KANSAS STATE UNIVERSITY

DOE/KEURP

SITE OPERATOR PROGRAM

**TDM Electric & Hybrid Vehicle
Production & Test Facility**

*Ground Breaking
October 11, 1995
Manhattan, Kansas*

*Year 5
Second Quarter Report
October 1 - December 31, 1995*

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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 nine 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 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

The Kansas Electric Utilities Research Program (KEURP), founded in 1981, manages technical research and development programs for the six major investor-owned electric utilities in Kansas and Sunflower Electric Power Corporation, a nonprofit generation and transmission corporation. Patterned after the Electric Power Research Institute (EPRI), the goal of KEURP research is to pro-actively seek and deliver technologies enhancing the value of electric services to its members, utility customers, and the state of Kansas. KEURP member utilities:

KEURP

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

Sunflower Electric Power Corp., Hays, Kansas
The Empire District Electric Company, Joplin, Missouri

The KEURP committee structure is made up of participating utility personnel, university faculty and public regulators. The chief executive officer or designee of each of the KEURP member utilities, the chair of the Kansas Corporation Commission (KCC) comprise the executive committee. The committee approves the annual research agenda, gives final approval on all research to be undertaken, and provides oversight for individual research projects.

Each member utility and Regents institution appoints a representative to the Technical Committee. The KCC liaison is generally the chief electric engineer. The Committee meets every two months to review ongoing research, consider proposals, and discuss future research opportunities.

Within the Technical Committee are the following subcommittees: Customer Systems, Electrical Systems, Environmental and Nuclear, Generation and Storage, and Long-Range Planning. Subcommittees meet at the call of their respective chair to review proposals and make recommendations, and meet annually to define potential research in areas of specific interest to KEURP. All proposals received by KEURP are submitted to one of the subcommittees for review, and the committee recommendation is sent forward for Technical Committee deliberation.

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 continues its efforts on research, design, development, and production of AC and DC motor controller systems. Products are used in a number of different industries from assisting the disabled in achieving a higher quality of life, to advancing the state of robotics, to assisting industries in specific motorized applications.

ICE Corporation continues its work on high technology power switches. ICE designed and developed high power switches and is working with a number of companies to provide specific applications for this product. ICE is committed to assisting K-State's electric vehicle program in vehicle demonstrations, research, testing, and evaluation of product. ICE provided a letter of commitment for \$2,000.00 per year for the five year contract as a cosponsor to the Department of Energy's Site Operator Users Task Force.

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 has worked with both federal government and licensed laboratories for

testing of infrastructure products. EHV Corp is working with state agencies and private companies in order to establish a national demonstration program for curbside recharging. Such a 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 federal electric & hybrid vehicle research & development programs.
2. Test & evaluate electric & hybrid vehicles through purchase and use of vehicles.
3. Collect data and develop historical perspective on vehicle requirements.
4. Develop and establish alternative fuel systems training.
5. Provide reports to K-State program participants.

Long Term Goals (5 years)

1. Assist the nation in reversing environmental trends concerning air quality.
2. Establish Kansas State University as a national site for testing, evaluating and reporting on new technology electric and hybrid vehicle technology.
 - a) Site will test vehicles through accelerated life use.
 - b) Site will determine long range reliability through dedicated testing.
 - c) Site will determine life cycle cost of such vehicles.
 - d) Reports will be generated for fleet manager use in determining "buy decisions".
 - e) All testing will be done in "real-time" to ensure meaningful data is collected.

Kansas State University, with funding support from federal, state, public, and private companies, has participated in the Department of Energy's Electric Vehicle Site Operator Program. By participating in such national programs, Kansas State is displaying, testing, and evaluating electric or hybrid vehicle technology. K-State program participants are provided the opportunity to examine the latest vehicle and infrastructure prototypes. KSU now operates three electric vehicles. Two vehicles are electric conversion vehicles from Soleq Corporation of Chicago, Illinois. KSU in conjunction with KEURP also initiated procurement of four (4) Ford Ranger EVs from Troy Design and Manufacturing (TDM) of Redford, Michigan. The first prototype Ford Ranger pickup truck was delivered to K-State for testing in December, 1995. The vehicle is being

operated on a daily basis. Failures and fixes are being monitored in order to ensure a fast feedback of information to the automotive engineers at TDM.

The electric vehicles have not been signed to illustrate to the public that it is an electric vehicle. Magnetic signs have been made for special functions to ensure sponsor support is recognized and acknowledged. As soon as TDM's Ford Ranger electric vehicles are delivered they 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

August 17-23 *Department of Natural Resources* *Sedalia, MO*
Kansas City Power & Light, assisted by two K-State students, Jill Dirksen and Rod Urbanek, transported a Soleq EVcort to Sedalia, Missouri for display at the Missouri State Fair. The Missouri Department of Natural Resources provided a variety of educational exhibits for the public. Among these displays were ways that individuals, cities, and governments can work to protect the environment in which we live. The event was well organized and the public showed significant interest in the Soleq EVcort.

Second Quarter

October 11 *Shawnee Heights High School* *Shawnee, KS*
The Shawnee Heights High School's advanced physics class visited K-State and viewed K-State's electric vehicle. A presentation was given by Jill Dirksen and Rod Urbanek on the activities surrounding the university EV program. The students were taken on a short ride after the presentation.

November 7 *Texas Utilities* *Ft. Worth, TX*
thru 19 EVcort #151 was transported to the Ft. Worth, Texas area by Rod Urbanek for the purpose of demonstrating electric vehicle viability to major utility companies. The vehicle was also reviewed by Texas State Senator, the Honorable Chris Harris. Utility companies are scheduled to undergo deregulation. As such, utilities are looking for new energy markets. Electric and hybrid vehicles represent a mobile energy source as well as requiring energy to operate. The unique nature of electric vehicles would allow utility companies to use EVs as reservoirs to store and deliver electricity far from where power is produced. By charging at night, electric vehicles would allow utility companies to maintain constant production levels of electricity which would lower overall costs to consumers and reduce environmental stress. The interest shown in EVs by the Texas utility companies is significant from their historical past. Texas has a well documented history of supporting petrochemical sources for vehicle propulsion. The promotion of electric vehicles by utilities would have a profound effect on the future growth of electric vehicle use.

Third Quarter (Scheduled)

MEDIA EVENTS

First Quarter

None Scheduled

Second Quarter

- October 11 *Electric Vehicle Plant Ground Breaking* *Manhattan, KS*
Troy Design and Manufacturing (TDM), Redford, Michigan, broke ground for their new multi-million dollar alternate fuel vehicle plant that is being built in Manhattan, Kansas. TDM has made a strong commitment to partner with Kansas State University, the city of Manhattan, and the State of Kansas to bring alternate fuel vehicle technology to market. TDM has, over the years, developed a working relationship with the Big 3 as a supplier of vehicle technology. It is believed, working in conjunction with TDM, that K-State can lend its research and technical capabilities not only to TDM but to its automotive industry partners. K-State, its administrators, faculty, and students look forward to both the opportunity and the challenge of assisting in the development of alternate fuel vehicles. Kansas and its community look forward to being contributing partners
- October 17 *Interview with Radio Station Sunny 102* *Manhattan, KS*
Professor Hague was interviewed by the local radio station to discuss both electric and hybrid vehicles and Troy Design and Manufacturing's (TDM) decision to move an automotive plant into the Manhattan area. The interview was taped and provided for distribution to other radio stations across the State of Kansas.

Third Quarter (Scheduled)

MEETINGS

First Quarter

- July 3 *TDM Corporate Overview* *Redford, MI*
Jim Hague, representing Kansas State University's EV program, met with Bill Coppola, Managing Director of Troy Design and Manufacturing's Electric Vehicle Programs. Discussions were held concerning possible "joint efforts" in producing and supporting a state of the art electric vehicle. Professor Hague toured TDM's manufacturing facilities. Professor Hague met with Mr. William "Bill" Roberts, President of Troy Design and Manufacturing, to discuss present and future opportunities.

- July 7 - 9 *TDM Visit to K-State, City of Manhattan* *Manhattan, KS*
 Bill Coppola, Managing Director of Troy Design and Manufacturing's Electric Vehicle Programs met with Kansas State University's President and Vice-Presidents to discuss joint research opportunities. A "team approach" is defined by all parties with an agreement to move forward in an aggressive manner with the desire to have TDM build an electric vehicle plant in Manhattan, Kansas.
- July 25 *KEURP EV Planning Meeting* *Topeka, KS*
 Jim Hague met with the KEURP EV planning committee and discussed possible opportunities with Troy Design and Manufacturing siting a Alternate Fuel Test, Evaluation, and Production Center in Manhattan, Kansas. KEURP's EV committee supported Kansas State University's efforts. KEURP was the first agency to step forward and make a financial commitment to support TDM's request for research support. KEURP's action was the "financial cornerstone" used to support TDM's decision to establish a manufacturing plant in Manhattan.
- August 22 *TDM Visits Manhattan* *Manhattan, KS*
 Mr. & Mrs. William Roberts, TDM's CEO, and Mr. and Mrs. Bill Coppola met with the Manhattan Chamber of Commerce, City of Manhattan Officials, and Kansas State University executives to define the needs of TDM in building a plant in Manhattan, Kansas.
- September 6 *TDM Notifies City of Manhattan* *Manhattan, KS*
 Troy Design and Manufacturing notify the State of Kansas, the City of Manhattan, and Kansas State University that TDM will build an electric vehicle plant in Manhattan, Kansas. Expected opening of TDM's plant will be late first quarter 1996 or early second quarter 1996.
- September 7 *KEURP EV Advisory Meeting* *Topeka, KS*
 KEURP representatives met with KEURP's executive committee to discuss and vote on support for the TDM Alternate Fuel Test, Evaluation, and Production Facility to be built in Manhattan, KS. The executive committee agreed to support the Kansas State University effort to bring this advanced technology opportunity to Manhattan and more importantly to the State of Kansas.
- September 12 *Kansas State University* *Manhattan, KS*
 President Jon Wefald held a press conference at Kansas State University to announce TDM's decision to build an electric vehicle plant in Manhattan, Kansas. TDM also brought copies of the announcement that was issued through **Automotive News**.

Second Quarter

- October 5 *Senator Bob Dole Meeting* *Washington, D.C.*
Senator Bob Dole met with representatives from Ford Motor Company, Troy Design and Manufacturing, and Kansas State University to discuss the new Alternate fuel technology and vehicle production facility in Manhattan, Kansas.
- October 12 *City of Manhattan* *Manhattan, KS*
The Chamber of Commerce held a series of meetings with Troy Design and Manufacturing. The opportunity to site a future natural gas production facility in Manhattan was the topic of discussion.
- December 4-8 *TDM* *Livonia, MI*
James Hague and Rod Urbanek visited Troy Design and Manufacturing in Detroit, Michigan plant where the prototype TDM Ford EV Rangers are being built. Rod worked closely with TDM's engineers on the vehicle that will undergo testing at KSU's site operator program. He was shown how to install data acquisition equipment on the vehicle for evaluation of performance and reliability. A detailed demonstration of vehicle assembly and the components used on the vehicle was also given during the visit. This will allow the repair of any malfunctions at the KSU site during evaluation of the prototype.
- December 5 *Product Steering Committee* *Livonia, MI*
TDM held its quarterly product steering committee meeting. Utilities and cities from around the United States were in attendance. TDM is nearing completion of its first "build" of 1996 Ford Ranger EVs. Kansas State University is scheduled to receive the first "prototype" EV Ranger from TDM later this month. TDM announced at this meeting that it will ship an EHV Corp, Manhattan, KS, infrastructure interface box with each Ranger it delivers to its customers. Additional boxes, for customer use, will be available from TDM or through direct purchase from EHV Corp. Further, the product steering committee was introduced to the curbside infrastructure unit that EHV Corp is developing with manufacturing assistance from TDM.
- December 12 *Optimists Club* *Manhattan, KS*
Professor Hague made a presentation to the local Optimists Club about electric vehicles and TDM. TDM's expected plant operations and the opportunity to the community was explained to those who attended. A significant number of questions were generated about the future of alternate fuel vehicles.
- December 15 *MDAS Workshop, University of South Florida* *Tampa, FL*
Rod Urbanek attended a workshop at the DOE site operator program located at the University of South Florida. The purpose of the workshop was to teach attendees how to use the Mobile Data Acquisition System(MDAS) developed at that location. An MDAS system will be installed on the TDM Ford EV Ranger operated at the

KSU DOE site operator program.

Third Quarter (Scheduled)

- January 22 *State House Testimony* *Topeka, KS*
Professor Hague, on behalf of the Kansas Technology Enterprise Corporation (KTEC), is scheduled to testify to the State Senate & House Committees on Commerce & Economic Development about participation in alternative fuel vehicle development activities. TDM's proposed production facility will be explained in detail. Professor Hague will also present samples of products that EHV Corp and IEM, Inc, Manhattan, Kansas startup companies, have developed with support from KTEC and other agencies.
- January 24 *KEURP Advisory Board Meeting* *Topeka, KS*
KEURP's quarterly electric vehicle advisory board meeting has been scheduled. Discussion points will include the purchase of four TDM electric vehicles. A status report has also been requested on the progress of TDM's production facility in Manhattan, KS. Budgeting issues will also be discussed in anticipation of DOE's request for proposal for testing and evaluating electric vehicles.
- January 29 *State House Testimony* *Topeka, KS*
Professor Hague, in conjunction with testimony provided by Jon Wefald, President, Kansas State University, will provide testimony on KSU's alternative fuel vehicle program to the House Economic Development Committee. K-State's electric vehicle program is one of two university programs highlighted to State legislative committees this year. Testimony is provided annually to State committees to demonstrate the universities commitment to solving future problems and supporting state economic development programs.

VEHICLES/COMPONENTS/BATTERIES

Soleq EVcorts

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. Soleq vehicles have performed in a routine manner during this reporting period.

CONTRACT YEAR FIVE							
	DATE	MILES	DAILY MILES	NUMBER OF CHARGES	MILES PER CHARGES	KWH USED	KWH PER MILE
1st Quarter	09/30/95	888	11.1	80	11.1	479	0.54
2nd Quarter	12/31/95	1387	16.1	86	16.1	951	0.69
3rd Quarter							
4th Quarter							
TOTAL		8662	17.1	507	17.1	5380	0.62

TABLE 1. EVcort (151) OPERATION SUMMARY

Assuming a price of \$.056/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 \$.96 per gallon of gasoline.

The increase in operating cost of EVcort DOE number 151 can be attributed to the use of the heater and lower battery efficiency during this quarter.

CONTRACT YEAR FIVE							
	DATE	MILES	DAILY MILES	NUMBER OF CHARGES	MILES PER CHARGES	KWH USED	KWH PER MILE
1st Quarter	9/30/95	402.7	6.1	66	6.1	189	0.47
2nd Quarter	12/31/95	449	7.1	63	7.1	428	0.95
3rd Quarter							
4th Quarter							
TOTAL		4601	13.3	345	13.3	3163	0.69

TABLE 2. EVcort (152) OPERATION SUMMARY

Assuming a price of \$.056/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 \$1.33 per gallon of gasoline.

The increase in operating cost of EVcort DOE number 152 can be attributed to the use of the heater and lower battery efficiency during this quarter. Its efficiency is much lower than Evcort DOE number 151 because it is kept in a garage and the preheat feature is used much more often.

On November 24, Soleq EVcort, DOE number 152, experienced a total loss of power when one of the lead battery cable terminals in the rear battery tray overheated and melted open. The cause of the failure appeared to be a buildup of corrosion between the heavy wire cable and the molded lead terminal. Closer inspection of the remaining cables revealed that other cable failures are imminent during high current levels which cause heating of the terminals. Soleq has begun production of a new type of cable to be retrofitted on two Soleq vehicles in the future. Soleq provided a replacement cable until the new ones are ready and the vehicle was repaired at the KSU site.

On December 21, Soleq EVcort, DOE number 152 had new tires installed on the front wheels in anticipation of adverse weather conditions expected during the winter. The old tires showed signs of excessive wear due to the increased weight of the vehicle after conversion to electric propulsion. The rear tires continue to wear in a normal manner. It is suspected that the front weight of the vehicle has been increased significantly and the front drive tires are demonstrating this fact by accelerated wear.

INFRASTRUCTURE

Charge Stations

Kansas State University continues its work with EHV Corp and KEURP in the area of infrastructure development. EHV Corp recently announced a sale of additional stock to a Venture Capital group and a Joint Venture with unspecified partners. EHV Corp is working with an automotive firm on a “new style” charge station for both public and home use. These units are expected to be Underwriters Laboratory certified. EHV Corp will offer the first produced unit to Idaho National Laboratory for testing, evaluating, and operational acceptance if the laboratory remains interested in this effort.

The Electric Vehicle Research Network (EVRN), as part of a National Electric Power Research Institute demonstration program for electric vehicles, contacted Kansas State University to request EHV Corp provide custom smart cards for the EVRN charge stations. The participants in the EV Charge station project are:

Boston Edison Company, Boston, Massachusetts
Centerior Energy, Cleveland, Ohio
Duke Power, Charlotte, North Carolina
Georgia Power, Atlanta, Georgia
New York State Electric & Gas, Binghamton, New York
Salt River Project, Tempe, Arizona
Tennessee Valley Authority, Chattanooga, Tennessee

These companies are evaluating both inductive and conductive charge stations in demonstrating electric vehicle technology to the public in their region. Because K-State’s work with EHV Corp led to the first commercial charge station using advanced smart card technology (microprocessor based “chip cards”), these utility companies are also evaluating advanced billing systems that are expected to revolutionize the way American will pay for services.

Billing Systems

Kansas State University, as part of its effort to evaluate infrastructure for electric vehicles, has been looking into billing systems and how they would apply to advanced technology alternate fuel vehicles. As research progresses, information has been gathered from several countries involved with advanced billing systems and they include France and Canada. Billing systems are being evaluated on the merit of “fitting” and growing with the United States present day “credit card” system. It now appears that in the next three to five years smart card technology will replace credit cards as the card of choice. Kansas State University wants to evaluate and expand the opportunity for the use of smart card applications in the alternate fuel vehicle and utility industry. A company, IEM, Inc has been formed in Manhattan, Kansas and secured orders for the first 500 smart card readers to be used in a non electric vehicle application. IEM, Inc is working with EHV Corp and its partners to ensure smart cards will be used on new charge station designs and in the new facility being built by Troy Design and Manufacturing. Additional pilot projects are being considered to integrate smart card technology. K-State, along with its utility participants, is looking forward to implementing this advanced billing technology into the American marketplace.

PROCUREMENT OF NEW VEHICLES

Ford Ranger EV Vehicles

The Kansas Electric Utilities Research Program, in participation with the Department of Energy's Site Operator Program, has ordered four Ford Ranger EV vehicles from Troy Design and Manufacturing. The first vehicle was delivered December 19, 1995. Testing will begin as soon as the vehicle is properly insured and licensed in the State of Kansas. This first vehicle will be owned by Western Resources and operated by Kansas State University. K-State will operate this prototype vehicle (first off TDM's assembly line) in a manner that will assist TDM in working out the "kinks" of these vehicles. It is expected that three additional Ranger EVs will be delivered to Kansas around May 1, 1996.

SUMMARY/CONCLUSION

The State of Kansas, the City of Manhattan, and Kansas State University will continue to promote alternative fuel vehicle programs. Activities will focus on those projects that have the highest likelihood of success while minimizing the expense of bringing technology to market. This approach will ensure that the Midwest region is positioned to support what is considered a “long term” process. The process is to change the existing transportation system to alternate fuels and assist in protecting and improving our environment.

The recent action by Troy Design and Manufacturing, and supported by partners within the State of Kansas, to build what is expected to become the showcase for advanced technology alternative fuel vehicle development and production only adds to this regions potential and strategic importance. Kansas remains a fuel neutral state that will promote the “best” alternative vehicle technologies as they emerge. Kansas and its universities will continue to assist this nation in developing advanced technology products. Kansas State University will continue to train this nation’s future engineers and managers to meet changing societal needs. Kansas State University, its administrators and faculty, will continue to provide leadership in the alternate fuel vehicle industry.

The federal, state, private, public, and local partnerships, being managed by Kansas State University, are a major contributing factor to any success that has been achieved to date. Funding and support from the Department of Energy, the Kansas Electric Utilities Research Program, the Governor’s office, the Secretary of Commerce, Western Resources CEO’s office, the Manhattan City Commissioners, many state, local, private and public offices, and strong support from Kansas State University’s President’s office have all contributed significantly to what has been achieved in Manhattan, Kansas.

New technology vehicles and the infrastructure to support them will emerge over the coming decades. Kansas State University and its program partners look forward to assisting the automotive industry in developing future transportation systems. Kansas State University, in partnership with Troy Design and Manufacturing is poised to impact the future!

ADDENDUM

Articles from

*The Manhattan
Mercury*

&

*The Kansas State
Collegian*

Differences in the electric car

The electric car converted by Soleq Corp. has an average driving range of 40 miles and is heavier than a gas-powered car. The battery and battery tray alone weigh 1,000 pounds.

Under the hood

Front battery tray (holds six batteries)

Relay box

108-volt DC to 12-volt DC converter

12-volt accessory battery

Source: KCPL

The control panel

Instead of having a gas gauge indicating how much fuel is in the tank, the electric car has a control panel below the radio to show how much battery power is remaining.

SARA SMITH/Collegian

DRIVE IT HOME, PLUG IT IN

■ K-State researcher tests battery-powered car, drives it daily

STORIES BY BRENT JOHNSON • STAFF REPORTER

Jim Hague slides behind the wheel of his Ford Escort and inserts the key into the ignition. He turns the key, and there is no sound. He presses the accelerator, and there is no sound.

Hague never has to stop at a gas station or check a gas gauge. When he gets home, he uses an extension cord to plug his car into the wall socket.

Hague is an associate professor at K-State who is researching electric cars.

His car looks like any other Ford Escort until you open the hood. This Escort has an electric-powered motor so what you see when you open the hood are six batteries and lots of cables.

The Escort is an electric-powered vehicle, getting its power from the 18 lead-acid six-volt batteries, said Rod Urbanek, research assistant for the K-State Electric Vehicle Site Operator Program. The batteries are situated in both the front and the back of the car.

The K-State Site Operator Program is part of a national electric and hybrid vehicle-research program that is headed by the U.S. Department of Energy.

K-State is one of the 13 sites in America that participates in the national Site Operator Users Task Force. The role of K-State is to test and evaluate the electric vehicles.

K-State owns two electric Ford Escorts. The Escort's were purchased by K-State for research in the Site Operator Program.

"We're basically testing and evaluating the technology and performance of the Escorts," said Hague, associate professor of architectural engineering and construction science. "In addition to our research, we take our vehicles all over the nation to display and promote electric-vehicle technology."

Both Hague and Urbanek drive the Escorts daily to record and evaluate data on the vehicles. They compile data and submit quarterly reports to the Department of Energy, Kansas Electric Utilities Research Program and to other program participants.

"I drive the vehicle around town mostly on errands and stuff," Urbanek said. "I try to drive the vehicle around 20 miles a day."

The Escorts were converted to electric power by Soleq Corp. in Chicago, along with the assistance from former K-State students.

"All major service and repairs are done by Soleq under warranty," Urbanek said. "Any minor problems we try to fix through trouble-shooting."

"It can be difficult because this is new technology, and there isn't a manual."

A majority of the funds used to purchase the vehicles were provided by the U.S. Department of Energy and Kansas Electric Utilities Research Program.

The K-State Site Operator Program has been under con-

CONTINUED

JILL JARSULIC/Collegian

Research assistant Rod Urbanek draws a schematic of one of K-State's electric cars. The University's two electric Ford Escorts will be phased out and replaced by four electric Ford Rangers built next year.

tract with the U.S. Department of Energy since July 2, 1991. The contract will end on Jan. 31. Total funding to date is \$1.56 million.

Hague said electric propulsion is the best method of taking a unit of energy and creating motion. Internal-combustion engines, found in most vehicles, are most efficient at creating heat, he said.

Electric cars not only differ by how they are powered, but in the sound they make — or don't make.

When stationary, an electric vehicle is eerily silent, Urbanek said.

"The car can be on, and you wouldn't even know it," he said. "The motor doesn't turn until you hit the acceleration pedal."

Even when moving, the electric car makes virtually no noise, he said.

The converted Escorts are heavier than the standard Escort.

"Because of the batteries and their tray, the electric Escort weighs more than 4,000 pounds," Urbanek said. "The batteries and tray alone weigh about 1,000 pounds."

Jeff Chapman, sales consultant at Dick Edwards Auto Plaza, said the curb weight of the comparable gas-powered Escort is 2,485 pounds.

This means it takes more energy to move the vehicle. Researchers are working on reducing the weight of future electric vehicles.

The top speed for the electric Escorts is about 85 mph.

"I've never taken the car up to 85 mph, but I have gone 65 mph," Urbanek said. "I didn't want to go any faster because it wouldn't look good to get a ticket in a state vehicle."

The average driving range of the Escorts is 40 miles on a full charge.

"What you need to know is that even though we say you have a range of 40 miles, you will not have solid performance out of the vehicle for all 40 miles," Urbanek said. "There is a significant difference in the vehicle's performance even at a half charge."

"At a half charge, the car will only go zero to 30 in about eight seconds, whereas on a full charge, the car will do it in about six seconds."

The average full-recharge time for the batteries is anywhere from three to 16 hours, depending on the ampere setting on which it's recharging, Urbanek said.

Recharging the car's batteries is as

CONTINUED

easy as plugging it into a normal wall socket in a house. The recharging plug is where you would fill a gasoline-powered car with fuel.

The cost to drive the electric vehicles is efficient compared to the price you pay per gallon of unleaded gasoline.

"These days a gallon of gas could cost anywhere from \$1 to \$1.10," Urbanek said. "The cost of charging and driving an electric car equates to about 80 cents per gallon."

Jill Dirksen, research assistant for the K-State Site Operator Program, said the figure varies due to temperature. In warm weather, it can be about 70 cents per gallon, and in cold weather, it can be about 90 cents per gallon.

"The efficiency of the batteries changes with temperature," Urbanek said. "In the winter, the capacity of the batteries is about 50 percent of what it is in the summer."

A common question about electric cars is how the heaters, air conditioners and radios can affect the vehicles' power.

"The car only uses up about 10 percent of the battery power when running heating and cooling," Urbanek said. "The radio hardly uses any power at all,

only about 1 percent."

The cars also feature an aspect that enables them to restore some power to the batteries when braking. This is called the regenerative braking system.

Hague said regenerative braking essentially takes the mass and speed of the vehicle, which is kinetic energy, and changes it into potential energy in the batteries.

Basically, when using the brake, the motor turns into a generator and restores some power to the batteries.

"While regenerative braking is efficient, you can only restore back about 10 percent of what you put out," Urbanek said. "Just like with anything else, you never get as much back as you gave out."

Hague said K-State put in the first purchase order for the electric Ford Ranger truck, to be made by Troy Design and Manufacturing. TDM is building the first volume electric-vehicle plant in the world in Manhattan.

"We will be getting the first truck made in that facility," Hague said.

K-State has a purchase order for four electric Rangers to research, test and evaluate. The Rangers will replace the Escorts.

"The Escorts will probably be donated

to a supporting Kansas Utility company for future research," Urbanek said.

Hague offered some predictions for the future of electric vehicles.

"There is a lot of risk with electric vehicles," he said. "For the next five years, the electric vehicle will be a novelty item."

"In five to 10 years in the future, the electric vehicle will move into the personal transportation sector, being used as a second vehicle."

Dirksen said the electric vehicle will first gain popularity as a second vehicle. For driving around town on errands, the electric vehicle will be more efficient than a gas-powered car.

"Ten to 20 years from now, with some technological breakthroughs, the electric vehicle will become a standard mode of transportation," Hague said.

Hague went on to say the movement toward electric vehicles resembles the Wright brothers' movement toward flight.

"Just like at Kittyhawk, the Wright brothers failed again and again," he said.

"So will the technology of electric cars," Hague said.

"Now, millions of people fly every day — we even fly people to space."

GROUND-BREAKING EVENT SET FOR 1ST ELECTRIC-VEHICLE PLANT

Ground-breaking ceremonies for the first volume manufacturing plant for electric vehicles in the world is scheduled for 4 p.m. today.

Troy Design and Manufacturing Co., a company from Redford, Mich., has a contract with Ford Motor Co. to manufacture a minimum of 2,000 electric Ford Rangers.

The ground-breaking ceremonies will be at the plant's future location in the Manhattan Industrial Park on Levee Drive.

The 40,000 to 60,000-square-foot

plant has a deadline to be open and certified to manufacture vehicles by Feb. 15.

James Hague, associate professor of architectural engineering and construction, said K-State will receive the first Ranger produced at the new TDM plant.

K-State has put in an order for a minimum of four electric Rangers, which will be used for research.

TDM choose the Manhattan site over locations all over the nation.

"This is extraordinarily important to

Manhattan," President Jon Wefald said.

"Their location here might be the single-most important company to locate in Manhattan or the state since 1945," he said.

Bill Coppola, managing director of electric vehicle development for TDM, said TDM chose Manhattan because of research programs at K-State, the strong support of Kansas utility companies and the community of Manhattan.

TDM will hire 52 to 67 employees in the first year. Production line workers will make about \$17 per hour.

► GROUNDBREAKING

Building begins for electric car facility

Brent Johnson
staff reporter

Not even a black cat walking in front of the podium during the groundbreaking ceremony could have ruined the moment.

Holding bronzed shovels decorated with purple ribbons, representatives from Troy Design and Manufacturing Co., K-State, Manhattan and the state of Kansas lined up to break the ground.

On the count of three, they plunged their shovels into the dirt, symbolizing the future of electric vehicles and Manhattan.

TDM is constructing the first facility in the world to volume produce electric Ford Rangers. The facility will also conduct research and development for alternatively fueled vehicles.

"This isn't going to be just a plant," said Bill Coppola, managing director of electric vehicle development for TDM. "There's going to be some engineering activity going on here."

Bill Roberts, president of TDM, said he was really surprised and awed by the support and interest of the community.

"The opportunity came, and we decided to try to establish Manhattan as the exclusive alternative-vehicle center of the world," Roberts said.

"From this fall on, hopefully K-State, Manhattan and Kansas will be linked to the future of the automobile industry," K-State President Jon Wefald said.

Bringing TDM to Manhattan was a team effort made by K-State, Kansas Electric Utilities Research Program, Kansas Technological Enterprise Corporation, Western Resources and the Manhattan Chamber of Commerce.

Even U.S. Senator Bob Dole, R-

Kan., shares the same excitement as Manhattan and TDM does, Roberts said.

TDM is under contract with Ford to manufacture 2,000 electric Rangers. The plant is under deadline to be open and ready by Feb. 15, with the first vehicle finished by March 31.

The company will be hiring 99 percent of its employees from Manhattan, Coppola said.

"We'll probably start hiring as soon as early December," he said.

TDM will train all the new employees in Detroit, in a plant just like the one TDM is building in Manhattan. When the employees get back to Manhattan, they can start immediately on the production of the electric Rangers, Coppola said.

"By the time they get back, the vehicles will be waiting for them, ready to be processed," he said.

Dunn Industrial Group Inc. has been contracted to construct Manhattan's TDM facility.

"We hope to get construction underway within the next week to 10 days," said Rob Traut, project director for Dunn Industrial Group Inc. "We still have to get a few permits."

Traut said he is confident they will have the facility finished by the deadline. The construction of the new TDM plant will be their sole project until finished.

"Although I'm not sure how many, I do know we'll be hiring some local help for the construction of this facility," he said.

Mayor Edith Stunkel said everyone is very excited about TDM setting up shop in Manhattan, and the future electric vehicles offer.

"Someday, cities across the country will thank Manhattan, Kansas for cleaning their air," Stunkel said.

Staff photo by Rod Mikinski

Dignitaries break ground for plant to produce electric cars (foreground) in industrial park.

The Sunrise, built by the Solectria Corp., may become the first affordable, mass-produced electric vehicle.

Electric Avenue

Todd Manning
Staff Writer

Thanks to 1998 zero-emission mandates in California, Massachusetts and New York, electric vehicles will start rolling off assembly lines in Manhattan and other parts of the country within a year.

But how long before one rolls into the next door neighbor's driveway or you take one for a spin down the highway? Well, unless you or your neighbor works for a utility company or the government, the answer from many experts is — a long time.

Why? Lawrence Dussault, executive director of the Global Electric Auto Association, can answer the question in four words. "It's the batteries, stupid."

"They are making incremental improvements in the cars' range — 50 to 60 miles," he said in a telephone interview from his office in Westerville, Ohio. "But right now, the electric vehicle is at best a second vehicle. Battery technology is limiting the technology."

Electric vehicles face a stiff challenge in the free market, Dussault and

others said, because they will be competing with gasoline-powered cars and trucks that have a greater driving range and, in many cases, cost half as much or less. The Solectria Sunrise, for example, has a base price of \$31,495. Officials of Solectria, a Massachusetts electric-vehicle company, have said the price will drop to slightly less than \$20,000 once the cars go into mass production.

But gasoline vehicles have several shortcomings and, because of those, may be driving their last days. First, pressing down the accelerator of a gas vehicle spews carbon monoxide, hydrocarbons and a number of other not-human-friendly chemicals into the air.

America's love affair with the gas vehicle also has become an addiction to Middle Eastern oil supplies. This year, about 40 percent of the oil consumed in the United States will be imported. By the year 2010, the import numbers will increase to about 80 percent.

Right now, however, gasoline remains comparatively cheap, and it's air quality concerns that have resulted in mandates passed in New York,

Massachusetts and California requiring that about one in 50 new cars sold in 1998 must emit no pollution — and only electric cars meet the test. The regulation would add 20,000 to 30,000 electric cars to California roads the first year alone.

Companies like Solectria and Troy Design and Manufacturing, soon to be in Manhattan, are rushing forward to introduce electric vehicles in time with the 1998 mandate. Troy Design and Manufacturing, or TDM Co., has announced it will complete a \$10 million electric vehicle plant in Manhattan by Feb. 15.

At first, TDM Co. plans to target its vehicles at utility companies and local, state and federal agencies. TDM Co. and Solectria, experts say, may be able to survive on the niche market. But as the mandated percentage increases — 5 percent by 2001 and 10 percent by 2003 — electric vehicles will have to start winning over the average consumer, and that, say the experts, will be the test.

"If you want to see a million of these (electric cars) sold, you — the typical person — have to be willing to buy

Continued

Continued

one," said Dana O'Hara, program manager for the U.S. Department of Energy electric vehicle field operations.

It all gets back to the batteries, O'Hara said. Currently, most electric vehicles are powered by conventional lead-acid batteries that provide a driving range of only 50 to 60 miles — the equivalent of two to three gallons of gas for many gasoline vehicles.

"This is like leaving home every day with the 'low fuel' light on," said William Glaub, general sales manager of General Motors Corp.

Other batteries, such as the nickel-metal hydride batteries available in the upper line Solec-tria Sunrise, have shown more promise, able to run 100 miles between charges. The problem is the relatively high cost of these newer batteries, at least until they can be produced in large quantities.

Professor Daniel Sperling and his colleagues are testing advanced batteries at the University of California at Davis' Institute of Transportation Studies. Sperling, a prominent electric-car advocate, concluded this summer that the batteries' "life span and performance in road conditions" were still hard to forecast, partly because "we don't understand the battery chemistry very well" and partly because "we don't have much knowledge of how people drive their vehicles."

That knowledge will only come as long as the zero-emission laws remain on the books and automobile manufacturers are forced to look into alternative power sources, O'Hara said.

"I've heard it said that the zero-emissions mandate is dictating technology and the market," he said. "Do we wait until we're all

choking to death to do something?"

In the meantime, Dussault said he believes electric vehicles may win favor as "second cars," driven to work or for shopping while the trusty gasoline model is used for weekend trips and vacations. Electric cars also have other advantages besides idle tail pipes, he said.

- Low maintenance. An internal-combustion — gasoline — engine has well over 10,000 parts, while electric engines have less than 1,000.

- Noise level. Electrics are nearly silent when running.

- Convenience. "Many people abhor going to gasoline stations," Sperling said.

The San Francisco Examiner and Boston Globe provided information for this story.

Board urges approval of increased TDM cost

Proposed site plan for the new TDM plant.

But the additional jobs aren't free. Martin said TDM Co. originally estimated it would need about \$3.3 million to move the natural gas conversion facility to Manhattan. Subsequent negotiations lowered the figure to \$2 million, he said.

The \$1.24 million from the city breaks down to \$975,000 in job incentives and a short-term, no-interest loan of \$270,000. The loan represents an upfront payment of money TDM will receive from the Kansas Department of Commerce and Housing in the form of job training funds. Martin said the loan repayment will come directly from the Kansas Department of Commerce and Housing.

But a problem became clear once the economic development board added the incentives to the city's earlier \$550,000 grant and \$418,000 10-year, no-interest loan. With \$200,000 committed to another fledgling Manhattan company, the economic development fund only will have about \$1.77 million by the end of the year. The total TDM incentive package came to \$1.79 million.

"We will make about \$40,000 in interest on the funds in this account (in 1995), so we will barely make it over the edge," said

Curt Wood, city finance director. The economic development opportunity fund is financed through a four-year citywide half-cent sales tax. The sales tax is expected to raise about \$8 million before it sunsets and brings in about \$200,000 a month, Wood said.

Despite cleaning out the fund for the year, several board members said they felt the addition of the natural gas conversion's would help ensure the city's investment of the electric vehicle portion of the plant.

"Anytime you can get a company to commit more resources in the same marketplace, we're a lot better off for it," said board member Mike Daniels.

Sonny Ballard, the lone board member to express skepticism about the initial TDM offer, agreed.

"I thought after our first discussion (with TDM) we had gotten by extremely cheap," he said. "After this addition, I feel it's even better. This is not all the money we have to work with. I personally think it would be foolish to turn them down."

Todd Manning
Staff Writer

Adding natural gas conversion to the Troy Design and Manufacturing electric vehicle plant will cost the city another \$1.24 million and strip its economic development fund of money for the rest of the year.

The Economic Development Opportunity Fund Advisory Board discussed both of those factors this morning and then voted 6-0 to recommend the City Commission approve the additional \$1.24 million. Board member Bob Krause, a vice president at Kansas State University, abstained from the vote.

The city dollars make up about 60 percent of the \$2 million needed to add natural gas conversion capabilities to the plant, which TDM Co., based in Redford, Mich., says it will build in the Manhattan industrial park. Western Resources, K-State and Riley and Pottawatomie counties have agreed to provide the other \$800,000, said Randy Martin, president of the Manhattan Chamber of Commerce.

TDM Co. initially had an agreement with the Ford Motor Co. to build the natural gas conversion facility near Ford's Claycomo, Mo., plant. Ford, however, relaxed the agreement and TDM, which had already announced plans to build an electric vehicle plant in Manhattan, decided to combine the two facilities.

The addition of natural gas conversion capability expanded the size of the plant from 40,000 to 60,000 square feet and increased the plant's projected workforce levels from 138 in five years to 198. The jobs are expected to have an average salary of \$30,000 to \$40,000.

Bill Coppola, TDM project manager, said the addition also will delay the opening of the plant from February to May. With the delay, he said, TDM has revised its plant design and chosen Schultz Construction to build it instead of a Kansas City contractor earlier named for the job.

► CITY COMMISSION

City supports TDM, gives \$1.2 million

Brent Johnson
staff reporter

The city commission voted 5-0 to approve \$1.24 million in incentives for Troy Design and Manufacturing Co.

The \$1.24 million is part of the \$2 million needed by TDM to bring a natural-gas-conversion facility to Manhattan.

The natural-gas facility will be an addition to the electric-vehicle-production plant TDM already plans to build in Manhattan.

"It is in my opinion to spend the money when you have it to make the sun shine," Bruce Snead, city commissioner, said.

The breakdown in incentives offered from the city of Manhattan for the natural-gas-conversion facility equates to \$975,000 in job incentives from the Manhattan economic development opportunity fund, and a participatory loan of \$270,000 in training funds.

The \$975,000 will strip the economic development fund of all its money for the rest of the year.

"The MEDOFAB money will all be gone," said Randy Martin, president of Manhattan Chamber of Commerce, "but it makes my heart raise because I can't think of a better way to spend it."

Commissioner Steve Hall said the city and the Chamber of Commerce needs to inform future business applicants that all money is concentrated on TDM.

"In fairness of future applicants, we need to be honest with them up front and tell them our focus right now is TDM," he said.

In order to fulfill the \$2 million needed to bring the natural-gas facility to Manhattan, area sources contributed money to the incentive proposal.

Those area sources are K-State, Riley and Pottawatomie counties,

Western Resources and private contributions.

"President Wefald said himself that K-State will donate \$100,000 cash," Martin said.

Riley and Pottawatomie counties will be contributing \$450,000. Western Resources estimated it will contribute around \$100,000 in energy-use benefits.

"Our contribution is based on energy use," Wade Graves, representative from Western Resources, said. "Once they complete the designs of the facility, we'll know how much our contribution will be."

The addition of the natural-gas-conversion facility to Manhattan's TDM plant has caused many changes to previous plans and contracts.

"The plant size has increased from 40,000 to 60,000 square feet," Stinson said. "There will also be ample space for expansion capability of 30,000 square feet."

The TDM plant job projections also increased to a minimum of 198 jobs in the next five years, Martin said. Those jobs will have an average salary of \$30,000 to \$40,000.

Bill Coppola, TDM project manager, said with the addition of the natural-gas-conversion plant, two things changed. First, the opening of the plant will be delayed from February to May.

"Ford has shown some contractual lenience," he said, "but we'll start producing some electric Rangers at our other plant in Detroit."

"As soon as we get some trainees up there, and we can flick the lights, we'll start rolling them off until we get the Manhattan plant open."

Second, Schultz Construction Inc. will be the contractor building the plant. Dunn Industrial Group Inc. from Kansas City had been chosen to do the job but was taken off the project.

Ford picks TDM as sole converter

Ford Motor Co. has given TDM Co. an exclusive contract to convert F-series pickups to natural gas fuel.

TDM will convert a small facility near Ford's Kansas City, Mo. plant to do the job.

Currently TDM and other firms convert Ford pickups for the fleet market.

Beginning with the 1998 model year, TDM will be Ford's exclusive supplier, said

Ford spokeswoman Karen Holtschneider.

"They are doing an outstanding job with the conversions right now," she added.

Ford chose Texas as the first market for natural gas pickups in 1994. The company sold 50 F-series pickups there before selling nationwide. To date, Ford has sold about 400 natural gas pickups.

David Sedgwick

TDM Co. plans to power Ford Rangers like the one above with electric drivetrains with lead-acid batteries.

EV plant to be built in Kansas

First product:
Ranger pickups

DAVID SEDGWICK
Special Correspondent

Thanks to a Michigan engineering firm, Kansas could become a leading producer of electric vehicles.

This week, TDM Co. of Redford, Mich., expects to announce plans to build a \$10 million electric vehicle plant in Manhattan, Kan.

At first, TDM will produce electric Ford Ranger XL pickups, each vehicle powered by a 100-hp AC electric drivetrain with conventional lead-acid batteries. They have a driving range of 55 miles and can be recharged in three hours on a 240-volt line, the company says.

The plant also will house an engineering center to design electric powertrains and components. The center will support TDM's effort to design its own electric sedan.

The company expects to sell at least 1,700 electric Rangers in the first two years to utilities, municipalities and other fleet owners, said Bill Coppola, managing director of TDM's electric vehicle operations.

TDM expects to sell each of these vehicles for \$26,000, although tax incentives should cut the price by \$6,000.

Gasoline-powered Ranger XLs start at about \$11,000. The electric Ranger goes on sale in March 1996.

SUPPORT FROM UTILITIES

The Manhattan facility will employ about 100 workers, Coppola said. A consortium of seven Midwest utilities is backing the program with money and "buy" orders.

The program also is expected to be endorsed by Sen. Robert Dole, R-Kan., who has criticized government mandates for electric vehicles.

The project also has won praise from the California Air Resources Board, which has mandated the sale of electric vehicles in that state beginning in model year 1998.

"This is the most ideal program we've seen," said one CARB engineer who asked not to be named. "We very much agree with their thinking, and it appears they are moving very quickly."

Ford Motor Co. also endorses TDM's program because it will provide an early look at the electric Ranger's suitability for the California market.

Ford will supply TDM with "gliders" — pickups with the gasoline powertrain and gas tank removed.

FIVE-PASSENGER SEDAN

TDM is also designing a five-passenger sedan with a range of 100 miles.

The company hopes to use an electric motor designed by Al Cocconi, one of the lead designers of the prototype drivetrain on General Motors' Impact electric vehicle.

The sedan will feature aluminum body panels and advanced batteries.

TDM expects to spend about \$1.2 million on a drivable prototype, which is expected next spring.

The car's styling will be sporty, but not too extreme, Coppola said.

"It will look like a fairly traditional vehicle," Coppola said. "We don't want to shock the customers."

TDM hopes to line up a partner — perhaps a defense contractor looking to diversify — to handle volume production.

Coppola said he is holding talks with two aerospace firms but declined to identify them.

If TDM lines up financial backers, Coppola estimated he might need \$70 million to \$100 million for design and tooling for a production-ready vehicle.

In recent years, TDM has thrived by producing prototype vehicles and components for the Big 3.

It also specializes in vehicle conversions for fleet owners such as Federal Express.

A new electric vehicle will involve some financial risk for TDM, Coppola said.

But he said the project will enhance the company's reputation for engineering prowess.

"We want to be in the forefront" of engineering design firms, Coppola said. "If we don't drive ourselves to develop higher technology, we're just another member of the pack." **ENR**

Electric car plant will add gas aspect

Todd Manning
Staff Writer

A \$10 million electric vehicle plant slated for Manhattan also will produce natural gas-powered vehicles, adding another 20,000 square feet to the size of the plant and more than 50 employees to its estimated workforce, officials from Troy Design and Manufacturing said Thursday.

Bill Coppola, managing director of TDM's electric vehicle operations, said the natural gas vehicles are part of Ford Motor Co.'s "Qualified Vehicle Modifier" program. The natural gas vehicle program will enlarge the plant planned for the Manhattan industrial park from 40,000 to 60,000 square feet and increase the workforce from an estimated 138 employees to 200 within five years.

TDM originally intended to conduct the natural gas conversions at a facility near Ford Motor Co.'s Claycomo, Mo. plant. No reason for the change of plans was given.

The announcement was made during a closed-door meeting with Senate Majority Leader Bob Dole, R-Kan. Those who attended the meeting included Coppola, Kansas State University professor Jim Hague, KSU Vice President Bob Krause and William Roberts, president and chief

executive officer of TDM.

"This project sets an example for private companies taking the lead in advancing alternative fuels technology," Dole said. Troy Design and Manufacturing and Ford have tapped into K-State's research capabilities and the Manhattan community's resources to explore the potential of the growing alternative fuels market."

TDM announced last month that it would build the Manhattan plant to install electric powertrains in Ford Ranger XL vehicles. The first truck is expected to roll out of the plant by March 30.

The addition of natural gas-fueled vehicles to the Manhattan plant apparently not only will add to its size and workforce, but its research activities. In a press release, TDM officials said the plant will focus on the development of alternate fuels, fuel handling systems and the production of zero emission, low emission and ultra low emission vehicles.

KSU will participate in research and development of electric vehicle and alternative fuels technology.

"K-State brought with them a distinct advantage of engineering prowess through both the electrical engineering and agricultural colleges," said Roberts. "K-State has performed as a site operator with the U.S. Department of Energy since the program began and the College of Agriculture will provide expertise in the development of agricultural derivative fuels."

TDM worked with the state of Kansas and the city of Manhattan through the efforts of K-State, state and local economic development staffs and Western Resources Inc, to bring the facility to Manhattan.

► NATURAL-GAS VEHICLES

TDM may extend plant

Brent Johnson
staff reporter

Troy Design and Manufacturing Co. might expand its alternative-fuel vehicle plant in Manhattan.

Manhattan could be the future sight of a TDM conversion plant for natural-gas powered vehicles, Randy Martin, president of the Manhattan chamber of commerce, said.

"After we were successful with bringing the electric-vehicle plant here, we approached TDM to locate their natural-gas conversion plant here also," said James Hague, associate professor of architectural engineering and construction.

If TDM finds a natural-gas vehicle conversion plant in Manhattan, the facility will generate more jobs in conjunction with the electric-vehicle plant.

The expansion of a new facility will generate an additional 60 or more jobs during the next few years. Pay for these positions will average \$30,000 to \$40,000 a year, Martin said.

To bring the natural-gas conversion plant to Manhattan, the chamber of commerce will develop an incentive program for TDM to be presented to the Manhattan city commission, Manhattan Economic Development Opportunity Fund Advisory Board, Pottawatomie, Riley county officials and other interested parties.

"I can't say what the incentives will be at this time," Martin said, "but I can say the incentives will be similar to the initial ones provided for the electric-vehicle plant."

TDM will require more land at the site of the electric-vehicle plant to add the natural-gas conversion plant. The size of the facility could increase from 40,000 to 60,000 square feet, Martin said. TDM's commitment to convert combustion-engine vehicles to natural-gas powered vehicles will generate about \$250 million in economic activity for the automobile industry, said Wade Graves, manager of research and development and technical development for Western Resource.

**TROY DESIGN &
MANUFACTURING CO.**

"Many fleets within the state will be converted in 1996 to alternatively fueled vehicles," Graves said.

The U.S. military, United Parcel Service, Federal Express and U.S. Postal Service all have vehicle fleets.

"By the year 2003, 70 percent of all fleet vehicles must be alternatively fueled," Graves said. "This facility will be the single most important hub for producing alternative-fueled vehicles in the U.S."

A natural-gas vehicle conversion plant in Manhattan could create even more spin-off jobs and re-location of more businesses near Manhattan, Graves said.

"The city has the opportunity to contact suppliers of parts for alternatively fueled vehicles to be close to the Manhattan facility here in Kansas," Hague said.

Martin said this is an excellent opportunity for Manhattan.

"I think the public will be very comfortable with this," he said.

City approves deal with TDM

Todd Manning
Staff Writer

Forget — for the moment, at least — wildcats, agricultural research and little apples. Officials from the Chamber of Commerce and a future Manhattan vehicle plant have christened the city "the alternative fuel capital of the world."

The slogan was a sales pitch to city commissioners Tuesday night, and a successful one. Commissioners voted 5-0 to up the city's stake in the electric and natural gas vehicle-producing plant by more than \$1.24 million — a \$975,000 job incentives grant and a \$270,000 no-interest loan.

Troy Design and Manufacturing, based in Redford, Mich., hopes to have the plant open by May. That's two months later than the original March opening date, said Bill Coppola, TDM project manager. Construction crews began moving earth this morning at the site for the 60,000-square-foot plant, just southeast of Quaker Oats in the industrial park.

The city already has invested \$968,000 in grants and loans in the electric vehicle portion of the plant, bringing the city's share to 41.6 percent of the more than \$5.3 million in state and local funds invested in the alternative fuel venture. The city money comes from an economic development fund established at the first of the year with a half-cent sales tax.

The commission's decision all but drains the economic development fund for the rest of the year. Curt Wood, city finance director, said it will take about four months into 1996 for the job incentives portion of the fund to show a positive account balance.

Other local and state incentives included \$100,000 raised by Kansas State University, \$105,000 in private donations collected through the chamber, \$300,000 from Riley County and \$150,000 from Pottawatomie County. The \$300,000 Riley County donation was earmarked for creation of a new Riley County industrial park, said Dale Stinson, chamber economic development director.

Chamber president Randy

Martin approached the commission with the same pitch as he had the Economic Development Opportunity Fund Advisory Board last week: Adding natural gas conversions to the plant increases TDM's financial interest in the plant and provides both the city and the company with a fallback position in the event that electric vehicle technology doesn't succeed in the marketplace.

"It secures the investment you've already made in TDM," Martin told commissioners. "Now, more than any other community, Manhattan will be the alternative fuel capital of the world."

The plant also is the first low-volume electric vehicle facility in the country, TDM officials have said. TDM has signed a contract with Ford Motor Co. to produce 2,000 Ranger XL pickup trucks with electric drivetrains at the plant.

The vehicle plant is expected to have a workforce of at least 200 within five years, with average salaries ranging between \$30,000 and \$40,000. Coppola said 99 out of every 100 workers at the plant will come from Manhattan.

TDM may get incentives

Brent Johnson
staff reporter

The city commission will decide tonight if it will approve \$1.24 million in incentives for Troy Design and Manufacturing Co.

The \$1.24 million is a portion of the \$2 million needed to bring the TDM vehicle natural-gas-conversion facility to Manhattan.

The natural-gas-conversion facility will join the electric-vehicle plant TDM plans to build in Manhattan.

The money, if approved by the city commission, will deplete the city's economic development fund of all its money for the rest of the calendar year.

"Our incentive package calls for a \$975,000 grant in job incentives and a loan of \$270,000," said Dale Stinson, director of economic development for the Manhattan Chamber of Commerce.

"That is the remaining money for the rest of this calendar year."

The remaining \$800,000 needed to bring in the

natural-gas-conversion facility will be provided through private funds, Stinson said.

Originally, TDM had talks with Ford Motor Co. to locate the natural-gas-conversion facility near Ford's Claycomo, Mo., plant.

After TDM established Manhattan as the future site of an electric-vehicle-production plant, area groups looked into what it would take to bring the natural-gas-conversion facility to Manhattan.

If the city commission votes to allocate the money to TDM, the plant will expand from 40,000 to 60,000 square feet. The plant will contain facilities for both electric-vehicle production and natural-gas conversion.

"It makes sense to put the two facilities together, rather than have them be separate," Randy Martin, Chamber of Commerce president, said.

The addition of natural-gas conversion at the TDM plant will also increase the number of jobs at the plant.

"The new facility will bring more than 60-plus jobs over the next couple of years," Martin said.

"Those jobs will average \$30,000 to \$40,000 a year."

Fate of TDM request on city agenda

Todd Manning
Staff Writer

It's a balancing act and the City Commission is the fulcrum.

On one side is an offer from Troy Design and Manufacturing to add a natural gas conversion component to its as-yet unbuilt Manhattan electric vehicle plant and at least 60 more jobs in five years to its projected workforce. On the other is the \$975,000 grant and \$270,000 no-interest loan TDM wants in return for doing it.

Tuesday night, the commission will have to eye the scales and make a decision. The 7 p.m. commission meeting will be held at the Riley County Seniors' Service Center at 412 Leavenworth.

Proponents of the request, including K-State President Jon Wefald and the Manhattan Chamber of Commerce, say the addi-

tion will increase TDM's investment in the Manhattan plant and help ensure \$968,000—the city already has committed to the project.

But the \$1.24 million for the new grant and loan would drain the city's Economic Development Opportunity Fund to zero for the rest of the year and possibly leave the job incentives portion of the fund in the red until next May or June, city staff said this morning.

"We have sufficient dollars—or we will have by the end of the year—to meet the request," said Acting City Manager Ron Fehr. "However, we will have to use all of the cash in the funds."

Under an agreement with the Ford Motor Co., TDM plans to produce 2,000 Ford Ranger XL pickups with electric powertrains at the Manhattan plant, beginning

in May. TDM initially intended to convert vehicles over to use natural gas fuel in a separate facility near the Ford plant in Claycomo, Mo.

The city agreed to give TDM a \$550,000 grant and a \$418,000 no-interest, 10-year loan and issue up to \$4 million in industrial revenue bonds to help finance the electric vehicle portion of the plant. Adding to that the \$975,000 grant and \$270,000 loan for the natural gas conversions facility would increase the city's stake in the plant to about \$1.79 million.

The Economic Development Opportunity Fund, financed through a half-cent citywide sales tax, is expected to have about \$1.74 million by the end of the year. The city already has guaranteed \$200,000 to another company, locating its production

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plant from Wichita to Manhattan.

Curt Wood, city finance director, said the city could make up the \$50,000 shortfall with interest collected on the present economic development fund accounts.

Sales tax collections that come into the economic development fund are split into five different accounts — a job incentives account for making grants, a participatory loan account, a seed capital account, a grant account and a contingency fund.

Because money taken from one account by another must be repaid, Wood said it will take about six months for enough money to come into the job incentives account to break even and begin showing a cash balance.

TDM, based in Redford, Mich., came to Manhattan earlier this fall with an interest in Kansas State University's electric vehicle research and brought with it a proposal to build the nation's first volume production electric vehicle plant. The plant, 60,000 square feet with the natural gas conversion component, would employ about 200 workers in its first five years.

Also Tuesday night, the commission will consider:

- A request from Stoneybrook Retirement Community to issue up to \$1.6 million in industrial revenue bonds to assist the retirement center in the construction of a 30-unit assisted living facility. Stoneybrook would pay off the industrial revenue bonds.

- Preliminary versions of ordinances to establish a truck parking ordinance and truck route ordinance in Manhattan.

- A proposal to lower city swimming pool fees for seniors 62 years and older from \$1.75 per admission and \$25 a season to \$1 per admission and \$18 a season.

- A contract for \$15,658 to install a sound system and \$4,500 to extend a cable feed to the fire station headquarters building at Kimball and Denison avenues.

The city recently moved its City Commission work sessions from City Hall to the fire station after a resident pointed out that the City Hall elevator was not large enough to hold his motorized wheelchair. The commission meeting room was on the second floor of City Hall.

Fehr said the total cost of the cable feed is about \$4,500 and TCI, which broadcasts commission meetings on its public access channel, is paying half the cost.

Troy plant: Time to get to work

Todd Manning
Staff Writer

For most of the crowd that converged on a milo field in the Manhattan industrial park Wednesday, it was a chance to applaud the groundbreaking for a \$10 million electric vehicle plant.

For Donna Ellison of Wamego, it was a chance to find a job.

"That's one reason why I'm here, so I could find out when they're taking applications," she said, standing next to her 26-year-old son, who is also job hunting.

"There's so many out there unemployed, we need things like this to keep working."

The Troy Design and Manufacturing electric vehicle plant, with a projected opening date of Feb. 15, is expected to employ 50 workers in its first year of designing and producing electric and other alternative-fuel vehicles. Construction on the 60,000-square-foot plant on Levee Drive near the Quaker Oats Company is expected to begin within the next week to 10 days, said Rob Traut, project director for Dunn Indus-

trial Group contractors.

TDM has contracted with Ford Motor Co. to install electric power trains in 2,000 Ranger XL pickups with the first vehicle rolling off the line by March 31. Ford will manufacture the trucks and deliver them to the plant minus the engine and drive train.

The groundbreaking ceremony, complete with purple ribbon-decorated shovels, attracted a who's who of city and business leaders along with TDM president Bill Roberts and Gary Sher-

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rer, secretary of the Kansas Department of Commerce and Housing.

Kansas State University president Jon Wefald hailed the event as the start of a new chapter in automotive technology. The plant, referred to as the Manhattan Vehicle Center in TDM materials, will be the first low-volume electric vehicle plant in the country, TDM officials said.

"It's very important for this community to be involved in this kind of opportunity that could be a paradigm shift for the automobile industry," Wefald said.

"Someday, cities across the country will thank Manhattan, Kansas, for cleaning their air," added Mayor Edith Stunkel.

KSU administrators and electric vehicle research conducted by engineering professor Jim Hague played an instrumental role in TDM's decision to build the plant in Manhattan. KSU students and staff will work beside the plant's vehicle engineers in developing and testing vehicles.

The city also provided TDM almost \$1 million in incentives—about half of which was a 10-year, no-interest loan—to help in construction of the plant.

"This technology is the future," Ellison agreed. But she and a handful of other people at the groundbreaking attached a higher meaning to comments from TDM officials that 99 percent of the new plant's employees will come from the Manhattan area

and that the company will announce within 30 days where to pick up applications.

Bill Coppola, managing director of TDM electric vehicle operations, previously said salaries for production line positions will average \$45,000 a year and \$60,000 a year for designers.

Even at half that salary, the jobs are better than anything else Ellison has seen in the Manhattan area in the two years she has searched for a full-time job, she said. Currently, Ellison's family gets by on her husband's Army retirement income and additional money he makes working at a Payless Shoes warehouse in Topeka.

When trying to support a family, Ellison said minimum wage jobs at fast-food restaurants and convenience stores don't cut it. She has applied with the state employment office and Manpower, she said, but to no avail. Her high school degree doesn't command much interest from employers, she said.

"They just have never found anything for me," Ellison said.

She views the milo field that city, university and state leaders see as Manhattan's foothold in a new automotive future as an opportunity for a better life. In his address at the groundbreaking, Commerce and Housing Secretary Sherrer seemed to realize that.

"All this comes down to," Sherrer said, "is raising the quality of life for this community and the people who live here."

KANSAS STATE UNIVERSITY

DOE/KEURP

SITE OPERATOR PROGRAM

**TDM Electric & Hybrid Vehicle
Production & Test Facility**

Prepared by

James R. Hague

Director, Electric Vehicle Program

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