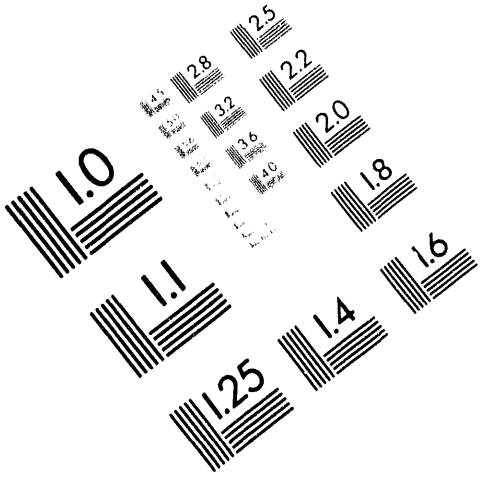

Association for Information and Image Management

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Silver Spring, Maryland 20910

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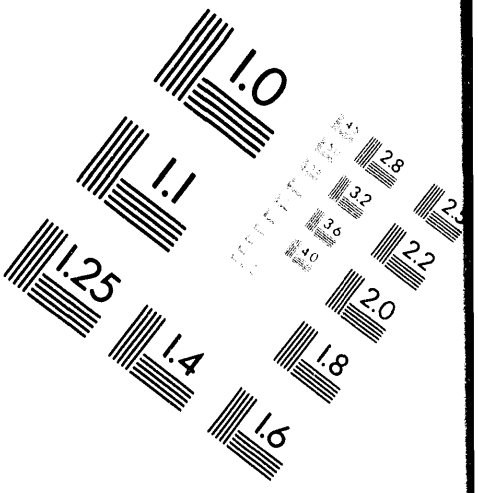

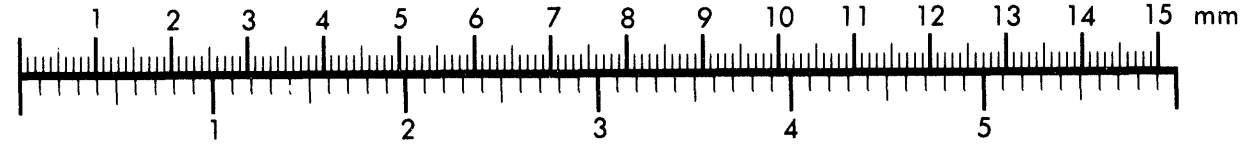

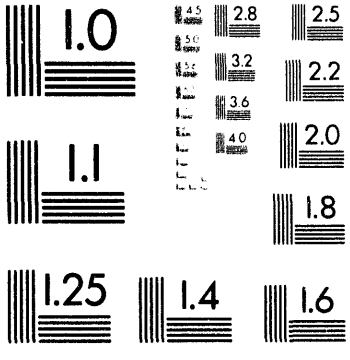

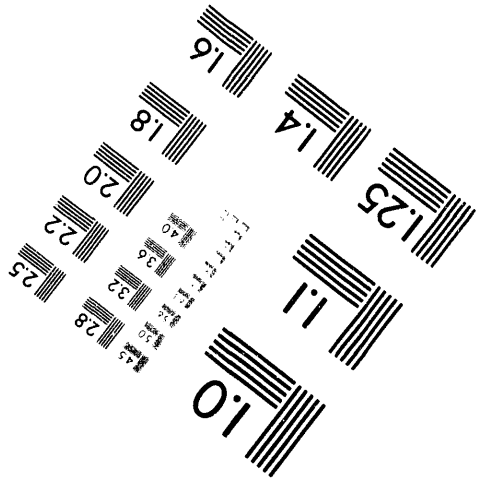

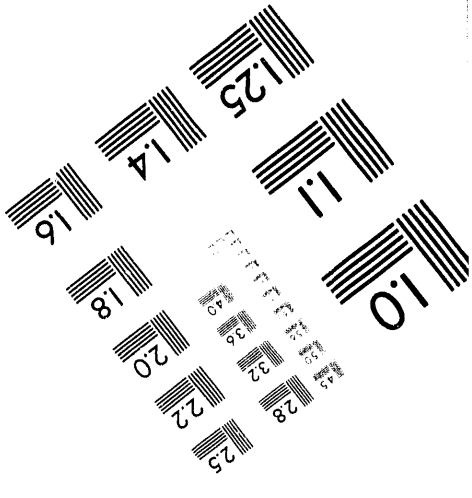

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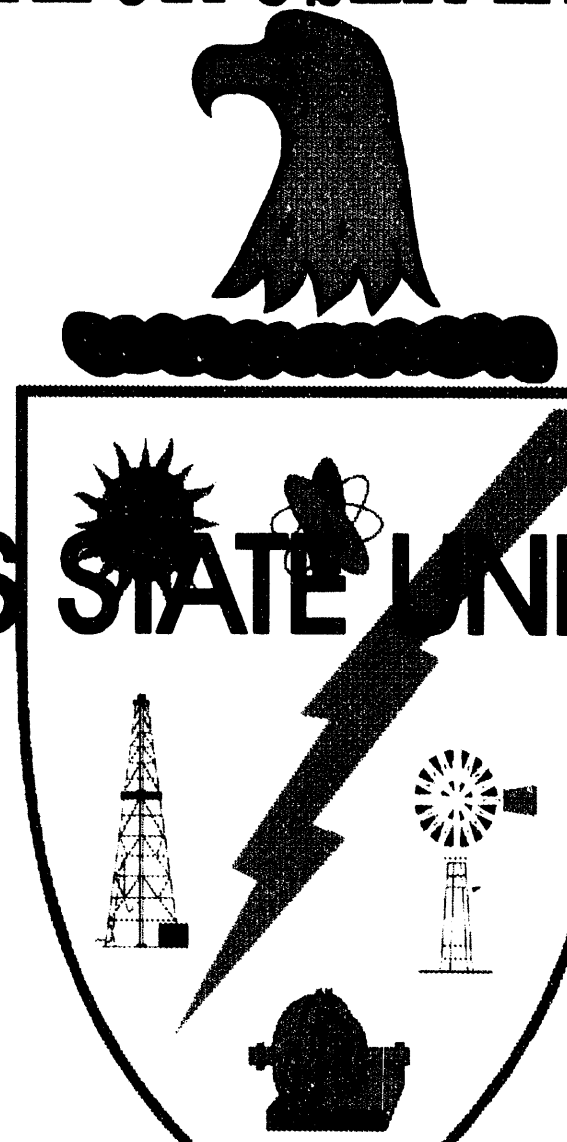
DOE/KEURP

SITE OPERATOR USER TASK FORCE



KANSAS STATE UNIVERSITY

Year 3 Fourth Quarter Report

April 1 - June 30

1994

MASTER

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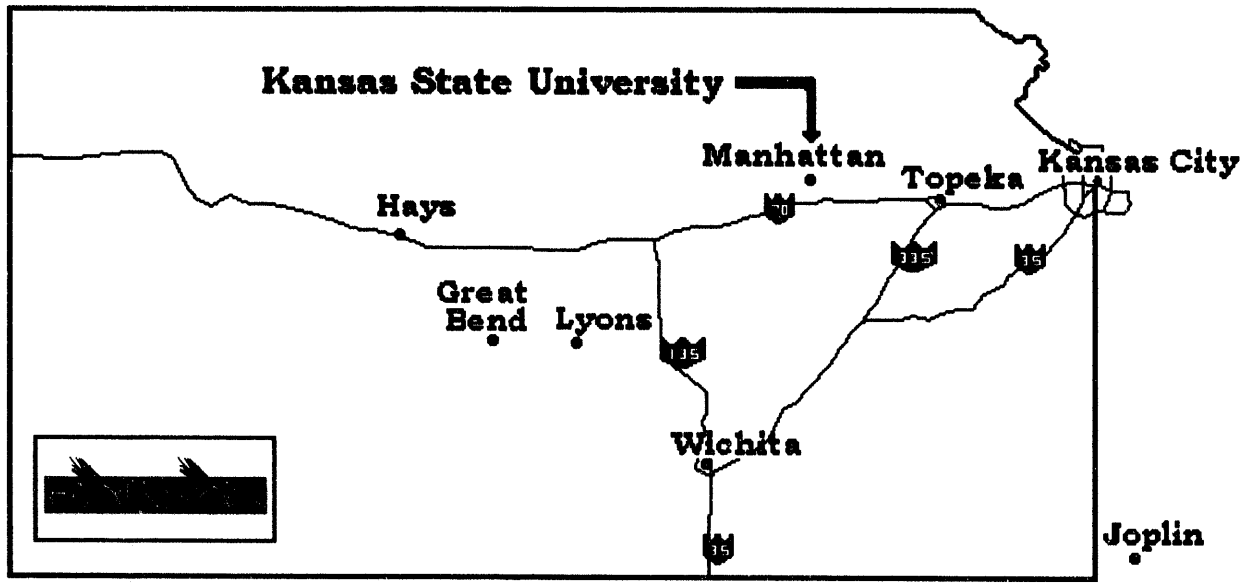
INTRODUCTION

Kansas State University

Kansas State University was founded in February 1863 as a land-grant institution under the Morrill Act. It has evolved into an internationally recognized comprehensive university. Kansas State University offers excellent academic programs, a lively intellectual and cultural atmosphere, and a friendly campus to its community of approximately 17,500 undergraduate and 3,500 graduate students.



The 668-acre main campus is in the northeastern Kansas community of Manhattan. Manhattan is approximately fifty miles to the west of the state's Capital of Topeka and eighty-five miles west of Kansas City. For reference purposes, a state map is provided above. The university offers more than 200 undergraduate degree programs and options, 60 master's degree programs, and 42 doctoral programs within its eight colleges: agriculture, arts and sciences, architecture and design, business administration, education, engineering, human ecology, and veterinary medicine.

K-State accomplishments have had extensive effects: astronaut space gloves and the water-purifying system used on the NASA space shuttles were developed here; two Kansas Centers of Excellence, one in manufacturing and one in value added research are located on campus; the University has national hazardous substance and atomic physics research programs; the Konza Prairie Research Natural Area is used for a National Science Foundation ecological research study on erosion and prairie mammals; and a major national center for basic cancer research is at K-State.

Paul Harvey, in a special commentary, labeled Kansas State University the "student scholar capital of the world." This statement was made based on the number of Rhodes, Truman, Fulbright, Mellon, Goldwater, Phi Beta Kappa, Rotary International, Javits, Tilden-Snow, and Marshall scholarships that have been awarded to K-State students over the past sixteen years.

College of Engineering

The College of Engineering at Kansas State University has excellent programs in every aspect of engineering. The college has an enrollment of 2,600 undergraduates and 300 graduate students. K-State offers degrees or options in almost every major field of engineering, including aerospace, agricultural, architectural, biomedical, chemical, civil, computer, construction science, electrical, engineering technology, industrial, manufacturing, mechanical, and nuclear.

Kansas State's College of Engineering is recognized nationally for the quality of both its students and faculty. Approximately half of all K-State's National Merit Scholarship finalists enroll in the college.

For six consecutive years, one or more K-State students have been selected for Washington, D.C. internships in the Engineering Program. Each year WISE selects a group of only 14 to 16 engineering students from more than 200 engineering colleges across the nation. These students work on engineering and technology public policy issues.

Ray Dempsey, a senior in industrial engineering, was selected as the 1989-90 outstanding black engineer by the National Society of Black Engineers.

K-State's College of Engineering is one of 10 colleges in the country to be cited twice by the National Society of Professional Engineers for its outstanding professional programs. The chapters of the departmental professional sectors have received national recognition. Most recently, agricultural engineering, civil engineering, and construction science have been designated as the outstanding student chapters in the nation.

Kansas Electric Utilities Research Program

Formed on July 15, 1981, the goal of this program is to undertake applied research and development projects that may enhance reliability and minimize the cost of electric service in Kansas. The Kansas Electric Utilities Research Program (KEURP) is a contractual joint venture between six major electric utilities that serve the residents of the State of Kansas:

KEURP

KPL, A Western Resources Company, Topeka, Kansas
Kansas City Power & Light Company, Kansas City, Missouri
KG&E, A Western Resources Company, Wichita, Kansas
WestPlains Energy, Great Bend, Kansas
The Empire District Electric Company, Joplin, Missouri
Midwest Energy, Inc., Hays, Kansas

The establishment of KEURP was made possible by the Kansas Corporation Commission (KCC). The KCC allowed Kansas electric utilities to include research and development (R&D) costs in their operating expenses, including dues to the Electric Power Research Institute (EPRI).

Kansas' universities play a unique role in KEURP with representation on the executive, technical and advisory committees of the program. The universities receive significant direct and indirect support from KEURP through direct funded projects as well as KEURP/EPRI co-funded projects. KEURP is working with EPRI researchers on projects to develop or expand Kansans' knowledge and expertise in the fields of high technology and economic development. KEURP is a major source of funding in the electric/hybrid vehicle demonstration program.

ICE Corporation

ICE Corporation is an original equipment electronics manufacturer. Seventeen employees produce solid state and microprocessor control systems for the aircraft, agriculture, and oil industries. Complete design and manufacturing facilities are located in Manhattan, Kansas.

ICE Corporation was one of seven Kansas companies awarded an SBIR grant from the Federal Government. The grant, from the U.S. Army Small Business Innovation Research Program for $436,000, was earmarked to complete Phase II of ICE's research of high technology power switches. The switches may be used in anything from a computer to an automobile. These switches have ratings as high as 400 DC volts at 100 amperes and yet are only the size of a standard business card. ICE has provided KSU with a $2,000.00 per year written commitment in support of KSU's EHV demonstration program.

Hancock Electric Motor, Inc.

Hancock Electric Motor (HEM) is one of the largest electric motor repair facilities in the state of Kansas. The shop facilities in Lyons, Kansas, contain a welding shop (metalizing, welding, and chroming facilities), machine shop (500 ton horizontal press, 250 ton vertical press, horizontal boring machine, and a 60-inch engine lathe), dynamic balancing, vacuum pressure impregnation system, and capabilities to rewind electric motors with 13,200 volt 10,000 horsepower ratings. AC motors, DC motors, synchronous motors and generators, pumps, traction motors, locomotive main generators, alternators, generators, semihermetic motors, and haul truck wheel motors are all within the realm of HEM's repair capability. Further impedance testing can be done with the 750KVA core loss tester. Labor rates run $40/hour with design and consulting costs at $75/hour plus expenses. HEM is committed to helping KSU in EHV demonstration, research, testing, and evaluation and has provided a letter of commitment for $2,000.00 per year for the life of DOE's contract. HEM has recently taken steps to allow production of electric vehicles to meet growing market demands within the Midwest region.

Hancock
ELECTRIC MOTOR, INC.

EHV Corp

EHV Corp is a Kansas Company specializing in manufacturing infrastructure components for the electric vehicle industry. The home office of EHV Corp is located in Manhattan, Kansas. Manufacturing of electrical and mechanical parts is accomplished by other companies while EHV Corp is primarily concerned with the research and development of new products and the assembly of existing products. EHV Corp has received an economic development grant from the state of Kansas for development of its EDD-7 charging station. Further, EHV Corp has developed proposals to DOE and EPRI concerning its products. EHV Corp recently delivered its first meter for testing by a governmental laboratory. EHV Corp is hoping to establish a national demonstration program for curbside recharging within the next twelve months. This project would involve the Federal Government, Underwriters Laboratory, and major utilities in establishing curbside charging stations in major urban centers. EHV Corp has provided a letter of commitment for $10,000.00 to establish this national demonstration program.

Advanced Manufacturing Institute

The Advanced Manufacturing Institute (AMI) was established to promote technology transfer in the state of Kansas. AMI's goal is to develop and transfer new technology to commercial manufacturers. This Center of Excellence, located in the College of Engineering, is funded by the Kansas Technology Enterprise Corporation that derives its funding through the state lottery system. AMI strives to increase economic development through research and technology transfer in advanced areas of manufacturing technology. The institute's objectives are to help Kansas companies by working with them to expand services, design new products, and increase productivity. Special emphasis is given to the needs of smaller companies.

KPL, A Western Resources Company

Kansas Power and Light Company is part of Western Resources. Western Resources supplies electricity and natural gas to most of Kansas and portions of Missouri and Oklahoma. Although KPL provides funding to K-State's electric vehicle program through its membership in KEURP, it provides additional funding directly to K-State in support of electric vehicle programs. KPL has been involved with K-State during the last fifteen years in providing support for electric vehicles. KPL engineers are working with K-State to develop a national demonstration program to evaluate infrastructure technology for electric vehicles.

PROGRAM PLAN.
Statement of Objectives

Short Term Goals (1 year)

1. Participate in the Department of Energy's Site Operator Program.
2. Evaluate Electric/Hybrid Vehicle technology through purchase of vehicles.
3. Collect user data and develop historical perspective on vehicle requirements.
4. Provide reports to DOE and KEURP on EHV data collected.

Long Term Goals (5 years)

1. Assist the nation in reversing environmental trends concerning air quality.
2. Assist Kansas City in reducing air pollution.
3. Apply and develop technological enhancements to EHVs.
4. Assist Kansas-based companies in developing EHV subsystem components for commercial use.

Kansas State University, with funding support from federal, state, public, and private companies, is participating in the Department of Energy's Electric Vehicle Site Operator Program. Through participation in this program, Kansas State is displaying, testing, and evaluating electric or hybrid vehicle technology. This participation will provide organizations the opportunity to examine the latest EHV prototypes under actual operating conditions. KSU now has two electric cars. Both are electric conversion vehicles from Soleq Corporation out of Chicago. KSU in conjunction with KEURP has initiated procurement for the purchase of four (4) Chevy S-10 pickup trucks.

The Soleq EVcorts have not been signed to illustrate to the public that it is an electric vehicle. In order to demonstrate the technology as feasible, the EVcort was deliberately not signed. Magnetic signs have been made for special functions to ensure sponsor support is recognized and acknowledged. The four Chevy S-10 pickup trucks will be used throughout the state by utility companies that are participating with K-State's Site Operator Program.

SIGNIFICANT EVENTS/MEETINGS/PUBLICITY

PRESENTATIONS

First Quarter

September 10 — *Networking for Career Enhancement Workshop* — *Lawrence, KS*
Professor Hague was a member of a panel that discussed women in engineering. Further, Professor Hague made a presentation on electric vehicles, research opportunities, and what it takes to start a small research oriented firm.

September 13 — *Honors Seminar* — *Manhattan, KS*
Professor Hague presented an overview of the DOE Site Operator Program to the College of Engineering's Academic Honor Classes. Don Rathbone, Dean of Engineering, teaches a "specific topics" class to honor's students. Approximately seventy of the top twenty-five hundred students enrolled in engineering at K-State had an opportunity to learn more about alternative fuel vehicles from Professor Hague.

Second Quarter

October 11 — *Fort Riley Elementary School* — *Manhattan, KS*
Professor Hague, at the request of Fort Riley's Technology program presented an hour program on electric and hybrid vehicle technology to three different eighth grade classes. Students were asked to write a report on the environment and the impact electric vehicles would have. Faculty members chose the best reports and those students were given rides in the K-state electric vehicle.

October 14 — *Beech Aircraft* — *Wichita, KS*
Professor Hague and Mrs. Jean Waters visited with Beech engineers to discuss possible advanced technology design electric vehicles. Beech Aircraft, which is based in Wichita, has already been contacted by Ford Motor Company about possible advanced vehicles design projects. Further, as part of an ARPA project, Beech Aircraft is working with Georgia Tech on a bus project. Beech was very receptive and interested in Kansas State University's electric and hybrid vehicle program and further talks are planned between both organizations.

October 25-28 — *Fort Leavenworth* — *Leavenworth, KS*

Western Resources, Inc., presented an electric vehicle slide show to a number of different schools in Leavenworth. K-State's Soleq EVcort was to be on display during the presentations but, due to logistical problems the vehicle was not used. Media coverage was available from both the school and local newspaper coverage.

November 12 — *Logan Junior High* — *Topeka, KS*

Western Resources, Inc., Wade Graves, presented an electric vehicle demonstration to Logan Junior High School's seventh grade class. Wade presented information about the future of electric vehicles and took students and faculty members for a ride in the Soleq EVcort.

November 19 — *QuailRun Elementary School* — *Lawrence, KS*

Western Resources, Inc., Wade Graves, presented an electric vehicle demonstration to QuailRun Elementary School. Wade presented a talk and vehicle demonstration to four first grade classes and their respective faculty representatives. The teachers were not comfortable with any students riding in the electric vehicle so no actual rides were given.

November 29 — *Dean's Honor Course* — *Manhattan, KS*

Professor Hague made two presentations on alternate fuel vehicles to the honor students class. The Dean of Engineering teaches this class for engineering students having a grade point average of 3.5 or higher. The course presents a wide variety of topics and issues that will challenge the next generation of engineers. The course's purpose is to add breadth to the engineering students curriculum. Further, it is an attempt to focus the students to recognize the worldwide issues and problems which may require engineering expertise. Obviously, transportation is a worldwide system and therefore presents universal problems that requires the best engineering minds to solve.

December 4 — *Scholarship Day* — *Manhattan, KS*

Every year, Kansas State University hosts parents and their high school students who are thinking of attending K-State within the following year. An entire day is devoted to bringing them on campus, meeting with administrators and faculty, and touring K-State facilities, special presentations are offered on some of the research that is currently being pursued at K-State. For the past two years, the Department of Energy's electric vehicle program has been high lighted. Professor Hague again made the presentation to over 100 participants. Significant interest is demonstrated by parents and prospective students and it is not unusual for this fifty minute event to last several hours, especially when a drive in the electric vehicle is offered. This year, the Soleq vehicle broke down with

the first demonstration drive. For those disappointed individuals, it was explained that is better to "experience and develop" the product here on campus before it comes into the general market. Visitors were enthusiastic and requested the electric vehicle be available each parents weekend so they could experience this new technology.

December 8 — *Western Resources* — *Topeka, KS*

Western Resources held its annual marketing meeting. The electric vehicle, EHV Corp's charging station, and the Meltric plug & cord display were all part of this annual event. Four forty-five minute sessions on EV technology were presented concurrently with NGV technology. The information was well received by interested stockholders.

Third Quarter

January 13 — *Manhattan High School Ecology Class* — *Manhattan, KS*

Professor Hague, at the request of Manhattan High School's Ecology class, presented three one hour programs on electric and hybrid vehicle technology and the effects of this technology on the environment. At the close of each program, rides in the electric vehicle were given to selected students.

February 9 — *Oakley Futurism Science Seminar* — *Oakley, KS*

Kansas State University's College of Engineering representatives was requested to participate in an educational seminar in Oakley, Kansas. The purpose of the seminar was to acquaint students, from rural communities with different areas of engineering they could pursue in a college career. Professor Hague presented topics on electric and hybrid vehicles and discussed opportunities that are available to work with such agencies as the Department of Energy during summer internships.

February 19 — *Odyssey of the Mind* — *Hesston, KS*

Western Resources requested Kansas State University's electric vehicle program demonstrate electric vehicle technology. Jarrett Thummel, a student assistant, presented an electric vehicle demonstration to participants in the "Odyssey of the Mind" science competition. Student competitors ranged from elementary grades through high school. In addition, the Soleq electric vehicle was used as a shuttle for judges and participants. Personnel were shuttled between the elementary and high school where the competition was being held. Students and faculty seemed very enthusiastic about electric vehicles and provided many positive comments.

February 23-25 *Pittsburg* *Pittsburg, KS*

Western Resources, Inc. representative, Wade Graves, presented an electric vehicle demonstration to Pittsburg High School students. Mr. Graves took two days out of his work schedule in order to demonstrate electric vehicle technology to the southeastern Kansas community. Mr. Graves received positive responses from all students and faculty.

Fourth Quarter

April 4 - May 6 *Alternative Fuels Education Road Show* *Throughout Kansas*

At the request of Western Resources, Professor Hague will take K-State's electric vehicle on a 14 day 13 site alternative fuels tour. This tour will enable Professor Hague to explain the developing technology in electric vehicles to high school and junior high students. This trip and a similar one planned for the fall school semester will travel to 32 different Unified School Districts. By the time the trip is done over twelve thousand students and several thousand faculty will have been given information on alternate fuel vehicles. This entire tour will be undertaken through a program established by the Kansas Corporation Commission to demonstrate advanced fuel technology throughout the state of Kansas.

April 21-23 *Rainforest Action Group* *Manhattan, KS*

In observance of Earth Day, Manhattan City Zoo sponsored an electric car exhibit to show one of the many ways energy can be utilized to ensure preservation of our earth's natural resources.

May 2 - 5 *West Plains Energy Show* *Central Kansas*

Mike Sauber, West Plains Energy representative, scheduled the use of Kansas State's electric vehicle. The vehicle was shown to area junior and senior high school students. Mr. Sauber showed the vehicle with brochures and information provided by DOE's Site Operator Program at Kansas State University.

MEDIA EVENTS

First Quarter

September 3-8 *Nebraska State Fair* *Lincoln, NE*

Kansas State University, in support of the Department of Energy's Regional Office, the Nebraska Energy Office, and Nebraska Public Power, set up a display of electric vehicle materials, an electric vehicle, and infrastructure

systems at the Nebraska State Fair. K-State personnel were available to answer questions during the week long event. K-State personnel attended a reception at the Governor's mansion in Lincoln and provided a number of dignitaries the opportunity to drive the latest electric vehicle technology. Other alternate fuel vehicles were on display at the fair but clearly, the public's interest was in the electric vehicle.

September 8-20 — *Kansas State Fair* — *Hutchinson, KS*

Kansas State University, in support of the Department of Energy's Regional Office, the Kansas Corporation Commission, and Western Resources, Inc provided electric vehicle materials, an electric vehicle, and infrastructure systems for the Kansas State Fair. Western Resources personnel were available to answer questions during the week long event. Western Resources' electric vehicle program received coverage both on local television stations and in local newspapers.

Second Quarter

October 21-23 — *S/EV93* — *Boston, MA*

Kansas State University was requested to participate in S/EV93. Further, EHV Corp was asked to display its curbside charging stations at this event. Due to previous commitments, no one from K-State or EHV was able to attend this event but brochures outlining the Site Operator Program and EHV Corp's charging station were provided to be handed out during the conference.

December 1-3 — *National EPRI Convention* — *Scottsdale, AZ*

Kansas State University participated in EPRI's Second National Infrastructure Convention. EHV Corp, as part of K-State's Site Operator Program displayed its curbside charger. EHV Corp's EDD-7 charging station was selected by EPRI to receive the largest cash award in the "EV Ready" category infrastructure design competition. This award was presented to EHV, Western Resources, and Kansas City Power & Light representatives during this convention.

Third Quarter

January 7 — *Advanced Manufacturing Institute Show* — *Manhattan, KS*

Kansas State University's Advanced Manufacturing Institute asked EHV Corp to participate in a Poster Display at their annual meeting held on K-State's Campus. EHV Corp provided the K-State Site Operator Program with an EDD-7 charge station for display. EHV Corp displayed a poster and a trophy which had been recently presented to EHV Corp for winning

the Electric Power Research Institute "EV Ready Award."

March 15-18 — *EV 500* — *Phoenix, AZ*

Kansas State University attended the EV 500. Several meetings were held during the annual APS race. These meetings were held with the Department of Energy to discuss the emerging EV America program. Kansas State University also worked with EHV Corp during this race. EHV Corp provided infrastructure equipment which was used during the race. In fact, one highlight during the race, Hughes Inductive Chargers were plugged into the EHV Corp EDD-7 in order to operate their systems during the race. This event proved that in fact Inductive charging needs a connective point in order to operate, so in essence, Hughes' system can be labeled a "connective/inductive" system.

Fourth Quarter

April 4 - May 6 — *Alternative Fuels Education Road Show* — *Throughout Kansas*

Media events are planned for local radio and television stations at each stop of the Alternative Fuels Education Road Show. The idea is to generate as much local interest and educate local communities about emerging alternate fuel vehicle technology.

May 19 — *Kansas Alternative Energy Day* — *Topeka, Kansas*

The annual Kansas Corporation Commission (KCC) Alternate Fuel Energy seminar was held May 19. The KCC split the event into a "road show" and a one day conference this year in order to disseminate more information to the general public.

May 21 — *City Park Car Show* — *Manhattan, Kansas*

The annual Manhattan Car show again will feature a DOE/K-State display demonstrating electric vehicle technology. Along with the static display of poster and vehicle, EHV Corp has agreed to display the EDD-7 charge station.

MEETINGS

First Quarter

July 12 & 13 — *Working Group Meeting* — *Detroit, MI*

Professor Hague was requested to participate on the Vehicle Production Working Group Committee that is part of the Presidential Federal Fleet Conversion Task Force. As a member of both the vehicle production working group and the main Task Force, Professor Hague will serve as

part of an advisory council to President Clinton. The working group met to discuss and offer opinions on how to produce alternative fueled vehicles.

July 14 — *INEL/DOE Meeting* — *Idaho Falls, ID*

Professor Hague, K-State, and Mr. Brad Johnson, PEPCO, traveled to Idaho to meet with Department of Energy and INEL personnel. The purpose of the visit was to discuss the 1993-1994 activities of the Site Operator Users Task Force.

July 19 & 20 — *Working Group Meeting* — *Washington, D.C.*

The Presidential Federal Fleet Conversion Task Force met to formalize all recommendations from the various working group committees. A draft report was developed during this two day meeting to be delivered to President Clinton by Gary Mauro, Texas Land Commissioner, on or before August 1, 1993.

August 12 & 13 — *Site Operator Users Task Force Meeting* — *Orcas Island, WA*

The quarterly meeting of the Site Operator Users Task Force was held at Orcas Power & Light. All members were in attendance except for the Los Angeles Department of Water & Power. The main topic of discussion was development of a SOUTF specification for the purchase of forty or more electric pickup trucks. The next SOUTF quarterly meeting was scheduled for December 8, at College Station, Texas.

September 8 — *KEURP Budget Meeting* — *Manhattan, KS*

KEURP's Electric Vehicle Advisory Council met at Kansas State University. Professor Hague presented specific task information, programmatic information, and budget information. The advisory council will review all facts and make recommendations to the KEURP Technical Committee in October. This meeting was held in order that Professor Hague will know what financial support is available from KEURP for the coming year. DOE has asked for "strawman proposals" by 1 October. Once the President's Budget has been signed, DOE will advise each site of available funding.

September 21-22 — *DOE/SOUTF Planning Meeting* — *Kansas City, MO*

A special meeting was held with General Electric, Hughes, and Westinghouse to discuss their respective capabilities in delivering forty or more electric pickups for the Site Operator Users Task Force. Specifications were discussed in general and each potential bidder made a presentation to SOUTF on their respective consortiums and their capabilities to produce required vehicles.

September 29 — *Budget Meeting* — *Manhattan, KS*

A budget meeting was held at Kansas State University. Discussion topics included Underwriters Laboratory approval of EHV Corp charging station, contract requirement for the coming year, funding sources, and participants capabilities. Organizations in attendance were Western Resources, Kansas State University, EHV Corp, and the Advanced Manufacturing Institute.

Second Quarter

October 18-21 — *Contractor's Coordination Meeting* — *Dearborn, MI*

The Automotive Technology Development Contractor's Coordination Meeting was held in Dearborn, Michigan. As Chairman of the Site Operator Users Task Force, Professor Hague presented this information October 21 at 11:20 a.m. Professor Hague finalized the paper for submission to DOE for printing in the annual Contractor's Coordination Report printed by The Engineering Society for Advancing Mobility Land Sear Air and Space.

November 15 — *Entrepreneurial Center* — *Manhattan, KS*

Professor Hague met with John Walters, Director, Kansas State University Entrepreneurial Center to discuss EHV Corp and its patented charging station. Discussions were focused on present and new patents EHV Corp has or is obtaining to protect infrastructure components now being developed.

December 1-3 — *EPRI Meeting* — *Scottsdale, AZ*

Professor Hague attended the Second Annual Electric Power Research Institute Seminar. Professor Hague attended this seminar with representatives from Western Resources and Kansas City Power & Light utility companies.

December 8-9 — *FFCTF Meeting* — *Washington, DC*

Professor Hague attended the Federal Fleet Conversion Task Force meeting. At this meeting the FFCTF's initial report was officially presented to President Clinton, Vice-President Gore, and Secretary O'Leary by Gary Mauro, Chairperson of the Task Force. The Task Force is assisting the President in formulating a plan to accelerate the conversion of federal vehicles to alternate domestic fuel use.

December 8-10 — *Site Operator Users Task Force Meeting* — *College Station, TX*

The SOUTF meeting was held at Texas A&M. Responses to the SOUTF proposals for forty vehicles were reviewed with additional action items developed. The desire of the SOUTF is to purchase orders during first quarter 1994. Final comments and commitments are being requested form

prospective suppliers.

December 13-15 — *UL Meeting/Return Soleq Electric Vehicle #152* — *Chicago, IL*

Professor Hague met with Underwriter Laboratory representatives to discuss U.L. Listing procedures. The meeting also covered the initial review, by U.L., of the requirements for the EDD-7 charging station to be listed by Underwriters Laboratory. Further, during this trip, the Soleq EVcort was returned to Chicago for a minor review of systems. This vehicle had a problem with the dc-dc converter and therefore the accessory battery would not maintain charge. Soleq quickly found and repaired the problem. It turned out to be a loose connection of the base of a transistor connection within the dc-dc convertor.

December 19-21 — *Soleq Electric Vehicle #152* — *Chicago, IL*

Two students from Kansas State University drove to Soleq's facilities in Chicago to transport the second vehicle, that had been purchased from Soleq, back to Kansas. This vehicle was officially ordered January 8, 1992. Although the vehicle is an excellent representation of electric vehicle technology, the delay in receiving the product has caused great consternation for all participants.

Third Quarter

January 4 — *KEURP Budget Meeting* — *Topeka, KS*

Representatives from the Kansas Electric Utilities Research Program and participating utility representatives met at KEURP. The purpose of the meeting was to discuss Contract Year 3's budget for the Site Operator Program based at Kansas State University. The budget and major tasks were approved for the coming year.

January 7 — *AMI* — *Manhattan, KS*

The Advanced Manufacturing Institute presented information at its annual meeting. Highlights of this year's presentations included discussion of the Department of Energy's Site Operator Users Task Force Program at Kansas State University.

January 31 — *Multi Media Show* — *Topeka, KS*

Wade Graves, Western Resources, and Jim Hague, K-State, attended a seminar on Multi-media presentations. Both organizations were gathering information on how to improve presentations routinely presented on electric and hybrid vehicle technology.

February 2 — *KEURP Meeting* — *Topeka, KS*

K-State representatives met with KEURP representatives. KEURP will be issued a subcontract to collect data on new vehicles being purchased by KEURP, as part of the Contract Year 3 program.

February 3 — *KEURP Buyers Meeting* — *Topeka, KS*

Representatives from each utility interested in purchasing electric vehicles through their respective organizations or as part of the DOE Site Operator Program met to discuss procurement procedures. Jim Hague, Kansas State University representative presented sample invoices and specifications to be used by each of the utilities or KEURP in the procurement of any electric vehicles from General Electric and Spartan Motors. Further, a discussion was held about what type of data would be required to be collected for the Department of Energy's Site Operator Program.

February 15 — *EPRI EVRN EHV Presentation* — *Austin, TX*

Kansas State University's Site Operator Program, in participation with EHV Corp, made a presentation at the Electric Power Research Institute's Electric Vehicle Research Network (EVRN) quarterly meeting. The focus was on EVRN's infrastructure project and the desire to establish more infrastructure for electric vehicles. Since that meeting EHV Corp has been requested to provide more information to EPRI and the EVRN members in order to determine if they want to pursue purchasing some quantities of meters for installation and testing.

February 17 — *KEURP Visit* — *Manhattan, KS*

The Director of KEURP visited K-State's campus to discuss Contract Year 3's program items and the budget. Specific issues raised concerned the purchase transaction of vehicles by KEURP and its member utilities, collection of data on subject vehicles, and overall program operation. A short time was spent discussing opportunities for Contract Year 4.

March 7 — *Hancock Electric Motor Inc.* — *Lyons, KS*

The Chrysler Dual Shaft Electric Propulsion (DSEP) Minivan was transferred to Hancock Electric Motor. The vehicle will become part of Hancock's research program of advanced AC motor and controller technology. Mr. Hancock states that his company will attempt to "rejuvenate" the Minivan. Hancock Electric plans to use the vehicle in day to day operations around the plant and within town.

March 18-20 — *APS Electric 500* — *Phoenix, AZ*

K-State attended the annual APS Electric 500 in conjunction with the Department of Energy's Site Operator Program. Meetings were held with DOE, INEL, ETC, PEPCO, and other interested agencies about general electric vehicle program initiatives and the EV America program.

March 29-31 — *Site Operator Meeting* — *Tampa, FL*

K-State participated in the quarterly meeting of the Site Operator Users Task Force. It was held on campus at the University of South Florida. It was determined that the SOUTF Chairman (Kansas State University) should make a presentation at *EVS*12 to be held in Los Angeles, California during December 1994.

Fourth Quarter

May 26 — *Electric Transportation Advisory Meeting* — *Topeka, KS*

Professor Hague met with the KEURP Advisory Groups to discuss the purchase of the S-10 pickups and review other vehicle technology.

June 6-7 — *Innovatron Meeting* — *Los Angeles, CA*

Professor Hague met with representatives from Innovatron Data Systems to discuss advanced technology payment systems. The charge station utilized by EHV Corp and K-State in the Site Operator Program uses advanced technology payment systems. K-State has other projects where this payment technology would be applicable. Discussions were opened to determine how K-State or other participants in the Site Operator Program might be able to utilize Innovatron's payment technology in future activities.

June 24-25 — Sunrayce 95 — *Manhattan, KS*

Professor Hague met with DOE and NREL representatives along with a number of college participants planning the Sunrayce 95 event. Kansas State University will serve as host for this event next year. K-State's electric vehicles were on display and just about all forty-three participants involved in Sunrayce 95 took the K-State electric vehicles for a test drive. K-State is looking forward to being an overnight host for this major event.

VEHICLES/COMPONENTS/BATTERIES

Soleq EVcorts

Both vehicles have performed during this reporting period without major incidents. The first EVcort, VIN 1FAPP15JXPW125411, which will be referred to by the Department of Energy's electric vehicle ID number 151, was delivered May 13, 1993. The second EVcort, VIN 3FAPP15J9PR106495, which will be referred to by the Department of Energy's electric vehicle ID number 152 on all the maintenance reports, was delivered to Kansas State University December 21, 1993.

During the last quarter, EVcort 151 was returned to Soleq to have its air conditioning system worked on. With the advent of summer the air-conditioning system will be given a thorough test for proper operation. In addition to air-conditioning maintenance and general inspection of the vehicle, the regenerative braking system, which was previously malfunctioning, was repaired and the vehicle was returned to Kansas State University January 4. EVcort 151 is again experiencing a problem with its regenerative breaking system. Previously, the regeneration system was too sensitive and the vehicle experienced "jerky" intervals when brakes were applied. Recent complications have developed at the opposite spectrum. Now the regeneration does not "catch" when the vehicle is operated at low rates of speed. Plans are being arranged with Soleq Corporation to repair the controller, where the problem is suspected to be located. EVcort 151 has now reached a total mileage of 2,630 miles as of the end of the reporting period.

EVcort 152 and 151 have both experienced a failure of the pre-heating and pre-cooling system. It is suspected that the relay that controls the operation of the pre-heating and pre-cooling system (one relay) has failed. Discussion with Soleq indicates they are investigating the problem and believe it to be a simple solution. Discussion with Platte River Power Authority about the relay indicates that to date, Platte River's vehicles pre-heating and cooling system has not failed. After a lengthy discussion, it was determined that other than checking initial operation, the Platte River vehicle's systems have not been extensively used like K-State's vehicles. This may account for the reason the Platte River system has not failed to date. EVcort 152 has also ran the 12 volt battery system down. The vehicle's brake lights remained in an "on" condition even after the brake pedal was released. This ran the 12 volt battery down even though the main battery pack had a full charge. To date it has not been possible to duplicate the problem. Discussions with Soleq agree that the problem will probably resurface and the vehicle will be watched closely over the next several hundred miles. To date the EVcort 152 has reached a total mileage of 1,004 miles as of the end of the reporting period.

OPERATIONS/ACTIVITIES

Soleq EVcort

The Soleq EVcort, DOE number 151, has been operated regularly since it was received in May 1993. During this past quarter, the vehicle has been displayed at various locations throughout the state. Included were shows to area high schools and junior high schools. The vehicle's participation was sponsored by Kansas State University and Western Resources to promote electric powered vehicles. During the previous quarter, the EVcort was reported as experienced a repetitive failure of the regenerative braking system. Although K-State plans to return the vehicle to Soleq Co. in Chicago, to this point no arrangements have been finalized. Soleq is very anxious to have the vehicle returned to Chicago for the repair. In addition, Soleq has been very interested in the performance of the air conditioning system. Last summer the air conditioning system was not working properly. Soleq dissolved the problem during the Autumn of 1993. Recently, due to the increasingly warmer temperatures, K-State has been able to test the system and has no complaints. No other problems have been encountered.

The Soleq EVcort, due to its on board charger, is not only driven in various weather conditions, but is also able to be charged under adverse weather conditions. The EVcort is subjected to normal everyday driving conditions in and around the Manhattan area. The vehicle performs comparably to the standards of the average conventional vehicle(internal combustion). Table 1 gives a general look at data collected on the EVcort to this point.

CONTRACT YEAR TWO

	DATE	MILES	DAILY MILES	NUMBER OF CHARGES	MILES PER CHARGES	KWH USED	KWH PER MILE
1st Quarter	09/30/93	662.9	7.37	40.0	16.57	527.0	0.79
2nd Quarter	12/30/93	514.4	5.85	32.0	16.08	318.0	0.67
3rd Quarter	03/31/94	744.8	8.28	50.0	14.90	410.0	0.55
4th Quarter	06/31/94	842.9	9.36	53.0	15.90	441.0	0.52
TOTAL	TO DATE	3521.3	7.71	175.0	15.90	2131.0	0.60

TABLE 1. EVcort (151) OPERATION SUMMARY

Assuming a price of $.05/Kwh for electricity, and 25 miles per gallon for an internal combustion engine 1993 Ford Escort, the cost of operating the EVcort on electricity equates to $.75 per gallon of gasoline.

Soleq EVcort, DOE number 152, which has recently become a part of Kansas State's electric vehicle program, has been operated regularly during this quarter. The vehicle is performing as expected, except for two minor problems previously discussed on page 12. As can be seen from the enclosed charts, the two vehicles (DOE 151, 152) are performing at the same levels. Due to the recent rise in alternative fuel popularity, Kansas State University's electric vehicle program has been busy fulfilling requests for electric vehicle presentations and shows. Without the help of an added vehicle such as this (DOE 152), Kansas State University could not have met the customer demand for information. Additional vehicles during the next year should be very helpful. K-State is very appreciative of the arrival and support that has been provided in receiving the second EVcort (DOE 152).

CONTRACT YEAR TWO

	DATE	MILES	DAILY MILES	NUMBER OF CHARGES	MILES PER CHARGES	KWH USED	KWH PER MILE
1st Quarter							
2nd Quarter	12/30/93	147.7					
3rd Quarter	03/31/94	961.3	10.68	60.0	16.02	629.0	0.65
4th Quarter	06/30/94	357.9	3.98	23.0	15.57	183.0	0.51
TOTAL	TO DATE	1319.2	7.33	102.0	12.93	846.0	0.64

TABLE 2. EVcort (152) OPERATION SUMMARY

Assuming a price of $.05/Kwh for electricity, and 25 miles per gallon for an internal combustion engine 1993 Ford Escort, the cost of operating the EVcort on electricity equates to $.80 per gallon of gasoline.

PROCUREMENT OF NEW VEHICLES

Chevrolet S-10 Vehicles

The Kansas Electric Utilities Research Program, in participation with the Department of Energy's Site Operator Program, is purchasing four Chevy S-10 pickup trucks for conversion to electric. The motor/controller technology is being provided by General Electric and the conversion is being accomplished by Spartan Motors. Delivery of the vehicles are expected around late August.

Several concerns have arisen from discussion with interested parties about the Chevy S-10:

a) It has been noted that the power steering system has been dropped from the conversion process. A manual steering system is expected to be used. There is concern that the added weight of the batteries and other components will make the use of the manual steering system difficult at best. Clearly, if this product were intended for the general public a manual steering system would be unacceptable. Each utility will have to evaluate their purchase order and specifications to determine what, if any action, they will take on this matter.

b) General Electric has reported that an American Monarch battery charger will be installed on the S-10. The weight of the charger has been reported at around 100 pounds. GNB has agreed that this is an acceptable battery charger to be used for charging the lead acid batteries to be installed on the vehicle. The concern is that more advanced and light weight battery chargers are available for use in this vehicle. Presently, GE and Spartan are reporting that the vehicle's cargo capacity is around 300 pounds with all systems installed on the vehicle. This means that the S-10 as presently proposed will become a two-person vehicle with no cargo carrying capacity. Again, each utility purchasing the S-10 will need to evaluate the specifications and purchase order for conformance and acceptability.

c) The Meltric plug and receptacle being installed in the S-10 for both the General Electric and Electric Car manufactured vehicles has created problems. It seems that GM changed the style of the 1994 gas cap and Meltric's receptacle will no longer fit in the gas cap area. Further, most utility representatives would like the receptacle on the front of the electric vehicle. GE and Electric Car claim that the harsh environment seen by the Meltric receptacle at the front of the S-10 would make it difficult to install in such a location. Presently, Meltric Corporation is working to find a solution to this problem along with the car converters. The last discussion with all parties concerned indicated that the receptacle would be located at the front of the vehicle.

SUMMARY/CONCLUSION

K-State has concluded the fourth period. The G-Van and Chrysler DSEP vehicles have been transferred to other organizations that can use them in their electric vehicle R&D programs. Since the companies that received the G-Van and Chrysler DSEP vehicle are associated with K-State's electric vehicle program, a beneficial relationship and additional information is expected to be gleaned from further use of these vehicles. The two Soleq vehicles continue to receive increased requests for demonstrations, displays, and use. Except for minor mechanical problems associated with operating any complex product, the EVcorts are operating in a routine manner. These vehicles clearly stand out as remarkable pieces of machinery that prove electric vehicles, with limited battery range technology, are feasible and useful to off-set the pollution caused by internal combustion engine vehicles.

During this past year Professor Hague served on a Presidential Task Force. The Federal Fleet Task Force focused on establishing a federal plan for converting the federal fleet to alternate fuels. Professor Hague entered his second year serving as Chairman of the Site Operator Users Task Force. Further, K-State in support of Western Resources participation with the Kansas Corporation Commission is traveling the state to educate the public on the use of electric and other alternate fuel vehicles. As such, K-State is involved at all levels of federal, state, and local government in promoting electric vehicle legislation, technology development, and public use of electric vehicles. It is expected that this effort will continue during the next year.

There are many new technologies emerging from the marketplace that can be integrated into the electric and hybrid vehicle program at K-State. The SOUTF's common specification used to purchase the Chevy S-10 vehicles is now being used by EV America to look at greater numbers of electric vehicles being purchased. Further, EV America is working to increase the funding for the Site Operator Program. Hopefully, all the "players" involved in this process are improving the national opportunity to prove that an EV market exists and is achievable in incremental steps.

In conclusion, this year has proven to be full of important activities for Kansas State University. New program opportunities routinely are being discussed. K-State will continue to be an effective participant with all Site Operators. Further, K-State will continue to work with the Department of Energy and its national laboratories in bringing better electric vehicle technology to the marketplace.

Kansas State University

Electric Vehicle Site Operator Program

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