Efficiency of No-Till Farms in Central Kansas, July 25, 2008: http://www.agmanager.info/crops/prodecon/production/CostEfficiency_NoTillFarms_CentralKS.pdf (accessed July 2008)

depend on soil type and regional climate.[82] Some estimate that global conversion from tillage to NT has the potential to sequester 5% to 15% of annual global carbon emissions for the next 40 to 60 years.[83] In the U.S. terrestrial sequestration may have the potential to reduce annual emissions by 15% to 20%.[84] In most cases, NT only sequesters carbon within the first few centimeters. A recent study of NT's effects on soils within Kentucky, Ohio, and Pennsylvania found that in most instances the amount of carbon sequestered was no different than under regular tillage when deeper soil cores were taken.[85]

NT requires greater uses of herbicides, necessitating proper herbicide management to avoid groundwater leaching of poorly absorbed herbicides. Moreover, under NT crop-rotation becomes even more important, as crop-specific diseases may remain within the past crop's debris.[86] During the first four to six years after switching to NT, increased organic matter at the surface immobilizes nutrients and, therefore, requires application of more nitrogen fertilizer—up to 20 percent more.[87]

To help educate individual farmers on the benefits of NT, Kansas State University's Agricultural Extension has developed a detailed publication entitled *The Kansas No-Till Handbook*, which, "…describes the management systems, economics, nutrient and pest management, equipment, and cropping systems conducive to no-till management."[88] Furthermore, private entities such as No-Till on the Plains (www.notill.org) and the Kansas Farm Bureau (www.kfb.org) hold regular expositions, promoting NT while giving interested farmers easy access to dealers selling specialized NT equipment.

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[82] Rattan Lal, 2008, Carbon sequestration, Philosophical Transactions of the Royal Society B, v. 363, p. 815– 830.
[83] Rattan Lal, 2008. Carbon sequestration rates range from negative to zero in arid and hot climates to 1.1 tons of carbon per hectare in humid and temperate climates. Normal rates of carbon sequestration are estimated to be 0.3 ton to 0.5 ton of carbon per hectare.
[84] Charles W. Rice and Debbie Reed, 2007, Soil Carbon Sequestration and Greenhouse Gas Mitigation: A Role for American Agriculture, Kansas State University Department of Agronomy
[85] Humberto Blanco-Canqui and Rattan Lal, 2008, No-Tillage and Soil-Profile Carbon Sequestration: An On-Farm Assessment, Soil Science Society of America Journal, vol. 72, no. 3, p. 693–701. In most cases, NT only sequesters carbon within the first few centimeters. In a recent study of NT's effects on soils within Kentucky, Ohio, and Pennsylvania, it was found that under most soil types the amount of carbon sequestered under NT was no different than under regular tillage when deeper soil cores were taken.
[86] Kansas State University Agricultural Extension, 1999, Kansas No-Till Handbook: http://www.oznet.ksu.edu/library/crpsl2/sections/No-Till.pdf (accessed July 2008)
[87] John P. Reganold and David R. Huggins, 2008, No-Till: How Farmers Are Saving the Soil by Parking Their Plows, Scientific American, June 30, 2008: http://www.scjam.com/article.cfm?id=no-till (accessed July 2008)
[88] Kansas State University Agricultural Extension, 1999, Kansas No-Till Handbook, page 3: http://www.oznet.ksu.edu/library/crpsl2/sections/No-Till.pdf (access July 2008)

Preliminary Policy Recommendation 15: The State of Kansas should adopt a goal of increasing energy efficiency such that the rate of growth in electricity peak demand and total energy is 50% less than it would have been absent the energy efficiency initiative.

Topic/Issue Description

Nationally, electricity sales (total energy) are projected to grow at an average rate of 1.1% annually (total sales increasing from 3,659 billion kilowatthours in 2006 to 4,705 billion in 2030). The largest increase is in the commercial sector, which is expected to see a 49% growth in demand. In the residential sector, demand is forecast to increase by 27%, compared with only 3% in the expected growth in demand from the industrial sector.[89]

In 2006, Kansas utilities generated 45.5 million megawatthours (MWh) of electricity in 2006, in response to total annual retail demand of 39.7 million MWh.[90] Demand for electricity in Kansas is projected to grow at an average rate of roughly 1.5% to 2% annually for the next 20 years.[91]

Reducing energy consumption through conservation and improved efficiency could result in downward pressure on all energy-related prices, deferral of energy-related investments in new power plants and extraction equipment, reduction in health and environmental costs related to the energy-related emission of pollutants and greenhouse gases. Moreover, energy conservation by individual consumers can result in lower monthly utility bills.

There is little doubt that Kansans have opportunities for cost-effective energy conservation and efficiency improvements. Many existing buildings are poorly insulated or have inefficient heating and cooling systems, resulting in excessive energy use and, consequently, excessive energy bills year round. Cost-effective energy conservation measures—such as upgrading attic insulation to at least R-38 or installing an Energy Star qualified furnace—may reduce energy usage by as much as 20 percent,[92] while providing dollar savings as well.

An oft-cited approach to increasing the adoption of energy conservation and efficiency measures is through utility-sponsored programs—commonly referred to as energy efficiency (EE) programs or demand-side management (DSM) programs. Such programs first appeared in the late 1970s and saw increasing popularity through the 1980s. Utility and ratepayer spending on

[89] U.S. Department of Energy, Energy Information Administration (EIA), 2008, Annual Energy Outlook 2008, Electricity Chapter: http://www.eia.doe.gov/oiaf/aeo/pdf/trend_3.pdf (accessed August 11, 2008).
[90] Energy Information Administration (EIA), 2007, Kansas Electricity Profile: Table 1, 2006 Summary Statistics (Kansas): http://www.eia.doe.gov/cneaf/electricity/st_profiles/kansas.html
[91] Based on preliminary data compiled by KEC staff for forecast load and capacity summaries. Finalized versions will be posted on the web site in coming months. According to the EIA, overall U.S. demand is expected to increase 1.1% annually: Annual Energy Outlook with Projections to 2030: http://www.eia.doe.gov/oiaf/aeo/electricity.html (accessed September 2008).
[92] U.S. Environmental Protection Agency and U.S. Dept. of Energy, 2007, Energy Star web site: http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac and http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing (accessed October 23, 2006).

EE programs peaked at $2.74 billion in 1993 and then declined,[93] coinciding with a decline in political popularity of these programs.

Currently, with energy prices increasing relative to the rate of inflation and growing concerns about the relationship between energy use and the environment, U.S. policymakers are once again focusing on utility-sponsored EE programs (see, for example, the National Action Plan for Energy Efficiency discussed below). Many utilities across the country offer programs that are designed to help their customers use energy more efficiently and, as a consequence, conserve energy. Programs range from efforts to inform and educate (e.g., online energy use calculators, energy efficiency tips) to cash rebates or other direct subsidies (e.g., the recent Change a Light program) to installation of control devices that can actually shut off power at times of peak demand (e.g., smart metering devices), to name a few.

The costs associated with utility-sponsored programs vary widely across utilities and among sectors (e.g., residential, commercial, industrial). In general, programs targeting residential demand tend to cost more than those targeting the commercial and industrial sectors. In fact, a recent summary of 22 utilities in the Midwest, Northeast, West, and Canada indicates that the cost of savings in the residential sector are consistently higher than the cost of the energy saved. In other words, it costs more to save one kilowatthour (kWh) of electricity through utility-sponsored programs than the customer pays for a kilowatthour (kWh) of electricity—anywhere from twice as much to 16 times as much.[94] Of course, this doesn't mean that there are no cost-effective utility-sponsored programs.

Kansas utilities also offer an array of programs, and many are considering expansion of these programs. Although individual EE programs vary greatly among utilities, generally most programs result in somewhat higher bills for all customers to cover the cost of programs used by only some of the customers.

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[93] American Council for an Energy Efficiency Economy (ACEEE), 2000, State Scorecard on Utility Energy Efficiency Programs, by Steven Nadel, Tor Kubo, and Howard Geller: http://www.aceee.org/pubs/u004.htm (accessed November 2007).

[94] For example, the average cost of energy for NYSERDA is $0.16/kWh and the average cost of savings is $2.64/kWh, according to Figure B-27: 2006 Electricity DSM Results by Region, in Energy Efficiency Potential Study for the State of Kansas, prepared by Summit Blue Consulting, LLC, August 1, 2008: http://www.kec.kansas.gov/reports/KEC_DSM_Final_081108.pdf.