# AUTOMOBILES AND ENERGY

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I — Preface

The content of the 4-H Automobiles and Energy members’ manual has been designed to stimulate thinking about the world energy situation: how petroleum energy is used in the United States; how each of us can reduce the amount of petroleum products we use without reducing our quality of life; and how teenage America can take the lead in energy-conservation programs now and in the future.

The specific objectives formulated for this unit are:
1. To focus attention on crude oil resources as they are believed to exist today.
2. To suggest management measures which will result in immediate savings of energy.
3. To enlist teen-age America in helping with the crusade to extend finite crude oil resources.

Suggestions to help adult volunteer leaders work with teenage youth on this unit can be found in the back of the manual. It is envisioned that volunteer leaders will utilize: tours and trips to automobile dealers, garages, and service stations; and available films and slide-tapes which are related to consumption of fuel. Discussion of current magazine and newspaper articles on energy use could be a valuable supplement to this very important unit.

Teens need to be prepared to accept the fact that there will be many conflicting reports on energy use. There may be exaggerated claims on both sides of the question. Some people may claim that oil resources will be depleted with 25-30 years; others may say 50-60 years; still others may project further into the future based on an optimistic hope that there will be new discoveries of oil. Perhaps each of us want to be optimistic even though we know that all resources on Planet Earth are finite.

We welcome 4-H members and leaders into this Automotive Unit because we feel that the search for answers will be enlightening to all who seriously pursue the subject of energy consumption.

II — SITUATION

Most of our energy resources presently come from fossil fuels, which are a special kind of decaying organic material. These fossil fuels were formed within the earth over 400,000,000 years ago. Natural gas, petroleum products, and coal are the main kinds of fossil fuels.

Man is consuming these fossil fuels at a rapid rate. If consumption rates continue unchanged, natural gas and oil will be depleted within the next 50 - 60 years. There is enough coal estimated to last 500 - 600 years at present use level. But if coal alone is substituted for oil and gas, it may only be several decades before its supply is at a critical level.

It will take several million years to form new fossil fuels. Therefore, substitute energy sources must be developed to relieve the burden placed on existing fossil fuels by increased consumption. This research will take time. Conserving energy will give us that time.

What will be the status of our fossil fuel supplies in the year 2000? That’s just a few years away — within most of our lifetimes. However, some drastic changes will occur even sooner. Experts tell us when 80 percent of a valued product has been used up, prices soar and it becomes a very precious commodity.

Even though many people are not aware of it, our oil imports are increasing steadily. It was reported in 1976 that the United States actually imported as much oil as it produced.

The United States has one-sixth of the world’s population, but consumes one-third of the world’s energy resources. This presents an ethical problem; do we have a right to consume energy at this rate?

There are also political and economic questions. When we import half or more of the oil needed, what happens if the foreign governments refuse to sell to us? Would we resort to rationing the domestic production? Or, would we let the price go extremely high so that price would determine the amount consumed? Since so many products are manufactured from petroleum, how do you establish the priority as to which manufacturing concerns receive a supply of the base materials? What are the alternatives?

The Alaskan oil fields are expected to produce for 10-15 years, but the total amount available is only a small percentage of the total oil annual consumption in the United States. Therefore, the Alaskan oil fields will not solve our problems.

The situation in the United States is serious. The cost of our oil imports is so huge that we cannot sell enough manufactured goods or agricultural products to pay for oil imports. As a result, we have what is known as a trade deficit and this contributes to the
problem of inflation in the United States.

A high percentage of the energy consumed is wasted. Voluntary conservation measures would help to solve our short-term energy problems. But, we will make little progress toward energy conservation until more of the public really believes that an energy crisis exists. The one great advantage of voluntary energy conservation is that it is far more acceptable to us. We do not like to be told what we have to do. We much prefer to be given the facts and then determine what is best for each of us in the given situation. The fact is that the energy crisis now exists and will get steadily worse until significant conservation efforts are undertaken by all citizens of the United States.

III — DRIVING FOR ECONOMY

Now, let’s consider your car. Since it represents approximately 40% to 45% of your yearly energy bill, any savings can prove to be substantial. And as gasoline prices continue to rise, the more each small savings measure will mean. The single most important element in determining your car’s fuel economy is how you drive and maintain your car. Driving habits are extremely important. In fact, a recent study by the Environmental Protection Agency states that driving habits and travel characteristics can have more effect on fuel economy than any vehicle design feature. It is estimated that careful drivers can get 30% more mileage than the average driver and 50% more than a wasteful one.

Here are some tips to help you drive more economically . . .

1. Slow Down. Driving at 55 mph will give you about 20% better mileage than driving at 70 mph. Dropping down to 50 will increase your mileage 25%, and 40 mph will increase your mileage by approximately 50%. The best mileage for cars often occurs between 30 and 40 mph.

2. Accelerate smoothly but don’t creep away from stops. However, avoid “jack rabbit” starts since they require almost twice as much gas as normal ones.

3. If possible, avoid stop and go traffic. City driving uses 30% to 50% more gas than highway driving. Drive at a smooth, steady pace, anticipating road and traffic conditions. Minimize braking by maintaining a reasonable distance and coasting to stops instead of slamming on the brakes.

4. Climb hills gently. Hold the accelerator steady until more power is needed, then increase gradually. Avoid pressing the accelerator to the floor. Winding and hilly roads require more gas than level straight ones.

5. Don’t allow your car to idle for more than a minute. It requires less gas to stop and restart it than to let it idle. This applies to warm-ups also. The improved viscosity of modern oils eliminates the need for long warm-ups. Instead, drive slowly for the first one-quarter mile.

6. Remove all excess weight from your car. Each 50 pounds costs you one percent more in gasoline costs.

7. Avoid bad roads if possible; they increase friction and reduce mileage. In fact, driving on patched or broken asphalt roads reduces fuel economy by 14% as compared to driving on smooth roads; similarly, driving on gravel roads reduces mileage by 36% as shown in Table 1.

<table>
<thead>
<tr>
<th>Table 1. MPG vs. Road Surface</th>
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<tr>
<td>If your car gets 14 MPG on good smooth roads, it will get</td>
</tr>
<tr>
<td><strong>MPG</strong></td>
</tr>
<tr>
<td>12</td>
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<td>11</td>
</tr>
<tr>
<td>9</td>
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<tr>
<td>6½</td>
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8. Be sure to remove snow tires after the bad weather is over. They not only increase friction, but they also wear out more quickly in warm weather.

9. Check your mileage each time you fill up. This helps you learn which driving habits will produce the best mileage.

IV — MAINTAINING GOOD CAR HEALTH

Another important factor in fuel economy is good maintenance. Gasoline consumption increases and power decreases when your car is malfunctioning. By correcting the following, considerable amounts of gasoline can be saved.

1. Regular tune-ups can save up to 10% of your gasoline bill. Spark plugs, timing, points, carburetor adjustment, and emission controls should all be checked. A misfiring plug can increase consumption by as much as 12%, and a malfunctioning carburetor can use up to 20% to 25% more gas. The car should be in good mechanical condition so it can benefit from a tune-up, i.e., no burned valves or worn rings.

2. Keep the air filter clean. An air-starved engine will get fewer miles per gallon.

3. Don’t allow tires to become under-inflated because this will increase resistance, which requires more power and gasoline to overcome. Check tire pressure frequently, at least once per month and maintain it at the recommended pressure.¹

4. Proper wheel alignment will increase mileage.

5. If your car is an automatic, regularly check the level of the transmission fluid.

¹Some people suggest carrying 3 to 4 lbs. over the recommended air pressure for your tires. This might give slightly better mileage, but it also increases tire wear. In no case should you exceed the maximum recommended air pressure stamped on the tire.

V — CAR CHARACTERISTICS AND ECONOMY

A third factor in determining mileage is the physical characteristics of the car itself. In general, the best mileage (mpg) is obtained from cars that are lighter in weight, have small engines, manual transmission, low axle ratios, and low frontal area (width x height). Here are some items you should consider when shopping for your next car or truck.

1. Vehicle weight greatly increases fuel consumption.
   A 5,000 pound car uses twice as much fuel as a 2,000 pound car.

<table>
<thead>
<tr>
<th>LBS.</th>
<th>22 MILES PER GALLON</th>
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<tr>
<td>2200 Subcompact</td>
<td>17 MPG</td>
</tr>
<tr>
<td>2800 Compact</td>
<td>14 MPG</td>
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<tr>
<td>3500 Intermediate</td>
<td>11 MPG</td>
</tr>
<tr>
<td>4000 Full Size</td>
<td>9 MPG</td>
</tr>
<tr>
<td>4600 Luxury Sedan</td>
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Table 2: Comparison of Vehicle Weight to MPG

2. Options such as air-conditioning, automatic transmission, and power steering are noted gas users.
   a. Air-conditioning reduces fuel economy by an average of 10% (20% in stop-and-go traffic). Use it sparingly, especially in traffic.
   b. A manual transmission is more important on a small car where it can increase car performance by 1.2 mpg as opposed to only 0.2 mpg on a regular size car.
   c. Power steering can increase fuel consumption by 1% to 6%. Power brakes and electric windows, seats, and antennas do not decrease fuel economy substantially, but they do add a bit to vehicle weight, which increases gasoline consumption.
3. Radial tires help reduce resistance and therefore help increase mileage ratings by an average of 5% to 6% (some claim as much as 10%). These tires also have a longer life. These two factors will offset the additional cost if you plan to keep your car for any length of time.

4. Currently, diesel engines get 40% to 70% better fuel economy than conventional engines. Rotary engines are 20% to 35% less efficient.

5. Emissions controls are not the "guzzlers" some people believe. While they do increase the fuel use of 3500 + lbs. cars by 13% to 18%, cars weighing less than 3500 lbs. actually get 1% to 2% better mileage, according to recent studies by the EPA.

6. EPA mileage ratings, which are now provided for all new cars, are the results of statistical, not actual tests, and are considered by many to be too high. They are, however, a good relative basis for comparisons between new car models.

VI — OTHER FUEL-SAVING TIPS

The following is a list of several other miscellaneous tips to keep in mind when trying to save gasoline.

1. Wind and grade have the same effect on fuel economy as does speed. Driving 50 mph into a 20 mph wind has approximately the same effect as driving 70 mph in still air. Similarly, 50 mph on a 4 percent grade is the equivalent of 70 mph on a level grade.

2. Be wary of additives and gadgets which claim to increase mileage.

3. Consider buying a vacuum gauge ($8 to $16). It measures how efficiently an engine is running and when fuel consumption increases. It can help you monitor your driving techniques to learn which ones produce the best mileage, and it can also help detect engine problems.

4. Never attempt to save gas by shutting off your engine and coasting down hills.

5. Pulling a trailer adds considerably to wind resistance and weight. It takes more power to overcome this extra load; consequently, even slower speeds are necessary to provide adequate mileage.

6. Motorcycles get from 43 to 100 mpg, depending on the cc rating. Of course, they don't protect you from the elements, and they are less safe statistically than automobiles.

7. Use gasoline of the correct octane rating for your car. The "correct" one is the lowest possible octane level which will keep your car from "knocking." (When buying gas remember that by using "Self-Serve" pumps you can save yourself up to 5¢ per gallon!)

VII — TRIP PLANNING TO SAVE FUEL

One effective method of saving gas is to park your car and not go anywhere. While this would save 100 percent of your gasoline costs, it may not be very practical. What you can do, however, is essentially the same thing, i.e., minimize mileage via efficient trip planning. Some ways of doing this are:

1. Eliminate all unnecessary trips and combine others so that as much as possible can be accomplished in one outing. Cold engines are very inefficient, so it is important to fuel economy to get the engine warm and keep it that way. In an average car, ten 40-mile trips will use the same amount of fuel as 100 one-mile trips. If singular short trips cannot be avoided, walk or ride a bicycle to avoid using the car. Trips of less than five miles account for 15%
of the total miles driven in the United States and 30% of the fuel used. An alternative for these trips is public transportation.

2. If you have several errands to run, plan your route so as to minimize mileage and time. Avoid back-tracking if possible.

3. Call in as many orders as you can to avoid making short trips. Many places will deliver. Bank or pay bills by mail.

4. Plan your vacation route carefully. Try to avoid bad roads and large cities during rush hour traffic (i.e., 5-6 p.m., 7-8 a.m.). Consider traveling by train or bus instead of by car or plane. Also consider vacationing closer to home; many people never consider visiting a nearby tourist attraction that outsiders travel many miles to see. Take only what is essential and avoid having to use a luggage rack, which can reduce performance by 1 to 2 mpg. If it cannot be avoided, drive more slowly.

5. Cold weather affects gas mileage. It takes 10% less gas to operate a car at 80°F than 30°F (2% less for each 10°F decrease). It would profit you then to make long trips in the summer months.

6. Short trips are greatly affected by cold weather. In 10°F weather, the average car gets only 4 mpg for the first mile, while in the summer it would get 6 mpg for that initial mile. This is another good reason to curtail short trips, especially in winter.

7. Join a carpool. Just pooling up with one other person could save you almost half of your current work-commuting gasoline bill.

8. Use mass transit if available. A full bus uses 50 percent less energy per passenger mile than a car with four passengers.

VIII — SUGGESTIONS ON LEADING THIS PROJECT

It is suggested that this project be a combination of discussion and action-oriented sessions to meet the needs and interests of the group. It is expected that the members of the group will do some of the teaching from the third meeting to the end of the project. This provides an important developmental experience for them. They can use resource materials procured from the sources listed in this manual or located elsewhere.

If one member of the group keeps records on the family car, perhaps he or she might share the record-keeping system with the others. Or, before a visit to a garage, they may want to develop a list of questions to ask a mechanic on how to increase m.p.g. If a field trip is planned to observe people's driving habits, perhaps they will plan how to report observations via radio, T.V. and newspaper or school newspaper to get an energy-saving message to the public. It is strongly encouraged that the group think of ways they can be assertive in telling the energy crisis message. These are only a few of the ways they can teach each other and the public at large about possible solutions.

For the first meeting or two, the project leader should review and discuss the content of this project manual and do the “Let’s Discuss” section found on page 8. Also, at the first or second meeting, develop a plan for five or six additional meetings by selecting from the Unit Activities, or designing activities which will enhance members’ understanding of efficient operation of the automobile. The plan for these meetings should be recorded on page 15 of this manual.

Assign responsibilities for locating unit aids for future meetings to members of the project group. This
is an important experience for them and will aid them in the future by developing confidence in their ability to locate resources. Assign responsibility for contacting dealers or garages for meetings to members, or ask one of the members to accompany you when these contacts are made.

IX — LET'S DISCUSS

Read through and check whether you agree or disagree. Then discuss the questions as a group.

1. My family could get along without an auto ............................................
2. My family could reduce car travel by 50% with no loss in the quality of our life ........
3. My family can use a car with smaller body and engine the next time we buy ..........
4. My family, 4-H Club, church, or other groups we are members of now utilize car-pooling to the maximum extent ..........................................................
5. Our family car is tuned and serviced regularly to obtain the maximum miles per gallon .
6. Every driver in our family has pledged to drive no faster than 55 M.P.H. ............
7. Young Americans can have great impact on reducing total automotive fuel consumed if they launch an all-out media campaign on energy waste ........................................
8. Our family uses (plans to use) radial tires and checks inflation periodically to maximize M.P.G. ..............................................................
9. Our family plans to have a council meeting to discuss methods we will use to reduce fuel consumption ..............................................................
10. Our family plans and limits the number of trips it makes to the same location daily or weekly ..............................................................

X — LET'S DO . . . UNIT ACTIVITIES

1. Maintenance Visit a garage or maintenance center and have a qualified mechanic discuss how to maintain cars for maximum efficiency.
2. Tire Center Visit a tire dealer to learn the relationship between tire maintenance and wheel alignment for most efficient and least expensive operation of car. (Those members who do not know how to change a wheel safely should learn how at this meeting).
3. 4-H Automotive Unit Study the "Car Costs and Record-Keeping" unit on pages 31-35 of 4-H Automotive Unit I — "The Car and the Highway." Adopt or adapt this record-keeping system for all cars in each family for at least a six-month period. Meet again to share with each other the results of record-keeping.
4. Media Meeting Use one meeting to prepare material for radio, T.V. and newspapers relative to saving energy. This can be a series of articles or broadcasts, or both.
5. Public Service Announcements Use one meeting for recording public service announcements and other material prepared for radio. Submit articles to newspapers.
6. Simulation Games Ask your extension agents to loan you group simulation games related to
energy for use during some of your meetings.

7. Energy Literature Review publications which are available from universities, Federal Highway Transportation Division, Consumer Information Center, oil companies, and automotive manufacturing and support companies which relate to efficient use of the automobile.

8. Automobile Films Select available films which are related to efficient driving or performance of the automobile.

9. Driver Observation Plan ahead to observe the driving habits of people at an intersection or other prime location. Keep a record of total drivers observed; number who drive correctly; number who made mental driving errors; number who drove in a manner that caused the car to operate inefficiently; number who had cars with malfunctions that decreased efficiency.

Work with city government to study traffic patterns in the community. Are there “bottlenecks” or other problems in the highway system that cause motorists to waste fuel? Help your community identify and correct these wasteful measures.

10. Wheels Kit Review some of the 4-H Wheels units to help you think of additional activities. The 4-H Wheels material is a complete kit of slide/tapes, lessons, plans and activities that are available from OKT/Colson, 901 N. Main Street, Paris, Illinois 61944. Many of the units in the 4-H Wheels material deal directly or indirectly with operating the car efficiently and could be used effectively as support information in an Automotive and Energy project. For example, “Where the Rubber Meets the Road” could support the discussion of effective tires on fuel economy. Another example would be the car buymanship unit where 4-H members could judge groups of cars in a used car lot for the ones they feel would be most economical. Contact your county agent for order forms for this material. Perhaps he already has a Wheels kit in the county office.

11. Mileage Game Your group may wish to use the “Amoco Mileage Game”. This is a realistic simulation of just about anything that can happen when you drive a car. Players learn to use energy conservation practices when operating the automobile. Each state has received one complimentary copy from Amoco. State leaders have order forms. The game may also be order directly from Concept Communications Company, P. O. Box 52, Hinsdale, IL 60521.

12. Tire Recycling Program Your group may wish to get involved in an energy-saving program that has been launched by the Firestone Tire & Rubber Company to collect much needed retread on worn tires. Your group is encouraged to collect old tires from backyards, garages, vacant lots and along roads. Under the program, Firestone pays $1 for each retreadable tire taken to participating Firestone retread plants and stores. Write Firestone for an information packet including the name, address and phone number of the nearest Firestone retread plant. You will be instructed to contact the plant manager to work out specific details for bringing in used tires. In cases where there is no retread plant nearby, a Firestone store will serve as a collection site. Inquiries should be mailed to E. K. Henry, Manager of Retread Manufacturing, Firestone Tire & Rubber Co., Akron, Ohio 44317.

13. Community Survey Conduct a community survey on automobile use, answering such questions as how do you get to your job (mass transit, automobile, etc.). If you use an automobile, are you in a car pool? These and other questions can be answered to find out how efficiently the community is using its automobiles. Articles could be written for local newspapers or flyers prepared to inform the community of the results of the survey. Your group may then want to encourage people to consider the advantages of other transportation alternatives that would be more energy efficient.

14. Bike Paths Your group could get involved in helping the community or its park district create bike paths to encourage more people to use their bikes on short trips to the grocery store, shopping, etc. Such bikes paths will not only help save fuel currently used in short trips by cars, but would also provide a great deal more safety for those individuals who would be riding, hopefully resulting in fewer car-bicycle accidents and traffic problems.

15. Check Lane Consider sponsoring a 4-H economy check lane. It could be combined with a safety check lane and could be as simple as checking for tire pressure and other things discussed in this manual, or could be a quick diagnostic check done in cooperation with a local service station to see if
the auto is tuned properly. Activities such as this could be held at a shopping mall, a large service station with adequate room or some other open public place that would allow for easy traffic flow in and out of the economy lane.

The ideas presented here, especially those that involve others as resource people, need to be well planned in advance to be successful. Allow adequate time to organize the activities you wish to carry out so that by the time the actual event takes place, everyone will thoroughly know their responsibility and the public will be thoroughly informed so that you will achieve maximum possible participation.

There are a number of people who should be willing, given adequate notice, to help you in carrying through your activities and in helping your group increase its understanding of how to operate the automobile efficiently. Good resource persons would be car dealers, services station operators, highway engineers, bus and taxi drivers, state troopers, city police or other law enforcement officers, driver ed instructors, safety council members, auto mechanics, automobile hobbyists, tire dealers, used car salesmen, car appraisers, motor club representatives and school mechanics instructors.

XI — THE 4-H ECONOMY RALLY - DESIGN AND ORGANIZATION

The 4-H Economy Rally is an outstanding educational activity that can help the group members put into practice the things they have learned about operating a car efficiently. Your group can begin planning an economy rally in its first meeting. You could involve just your own group, or countywide or multi-county 4-H groups. A sample of how this activity could be conducted is discussed below.

Objectives
1. Provide 4-H participants with useful, relevant information on fuel-efficient driving techniques.
2. Illustrate the importance of the motorist's role in domestic energy conservation.
3. Demonstrate that efficient driving techniques can result in substantial fuel savings without time or speed penalties.
4. Offer 4-H participants the opportunity to evaluate their own driving techniques under controlled conditions.

5. Provide a medium for developing, testing and publicizing effective driving techniques.

Resources

To conduct the rally successfully you will need certain resource people and locations . . .

A. Service Station and Owner to allow rally participants to fill their cars with gas at one central location. This station will serve as the starting point for the rally. Depending upon the type of rally you run (i.e., whether it is a circular route or a linear route) you may need a second station to be the finishing point. You should be able to recruit volunteers to help out at the starting and finishing points, since everyone will be filling up at these stations.

B. A set of scales (such as those found at a grain elevator, highway weighing station or any other location where vehicles are weighed) are needed to determine the ton miles per gallon. This measurement, made before the rally begins, allows for differences in style of automobile, amount of equipment carried and weight of drivers and observers.

C. Police or traffic safety volunteers will be needed to serve as official judges for the contest and to manage the check points along the route.

D. The Sports Car Club of America, which conducts economy rallies as one of their national activities, is active in many communities. It also sponsors a number of regional economy rallies that you may wish to check into for further group participation. For information on the Sports Car Club economy rally nearest you, contact the address listed in the Resources section of this manual.

Sample Rally Design

After your group has selected a coordinating committee, the committee can organize the program by securing the necessary facilities and volunteers and by mapping out the economy rally route. Make sure this is done well in advance of the target date for the actual rally.

Once these details are set, the group can promote the activity through flyers, newspaper articles or letters written by the county Extension agent inviting other 4-H
clubs in your county or surrounding counties to participate.

After adequate promotion, a date is set up for a general organization meeting about five or six weeks prior to the actual rally. At this meeting entries are taken, the details of the rally described and any questions answered. A short workshop could also be conducted at this meeting for those 4-H members who may not have been involved in the 4-H Automobiles and Energy project. (Individuals who want to enroll in this project may obtain the necessary materials from the county Extension agent.) This short workshop would review efficient use of the automobile and proper preparation of vehicles for the economy rally. Your group may wish to sponsor additional workshops prior to the rally on these topics.

On the day of the rally, all participants should drive their vehicles to the designated location to have their vehicles weighed, classified and thoroughly inspected for safety. The entrants may fill out their entry sheets during this time. The rally judges are to check such items as the weight of the car and the odometer reading. The group then proceeds to the service station designated to be the starting point of the rally. Here the automobiles are filled with fuel, the course directions for the navigator are distributed and any final questions are answered by the rally coordinating committee and the judges. The entrants leave the starting point at five-minute intervals.

The course can be laid out as a circle ending at the same service station or as a linear course ending at a different service station. Entrants receive the signatures of the judges at the various check points as they proceed along the course. In addition, your group may choose to use roving observers on the route to look for infractions and to assist cars in trouble.

At the finish point service station, gasoline tanks will again be filled. Gasoline usage will be recorded and checked by the judges on the entry form. Winners will be determined in ton miles per gallon for the different car categories after penalty points are assessed for failing to meet the time schedule or for missing any check point along the way. Your group should set in advance the magnitude of penalty points given for each possible infraction.

Another way to score the rally is to classify the participating vehicles according to the current U. S. Environmental Protection Agency (EPA) Department of Energy (DOE) Gas Mileage Guide. Each entrant will compete against similarly classed vehicles for class awards. The vehicle's fuel consumption will be measured and compared against similarly classed vehicles to determine class winners. The object of this system is to obtain the greatest percentage improvement in gas mileage over the EPA/DOE published Combined Miles per Gallon (MPG) figure for the corresponding make, model and year of the vehicle entered.

Plan for the 4-H Economy Rally to conclude at a service station that is near a picnic or recreational area so you can hold a recognition picnic afterwards. Recognition could be given to all the participants in the form of patches or automobile stickers that might read something like "4-H Energy Efficient Operator". Recognition for individual winners will be determined by the coordinating committee.

During the recognition picnic, you could discuss problems and situations participants encountered while on the course, such as delays and particular traffic hazards. The members of each driving team could share what they learned to help them operate an automobile more efficiently in the future.

If participants need to prepare and bring their own food for the picnic, this provides an additional opportunity for other projects to be covered, such as food conservation and safety, foods and nutrition and packing for trips. After the discussion, the program can conclude with some recreational activity.
XII — RALLY RULES AND FORMS

Following is a sample copy of 4-H economy rally rules, entry sheet and navigator instructions. The directions presented will give you an idea of how to write directions for your own particular rally.

Rules

1. All drivers must have a valid drivers license.

2. All entrants must belong to a 4-H club in one of the participating counties.

3. All contestants will have their cars filled with gas at the beginning and end of the rally at the participating filling station. Contestants are prohibited from adding any extra fuel during the rally.

4. Contestants will pay for their own fuel.

5. All cars will be weighed with the trunk open and placed in a weight division.

6. Each team will consist of one driver and one observer.

7. Only the driver may drive the car.

8. The observer does not have to have a valid drivers license.

9. The cars will leave at five minute intervals.

10. Cars will have a time schedule to follow and will be penalized for crossing the finish line behind schedule.

11. There will be 3 check points where all cars must obtain signatures from the official present.

12. The contest winner is based upon ton miles per gallon.

13. All drivers and operators must have parental approval and submit an entry and release form.

14. Entrants must obey all state and local traffic regulations. (Violators will be disqualified.)

15. Entrants are prohibited from coasting with the engine off, the transmission in neutral or the clutch disengaged. These procedures are unsafe practices and can be a violation of the law.
XIII — 4-H ECONOMY RALLY ENTRY SHEET

1. Driver’s Name

2. Observer’s Name

3. Car Entry Number

4. Car Make __________________________ Year __________________________

5. Odometer Reading - Beginning __________________ Finish __________________

6. Departure Time - Beginning __________________ Finish: __________________

7. Scale Gross Weight of Car __________________

Any added Gasoline ___________________ Gal. @ 7 pounds per gallon.

8. Total Gross Weight ___________________

9. This car is (Check correct one)

   Heavyweight _______  Middleweight _______  Lightweight _______

   (Over 4,200 lb.)                         (3,500 - 4,200 lb.)                         (Under 3,500 lb.)

10. Tons in Decimals _______________________

11. Ton-miles traveled __________________ (00.0)

    (Tons in decimals x _______ official miles of course)

12. Gasoline cost in dollars and cents ____________________ ($0.00)

13. Gallons of gasoline used ____________________ (0.0000)

14. Ton-Miles per gallon ____________________ (00.00)

    (Total ton miles (item 11) ÷ gallons of gasoline (item 14))

15. Car miles per gallon __________________

    (Official length of course ÷ gallons of gasoline)

16. Entrant’s placing

    Ton-miles per gallon __________________

    Car-miles per gallon __________________

______________________________
Official Judge’s Signature
XIV — SAMPLE 4-H ECONOMY RALLY INSTRUCTIONS

Instructions to navigator and driver:

1. Follow these directions closely in order to stay on the course.

2. The run should be completed in 2 hours and 14 minutes. Use the time schedule at the right hand column for guidance.

3. Check points marked with flags will be set up on the course. Be sure you get the signature of the persons manning the check points.

<table>
<thead>
<tr>
<th>Total Distance</th>
<th>Time Schedule</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>00</td>
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<tr>
<td>.09</td>
<td>05 min.</td>
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<tr>
<td>2.9 miles</td>
<td>10 min.</td>
</tr>
<tr>
<td>4.8 miles</td>
<td>15 min.</td>
</tr>
<tr>
<td>66.1 miles</td>
<td>2 hr. 14 min.</td>
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</tbody>
</table>

FS Station - Washington Street
Start West on Washington Street to Grandview Street
Turn North to Springfield Street, then turn West to Marker N050W150
- turn North - Weigh car at elevator scales.

Turn North to stop sign.

Turn West at stop sign and proceed. Good Luck???? N100W150

Turn South at N100W300, go over RR track and across 133 to stop sign. N050W300

Turn West to end of brick then South to Marker W400s follow blacktop to the West.

Continue West to end of blacktop and go straight on gravel to stop sign. W85S CAUTION MUD PUDDLE.

Continue West on blacktop to Marker W1000S, turn North on gravel to T road. N100W1000

Turn West and proceed on blacktop and go over wooden bridge and continue West to stop sign.

Continue straight across Rt. 49 on gravel, follow S curves and continue West to T Road.

Turn South by green house on left side of road. A red barn sits on the right.

Follow blacktop around curves and bends. CAUTION! DO NOT RUN OVER CHICKENS!

The economy run will continue in this fashion until participants:

Turn left at stop light to next stop light. Turn left on Central to Washington Street and back to F. S. Service Station.

FINISHED !!!!!
<table>
<thead>
<tr>
<th>Meeting #</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>October 13</td>
<td>Jones home, 221 Osage St.</td>
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<table>
<thead>
<tr>
<th>Content to be Covered</th>
<th>Who Will Do It</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Driving Tips</td>
<td>Dave</td>
</tr>
<tr>
<td>2. Guest Speaker</td>
<td>Sharon</td>
</tr>
<tr>
<td>3. Field Trip</td>
<td>Kate</td>
</tr>
<tr>
<td>4. Economy Rally</td>
<td>Gary</td>
</tr>
<tr>
<td>5. Trip Planning</td>
<td>Larry</td>
</tr>
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</table>

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<thead>
<tr>
<th>Equipment - Material Needed</th>
<th>Who Will Get It</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carousel Projector</td>
<td>Bob</td>
</tr>
<tr>
<td>2. Screen</td>
<td>Bob</td>
</tr>
<tr>
<td>3. Cassette tape Player</td>
<td>Bob</td>
</tr>
<tr>
<td>4. Slides and Cassette</td>
<td>Susie</td>
</tr>
</tbody>
</table>

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**Meeting #2**

<table>
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**Meeting #3**

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<td>4.</td>
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</tr>
</tbody>
</table>
available from:

AAA
Traffic Engineering and Safety Department
American Automobile Association
1712 G. St., N.W.
Washington, D.C. 20006

Alyeska Pipeline Service Company
1835 South Bragaw Street
Anchorage, Alaska 99504

American Petroleum Institute
1801 K Street, N.W.
Washington, D.C. 20006

Antique Automobile Club of America
National Headquarters
501 West Governor Road
Hershey, Pennsylvania 17033

Association - Sterling Films
866 Third Avenue
New York, New York 10022

Automobile Manufacturers Assoc. Inc.
320 New Center Bldg.
Detroit, Michigan 48202

Automotive Information Council
6th Floor, 666 5th Ave.
New York, New York 10019

Automotive Safety Foundation
200 Ring Building
Washington, D.C. 20036

Automotive Service Industry
230 North Michigan Avenue
Chicago, Illinois 60601

Chrysler Corporation
Massachusetts Avenue
Highland Park, Michigan 48203

Consumer Information Center
Pueblo, Colorado 81009

Firestone Tire and Rubber Company
Director of Consumer Affairs
1200 Firestone Parkway
Akron, Ohio 44317

Ford Motor Company
Information Section
Department of Educational Affairs
3000 Schoefer Road
Dearborn, Michigan 48121

General Motors Film Library
Public Relations Staff
General Motors Bldg.
Detroit, Michigan 48202

Highway Users Federation
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036

Modem Talking Pictures
1687 Elmhurst Road
Elk Grove Village, Illinois 60007

National Automobile Dealers Association
2000 K Street, N.W.
Washington, D.C. 20006

National Automotive Parts Association
10400 West Higgins Road
Rosemont, Illinois 60018

National 4-H Council
150 N. Wacker Dr.
Chicago, Illinois 60606

National Safety Council
425 North Michigan Avenue
Chicago, Illinois 60611

National Tire Dealers and Retreaders Assoc.
1343 L St., N.W.
Washington, D.C. 20005

Rubber Manufacturers Association
1901 Pennsylvania Ave., N.W.
Washington, D.C. 20006

Shell Oil Company
P. O. Box 61609
Houston, Texas 77208

Tire Industry Safety Council
Suite 766, National Press Bldg.
Washington, D.C. 20004

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

United States Environmental Protection Agency
Office of Public Awareness (A-107)
Washington, D.C. 20460

Your State 4-H Office

when making requests be specific as to the subject area in which you need support mater