

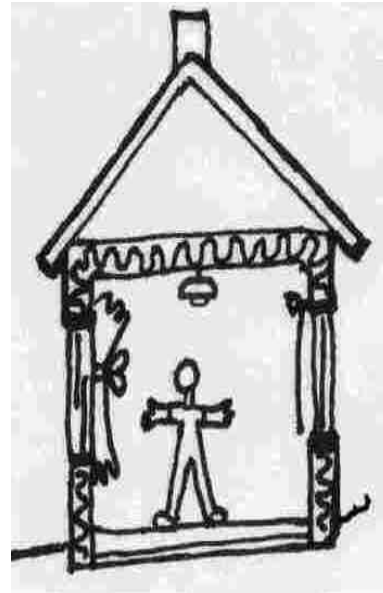
The Fuel Saver's Guide

subtitle: Beating the System. 8th edition, 2009

An Ebook for the new millenium

Updated
To 2/09

Published and distributed electronically and put into the public domain
as an answer to the energy woes of today and of the future



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foreword

Almost nobody reads forewords. However, let's do one anyway and take a look at why you downloaded this huge file, and what to expect from it.

- * Frustration caused by rising/oscillating home and transportation fuel prices. This guide is designed to help you control fuel costing as an individual. If you are a business whether large or small, it will, when applicable simple suggestions given here are implemented, add handsomely to your bottom line.
- * Frustration caused by the arguments over 'greenhouse gas generation' aka CO2 or global warming gases. Whether scientists agree with each other or disagree over the cause of global warming is not the issue. The issue is that excessive use of carbon bearing oxidizing fuels by an expanding population is poisoning the atmosphere of the only planet that we have. Agreement of opinion of any of the world's scientists as to the cause of global warming is not necessary for an individual to cut his/her contribution to the atmosphere of greenhouse, acid rain, and lung concern gases and other, such as particulate pollutants, thereby saving wasted fuel dollars that could be better used for other purposes, or banked for future use.
- * Frustration regarding the long lead times that both government and industry require to implement promised programs and hardware to reduce fuel consumption, therefore fuel costing. There is no valid reason why a family or business can't start on their own fuel saving program now, today. You will be way ahead of government and industry timetables, independent of them. Yes, as time goes on, more 'ammunition' will come along from various sources to help your fuel conservation program. But now, starting with the Fuel Saver's Guide, you don't have to wait for it.

And finally,

- * Frustration caused by the simple fact that almost everything you have heard of previously to reduce your own fuel expenses costs big money to implement. This guide is heavy on 'free' or 'minimum cost' methods to achieve close to minimum fuel use in your – and everybody's - situation. This guide is not 'adware' or 'futuretech'. Futuretech is a cop out. Every fuel saving suggestion given here can be done now and every piece of hardware needed to implement it, if any, is available now.

You may be surprised by the free distribution of this guide. Maybe looking for a 'catch' to it such as requesting contributions etc. There are none. The participants in the ad hoc workgroup who produced this document have their 'fuel based' frustrations too, and have found ways out of them. This free sharing of the distilled knowledge of many individuals is the cure for us, a reaction against the tyranny and influence of the fossil fuel industries into every part of our daily lives. We can't boycott them. However, we can use less of their products, none wherever applicable, and reduce their influence. We urge the readers of this guide to get on this same program. Use less fuel, and share this guide and all other fuel saving info with others. Your planet (and your bank account) will thank you.

As with all ECFSC participants, Anon

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Gas saving tips

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It's smart to be energy smart

- Be aware that your driving style and habits influence your gasoline bill.
- Concatenate short trips. Do them all together, a planned route.
- Do as little idling as possible. According to a Canadian govt study it is better for your engine to warm it up by driving easily than by idling it. Remote starters promote long idling, fuel waste.
- Use the A/C less, only when you really need it. It costs fuel to run.
- Trade in that fuel hog - SUV etc - while you still can.
- Keep your tires at 35 lbs or highest mfg's rec. – check pressure monthly.
- Buy only from the gas stations that are the cheapest. Use the lowest priced no lead grade if 'premium' not needed. NEVER make a trip just to buy gas.
- NEVER use plastic to buy gas, as with minimum payment you add finance and possibly service charge to it's price even if it's paid up monthly.
- Car pool for commuting, shopping, children's activities etc.
- Commute in the family vehicle that uses the least gas.
- Get a bike, electric bike or adult scooter for the short 'one person' trips
- Never let your teenager borrow your car until he/she is educated as to *economical driving practices*. It is up to US to teach THEM.
- Think before you drive – is this trip necessary? Again, concatenate.
- Plan ahead to avoid stop and go or heavy traffic.
- Drive slower, drive steadier. Fuel mileage is best below 62 mph.
- Anticipate traffic lights and stops. Coast earlier. Accelerate slowly.
- Use public transportation whenever possible
- Buy your next car with fuel economy foremost in mind.
- Consider alternative fuel systems – electricity, biodiesel, hybrid
- Consider not owning a car, but renting one when you need one. All other transportation public, or on a bike, electrified bike, or adult scooter.
- Consider moving closer to where you work, or finding employment closer to home. Shop closer to home. Consider family entertainment that does not involve driving, or involves minimum driving.
- While you're at it, consider energy saving improvements to your home. Heating fuel is going up too. Why waste it? Only buy 'energy star' rated appliances. Use compact fluorescent light bulbs. Use a fan instead of A/C most of the time. Cook more with your microwave. Improve insulation. Stop drafts. Use a 7 day programmable thermostat. Keep temp at or below 68.

**Saving fuel helps to preserve a depleting natural resource
And ramps down global warming – acid rain gases.**

**Don't accept that 'mucho dinero' fuel bill. Use your head to save money
and to beat the system that made it happen.**

FUEL COST PER MILE

<i>Miles per gallon</i> (Short trips are less)	<i>Fuel price</i>	<i>Per Mile</i>	<i>Per 100 miles</i>
10 (Hummer, SUV)	\$2.00	20c	\$20.00
20	2.00	10c	10.00
30	2.00	7.5c	7.50
40	2.00	5c	5.00
50 (Prius, hybrids)	2.00	4c	4.00
10 (Hummer, SUV)	\$3.00	30c	\$30.00
20	3.00	15c	15.00
30	3.00	10c	10.00
40	3.00	7.5c	7.50
50 (Prius, hybrids)	3.00	5c	6.00
10 (Hummer, SUV)	\$4.00	40c	\$40.00
20	4.00	20c	20.00
30	4.00	13.3c	13.30
40	4.00	10c	10.00
50 (Prius, hybrids)	4.00	8c	8.00
full size electric veh @3m/kwh @.15/kwh		5c	5.00
100+ mpg (gas motorscooter) @ \$3.00/g		3c	3.00
electric bike or motorscooter @ .15/kwh		<1/2c	< 50c

Example: interpolating the chart, your vehicle gets 25 'highway' miles/gallon at \$3.00/gallon. Your cost per mile and per 100 mile figure would come out to halfway between the 20 and 30. Figures. Average the 'per mile' to get cost. (ave 15, 10 = 25/2 = 12.5c / mile and x100 would be 12.50/100 miles). Short 'cold engine' trips are 1/2 your 'city' MPG figure. So using the same example, cost would be more than **double per mile** (about 27c) **for the first 5 miles of each trip**. *Note* that prolonged idling does not completely warm up engine/chassis (see gas saving tips). *Note* that most all 'scooter', bike, or 'electric bike' miles replace 'cold engine' gas vehicle miles (short 'small grocery' trips etc) although this chart itself doesn't mention it. *Note*: Gas price column should be interpolated also.

Here, you see that the fuel mileage of your vehicle and the way that you drive that vehicle have much more to do with the cost of your trip than the price of gas.

**DON'T BLAME THE PRICE OF GAS,
BLAME YOUR OWN CHOICE OF VEHICLE AND YOUR DRIVING STYLE**

It is smart to be energy smart

Miscellaneous items / alternatives regarding fuel and fuel saving

Everyone you know should read this Ebook. Even those who do not have email. Most of the stuff in here will never get into the media. It upsets too many commercial applegarts. First, we will start with transportation issues.

Figuring your own vehicle's miles per gallon accurately

When you stop at the gas station, fill her up. When the automatic nozzle stops, start it again 3 times (it will click itself off, do 3 clicks). Or if possible, fill to the top of the filler tube. Record your odometer mileage including tenths. If you have a trip indicator, set it to zero. DO NOT, this first time, record the number of gallons you bought (this common mistake throws off a lot of calculations. Best to pump it yourself gas station attendants like to stop on even numbers so they won't have to make small change. .

Drive until you have used most of the gas, below $\frac{1}{4}$ full. Stop, if possible at the same gas station and fill again the same way same grade of fuel. Record the number of gallons read on the gas pump including decimal figures. Record your mileage or record your trip indicator, subtract odometer readings to get the difference, ie, the number of miles you drove. Do the entire procedure twice in a row, once is not enough for best accuracy. With a pair of 'fill and records', you will see a difference – so average them to get an overall average figure. However, a single fill will be good enough for a 'starting figure'

. With a calculator, divide the fuel 'gallons' figure into the miles. Record the answer to 2 decimal places. This is your own vehicle (and driver's) miles per gallon. A starting point. Don't do this testing right after a tune up. Some cars require about 100 miles after tune up before their engine's computer finds and sets the optimum points for all engine parameters. And - as on pg 4, expect lower mpg if you have mainly done short trips.

REMEMBER that the 'rated' fuel mileages given when you bought the car (city/country) was for a brand new vehicle likely done under ideal conditions on level ground with an expert test driver. OR; it could have been done on a test bed. Your figure may be worse than published. If it's not satisfactory, either it needs a tune up, or the tire pressures are low, or the person driving it needs to follow several of the driving specific 'gas saving tips' in the document gas saving tips'. Possibly all 3 of these reasons. If you don't know the published figures, that's OK, do a baseline test (shown below). Even if it's better than published, you will still save money using many of the hints in this document and in 'gas saving tips', as you will be burning less gas by driving less miles and driving differently. Adopting other tips and examples, - one instance being concatenation, another, averaging as explained later - you will burn MUCH less fuel.

There are exceptions. Mileage varies between summer/winter (better in summer) Sometimes the gas station itself gets filled by a different supplier and the gas is different. This will make a mile or so per gallon difference usually. Some states use a higher percentage of ethanol in the gas, which lowers fuel mileage. Anyone else driving that car will use it differently (jack rabbit starts, gas pedal 'pumping' while driving, tailgating and quick stops at traffic lights, or driving over 55 will lower it, over 62 lowers it even more. Those people going over the 65 mph speed limit are really paying the fuel companies through the nose! Even hybrids don't get max economy in the fast lane. Air resistance is

not a linear function, streamlining not perfect, and vehicle designed maximum efficiency point has been passed, is on downcurve.

Gasoline/diesel fuel savings issues

There is very little difference in brand or grade of gas as to power, mileage obtained etc. What you are really doing is choosing the price you want to pay for it. If you have chosen to buy a vehicle that requires higher octane premium (priced) gas, that's tough, but you must (unfortunately) pay for that choice until you trade for one that doesn't. .

This writer has been using pretty much exclusively 'cheap brand cheapest price gas' for over 40 yrs and has never had a gasoline-caused problem. Nor has heard of anyone else having one except for muddy water in the gas from poorly designed low lying gas stations after real big rainstorms. And that can happen at expensive brand stations too.

Only real difference – you must pay cash for lower priced offbrand gas. Here you save too, getting cash from your bank's 'no charge' debit machine - or even as you pay for your groceries with debit card as a 'cash checkout' from the supermarket. You will not have to pay service charge or interest on the gas station's card or additional 'loan' interest on your own revolving charge card if you get your cash from a debit card.

Note that some gas stations charge more per gallon if fuel is paid for by card. Paying with cash saves you this charge as well as the card's own 'interest rate'.

Commuters, sit and do some 'Jr Hi School' math with a calculator on your charge card statement and see how much interest you pay on anywhere around \$100-500 worth of gas a month. Even if the gas portion is paid off **monthly** you lose money, as interest on most cards is **daily** on the unpaid balance until you pay it. And that's every month. You lose always, the more you charge on those cards no matter how fast you pay them off. All charge cards are merry-go-rounds designed to make money for the stockholders of the corporations that own that particular 'brand' of card. The only way to get off the merry go round is to stop using the cards and pay them off as fast as you can.

Incidentally; most who really know their money math do not even own charge cards. They use a debit card which is just like writing a check unless you use a machine that is not allied with your own bank and charges a fee. This writer has only had one 'debit card service charge' since getting the card perhaps 6 yrs ago and that was unavoidable. I did not raise my money to **give** it as interest to a bank. I raised it to **put into** a bank so **they would give me interest** This is the underlying principle. (Even the checking account in this family bears interest. Shop the banks look for the best deal). Do that, your money itself becomes more efficient. It's just like getting a decent raise in pay, but this kind of raise is tax free, FICA free. And you don't have to work to get it. Just think before you choose a bank, and think before you buy.

Incidentally, nix 'overdraft protection' on your debit card. Many banks add a hefty fee for overdrafts when they get protected. Some of them, the overdraft gets paid by Visa etc and then you pay interest. If your card gets stolen and used before you can cancel it, the theft would be limited to your balance then the card would run dry. With overdraft protection, it would continue – so your security is much better without overdraft protection.

If you can set up your household financial affairs to maintain a bank balance large enough for any expected household purchases (example, one of those \$3,000 TV sets), you would then be your own banker and not pay interest. Instead, you would earn a bit

less interest on the decreased balance of that account if it was interest bearing. Which would be in the 'peanuts' category.

The only purchases that you should need to set up monthly time payments on would be a house mortgage and a new or pretty new used car. Both of these bigtime 'charge accounts' are unavoidable.

However, if a person can reject the image advertising of a new vehicle and set their mind to driving a used 'cash car' and knows how to pick em; Scratch the car payment, and the expensive comprehensive insurance needed to satisfy the requirements of the finance company, and the car loan and insurance co finance charge and save bigtime on depreciation of the vehicle too. It is a lovely feeling to own and drive a real decent fuel efficient car that someone else has paid most of the depreciation on. This writer (along with most auto mechanics, used car salesmen and a lot of bankers) has been doing that for many many years. The convenience of a credit card when buying gas? Hello?

Business, corporations, even government need to use a card for record keeping purposes. Unfortunate, but good records are a vital part of being in business. To those people; examine your use of a card to see if a minor change of accounting/payment practices could save you yearly dollars here.

You will find that it really pays – with the average person 20 to 30% and with some, like the fast lane road rage type up to 50% of their gas dollars - to follow the pertinent 'driving specific' tips in the gas saving tips document on page 3. Any driver can do more than 50% by also following the 'non driving specific' tips, such as miles per gallon averaging. One example given further on using 'averaging' among other methods reached over 90%. Averaging will be explained later under it's own heading in this document.

It is obvious from studying this document, the mileage chart, and 'gas saving tips' that every individual driver is responsible for the fuel 'miles per gallon figure' he or she gets. Styles of driving vary. Types of trips vary. Instance; Do not blame the person who does a lot of short trip cold miles driving (like bringing children to school and sports events etc) for being a wasteful driver. It is the nature of the trips (short trips with the whole vehicle drivetrain, not only the engine, not yet at optimum temperature for fuel economy) causing poor mileage (even those, minimum idling and economical driving habits will improve).

And - - don't pat yourself on the back for good mileage unless your only measure is what you yourself used to get in the same vehicle before changing your habits. And if you do want to document your improvement, do it on at least 2 full tanks of gas doing the same 'oldstyle' type of driving without changing. To make a baseline for comparison, don't change a thing for the first couple of recorded and calculated full tanks. (Which unfortunately would be a waste of fuel dollars compared to not making a baseline).

Now here's the bad news. If you are driving a vehicle such as the much maligned SUV that is inherently bad on gas due to weight size and *especially*, excessive unnecessary power, you will gain little with the 'driving specific' gas saving tips. Reason, cold hard unchangeable mathematics. If 10mpg is what you're getting, improving it 20% only gets you 2 mpg more, total 12. If the vehicle has better economy and is getting 25mpg, 20% of that is 5 mpg, total 30. Over twice what you will save using the same methods on a 10

mpg gas guzzler. And - as you see by the 'mpg' chart - mpg translates directly into dollars. AND – this type fuel economy, as all others given here, adds up to serious money yearly.

How would you like to get 20% (a minimum figure, many get more), one dollar out of every five of every dollar you spend on gasoline (and other fuels as well) as cash in your fist all at once 12 months after starting this (or any) fuel saving program? And at the end of every 12 month period thereafter compared with now. Put your imagination to work and dwell on it. This is the bottom line of what will, in fact must happen when you follow the free advice given in this guide already and in the following pages, especially the financial issues near the end of Section I. This is not just a promise, it is mathematical certainty. And Free!

If driving the guzzler is unavoidable, such as a work truck, use the methods anyway at least it's something, and endeavor not to drive it unless you are actually working with it. And don't justify and say 'the customers pay for it anyway and it's a tax deduction'. This is fallacy. As any real sharp accountant could tell you. It's your money. Don't give it away to the oil barons. They are rich enough.

If you are driving a guzzler for such reasons as 'personal image', remember that the image of these vehicles has changed, the owners of fuel hogs are thought of these days as being 'not too bright' instead of 'too rich to care about fuel mileage' and are not envied. Trade it for something 'smart'. Like a nice 30+ mpg sports car. An *economical* 7 passenger minivan or crossover (newspeak for station wagon) Perhaps a hybrid. Then use the fuel saving info to do better on that ! It's image, and it's smart.

Note that engines over 3.0 liters are never particularly good on fuel (excessive unnecessary power.) As a general rule, the higher the engine displacement, the lower the fuel mileage. Exception here – the person with a smaller engine who 'pushes it' to more than design average speed/load gets lower fuel mileage for the 'pushed' trips. Turbochargers likewise guzzle fuel. Fast vehicles are thirsty vehicles. A yearly listing of different makes/models fuel consumption comes from the EPA / EERE. See website listing in section III.

A quick fuel saving tune up for most everyone for about \$10.00

If you have fuel injection (most vehicles today do). Fuel comes from the injector nozzles like out of a quality spray paint can. A little bit of gum inside one cylinder's nozzle will make the spray pattern desired by the mfg off center, or a stream, or otherwise defective. Sometimes this roughens the idle just a little, not real noticeable. But it plays hob with fuel mileage as if one cylinder is not burning it's gas as designed to, you then have 5 ½ instead of 6 cylinders. And that requires more gas pedal (injector pulse width) for the same road speed. Therefore, less gas mileage.

Step 1. There are injector cleaner liquids on the market in auto stores. Buy a mid priced brand. Follow directions. Some people report a boost in fuel mileage as much as 5 mpg more with a nominal 20 mpg vehicle that is presently getting less.

Step 2. Fill all tires to 35 lbs (or more if specified in your manual, such as for trucks) The high limit of their range. It is very important to keep your tire pressure up and equal, check them at least monthly, and always before long trips. NEVER carry low pressures to soften your ride. This costs you dollars in gas. Sometimes it is recommended to go lower

on the fronts to prevent aquaplaning at high speeds. But you will not be going at high speeds any more. Just average or below speed limit speeds.

Step 3. Replace the engine's air cleaner filter (or clean it if you know how).

You are done. Now, after a week or two to work the stuff through the fuel system and get rid of the gum, check your mileage (same driver, same route) again. Smile. If your idle still isn't silky smooth, remove one spark plug, Look at it. If it looks good, not eroded, use the cleaner again. If not, replace all plugs. (Remember, with new plugs your engine's computer will take a few days to reset itself the results might not be immediate)

Cars that start hard or don't start at all in the rain

YAH – everyone thinks of the plug wires and distributor cap and rotor. So some carry wire drying sprays or even start em by drying the wires and cap with a hair dryer.

Look to the spark plugs themselves. Even some mechanics say they never wear out in the newer cars. Wrong. The gaps erode wider and it takes more voltage to make a hot spark at over the designed width. The wire dry or hair dryer work to start the engine because it eliminates the moisture-caused electrical leakage which lowers available spark voltage to jump that big worn gap. A diagnostic computer readout does not report any error code for this trouble, even a tough dyno test says everything's OK.

This is why good mechanics R and R the job (ripout and replace) wires, cap, rotor and plugs together. If you have this problem, take out one plug and look at it. If it's gap is eroded replace all of them. This normally solves your wet start problem without wires cap and rotor. It will also boost your miles per gallon by a mile or two when your computer resets. Plugs should be replaced every 50,000 in newer cars, but in non electronic ignition vehicles (older) gapped at 15,000 replaced at 30 to keep up fuel mileage. A widened gap is retarded spark timing to the older vehicles. Retarded spark eats gas. (Too far advanced makes fuel 'ping' and is damaging.)

If you just bought a used car, it pays to visually check at least two plugs. You don't know what sort of plugs the previous owner had in there, perhaps cheap ones which erode quickly. If they look bad change em all. Incidentally, have found no difference using those 'super premium price' multi electrode plugs.

Cars that don't start at all

Remember that a fuel injected engine requires no 'pumping of the gas pedal' to start it. Don't touch the pedal until she is running. If you 'pump' you will flood the engine and then will have 2 problems instead of one.

Diesels will flood too. Encountered one dead Diesel (Mercedes) in a parking lot where fuel was actually dripping from the tailpipe from 'pedal pumping' trying to start.

Some cars – especially Diesel - seem to require ether based 'starter fluid' especially in cold climates to start. Instead of that, spray in WD40. It's easier on the engine.

If she turns over real slow or only clicks, look to the battery first, get a jump from someone or better yet, buy one of those 'emergency car starters' which is essentially an extra jumper battery to carry with you. Jumping can start a flooded car if you don't touch the gas pedal. When jumping one car with another the 'donor' car's engine should be running, and leave the cables connected for about a minute before you try to start. Be extra careful of battery polarity (positive to positive)

Most 'parking lot', even home driveway 'deadsters' are caused by leaving the lights on which kills the battery - especially on rainy days. Always check the lights when parking. Quite a few are caused by leaving a door open or listening to the radio while parked.

Another type of 'no start' especially in winter. Battery good she turns over fast but won't start. YAH many people carry starting fluids. But forget the important part of using them.

Normally with a fuel injected vehicle you don't touch the gas pedal when starting. However, this deadster is no longer a 'normal' vehicle. When using a starting fluid you have to open the throttle (floor the gas pedal) (hold it down, don't pump it) to give the engine enough air to be mixed with that fluid. This is quite often the reason why the mechanic you call can start the car using a spray can starting fluid but you can't.

There is nothing the average owner of a vehicle less than 10 yrs old can do to repair it under the hood except to add fluids, change filters and clean and tighten the battery cables and terminals. It is well worth it to join a 'motoring plan' that pays for towing if it is less than \$75 yearly and you don't already have a dealers plan that does that. For seniors, the AARP plan is satisfactory, hassle-free.

A fuel tip for those looking for a van pickup or other 'work truck'

Especially used trucks. In the old days we rated these as either 'plumber's trucks' or 'highway trucks'. The difference has to do with fuel mileage. 'Plumbers trucks' need to carry heavy tools and heavy buckets of pipe fittings. Therefore they need to have heavy duty suspension and have a high rear axle gear ratio. 'Highway trucks' are used for lighter loads and long distance travel therefore have a lower rear axle ratio. Also, quite often, smaller more economical engines.

Translated into fuel mileage; if you use the wrong truck for your purpose it will burn a lot of gas. In the 'plumber's' type, the rear axle ratio being higher to carry a heavy load, the engine makes more turns at the same road speed, regardless of engine size. That means that moving with fast traffic or on the throughway, the engine is running too fast for good fuel economy. Also, these higher weight capacity trucks are apt to have a more powerful engine in them, which of course takes more fuel. They are gas hogs simply because to do the job they are designed for, they have to be. Whether loaded or not.

Highway trucks are lighter duty, meant for lighter loads therefore can have axle ratios closer to the ideal for standard cars. Likely also have 'car type' engines. If heavily loaded they bog down a bit therefore fuel mileage suffers. But isn't it better than driving a fuel hog that always get bad mileage than to have one that does that only with a 'much higher than average' load?

Trucks built to plow snow in winter never get good fuel mileage. Engine power and axle ratio are both at fault, factory chosen for best performance when pushing snow. Don't commute in one.

With a used truck; A quick clue to what type it is; Look at the rear springs. If you see an extra leaf it's a heavy duty – if you see a heavy duty trailer hitch it's a heavy duty. Cars and trucks also have a plate on the driver's side door that tells you weight carrying capacity. Typical mileage for a fullsize 'heavy duty' may be 10-12mpg , highway type 18-22. Dual rear wheels also lower fuel mileage.

Think about what you will be carrying in the truck. Minivans with fold down seats

or with rear seats removed, a loose plywood floor laid in carry a lot and get decent fuel mileage. A lot of fleets are using them now instead of van trucks. And electricians, HVAC people. Even plumbers !
Always consider your purpose, load, and major expected route (City or hwy) when you buy a pickup or van type truck.

Miles per gallon averaging

Simply stated, this is, in a family with more than one vehicle, using the vehicle that costs the least to run to do most of the driving, commuting included if possible. Averaging the MPG/miles driven of 2 different vehicles, you get a higher total average. Often, much higher.

Example 1) Both people work days. One vehicle gets 30mpg the other gets 20. The person with the longest commute, ie the most miles should use the 30 mpg one. Even if it's a beater, not chic looking etc. A look at the chart (pg 4, fuel cost per mile) will tell you why. In this instance, at \$3.00 a gallon, every 100 miles you are throwing away \$5.00.

An example local to here, a fellow commutes from Boston's South Shore to Cape Cod about 150 miles a day for 5 days, 750 miles a week. At the present price of gas (Summer '08) near \$4.00) he would be throwing away \$50.00 a week if he didn't switch from his 20 mpg car to his wife's 30 mpg car. Of course, the actual cash saving has to take into account how much her fuel bill went up. In this case not much she has about a 5 mile round trip commute, only 25 miles a week. They made the switch and are happy as clams.

This is also a good example of 'thinking yearly' rather than just weekly or monthly. How much non-taxable yearly income did this couple earn due to the switch? (Wow!) (Note that new thought. Saved fuel of any type is actually a non-taxable tax clear income)

This also shows the importance in 2 car families of buying vehicles that both parties are comfortable operating, and if one is some sort of a 'sports truck', driving it as little as possible. Better still, trading it for a real economical vehicle, perhaps a hybrid. Incidentally, here in the Boston area it is getting hard to get a decent trade on an SUV. You see some pretty new looking ones in people's yards with for sale signs on them.

Example 2) Car pooling. That's averaging. It doesn't require math but if you got 4 people in the pool and each one drives a week, that is 3 weeks out of 4 that you don't drive. Or pay. The savings are fantastic. The longer the commute the more you save. AND; if it's to a T parking garage or commercial parking lot you save even more, 3 weeks out of 4 you don't pay to park. AND if there are tolls to pay, that's 3 out of 4 you don't pay. AND if every driver in the pool understands and practices the other fuel saving tips you all save even more. AND if more people car pooled there would be less traffic on the road, less delay. AND you could use the HOV (high occupancy vehicle) lane so you would spend less time on the road, spend more time at home.

Everyone who carpools wins big. Only people who lose? Big fat oil industry cats mainly in CA and TX and overseas people who wear bathrobes in public.

There are usually 'car pool people hookup' orgs in or near every major city. Some are volunteer (no fees), some are commercial (private buses or paid references to other people wishing to carpool or already pooling with a spare seat). See website listing for one example of this. Some newspapers have a 'rider wanted' section. or one could be in

'misc'. A 'carpool or rider wanted' notice on the supermarket bulletin board - yours or someone else's - could get you into this.

Another type of car pooling; Informal, single vehicle, between friends. Essentially, a private 'bus' for a specific purpose, if one of them has such as a 6 or 7 passenger van, minivan, or station wagon big enough. Everybody else kicks in a couple of bucks for gas. You all go to the mall, or to church, or to wherever together. Nice and simple. But don't get trapped into driving one person to a place for 2 bucks unless you want to go there yourself.

If it's a longer ride, figure the gas using the chart and go for the nearest higher dollar total, but 2 bucks a ride is still minimum. Remember, there's oil and wear and tear and insurance too. And the more weight you have in the vehicle the less mileage it gets. These days (mid 08) with \$4.00 gas, three might be a better figure. Don't charge excessively, that's an unlicensed livery. Liveries need a special permit, perhaps a special drivers license too.

You have to get together and set this up yourself. Maybe a weekly grocery trip. Explain it to the group so they won't think you are a cheapskate. Everyone saves gas money this way and whoever drives does too because he/she gets paid for their gas. This is done a lot in small towns where major shopping gets done in a mall or the city. Sometimes it's a nice relaxing lunch date with friends along with the shopping too. Stuff like this happens in Mayberry USA - and an awful lot in VT NH and ME.

Example 3) This writer owns a 20 MPG avg Ford van. Also, an adult size 750 watt Chinese electric 'commuter motorscooter', 48 V battery operated. Any trip within the 20 mile round trip range (between battery charges) of the scooter is done on it. This type has enough locked compartment space to carry a full gallon of milk plus other 'emergency shopping' items. Of course she is not driven in bad weather or in winter, but does a lot of miles on those 'one person little trips' always necessary such as small shopping, to post office, library and town hall, visiting, club meetings etc.

Note again the figures above. 20 mpg for gas, 20 mile range of scoot. At the gas prices of today (6/08, almost \$4.00), every 20 'scooting' miles this writer saves \$3.92. Think that's good? Here's the biggie; Well over half of those scoot trips are short, in the 'cold chassis category. Ergo, the calculation figures at a gas saving of half the 'city' mileage of the gas vehicle. Which is (figuring half) $17\text{mpg}/2 = 8.5\text{mpg}$ rather than the average figure of 20. Makes a 'wow' out of the whole thing. Grab a calculator and figure it yourself!

To charge the scoot for 20 miles takes about 15c worth of electricity. Scoot does not depreciate much, was inexpensive not requiring financing (a cash buy) nor does it need compulsory or any other kind of insurance to register it. Think about it.

Scooter is new this (05) late Spring and so far (Nov '05) she has a bit over 600 miles on her. 600 miles (using the chart at \$3.00/ gal) works out to (as all of the short trip driving would be cold miles at $\frac{1}{2}$ the mileage (also 'cold when coming back from an extended visit or other short trip) $\$90. \times 2 = \180.00 (at \$3.00 a gallon) worth of gas I didn't have to buy, not mentioning less wear and tear on the Ford. And the driving is more fun. Many more miles will be logged next year, and in the future. (Update '08. There were!

Scout has more than paid for herself and has had no maint except lubricating the front wheel bearing – which was in the manual that came with her for 1000 mile maintenance).

Seeing as these same type scooters (or electric bicycles) are available at anywhere between \$300 and \$1000 and don't eat much, they will pay for themselves in short order.

Remember your purpose, these scooters and moped types are, among other duties, used for small grocery shopping and must be able to carry a small grocery load, preferably under cover in compartments, haversacks etc.

A totally different kind of 'averaging' is done using only one vehicle, It could even be the one you are driving now. The principle here is simple, logical, and already mentioned in the page 3 'fuel saving tips' poster. But not as averaging.

This is simply the concept of knowing that short 'cold chassis miles' trips are costing you more for fuel than 'warmed up engine' miles – and as a result, lowering the number of trips that you make (concatenating trips) especially focusing on the 'cold' ones.

Favor alternatives to do those short 'always necessary' trips. A fellow local to this writer for instance, drives to the gym ½ a mile from his house. Why not walk? Why not jog? Why not bike? All are healthier. And that's what the gym is for. He would be averaging' driving miles down by doing 'human power' miles, which cost nothing at all.

Another – buying ahead on those non-perishable items you are always running out of and have to drive to get. and 'stocking ahead' food items that commonly make short trips necessary. Buy two not one of the most common 'run out' items you have, and when the second one is opened, immediately put it on the shopping list.

Cutting down the total (especially 'cold engine') miles that you drive puts money not in your fuel tank but keeps it in your bank account. Perhaps an ivory tower professor of mathematics from Cal Tech would argue with this statement, but averaging a single unnecessary short trip with not making it at all cuts the cost of making that trip to almost zero if you do it while doing another. That's what you do repeatedly when you concatenate a bunch of short trips. (Math says, with a 5 mile trip, 2.5 miles. However, the second stop might be a mile away from the first one and closer to home. Special instance in play here, math must apply to instance, not generic to all. At any rate, you save bigtime regardless of specific instance whether you agree with the math or not.)

One last comment regarding averaging. Buying a new fuel efficient vehicle to replace a fuel hog in your family will certainly average your family's automotive fuel costs down. But it isn't enough. The driver of that new vehicle, to gain maximum benefit from the new fuel efficient vehicle, must become *a fuel efficient driver*. A new vehicle DOES NOT render the 'driver specific' tips given on page 3 obsolete. The new vehicle is only half the answer. The driver is the other half. Looking at the same thing a little different way; Half of your total 'best fuel miles' package costs you money (buying a fuel efficient car). The other half is absolutely free (changing your driving style and habits).

Let's reiterate. Page 3 is the key here. That's why it's up front and that's why it's a poster.

Following those simple suggestions on page 3 puts a lot of money yearly into your pocket. If you like that, put a lot more in there by implementing, not just reading the 'home, lifestyle etc' suggestions in the rest of this guide.

The following section gives an overview of alternatives that are especially effective to cut down, average down those fuel - wasting short trips.

Simple Alternative Transportation; Alternative Vehicles

Alternatives save fuel. Of special interest are the electrics. Plus point, they cost much less to run and maintain, and are much easier on our atmosphere, emitting no carbon bearing gases or other pollutants.

As to the minus side; The plug-in electrics have a relatively short range. This is easily overcome by using the electric only on the short trips. The average person spends a bit over 1/3 of his driving time doing short cold engine fuel-wasting trips such as intown or to public transportation work commutes, small item grocery etc shopping, picking up mail, going to intown meetings or events etc. These and more similar trips are all opportunities to save a good dollar on fuel and en passant, contribute less carbon bearing and other pollutants to the atmosphere by owning and driving a plug-in electric fuelled vehicle.

The technology of plug-in electrics is mature. Full size vehicles such as the Ebox (see website listing – and contrary to media blather it *is* a production vehicle!) are out there as well as numerous smaller personal vehicles as described above in example (3) and the following pages.

Of course, we also have the microminis, most of them LSV's (low speed vehicles) as described further on for the states that allow their use (FL and NV allow them among others). A plug-in vehicle of one of the types shown in this guide can be a smart choice for individuals – or even families where a full size gas vehicle as a second car would not be an option. Example, the electric bicycles below can be an option of powered transportation for those over 16 without drivers licenses, as most states do not recognize bikes, even powered ones, as needing license or registration. And a bonus. The present gas commuter who has a commute within range will find the electric a fun commute rather than the present harassment.

Suggestion to the reader; Examine your own use of a gas powered vehicle to see if there is a place for this clean and relatively inexpensive form of alternative in your life.

A) Mopeds and scooters (2 wheeled vehicles)

There is very little info out there regarding this alternative. We will expand it here. Mopeds are actually low powered strongly built motorbikes, a step below light motorcycles, about halfway between bicycles and motorcycles. Some have pedals. These are limited to 50 cc's piston displacement by law, and new laws have been made that new ones imported to the US must have clean burning 4 cycle engines. Some have catalytic converters. (the older ones had 2 cycle engines). However, different states allow different horsepower figures, therefore top speeds. The mopeds sold in those states mandating lower speeds, the 49 cc engines are throttled down some way by the factory to fulfill state MV regulation specific legal parameters.

Some of these are plug-in electric, battery operated. The electric scooter mentioned above (in example 3 pg 12) is DOT approved and classed as a moped in most states, quality is sufficient for anyone familiar with Vespa scooters or motorcycles to approve.

To class as a moped in MA and most states, top speed the vehicle is capable of doing on the flat can be no more than 30 mph and at over 25 mph they are ‘speeding.’.

Compulsory insurance is not required, nor a motorcycle license in any state. Registration fees are cheap (2 yr RMV sticker, \$40 in MA). Check your own state MV laws before considering one.

All 2 or 3 wheelers in the moped (30 mph) class must be DOT approved, ‘adult size’. Anything that’s not DOT approved is not legal on the roads anywhere, an example being the ‘road rocket’ type mini motorcycles – which are ‘offroad only’, or light foldup scooters. Note that HP vehicles do not fall into this ‘DOT approved’ class.

The differences between road-legal mopeds and road –legal scooters are mainly in the frames. Mopeds have pedals. Scooters do not. Mopeds have large bicycle size (20-24") wheels. Scooters have smaller wheels, on the order of 12 -16". Both use 'step thru' frames but scooters have floorboards, where mopeds have the bike type pedals as footrests. However, most state motor vehicle registries class them both as 'mopeds'.

Mopeds and scooters are available with either gas or electric power. The gasoline versions get between 90 and 110 MPG and the adult 2 wheel electrics are figured at a 'miles per gallon equivalent' (MPGE) of a bit over 300.

WARNING: Smaller wheeled scooters than mentioned are mainly foldups, not DOT approved and unsuitable (or in many states, illegal) for commutes. The most reliable of this type at present appears to be the foldups built by Izip under 3 main brands, their own Izip, Schwinn, and Currie. None of them are registerable although they have been on the roads. Some are only toys. Note that this same company (among several others) also markets DOT approved scooters and Electric bikes.

Many states or municipalities have banned these non-DOT scoots from the public roads due to unprincipled use by teenage hot rodders. However they are great for large campgrounds, to carry in motorhomes and on cruising yachts. Advice for these: The seats of fold-ups are uncomfortable on all tried out here (many). Best to find a good seat from a junked moped (not a bike, tried one) and use it. Never consider a stand up scooter, they are fatiguing to ride, and carry no groceries. Most stand-ups have very poor brakes.

Segway is a different breed. A fun ride but slow with very short range and no space for groceries. Too much complex electronics. Heavy to put in a car. Some malls and communities are banning them. Decent DOT approved commuter type scooters come at much less than 1/4 their price.

As to commuting with an electric bike (ebike), moped, or scooter. All ‘T’ station lots and parking garages near Boston have free 120Vac electric charging facilities, many other suburbs of other major cities have a similar arrangement. Some scooter commuters also charge at work. (Extends range for the trip home). In other words, you can live 15 miles from the T station and charge there for the other 15 home making effective round trip range 40, not 20 as specified by most fullsize electric scooters. This also works visiting friends charge there. Always bring a short (10-12 ft) extension cord and multi outlet adapter if you do this. These don’t draw a lot of power, up to 4 scooters can charge from one standard outlet. From ‘near empty’, charge time for most brands/types is about 4 hrs, at which point the charger goes to trickle (maintain) or shuts itself off. Most owners just plug them in when getting home and forget them til the next morning.

A word about range. Gas mopeds usually go 100 miles before they require refueling. Most adult electrics have a round trip range of 20 miles before needing a charge. This puts people off, especially with the electrics. Reason; They don't 'think out of the box' and are thinking in automobile terms of an 'all purpose vehicle'.

Scooters/mopeds are 'special purpose vehicles' and that purpose is to have fun while saving gasoline and wear and tear on the car. Or as an 'ultra economical second car' for short trips. Same as a bicycle would do but longer, faster, effortless. Short trips are all that will ever need to be done on a moped or scooter and as mentioned on the 'mpg chart, short trips in a 4 wheel gas vehicle are expensive in fuel. For the 'scooter' example given on pg 11, the longest trip ever taken for these shopping etc trips during her recorded 1000 miles (not documenting any more, just happily riding her) was 16 miles round trip, mostly 'cold engine' miles if by car both ways.

If there are multiple trips, you plug her in between trips to refresh the battery so a person can actually do these short trips all day, well over the published or calculated 'range' figure. This is true of *all* plug-in electric vehicles big or small.

. Another perk - these park closer to the door at work, shopping, anywhere including the T garages and parking lots. Charging outlets are all inside the T parking garage here, near the bike racks, out of the rain and nearest to the train. You do less walking, can always find a 'close' parking space anywhere with any sort of bike or scooter.

Cost of operation here in MA; 2 yrs moped registration; \$40, motorcycle license not required, just regular license. Insurance not required. A DOT approved helmet required \$30-\$50. A good cable lock \$15.00. Electricity to charge equivalent to 300+ miles per gallon and it doesn't show up on the electric bill (less than a buck a month). Gas version of the same brand and type scooter is about 100 mpg, range is 100 miles before refuelling and they have pretty quiet 4 cycle engines, not screaming popping 2 cycle types. Scooters/mopeds require almost no maintenance, basically the same type maintenance as bicycles. (Do a fairly slow break-in when new, check oil level regularly (if gas fuelled), keep the tires at specified pressure, lube brake cables, tighten anything loose, not much else.)

As to MPG averaging an electric scooter (Escooter) with a car. In the pg 12 example the math isn't even worth doing. This is November '05. This writer, a scooter owner, has not bought gasoline since June, tank in Ford van is still 1/4 full! (missed the whole 'Katrina' price spike) This is the example spoken of earlier. Averaging gas cost down close to 100%.

(update 07) Same story. Gas vehicle used so little that auto insurance company gave a 'low yearly mileage' discount for 06 insurance coverage, rebate for 05. 07 will have one too, and 08. These rebates helped to pay back the scooter's purchase price quickly.

Note that now (10/07), motor fuel is a bit lower but on the rise again. The higher it goes, the more money that is saved by the alternative fuelled vehicle owner.

When choosing an *electric* moped or scooter, remember that the more power the motor has, the less range the scooter will have. The one in this example has a 450 watt motor. Enough power to negotiate the steep hills here with a 210 lb driver and full load of groceries. More power only shortens range, will climb steeper hills but top legal speed is still 25 MPH. Less power would be OK in flat country (250 watt recommended minimum) and would have more range, given the same battery type and weight.

Update 9/08. Locally (Boston area, to the South) a large ‘small engine and lawncare equipment’ shop just took on a new ‘unfamiliar brand name’ Chinese-built adult size Vespa-like gas scooter. This has an electric starter, all the bells and whistles expected of a deluxe model and plenty of covered storage space. Under seat space will fit a Gallon of milk plus more. Design is modern (streamlined with fairings) and comes in 2 types and several colors. A test ride on one proved it comfortable to ride and quiet, with plenty of power for the hills compared with most other brands. Workmanship appears excellent. Needs no oil mixed with the gas. The price? An amazing \$800.

Best of all, this dealer, already being in the ‘small engine’ business, could service it on the premises if necessary (very seldom, there is little to go wrong) both in and out of warranty.

This writer would have bought one then and there if there wasn’t already a pretty new and decent scooter in the family. It is a policy of ECFSC not to ‘do commercials’ or have commercial innuendoes so won’t give the brand name. However, if you see a real slick looking Chinese 49cc gas scooter at this price with electric start and a kick starter also, that has twin (streamlined and integrated into the design) mirrors, a locking rear carrier, big underseat storage with lock, and a locking gas tank cap at or near this price, it’s likely the same one.

As to riding these; You would think that the low 25-30 mph speed of mopeds and scooters would turn you off as being a crawl. Not always the case. In the typical ride here, a suburb of Boston, traffic on the commuter’s town roads is heavy with many traffic lights. Mopeds or scooters always beat cars through these multiple traffic lights as they ride on the right, in the ‘plow lane’ where bicycles do. Cars doing stop and go never build up much speed. There is a mile section here where this writer on a scooter beats the cars by a full five minutes at traffic peak time. Bicycles come in second. On another main road in town, close to 10 minutes both outgoing and incoming. These machines allow driving at the congested times on roads where you wouldn’t think of even trying to use the car unless you absolutely had to. The city of Boston with it’s congestion sometimes appears full of them mainly used by college students. Think ‘fast bicycle that doesn’t need pedaling’ when you see any type of scooter.

B) Human Power

Never put down the lowly bicycle. With dual ‘pannier type’ carriers astride the rear fender a bike will carry groceries, school paraphernalia, or much sports equipment. So what if some teenagers don’t think they are cool. They are! That’s one of the many reasons they are used so much by college students (even professors!)

A fellow here in Cohasset MA got his picture in the paper during the height of the ’05 gas ‘prisis’ as he has a pickup truck and a bicycle. He logs 4,000 miles a year on the bike and less than 4,000 on the truck. Now that’s real averaging ! He has more than doubled his personal fuel mileage, cut his yearly gasoline bill by well over half (as most bike trips are ‘cold engine’ gas vehicle trips). And . . . it’s good exercise, ask any doctor.

The trick of riding a bike (or scooter/moped/Ebike) comfortably is to make sure it fits you comfortably. Adjust it for yourself. Then start those muscles that don’t get used much otherwise off slowly, and gradually increase your distance of travel. Don’t start

right off on long rides, build up to them. For our purposes it is not necessary to have a hi tech expensive bike (which are stolen quite often) but a mass market special with good carriers added to it or even a good used one from a bike shop or yard sale. Only bike racers, bike tourists, and athletes have a reason to have expensive bikes. AND – remember your purpose. A bike is useless to you unless it can carry groceries. Get those big rear carriers, or a bike trailer also for big loads. Some bikes have ‘automatic shifters’. Don’t get an early one. They are fussy and need adjustment often, won’t shift out of ‘low’ until you are pedaling like mad. They drop the chain a lot. The newer ‘electronic’ automatic shifters haven’t been out long enough to make a report on, but hopefully have solved these problems.

Some bikes are ‘low riders’ called ‘recumbents’. Pedals in front, you lay back into a chairlike seat to pedal them. Many are built in home shops the special parts needed are available. These are for serious cyclists only, and expensive, and can be a disadvantage in traffic as are not as visible as conventional bikes. Some of them are trikes. Upside, they are especially good for bike tourists. Google the subject to find out more about these.

Bicycles can be easily electrified by replacing the front wheel with a motorwheel, most of which come from China as kits. Early ones were unreliable junk. The newer motorwheel kits are excellent.

The older motorwheels added pedaling effort to the bikes when not activated, the newer ones seem to have overcome this problem. A tip is don’t go for speed, go for a max of 15 MPH under power alone, otherwise they will bog down on even mild hills and won’t carry heavy loads of groceries. Uphill you have to help the motor by pedaling, or on big hills you must walk it up but what the hey, it’s a bike isn’t it? But relax and enjoy the rest of the ride as you beat the system real cheaply.

NEVER consider a friction drive (puck drive) bike motor whether gas or electric. These don’t like rain, the drive slips – and wear down the powered tire fast, you will need a new tire every year. Some of these friction drive bikes or conversion kits are built thoughtlessly so that the pucks themselves wear out as well as the tire. Pucks made from grindstone don’t wear out, it’s the motor bearings on those that wear out (from sand getting in) plus the yearly tire. Sand doesn’t get into motorwheels (motor within the wheel) and tires wear very little, like other bike tires.

Recently (10/06) a nice looking 750 watt motorwheel electrification kit was seen including batteries for \$399. On the net on a scooter site can’t remember which. 750 is a lot for a bike this should have no need of pedaling on all but the big hills. But with that amount of draw, range under power alone will be relatively short (bikes can’t carry a lot of battery weight).

People who have motorwheel conversions (or factory electrified bikes) tend to use the motors almost fulltime without much pedaling. Effectively, these conversions have become motorbikes that need no registration or drivers license. Because they are still bikes.

There is a couple in Hull MA that have for their **only** transportation 2 *factory built electric bicycles*. Both have bike trailers on them. When they need a car, perhaps once a month, they rent one for the day. Makes sense, as everything they both normally need

including work commute is right in the same town. They even go camping with these, and have blow up kayaks that fit in the trailers for a run around the estuary and a little fishing. Range is about 20 miles under power in flat country, less in hilly country. Speed of electric or electrified bikes is about 15 mph. Recently, these owners bought spare battery packs to take with them in the trailers, now are able to go longer distances without charging or go camping where there is no electricity to charge.

Electric bikes, like scooters, use so little electric power to charge them that it doesn't affect the electric bill, so fuel is effectively free. And needless to say, same as the electric scooters, these are ecologically sane, making no emissions or CO2. Theirs are 'Think' brand from Sweden – but were mfg'd in China. They have had them for about 4 yrs without any problems. However, these were initially expensive, with trailer about \$2000 each. Nowadays, you can get a decent basic adult electric bike made in China for less than \$1,000. Izip is a brand to investigate. There are others. Check your local bike shop.

Electric assisted bicycles in MA require no license or registration but you must wear a helmet. Which is prudent on any bike. Check your own state laws regarding electrified bicycles. BTW; many people are starting to think of electric assisted bikes as 'human power/electric hybrids'. Which they certainly are!

Motorcycle shops can handle repairs on any Electrified bike, or any moped or scooter, and most problems on an electric bike or scooter are the bike part itself, not the electric part, items such as worn tires or brake shoes, brake cable adjustments etc. Bike shops can work on them, or any owner who is familiar with bike repairs and has the simple tools to do it.

There is a new type bicycle recently seen in the US but fairly common in Europe. This is called the 'long John'. Envision a standard bike, heavily built, with a long low platform between the rider and the front wheel. These are 'cargo carriers – the space on the platform could easily hold a weeks groceries for a big family. These require the 'athletic type' to ride them, they, being heavier, are not easy to pedal except on level ground. Presently, there are no reports of electrified versions, but this may be forthcoming. Or a motorwheel kit could be added by the owner.

There are also *adult tricycles*. Fullsize bikes built as trikes. These are mainly in flat country such as FL and AZ, also used within retirement communities, large campgrounds etc. These have a large carrier between the rear wheels, excellent cargo carriers. Like bikes they can be motorwheel converted to electric power. However, go for a slower top speed than 15 mph. These are not hot rods but work horses you will find them fun to ride. Also, trikes with this high a center of gravity must be slowed way down on curves and to almost nothing to turn right angle corners as they don't lean like bikes, will trip and tip instead and will unseat you as well as damage themselves.

Some trikes are the 'pedal powered taxis' you see in the big cities and at tourist resorts. They are well built and safe. But they are heavy, requiring an athletic type to pedal them.

There is one company (Ebike) that made a different design trike. As the 2 rear wheels were small and fairly close together, there were no 'corner' concerns. These were a fun ride too and hauled a load - but they were pricey, well over \$1,000. Ebike is no longer in business at this writing. Why? They came out too far ahead of their time. With a product line much too expensive in comparison with other brands.

One smart company has come out with a trike (gas powered moped type) that has tilting wheels. However, it is expensive. There is another in the final stages of design in New England. Some 'low rider' recumbent pedal trikes have this feature.

Advantage of these types; no kickstand necessary, no corner concerns and will carry a heavier load than a 2 wheeler which is great for 'short delivery' vehicles such as 'in plant' or college campus. In years past we had 'sidecars' for both scooters and motorcycles for local delivery service, these latest are modern engineered versions.

C) Other alternative vehicles

Motorcycles are a giant step beyond scooters and are good commuting vehicles. However, the greatest majority of these are heavy powerful vehicles only getting 35 to 50 MPG. The light ones (250cc or so) do much better on fuel and most light ones can keep up with fast highway and right lane throughway traffic.

All motorcycles need special registration, compulsory insurance in states that have it, and a motorcycle license. So with these added expenses, are not dirt cheap to ride as the moped/scooter types have proven themselves to be. There are electric versions available including trikes completely enclosed, see these on the internet

Handicap trikes are not just for the handicapped. Used HP trikes can be found cheap, going rate around here seems to be about \$300. They are quite well built and reliable, most of the older ones will run on 2 12 volt garden tractor batteries.

Some have 4 wheels. They will go 2 miles, some of them more, at 5 -7 mph, or up to 5 miles using expensive HP vehicle batteries. The newer ones often do better than this, and there are relatively expensive ones – even 2 person types - with bicycle size wheels that are excellent as to range as they carry big batteries and can be converted to carry bigger heavier batteries. If your grocery run is a mile or two roundtrip, and you install a big carrier basket, you are in, even with smaller older ones.

Have seen these haul bike trailers and even a couple with sunshade umbrellas on them. These mainly ride on sidewalks, always stay far to the right otherwise. FL West Coast is full of them. As with any of the above alternatives, using one of these as a second vehicle is a lot smarter than starting up a big vehicle to do a little trip. And it's fun.

There are a lot of 'little electrics' of all types in foreign countries and in the US, especially in FL and AZ, around the retirement communities.

Some of those are home made by retired mechanics, engineers, etc. Why electric? Distances are short, hi speeds unnecessary for these experienced and wise people. You don't need 200 horsepower to go a mile or five for a jug of milk or to play bingo and these people know it. Electrics of any type are simple, quiet, and vibration-free. And they cost next to nothing to run and maintain.

ATV'S are used mainly in remote areas as small commuter/shopping vehicles. However, being built for 'deep woods' use the tires brakes and suspensions are not suitable or even quite unsafe for paved roads. And most are noisy.

The future may bring us ATV types which are more suitable to be used on public highways. Best advice – don't wait for them. If they are 'better' for roads, expect them to be 'worse' in the woods. Some things do not compromise well.

Golf carts are good large plant maint vehicles, some are used as NEV's (below). Most are 36 volt electric and will do 25-30 on the road, need a charge at 15 miles or so on road surfaces, less miles on rough ground. Some are gasoline but require much more maint than electric, do 50 or so miles a gallon on the road. Golf carts are banned from public roads in most states. However, GA allows them in many places and the area around Peachtree City is full of them. There is also a community in Kissimmee FL where you often see more of these (and NEV's, see below) parked at the market than you see cars.

Neighborhood electric vehicles called NEVs are also called LSVs (low speed vehicles). The most common are the 'bubble cars' you see meter maids drive, or are used in large gated communities, resorts, or college campuses by maint and security people. In MA, mainly municipalities and campus type schools use them. Some states have laws allowing non-government owned ones on the public roads. Hopefully all states will come out with uniform NEV laws for private ownership and public road usage as some of these are like miniature cars with windshield wipers, even heaters, and make ideal emissions-free and super cheap to fuel commuter vehicles, 100+ mpg equivalent, up to 275mpge (see website listing).

Most LSVs so far have been electric. In states allowing private ownership and use of NEV's on the roads, speed is limited to 30 MPH and they cannot use throughways. 35 mph limit would be a better legislated maximum speed for these, as the newer ones are capable of a bit more than that and they would match existing traffic patterns better. Most foreign countries seem to be full of NEVs. In the USA, some golf carts classify as NEV-LSV where these types are road legal.

Fullsize battery electric vehicles are no longer made in large quantities in the US since GM ceased production, then crushed their sporty plug-in EV1's. However, there are plenty of full size plug-in battery EV's (PEV's) out there both in the US and in other countries, especially in Sweden, the UK, and in developing nations. Most of them will go 60 miles on a charge and can do over 100 a day if charged twice a day, and can do 65 on throughways. Gasoline mileage equivalent, figure these at 80 mpge. Some do better.

Plug in fullsize vehicles in the US are either the ones sold during the 70's energy crunch still out there commuting (electrics are reliable!) or they are regular gas vehicles converted to plug-in electric by their owners (or in some cases especially in CA by specialty custom conversion shops).

One conversion of note is a 'production' car built to order for the customer, the Ebox. This is a topnotch conversion of a brand new 5 passenger Scion XB which will do 95 MPH and go 140-180 miles on a charge. 0-60 `time is 7 seconds, she is quick. These do not use lead acid batteries, but are using advanced li-ion types. Full charge with her 220VAC fast charger can be done in 2 hours, or normal rate 5 hours. See website listing.

An internet search will find you other custom conversions of sports cars, kit cars, and even conventional production cars.

There is a lot of tech university interest in these as design exercises. Northeast Sustainable Energy sponsors the 'Tour de Sol', a car show and enduro with engineering trials for them, whether solar powered or not. Teams come from all over the country and Canada to compete and exhibit. This is presently based in New Jersey.

NEDRA (the national electric vehicle drag racing group) has several racing classes for electrics, they drag race mainly at Hagerstown MD, and at Woodburn OR, Las Vegas, FL in Miami, in CA, CO, and at the Bonneville (UT) Salt Flats. Most of these racers are conversions of existing gas chassis.

For those interested in drag times, the current NEDRA champ for the quarter mile is Dennis Berube at 8.801 seconds, 137.65mph.

In the Jan 05 issue of Car and Driver magazine is an electric rail type dragster that is charged only by both wind and solar power (and wins!). She is a converted 'junior' chassis. This same racer, maxing out in it's class on an 1/8 mile track (and setting a time which may never be exceeded in that class) has since (07) been converted to a salt flats racer and is active on the salt, looking for electric competition forthcoming.

Racing is the way that gas vehicles have traditionally been developed and proved out and through it, become more efficient and reliable in the past. It is the same for plug in electrics and their components. The batteries in the new hybrids have been developed and improved greatly over the past few years through the tortures of the racetrack along with other type batteries. So have the electronic controllers and motors for the electric vehicle conversions, and the smaller motors in the NEV's. If you want to view these trials, the EAA website – or local chapters available from it – and NEDRA have the dates.

Winter vacation in FL? Check out the 'Battery Beach Burnout' for both the electric drag racing and an EV motorcross (timed cone setup) as well as a general EV show on the same weekend Fri/Sat in late January, (09, now in Feb). Verify the date and location on the web on the FLEEA and NEDRA sites. see website listing in section III.

There are also a *lot* of regular plug-in commuter vehicles, mainly conversions (some of them 'street' class dragsters) attending and on display at any of the electric racing events. Bonneville plans an international plug-in electric vehicle event for some time in '09. Google it.

Any plug in (or pure) electric vehicle (PEV) only has 3 basic parts in it's drivetrain. A battery, an electronic motor controller, and a motor. Most use conventional (stock) 5 speed manual transmissions, which upon conversion become, 'en passant' semi-automatic, the clutch used only for shifting, not starting off. Some are even built the same way but without the clutch – depending upon the transmission synchros to allow a shift when needed. There are advantages and disadvantages to both types. However, the majority out there now or are in process of being converted have the clutch.

Most have onboard 'plug-in house power' (120 volt) battery chargers. Some have, in addition, 220 volt chargers at their home base which are 'fast chargers'. Full size vehicles can have heaters and defrosters, power brakes, even air conditioners. But most

are kept simple without frills, as they are purpose built for relatively short commutes below 20 miles one way.

Electric is the simplest way to build a vehicle using the least number of parts. The only reason the new 'factory' plug-ins have been (and will be) expensive is that they are built by corporations using expensive skilled labor, special newly designed body types and newly developed hi tech batteries. Also, dealerships must be equipped and the technicians trained. The Ebox is an exception, as it is mostly a Scion 5 passenger XB dealers and techs already in place for the vehicle, and 'test by internet' if for the electric part. Therefore, the price is much less than would be expected for a high performance state of the art plug-in electric.

There have been many different types of vehicles converted to electric by both factories and backyard mechanics. Even boats, and at least one light airplane.

Many conversions of (older) existing plug-in vehicles have been 'trade school' – even University projects, especially during the 70's energy crunch. Then, both industry and government gave grants to start these projects off. Many of them came up as viable 50+ mile commuters. Some even came up as solar powered enduro racers. There was much experimentation going on then with battery types, hardware and the electronics required. Many of these cars became test beds for the new hardware. Much was learned from this period, all parts used today in the conversions have been improved by these 70's cars and their competitions both enduro and drag racing.

This is still going on. South of Boston MA, a 70's production electric vehicle called a 'Citicar' has recently been restored and modernized at a local trade school and has been exhibited at Altwheels, New England's largest alternative transportation show among other places.

There are others being worked up by schools at present (08), most of them conversions of existing full size gas vehicles. Parts to do this now are pretty much standardized and available from several sources. An ideal project for any school with the facilities necessary. Other departments get involved, for instance drafting and the ecology segment of the science classes. It only a matter of time before there will be 'electric vehicle technology' course segments at the high school level.

Conversion of a conventional vehicle from gas engine power to plug-in electric is not rocket science. Neither is it terribly expensive. The most complex part of the job is not the wiring but mechanical aspects, such as welding up – and often enclosing - the battery racks. A typical arrangement for a typical vehicle (a 50-60 mile range 4 seat commuter) might be to have 5 batteries in the engine compartment and 10 in the trunk, giving balanced weight and ease of access. Forklift/pallet jack/golf cart type lead/acid 6 volt batteries which are inherently 'deep cycle' are used by most builders.

Opening the hood on many of these, the engine compartment appears almost empty. The modules for motor control, battery charge, and 12v system charge (a DC/DC converter rather than an alternator) are relatively small. The conventional transmission (manual) and drive train is used as is where is and the DC motor couples directly to the clutch assembly. Having the clutch gives more versatility of shift points and less time lag when shifting than the 'clutchless' type, both are semi automatic drives. (Clutch used only for shifting, not for starting from stationary.)

Motor is usually a factory modified 'forklift truck' type, a type which over many years has proven equal to much harder work than just running a passenger vehicle.

Perhaps $\frac{3}{4}$ of the 'non-factory' conversions running today use this simple arrangement, whether the 'donor vehicle' be a 2 door, a 4 door, a van, or a pickup truck. The rest use either developmental parts, or a packaged AC drive system (see website listing for Ebox)

The 12 volt 'lights etc' battery charging is handled by a 'DC to DC' converter, taking a small portion of the big battery pack voltage down to 12 volts. This is an electronic module, not an 'alternator,' and is totally automatic. Early EV's used no module, and during long night runs the lights dimmed. This does not happen with today's vehicles. As to the older types, most older conversions have had this module added.

A lookup on the net will show when and where the closest monthly meeting of the closest local EAA (Electric Automobile Association) chapter is and the association, wherever it meets welcomes visitors. At a meeting there will always be several of these conversions present, the owners only too happy to show off their handiwork, perhaps even giving 'test rides' to a newcomer

There are a couple of good 'how to' books on fullsize vehicle conversion available (See the EAA website). but even with the book, it is best to check out actual vehicles in daily use at one of these meetings. Books can't show everything.

As few people have the skills, space, and tools necessary for this work, specialty conversion shops have also sprung up. Do a web search, also check the local Electric Automobile Association chapter websites and the EV parts suppliers where you may find someone who does these conversions who doesn't have a website.

Upsides and downsides. The greatest 'up' for the majority of owners is that the owner becomes totally independent regarding transportation fuel. Price and availability are no longer a concern, commute will not be affected by the volatility of the politics or practices of the international fuel cartels. Fuel pricing is a good part of that.

Gas-specific maint is no longer a concern. No more \$surprises from the muffler shop or 'bad news, trade her's from the repair department. At inspection time, no expensive surprises due to a failed emissions test. Inherently, there are no emissions at all.

Another; the decreased wear and tear as well as fuel expense of the second (gas of course) vehicle in the family due to increased use of the electric. – which means that it can usually be kept much longer before trading in.

Another; With the electric, vehicle maintenance is no longer an issue. 90% of the items that would need regular maintenance or are subject to breakdown are gone.

Owner specific maint, which even a gas car needs, is limited to checking tire pressures and checking/filling battery water when needed. Battery terminals should be inspected, tightened if necessary. Occasionally, the battery voltage should be tested and any low ones found should be charged individually. This is called 'equalization' and is done on submarines, lift trucks, and other vehicles using batteries in series.

Of course the vehicle is still, even with the new powerplant, what she was born to be so that a dealer or independent mechanic can still get parts and work on the rest of it such as brakes and shocks. New electrical parts added are all standardized, easily available and the 3 modules added are, in addition, rebuildable.

As to downsides; Largest downside is that batteries of this type age. As this happens, performance stays about the same but range goes down. The wise owner puts away a small portion of his saved gas/maint money each month into a 'battery amortization' category so when this finally happens buying a new battery pack will not hurt.

The owner will need to know what the batteries require as to obtaining maximum lifespan and how to measure them and water them. And how to inspect and tighten big terminals.

All other downsides have to do with the owner having to make minor adjustments his lifestyle to allow for maximum use of this economical vehicle, and learning to drive it for maximum efficiency. When the owner has this learning curve 'taped', all downs relevant to learning go away.

Regarding the driving of these full size converted vehicles. They are a bit heavier than stock gasoline so power brakes are recommended. All that requires is a donor vehicle that had power brakes to start, a small 12 volt vacuum pump and small vacuum reservoir tank added. The gas engine normally provides braking vacuum. But it will be gone. A power brake type master cylinder and the associated vacuum supply can be added to many 'manual brake' chassis where there is space for it.

'Donor' vehicles of many body types have been converted. The main requirement is that the donor should be light in comparison, but strongly built and of course, in good shape and rust-free. A light vehicle gets better throttle response and range than a heavy one. Also, there must be sufficient space for batteries both front and rear to spread this extra weight along the vehicle sensibly.

All electrics are ghostly silent, especially noticeable upon acceleration. Conversions will keep up with any commuter traffic and if throughway driving is a part of it, 65mph is not a problem for a full size vehicle. Vehicles can be design maximized for performance, in many cases outperforming their gas equivalents but most are designed as commuters, maximizing their range between charges.

The feel of the average vehicle is like any 'stock' stick shift gas commuter with a basic small 4 cylinder engine in it, with a couple of passengers in. All 'commuter vehicles' even gas powered ones are mild mannered, electrics are no exception. The type of vehicle mentioned above thrives on a 20 mile or less each way commute.

Some 'city' parking spots have 120V charging outlets. At the Boston red line (Southernmost terminal, Braintree) for instance, there are 5 charging spots and the electricity is at no cost beyond parking fee. Some EV drivers charge at work. Charging may not be necessary but many do it anyway if opportunity and permission are there.

All owners of conversions also have a gasoline car for the long trips so the relatively short range between charges (50 – 60 miles in this type 90v conversion) is not a problem.

Range is only a problem in the minds of the 'knockers' of electric, the untutored. These vehicles are purpose built as a 'second car' to do all of the short fuel- wasting trips (see pages 3 and 4 of this guide) – and the everyday commute if it is within range - and the knockers don't know that. Knockers don't know much. (Neither do parrots)

As to the fuelling of these vehicles; Seeing as that the battery chargers have automatic shutdown when the battery is full, the vehicle, when not being driven is most always plugged in. Just like a cordless electric razor is. It is almost unheard of that an electric vehicle owner runs the battery down to dead. There is a voltmeter to monitor state of charge. If disregarded, the vehicle 'yellows out' just as a flashlight does, the driver feels her getting 'lazy', stops at any gas station to charge for an hour for a couple bucks and is more careful to plan his driving next time. Simple. Proportionately, an awful lot more

gas vehicle drivers run out of gas. No warning? There's a gas gauge in every gas vehicle but it somehow gets disregarded.

Many converted PEV owners also have 'fast chargers' at home which operate from 220V electric stove or dryer type outlets. These allow a full charge in about 1/3 the time of a regular charge, giving more miles possible per week than can be calculated by normal methods. The 'knockers' do not know this as they won't investigate, won't think 'out of the box' but continue to knock, parroting adverse media comments.

Mainly, the media favors a 'status quo' position regarding EV's. Electric vehicle people do not spend advertising money in mainstream media. Gas vehicle manufacturers and fuel producers do. The media is responsible to their advertisers, a fair, honest and logical position for them. As for the knockers, parroting that is a comfortable thing for them to do which takes no brainpower at all.

(edit note – never argue with a person who condemns before he/she investigates. Just give him the website you downloaded this guide from, or a CD copy of this guide. This writer drives a PEV (a converted '87 Nissan Centra 2 door, converted at about 100,000 miles now has over 25,000 electric miles on her) and has had her to many 'cruise nights' where antique/custom/hotrod types congregate weekly giving free shows to the public. There, some people will knock electrics. Even when they see one with a happy owner. The concept of a separate 'commuting and short trip' vehicle to save gas money and to help clean the air is foreign to them. Well, the concept of putting gas money and gas vehicle maintenance money in my own pocket instead of somebody else's is not foreign to me, or any other EV driver. Two vehicles are necessary in this family, one of them is just *much* less costly to run, has no time payments, and needs almost no maintenance. End of comment)

Note that the sections above apply only to converted plug in electrics. Commercial plug in electrics such as the Ebox and Tesla do not need any owner maint of batteries and their learning curves are so small to be almost nonexistent. Regarding the new advanced type batteries in both of these vehicles, nobody knows yet what their lifespan will be, but can only estimate. Some say they will last as long as the vehicle. With the Prius, the figure of 346,000+ miles on the vehicle's battery pack has already been proven in the Boston area.

There are other gas powered vehicles besides transportation types that have been successfully electrified. Lawn care is one area of interest, and for many years, small lawns have not necessarily been mowed by noisy smelly gas engines.

There are plug in battery operated mowers out there in the marketplace. Neutron is one available today and there have been others in the past classed as 'cordless electrics'. Look for more of these types to be out there in the marketplace as mfgs 'green up' their product lines. Your own mower will need expensive repair or replacement as all gas powered mowers do. Investigate electricity when you are looking for a new mower.

One factory design of note, a brand new design of the 70's, not a conversion, is the electric lawn and garden tractor sold by GE, New Idea, and Wheelhorse during the 70's – early 80's energy crunch. These were 'estate size' use 6 golf cart batteries and sport a 42" 3 blade front mower deck, a 40" snow blade, even a 42" snowblower with it's own electric motor. Rear accessories were also offered including a driveway/lawn vac/leaf blower, and several other garden tilling and lawncare accessories. Lift for accessories

both front and optional rear is an electric winch. Plug-in 36 volt electric hedge shears and grass trimmers were also there for the little jobs.

Smaller versions were made by GE and Wheelhorse in this period, Sears even had one of their own, all 3 using 2 blade belly decks. These were a bit more expensive than equivalent gas 'riders' but needed almost no maintenance beyond sharpening.

Electric tractors were built sturdy, estimate well over a third of those built are still in use today. Their gas operated cousins of the period have long since burned or rotted out.

There are several in New England – likely more in different parts of the country – that charge purely by solar power. An article on how to do this was in the Jan-Feb '04 issue of 'Current EVents', the bimonthly publication of the Electric Automobile Association. These vehicles, by replacing gasoline fuel by solar electricity, pay back the cost of the panels quickly especially in situations where the tractors are in use 12 months of the year. Quoting the article, their fuel is 'pennies from Heaven'. A bonus, they are quiet.

Electric lawn tractors went out of production in the late 80's, more a failure of marketing than of the products themselves. However, There is a company in Canada presently building the same type tractor with multiple accessories using the latest technologies, it is called the 'Electric OX'. John Deere may be coming out with one.

Most of the 70's factory and backyard and commercial full size auto and pickup truck conversions are still with us. Full size Evehicles are mainly in CA, although there's a scattering of them in every state of the union.

The major public concern regarding electric vehicles seems to be the amount of lead in the batteries. Not a problem at all as 97% of all discarded lead acid batteries today wind up at highly regulated recycling plants. The other 3% are the ones that are not disposed of properly by uncaring individuals. (09) Today's figures may be better due to higher scrap yard prices for lead. There will be no additional lead or any other chemical element added to groundwater or atmosphere by electric vehicles due to this government mandated and regulated battery recycling procedure. Other types of batteries as they are developed will fall under this mandate as well.

As to another common concern; stack emissions from power plants to make additional power for these. Download the Chip Gribben report available from the EAA website listed here. Add to it that not all electricity is produced by burning fuels. While there, download the one about EV myths. Also, EV history.

Lately (08) there has been much media talk and speculation regarding large numbers of fullsize PEV's being added to the present load on the electric grid, thus overloading it. This is pure hogwash likely generated by 'big oil' lobbying of the media. They do not take into account the much less electricity that would be used to process and pump gasoline, or used in the pretty much constant repair of gas engines, unneeded by electrics. Neither do they recognize the fact that most everyone who has so far used an electric vehicle since EV history began (before 1900. In fact, electrics were the first vehicles that could be called 'automobiles' even before steamers were built) has charged at night, when the grid is lightly loaded (malls, factories etc closed at night)

These media commentators need a wake up call. As a final comment here, these self proclaimed experts do not take into consideration the increasing use of fuelless windpower to generate electricity, with municipal and industrial systems all over the

country feeding the grid on a 24 hour basis. There may be no wind in Boston at a specific time for instance, but plenty on Cape Cod or in Maine which are less than 100 miles away on the same grid. Seemingly, most commentators and a lot of the 'experts' they call up don't like fuelless windpower either.

The newest full size pure electrics are a giant step into the future, as for the first time in history they do not use lead acid batteries. They use hi tech, light (and quite expensive) Li-ion (same as most laptop computers) or other advanced types and are much more efficient overall, with much greater speed and greatly increased range between charges. At present super pricey, with increased production prices will go down. Many people in the auto industry look forward to such vehicles as the futuristic and sporty Tesla, or the revolutionary 5 passenger Ebox, a much less expensive Evehicle, getting down to or even below the price range of midrange SUV's within 10 years. This is proof that even though GM 'killed the electric car' and through that, attempted to kill the genre, the only one they killed was their own EV1. They could not stop progress.

GM is now announcing a different type of EV - hyped in one report as a 'revolutionary design hybrid' - in the design and pre-production stages. However, the credibility that GM lost over their EV1 debacle in their highest 'target' marketing area will come back to haunt them marketwise.

For more info, [www://eaaev.org](http://www.eaaev.org). Follow all the links. These people saved money and had fun by driving converted plug-in electric cars and trucks even back when gas was cheap!

Tip regarding all alternative plug in small electric or electrified vehicles: Unsatisfactory reports on these are always due to people using them who do not understand the instruction manuals or operating parameters thoroughly. Examples; by inattention to instructions, discharging the battery of a scooter or converted bike without immediate recharging, causing it to sulfate – especially over the winter. Or treating the vehicles roughly expecting them to be toys or hot rods rather than workhorses, commuters, and fun vehicles. Or not doing prescribed maintenance such as lubrication points and tire pressure. Even a bicycle would not satisfy this type person when mistreated this way.

Also, electrics of any type, even fullsize conversions are habit forming. You will find that you would *rather* go out on the electric doing the short trips and small shopping than in the gas car, and you will often find people admiring it and questioning you about it so be prepared to answer questions.

One last comment regarding pure electric vehicles; the higher gasoline prices rise, the more an electric vehicle owner saves in comparison to gas. Our electric rate depends only in part upon the price of fossil fuels, it will not rise as much.

While on the subject of environmentally clean electric transportation, check out environmentally clean sustainable electric power. Crank 'windfarm' into your browser. For an operating municipal wind turbine, crank in Hull MA, the town website or Hullwind.com.

There definitely are alternatives to burning expensive fossil fuels in powerplants. The Australian outback has run mainly on wind generated electricity since the WWI era. There's a lot of wind energy being used in Europe. The USA is just starting to get into it, grudgingly, as the oil coal and natural gas lobbyists who influence the federal govt don't like it one bit. However, it makes sense and can happen if people are for it and local governments, not being heavily lobbied, responds to the people's needs (not the fuel producer's needs!).

As you will see on the Hull MA website, this has happened.

Hull has smart forward-looking people in their town govt and municipal power organization. One member of the municipal power organization in particular, who did the research and became a one man lobby to the rest of the board. Also, to those few people, both elected/appointed and regular townspeople at the time who would listen and see the many advantages of town government owned windpower to a community.

Hull also has smart forward looking regular citizens who conceived the area's first independent 'green' organization and promoted windpower to the rest of the people, fought those who opposed it through the local media and won the battle. This started as a tiny organization that held the first 'Earth Day' show since the 80's (Sustainable Living Festival) in Eastern Massachusetts, thus winning over both the rest of the town government and a good portion of the general public to the cause of green squeaky clean fuelless power.

This organization has prospered, and fostered 'sustainable living' groups in other towns in the 'South of Boston' area. From a first free to the public 'Earth Day' show attendance of 300 this same free show run by the same people this year (08) had an attendance of over 2,000 people. Hats off from the ECFSC participants who produced this Fuel Saver's guide to the town of Hull's municipal government, and to the people, both active and retired, in their power board. Also, especially, to the unflagging dedication of the leadership and rank and file members of the Hull-based organization now known as Sustainable South Shore.

(update '08) Since Hull has shown the way windpower-wise, Hull's town government has had a lot of official visitors from the governments of other municipalities, seeking to learn how they can do the same thing, set up their own municipal wind turbines. There are proposals pending, computer studies of aerology data being done in many places due to these visits. People in town government are beginning to learn that a wind turbine, at it's bottom line only has two outputs. Cleaner air for the planet and money for whatever municipality industry corporation or even private individual owns it.

Wind turbines become income for a municipality the moment they start to turn, one that does not depend on taxation, produces no detrimental effects, and needs no 'staff' or other expenses. They can be put most anywhere including on 'unbuildable' land. And the biggie is that this new income helps hold down the tax rate of the people of that municipality in these days of increasing municipal fuel expense.

There is opposition to wind power. Financing and lobbying for this comes from 'guess who' – the industries who would be negatively affected by it, meaning the fossil fuel industries.

As to public opposition; this is mainly from those who do not like the view. This is commonly known as NIMBY (Not In My Backyard) opposition. Many 'pseudo enviro' issues – those disproved by experience in other areas and countries are repeatedly brought up to hobble the municipal leadership who would otherwise embrace windpower. These opponents even believe and promote to the citizens that a huge tower in the area would lower property desirability, therefore salability. Hogwash, as in Hull MA, all property values within the sight of either of the wind turbine towers have increased since the towers were put up. This same thing, increase of salability, has happened in all known other communities that have put up wind turbines. It shows a forward thinking municipal government, a good place to live.

A question to those windpower opponents; Seeing as that our expanding population must have new sources of electric power in the proposed area of the new wind machines, would you rather see dirty smokestacks in their place? The fuel producers would. Back to the main subject at hand. Transportation.

Forget hydrogen powered vehicles. The combination of a fuel cell stack and high pressure or chemical absorption tanks are only a complicated and extremely expensive substitute for a battery in a conventional plug-in all electric chassis. Essentially, a longer range lighter battery. And we already have that. (check out Tesla, Ebox sites).

This is pie in the sky stuff for rich companies to buy and to make others rich and the average person could never afford one. Even if we could, most commercial hydrogen is refined from natural gas and then we would be back in the clutches of the fossil fuel barons. Until there is no more fuel left to refine. Likewise, the much heralded 'at home' hydrogen source extracts hydrogen slowly from natural gas, a depleting non-sustainable natural resource. The supply side of Hydrogen is not sustainable unless electrolysis or membrane separation is used to make it from water using sustainable electricity such as wind or hydropower. These separation processes are inefficient whatever their power source may be, therefore costly. A huge capital expense will be required to produce store and transport the hydrogen needed for even a miniscule (<1%) amount of the transportation we have today – and even more in the future. This expense can be seen already in CA – the 'hydrogen highway', a small part of it being in existence as in CA, hydrogen from the producers is already flowing to food processors and the chemical industry, and has been for many years.

The media, apparently being lobbied by natural gas interests, appears to be convinced that hydrogen is a brave new way to run a car so it gets a lot of media play. Some industries are making bigtime govt subsidy money messing with it. It may pay to use it as urban public transportation fuel. But it is not, and never will be for us, the little people, at a reasonably affordable price. No. Nyet. Non.

Other types of 'new tech' automobiles are out there. Giving one, compressed air power.

High pressure tanks and hi pressure mini turbines will certainly run a vehicle. BUT . not economically. The supply side, IE the compression process is quite wasteful of energy. The higher the pressure, the lower the efficiency of this supply side. And it takes an awful lot of pressure and pressure tank space to get even a light vehicle an appreciable distance before refuelling.

There is presently no infrastructure (compressed air stations) and these, being capitalized under today's interest rates will make the fuel sold by them quite expensive.

Most of this type stuff is 'futuretech', a cop out. In order to be viable today, a new transportation development has to be available today, debugged by long experience today, mass produceable today, and the most important part, affordable to the masses today. Countless thousands of people are out there now saving money and lowering their CO2 footprints by using presently available alternative vehicles. Don't let a dream of 'futuretech' put off your own plans to make a change that can be done now.

Hybrid cars; In every hybrid by any mfg, an electric motor/generator and a gas engine work together to give you 'better than excellent' fuel economy in a full size 4 or 5, even 7 passenger vehicle without compromising performance. This is the best possible 'full size' vehicle solution for the most people at present and likely in the near future to ramp down the world's (as well as the individual's) need for automotive fuel. The Toyota Prius is the best known, and has been on the market long enough to prove it's reliability, and the validity and reliability of the genre. There is one Prius in Hingham MA with over 346,000 miles on her (08) having had no drivetrain repairs and still using the original battery pack. Performance is 'like new'. This Prius holds the 'record' for most miles driven by a hybrid vehicle in North America and likely, in the world. Several others near that mileage are reputed to exist in Japan where they were first introduced.

Fuel mileage of the gen 1 (original) Prius varies between 60 (in normally wasteful short trip and stop and go driving) and 45-55 on the turnpike. In other words, these hybrids get better 'city' mileage than 'country', the reverse of 'gas only' cars. At high speeds in the passing lane (perhaps doing 85) they get about 40. The MPG variance depends mainly on terrain, winter/summer, and individual driver habits as other vehicles do. The Gen II (2006-9 model) does a bit better on gas and has other improvements as well. Instance – the rear seat now fold flat all the way back, the shift lever is easier to handle. Visibility is better.

There are very few available in the 'used car' market. You almost never see the Prius advertised. There is no need for dealers to advertise this model. They are so much in demand they sell 'sight unseen', often with a waiting list. (07, producing more, no waiting now). (08, same story. Few trade-ins, people keep these hybrids.)

A fine solution for a gas hog owner to eliminate present 'gas price' woes and prepare for a future with even higher (\$4.00 – \$4.50 7/08 in most of New England presently) gas prices is to trade in the guzzler for a hybrid. (9/08, \$3.70 and falling but it'll be back up there soon.) (2/08 below two bucks but how long can that last? Gone up 15c in the past 2 weeks)

The Prius, by the way, is a great 'long thruway trip' car, comfortable and effortless to drive, great visibility and response. Toyota now makes a 4WD hybrid SUV (Highlander) able to tow 2500 lbs, so those who want SUV features can now have a hybrid that is rated at, depending on terrain and load between 30 and 40+ MPG. Which is outstanding, unique for a big 7 seater 4WD vehicle with 268 hp total that will do 0-60 in 7.3 seconds. One local owner reports almost 50 highway mpg. Fantastic for a full featured SUV. He must be pretty good at economical style driving.

Honda stopped producing the Insight, which is a 70 hwy 60 city mpg hybrid vehicle. It's a light 2 seater with a sports car look. There are very few around as used vehicles. People who have them keep them. Honda now has a Civic hybrid. Ford also has one (the Escape SUV type) You will be seeing more hybrids by various manufacturers as time goes on now that they have been proven and have caught on with the public.

Hybrids are relatively expensive now, trendy and likely the most fuel efficient fossil fuel burning full size vehicles that will come to the public in the present generation. Hybrid drivers are looked upon as wise people, in tune with the times, and the Earth and her needs. Gone are the days when a gas guzzler driver is looked up to. 'Not too smart' is the general attitude towards the fuel wasting vehicle driver at present and will continue to be as fuel prices go up and down – and up – and up.

Being developed and on the road now are 'plug-in hybrids'. These give a range of about 30 miles on electric alone and can be charged by either the gas engine while driving or by plugging them in. Pure plug-in electric for the short trips, hybrid for the long ones. An aftermarket conversion kit is available for the Toyota Prius to add this plug-in capability. Envision the question "Which fuel am I going to drive with today?" The conversion is pricey now but as production gets into full swing it should come down a good bit. The future should bring us a OEM versions of this type vehicle. However, it would be a good bit more expensive for this type of 'dual fuel' model.

For those who think the hybrid is a new concept. Yes it is, for automobiles. However, the railroads have been successfully (and cheaply compared to other fuel systems) using hybrids (diesel electric locomotives) for over 75 years. Pure electric loco and 'streetcar/subway' transport has been in use in the US for well over 100 years. More than 50% of all mainline railroad trackage in the world has been electrified, uses pure electric locomotion. Both the 'Chunnel' and the bullet type high speed trains are electric.

Vehicles other than the above categories

Boats; Recreational boating; Choose sail rather than power. Fuel at marinas etc is much higher priced than shoreside. It only takes an economical 6 hp outboard to bring a 24 foot 5 sleeper sailing sloop home or out to where the fish bite when there's no wind.

As to powerboats; plug-in electric sport fishing and cabin cruisers in the same size range have been built in FL among other places. They charge from dockside power and can be hybridized easily using a contractors 220V generator. Several are docked at Ft Lauderdale FL. On electric they are almost as quiet as sail. Halsey Herreshoff, a U.S. yacht designer/builder of international repute, came out in 06 with a hybrid day cruiser.

Lake Winne in NH has many wood powered steam launches. Most are restored antiques. Some are newly built reproductions. A person needs special skills to run these, most owners are live steam antiques hobbyists or engineering people. These too are quiet and cheap to run. Every year there is a week long regatta for these on the lake's North end. Many are kept at the lake all year, some come trailered in to participate.

Camping vehicles; This writer, in the late 70's, toured extensively coast to coast in a pickup camper, the truck was a 350 Chev Silverado. This was mainly 'right lane' thruway driving and fuel mileage averaged 15mpg, twice what a towed trailer or motorhome of any sort available then was getting. Inside the camper were 2 Puch two cycle gas mopeds (100mpg, 49cc,25mph) with folding rear baskets which did all the little trips in the areas of interest. A 2x6 stowaway ramp allowed easy loading/unloading. The camper part was

chosen for interior space to store these and the ability for 2 to sleep and cook (on rainy days or during short overnites) with them aboard.

Perks; Mopeds were treated as bicycles at places like Disney and Magic Mountain, parked for 50c or free and right at the main entrance. Campground was 5 miles away from Disney FL, for instance, much less expensive than closer campgrounds. During extended stays it was not necessary for the lady to store all the cooking stuff and myself to unplug/ store the cords, water hose etc when leaving the camp for shopping exploring, points of interest etc, then repark, relevel, and reconnect after the trip. The mopeds saved this extra work. Less work on vacation = more time to play. Many stops were state parks and they are fantastic! All campgrounds we stayed at had showers, most also had swimming facilities, convenience stores etc. Never leave on a trip like this without 2 different current 'camper's' map books to cross-check facilities, and a general, but open to change route plan.

Total cost of 6 weeks of this was much less than the cost of a week cruise to the islands, or 'fly and rent a car' for a week to most anywhere. And - - burned *much much* less fuel per passenger mile than a jet plane or a cruise ship to anywhere.

Other; Note that the 'big 3' automakers in the US are having financial trouble. If they built the economical automobiles that people want and need instead of concentrating on heavy 'image' marketing of overpowered hi priced gas hogs they wouldn't be. US Mfgs build excellent vehicles but are behind the times, not in step with demand. We need 'peoples cars' not overpowered fantasy imaged gas hogs.

Somehow, Detroit has been blind to the success of foreign manufacturers who have given us 'people's cars'. And has forgotten the lesson of the 70's which made these smaller lighter more economical vehicles (and their manufacturers) popular.

In general, automobile manufacturers (and buyers) need to restructure their thinking as to the 'image' of inefficient gas guzzling vehicles. These vehicles are neither good for the atmosphere, nor good for the planet's limited petroleum reserves. It is a selfish uneducated image. Is that the image a person would want?

Fuel pricing

Petroleum derived fuel prices, especially gasoline, has been doing jumping jacks for many years, mainly since the late 60's. Up, down a bit, up, down. But mainly up. Research this yourself on the net. There are 'fuel price watch' sites listed here. (11/08 – gasoline is a bit below \$2.00/gal now in the Boston area. Figure out for yourself why it has gone down.

(Hint; the US auto industry needs a bailout and the dealers are clogged with both new and trade-in high fuel consumption vehicles that are not selling. The 'sheeple' may think 'The emergency is over. Now I can buy that nice looking 12mpg SUV cheaper.)

'Down' at present regarding oil by the barrel can quite easily go 'up' again.

Another; Fuel prices were manipulated downwards to slow down and finally end public interest and participation in fuel economy measures during the last part of the 70's energy crunch. Government subsidies on such as solar installations ran out their time

periods. The auto industry again started to promote power and performance rather than fuel economy.

Is this present (late 08 - early09) downturn in fuel prices part of a similar manipulation of both government and public by the fuel industries? A repeat of the historical petering out of the 70's crunch? Media reports here of speculated causes cannot be relied upon.

Regardless of the cause – you who read these pages will, by implementing changes in the amount of fuel you burn and keeping to the principles shown in this guide will still save a peck of money while simultaneously, by lowering your fuel useage therefore your carbon footprint, and help to clean the atmosphere.

When crude oil derived transportation fuel and home heating fuel get to unprecedented prices and gasoline got to a higher price per gallon than milk as happened in Fall 05 (and is headed there again now in late 07) (and has again surpassed it in '08) something is basically wrong with the system that provides them.

The reason for the Fall 05 rise given by both government and media was that hurricane Katrina knocked out a good part of production, refining, and distribution capacity. Hello ? Anyone who checks the date that Katrina hit against the curve of rising prices of fuel will find that fuel rose to an unprecedented high well before Katrina. But who checks? The public has been programmed to accept, not question media reports.

Secondly; There were other refineries not affected, which could continue to provide 'pre Katrina' prices to their customers but didn't. To many, it is obvious that the extra jump in price was the entire system of distribution taking advantage of the public to pay for and 'average out' post Katrina recovery costs of the lost facility. (Same thing has happened again 9/08. Big rise everywhere allegedly due to hurricane damage to oil facilities in and around Galveston)

Third; a vital support system is that is so fragile that every fuel user in the entire country was affected by damage to a relatively minor part of it is *obsolete*, especially in these days of worldwide terrorism.

The answer, of course, is a more widely distributed less complex production and distribution system.

The electric grid is a good example of this, as it is together, yet independent. The loss of one plant or even multiple plants simultaneously will not affect price, production or distribution of the entire system. And the biggie; It has happened before, the great Northeast blackout was an instance. The price was not and could not be affected. And power was back in the entire outage area in a few days. Recently (12/08) an ice storm knocked out a large number of Western MA power transmission lines. Crews have been working to restore power 24/7 and now, 2 weeks later the job isn't finished yet, several small communities still do not have power. (All restored several days later) Have any electric bills been affected? Of course not. And they won't be.

You will find more information regarding fuel pricing farther on. It's going nowhere but up. The price is one of the three basic reasons why we look for alternatives. The one that hurts us today.

The other two hurt our grandchildren and great grandchildren yet unborn.

Alternative fuels

Crude oil is the source for many products and processes besides just transportation and heat. We must have alternatives as our normal fuels. Reason; when this crude oil gets burned up, we will lose also the industrial products derived from it.

Most plastics are crude oil derivatives. There is hardly a branch of the chemical industry that doesn't use some part of each barrel of crude by breaking up crude petroleum's long chain molecules into 'tailor made different molecules' in it's output. Even medicines including many of the new 'wonder drugs' could not be made without crude oil. Look this up in an encyclopedia some time, You will find a list longer than we would want to print here of products and processes that would be forever gone if the chemical basis of them, oil with one list, coal with another, natural gas with still another were gone.

The worst thing that we can do with this crude oil (and the other long chain molecule fossil fuels) which now appear to be in plentiful supply but will in the relatively near future decline to a trickle is to burn them or any part of them. It makes no sense at all to recklessly squander these endangered natural resources. They are the heritage of our grandchildren and their grandchildren. Therefore, the need for alternative fuels.

Here we will deal with those alternative fuels suitable for use as transportation fuel, especially conventional cars and trucks. *Alternatives reduce our dependence on domestic and imported oil but still, no matter how clean they burn emissionswise, they still oxidize carbon and put out CO2, the primary global warming gas. There is only one 100% exception to this general statement on this list.*

Biodiesel is a partial exception to the CO2 problem. When corn, soybeans etc are grown, photosynthesis takes place and the plants absorb CO2 and put out oxygen. Therefore the supply side puts out only the CO2 needed to process the oil bearing part into vegetable oil, which is much much less than the CO2 output needed to refine crude oil into motor fuel. This veggie oil can be burned pure and new, or it can be first used for food prep purposes and when worn out for that purpose, recycled into motor fuel. Afterwards, a lot less energy then initially (mainly chemical energy) to process 'recycled from food prep' veggie oil into diesel fuel.

Another advantage, vegetable oil is easily biodegradable and inherently clean burning, unlike crude oil (mineral oil) derivatives.

And the biggie advantage; it can be 100% USA supplied (mainly corn or soy) doesn't need expensive dangerous fuel wasting 'supertanker' transportation to get it here, or can get involved in a 'Torry Canyon' type oil spill. It won't show up some day on the world's beaches.

The downside; That is, if it all gets grown and processed here. Presently, it is not.

However, there is another type of biodiesel that is. Biofuel is refined here in MA using second hand friolator oil that won't cook good any more. We call vehicles that use the stuff 'greaseburners' and the fuel itself is called 'grease' (as opposed to new pure biodiesel.) A diesel must be converted to burn 100% 'recycled bio', the conversion kit is (07) about \$1500 including a heated fuel system for those well known New England winters. (09.price has gone down a bit check the web on this)

The used 'fry oil' must be chemically reprocessed, as filtering alone leaves in chemical and particulate impurities that cause short engine life. There are 2 companies in Boston

that do this commercially. There will be more, as the equipment to do it is relatively inexpensive, a person can set up a miniature processing plant in his garage. Several Boston area people, individuals, who have converted their own diesel vehicles are already making their own motor fuel. One of them sells and installs conversion kits to fit most any diesel. Hang 'greengreasemonkey' into your browser to view this option. There are others, see website listing also google the subject.

At present, (07) the cost of recycled biofuel from a commercial producer is about the same as diesel fuel, around \$2.90, but is quite a bit less, about half that, for homemade fuel. However, the cost will remain at today's level regardless of what happens in the oil industry. (08-Wow did it happen !!) If you bring in your own used vegetable oil to one of these reprocessors, you get a discount on the fuel, which is great for those who own restaurants. (08) A few restaurants, mainly chains, are not giving away used fry oil but selling it to commercial reprocessors now. However, there will always be oil for the small home processors from the smaller places. The exhaust of reprocessed is quite clean, smells like french fries.

Biodiesel, as 'brand new' vegetable oil has a problem. Land being used to grow fuel cannot be used to grow food. There is only so much arable land in the world suitable for farming and our growing population will need more of it for food as time goes on. Great areas of virgin land, especially in enviro sensitive areas such as the Amazon rain forest areas, are being and have been cleared to produce soy, cane, beets or other biofuel (ethanol or veggie oil) feedstocks. A good reason why the prospect of using recycled fry oil is so exciting.

Some stations especially on turnpikes are starting to sell 'blended Diesel fuel' sometimes called 'clean burn Diesel. This is usually 5-10% bio that burns cleaner than straight diesel.

Home made biodiesel (aka 'grease') on the other hand, is mainly recycled waste vegetable oil that would normally go in the garbage and has already been used for food prep purposes. Motor fuel is it's recycled state. Now (07) we are getting more 'new' veggie oil as blending stock and more 100% biodiesel.

Corn squeezins Basically this is not a real clean burning fuel. Ethyl alcohol (ethanol) same as 100 proof rotgut moonshine but denatured so it can't be imbibed. There are some people using it 100% with various vehicles in the farm belt. Also, it is an additive (vicinity of 2 – 15%) to gasoline. It lowers emissions but unfortunately, as it burns poorly and picks up water, also lowers power and miles per gallon. The supply side of ethanol puts out a 'garbagey' smell (as it is a ferment process) and it takes a lot of hydrocarbon sourced energy to process it. Exhaust of 100% contains formaldehyde and stinks. There is no price advantage to it at present.

This is not a 'world solution' as arable land must be used to grow the raw material corn sugar beets, etc. Land that is taken over to grow fuel cannot be used to grow food, same problem as with new vegetable oil. With ethanol produced in the USA, the spent corn mash is used as pig fodder, which helps the supply side. Methanol, AKA 'wood alcohol' is too dirty a burn to use for motor fuel. Also, this reuse of spent mash does not happen.

Experiments are taking place now (06) to use vegetable husks to produce this fuel rather than using the edible part of the plant. In FL, waste from the orange juice processors recycles into ethanol, but being seasonal, it will never be a big industry. As

with biodiesel, there is much virgin land loss, sensitive forests burned especially in the Amazon rain forest area to farm sugar bearing ethanol feedstocks such as corn, beets, or cane.

The addition of ethanol to automobile fuel lowers some types of emissions. However, it also lowers miles per gallon. The more gallons used to do the same miles increases those same type emissions, also increase greenhouse gas output when looked at as an overview, including miles driven, of the entire transportation cycle. Another reason why alternatives to the present oxidizing fuel systems must be put into practice worldwide.

LNG (Liquified Natural Gas) or CNG (Compressed Natural Gas) This is used mainly for mass transportation in cities as it is clean burning, not further polluting city air. It is not available everywhere. Some buses are now LNG or CNG. And Boston smells better, especially in and near the T bus terminals, because of it. Many smaller vehicles are presently running on CNG. This fuel is an oxidizing fuel as well, see above.

Propane. This too is a clean burning transportation fuel mainly used in warehouse forklift trucks. Most any car or truck that uses a carburetor and not fuel injection can be easily converted to use this fuel, but it derates the horsepower about 20%. Propane burners do not dirty their oil, engine and exhaust components seem to last forever. Most propane delivery trucks burn it. At present it has a lower price than gasoline but being a depleting hydrocarbon fuel, this price advantage should not last long. Propane burning or carrying vehicles are not allowed in most tunnels and many states require a special road tax to be paid on it as well. Propane is not yet available coast to coast without getting off the turnpikes. And of course, there is as much CO₂ and other greenhouse gases produced by propane as any of the other oxidizing fuels mentioned above.

Electricity. A different category transportation fuel than all of the above as it is not only clean but sustainable. Gives off no CO₂ global warming, 'lung concern' or acid rain chemicals or emissions when used, the cleanest (as well as cheapest) fuel that there is.

The supply side can be clean and sustainable (hydroelectric, windpower, geothermal, photovoltaic, or surprisingly, nuclear). However, it can also be quite dirty (coal) and use depleting fossil fuels (coal, oil, natural gas) to generate it.

All handicap individual personal transportation has always been electric, and the history of highly successful electric automobiles and trucks goes back to before their steam or gasoline equivalents came on the scene. In the early days of the automobile, electrics were valued by individuals as they needed no steam engineer, chauffeur, hand cranking to start, warm up or special knowledge to drive. They were clean with no odor, especially liked by the ladies. They were quiet, didn't frighten the horses. The only reasons they got out of favor was the invention of the electric starter for gas cars, and the extreme low cost of the Model T Ford priced them (and many, many gas and steam car brands) out of the market.

Electricity is *the* major transportation fuel today in the world's railroads and subways and is beginning to pick up popularity again in great numbers with the hybrids. (Electric cars with an integrated onboard gasoline run generator is the easiest way to think of them). Plug in battery operated commuter scooters are fast gaining popularity (especially in China, India and Pakistan and the US West Coast).

There are many electric LSV (30 or so mph) delivery and commuter vehicles mainly in Scandinavia, Europe, China, Japan, and the UK. Some US states allow these smaller lighter and economical vehicles to the general public, not just to municipalities. (We need this type of MV legislation in ALL of our states. Until we have that, the US will be behind the rest of the world in clean fuel efficient personal transportation)

In addition to being a clean motor fuel, electricity is and always will be cheaper than any other motor fuel, given vehicles that have been designed to use it. Railroads are fast becoming all electric all over the world mainly for this reason. Over 50% of the worlds mainline trackage Including the hi speed 'Chunnel' and bullet trains are electrified.

A look at the 'MPG chart' on pg 4 will show the price difference. And that's not a 'projected theoretical' difference, it is what's happening now, with present day technology, in countless families all over the world. Check out the EAA website and when you do, consider that not all EV users are association members. Mainly, members are the individuals who have converted their own vehicles or drive vehicles converted by other individuals and have an interest in the technical issues of their electrics. Hybrid people are there too if they have an interest in the technical aspects of hybrids. The New England chapter presently has close to 30% hybrid members.

Electricity was the first automotive and truck motor fuel of the past, it is presently the fuel of choice for forward thinkers, and mainly due to the declining amounts of pumpable fuel left underground, **must become** the motor fuel of the future.

Non-transportation fuels

There are some fuels that are intentionally not mentioned above as they are not in big supply or not particularly suited to being 'transportation' fuels.

As for these 'non-transportation' alternative fuels; many are listed below. All but the last four mentioned in the list below put out lung concern particulates plus global warming and acid rain products. These therefore can not be a world solution to our need for fuel.

As for these last four? Non-polluting. Clean and green. But at present mainly limited by the politics, practices, and lobbying of the present fossil fuel supply industries. These last four, listed under their separate heading (non-polluting) have no ownership or limitations, and are clean green fuels available free for the taking.

Biomass . This is the category of many different fuels that have a biological origin but are not fossil fuels. Ethanol and biodiesel for instance, are sourced by biomass. However, the term is not applied to them. Such fuels as 'trash to energy' and wood come under the heading. Biomass converts to energy through oxidation (burning), therefore puts out CO2 and other undesirables. The main reason for the use of biomass fuels is as an alternative to expensive fossil fuels. Below, the (*) symbol will identify biomass fuels.

Biogas * This comes as a by-product of sewage treatment and has been used for many years in many city systems to run sewage pumps. The town of Braintree MA has capped their old landfill to provide biogas to generate electricity. A new thought in the same category is to use municipal garbage in plants designed to harvest the biogas from it, the spent residue becoming fertilizer. This is only at the 'design' stage now.

Wood * and *coal* were used in gasoline-starved WWII Germany England France and Spain as transportation fuels by onboard generation from coal and wood, the burning of

resulting carbon monoxide/methane/hydrogen rich gas in modified gasoline engines at much lower power outputs. Most were trucks and buses. Smokey and inefficient, these vehicles were called 'gasogens'.

During the same period, Germany (mainly) made 'synthetic oil' from coal. This was a dirty process but who thought of that in those days with the Allies closing in? The process has been cleaned up (somewhat) and is being used to provide small quantities of motor fuel today.

Another fuel type of chemical origin, Hydrogen peroxide, was used in the last few submarines WWII Germany built. These were called 'Walter boats'.

Wood* and coal have been used for transportation by the railroads in steam locomotives since 1804 and are still being used today mainly in 'tourist railroads'. Wood and coal fuelled steam operated farm tractors were in use long before the gasoline engine or automobile were developed, and are still being run at 'thresherman's reunions' in the USA, mainly in the midwest and still farming in the OH and PA Amish areas. In the plains states, hay* was burned by these tractors in a special firebox.

Today, wood chips or pellets* are burned in quantity to make steam for electricity generation. This allows use of wood unsuitable for any other purpose (such as stumpwood, bark, tree trimmings etc) to be burned uniformly and predictably. Pellet stoves are quite popular for heating farm outbuildings. In the same category are the stoves that burn dried corn kernels*, mainly corn growers use these.

In the late 1860's and up to about 1950, street gas for lights and cooking was made by injecting live steam into burning coal, giving a gas rich in hydrogen methane and carbon monoxide. There were several companies that made general purpose stationary engines and water pumps that used this gas. The entire cycle was inefficient and dirty but coal in those days was plentiful and cheap. Calcium carbide made acetylene gas, same story, but acetylene was used mainly for welding metals and for lighting. Acetylene is still used today in quantity, mainly for welding and cutting iron and steel. but it too expensive to use for transportation or home heating.

*Peat** (which is 'young coal needing only burial by natural disaster and only a few million years of compression and aging to become coal and a few million more to become crude oil) has been used for heat in Scandinavia and the UK for centuries. It is nearly gone now, burned mainly to give an authentic atmosphere to tourist pubs and inns.

*Bagasse** is dried sugar cane after the sugar has been extracted. It is used as the fuel of choice to make process steam for sugar extraction. A nice closed cycle.

Municipal trash* is an up and coming source of steam for electric generation. Southeastern MA has a fine hi tech plant called 'Massburn' that sorts the trash to remove recyclables and hazardous chemical items before burning it.

Non- polluting sustainable sources of energy

Tidal power has been used in the past for small mills and saltworks on the East Coast in the late 1600 to early 1900's period. Presently, large scale uses of this power are being investigated. Any large scale use of tidal power will require huge expense. The power itself is free, but the methods of collecting of it, at present, are not cost effective when compared to other sources of sustainable energy.

Geothermal is a great source of power. Iceland practically runs on it. However it is not a transportation fuel, mainly for heating systems and not available everywhere in the

world. Where there is a lot of it, as in Iceland, geo is used to make electricity, which then can be a transportation fuel. Small geothermal aided home heating/cooling systems are available in the USA, working on a new principle, therefore not needing hot springs or magma sources near them. They are heat pumps, saving Summer heat, storing it underground rather than discarding it as air conditioners do. In the heating season this stored heat is used to supplement the 'heat' end, making it more efficient. Energy to run this cycle, of course, is electric as with all heat pumps but you get much more 'bang for your buck' from this system than other heating systems available. And . . . electricity to run this type geo aided system can be sustainable if your utility provides it.

Solar power can be used by anyone, from big industry to the small homeowner, even backpack camper. It is easy to collect in many different ways. When collected it can come through it's collecting and storage arrangement as either heat or as electricity, dependent on the collecting hardware used. Many contractors in the US and Canada and all over the world install this hardware, or it can be bought and installed, some of it even manufactured by the average homeowner who is skilled in the use of tools. Solar power installations pay their way, as they replace conventional 'bought' power and have little or no maintenance. The most efficient solar power for the homeowner with the fastest payback is domestic hot water heating. And - contrary to popular belief - solar power collectors need not be installed on a roof. Many are ground-mounted.

Windpower is a sustainable land based or transportation fuel older then the pyramids, at its peak in the era of tall ships. Land based windpower has been with us for well over a thousand years mainly for pumping water and grinding grain, and through the generation of electricity, well may become the transportation fuel of choice of the future.

Fuel saving gadgets

Years ago this writer tried alky and flash steam injection. Yes – this gave a mileage boost. On a nice simple flathead 6 (1939 Olds). However, it will not do anything to today's much more sophisticated engine designs. A local experimenter messed with it a good bit on a computerized fuel injected vehicle a couple yrs back. Results were inconclusive. We suspect that because the older cars allowed manual timing advance (which was mainly the reason for the fuel savings, long trip dash controlled manual timing advance without preignition) and the newer ones timing is done by the onboard computer, he could not gain that timing advantage.

Tried also one of those 'super spark' things on the ignition coil of a Dodge 318. No mileage difference at all. It just made engine static on the radio.

Today there is a magnet that goes on the fuel line and is said to 'polarize' the gasoline molecules. Hasn't done a thing for anyone I know, and this writer knows an awful lot of automotive diddlers (gearheads) both full time professional and backyard mechanics.

There are 'miracle liquid' gasoline additives in small expensive bottles that are hyped to get you more miles per gallon. Yes, these work but are mainly fuel injector cleaners with a different hi tech sounding hype. Xylol or acetone, enamel solvents, work as well and are much cheaper. As in the instructions for these miracle liquids, add 2 liquid oz of xylol to every 5 gallons of gasoline as a mileage booster. Acetone is an alternative 3 oz to 10 gallons. Acetone must be pure, as with one or two brands of fingernail polish remover. (example; Sally's Beauty Supply) The commercial 'solvent' types do not work well, as they may contain a trace of benzine which negates the effect.

Try both alternately see which one works better, or even try mixtures as all vehicle types are a bit different in requirements. Acetone appears to have the edge here. This writer presently using a mixture, 10 gallons gas, 2 oz acetone an ounce of xylol and an ounce of mystery oil but proper data has not come up at this writing. Many people including this writer get an extra couple – or even more- miles a gallon by doing this. It's an auto mechanics secret, not for everybody as these solvents are volatile and dangerous for the layman to handle.

Note: More is not better, it's worse. The effect has a critical curve. Don't overdose.

Note: An oldie but still goodie. A little (2 oz) Marvel Mystery Oil in the crankcase and very little (1 oz-10 gallons) in the fuel tank. Keeps everything cleaner and extra lube.

Note: Diesels are helped by this too. Even better for them, there are commercial additives for diesel, the best known is 'Power Service' which among other things prevents run-on.

Note: Cars designed for Europe's standard fuel, 92 octane. must use premium gas because the USA's standard is 87. DO NOT run regular 87 octane in these vehicles. To do so will likely cause damage to the engine. Some additive info says that they will allow 87 to be used, but this writer presently would play it safe, bite the bullet and pay more for premium rather than take chances with a \$20,000+ vehicle.

To this writer, many of these 'miracle fuel saving gizmos' are just another variant proving PT Barnum's famous quote 'there's a fool born every minute'. As well as the anonymous addition to that, 'and two to take him.'

Suspecting that if some accessory did come out that worked to significantly improve mileage;

(1) It would not be marketed in the sensational mail order fashion that it is (*Amazing mileage booster* or whatever) but would go through legitimate auto parts stores and chains such as Advance, Pep boys, AutoZone, Sears, Western Auto etc stores that deal with a lot of walk-in trade and lots of auto mechanics. Small companies without facilities to produce large quantities of product would likely market through the internet. Some of these may be viable due to the better understanding of combustion in these hi tech times.
(2) If legitimate, working as advertised and patented, the rights would be grabbed up by a major auto manufacturer or oil company and it would disappear forever. That's what happened to the Fish and Covey vapor/catalyst so called 100mpg carbs and several more like em. You can get a copy of the patents of these things but they won't work with today's formulations of gasoline. They did work back then.

There are exceptions. One showing promise is called a 'Fog Warmer' otherwise known as a fogger, fuel heater, or fuel expander. This gives a solid mileage increase on diesel and Japanese fuel injected gas vehicles. It is a bit expensive and is best installed by automotive technicians familiar with loop charged fuel injection. If installed in 'Detroit' gas vehicles, their computer systems may, given a short time, react to the change by lengthening the injector pulse width or making other adjustments to bring the engine parameters back to "factory specified normal"; thereby canceling part of the gas mileage increase.

There is a good amount of experimentation going on (08) among a new breed of automotive mechtech /gearhead for want of a better name call these people 'fuel save

nerds'. In the past these people experimented with stock engines and made them more powerful for racing and communally gave us the 'hotrods' and a whole industry devoted to them. Now many of these same type people experiment to give us fuel economy. They have had some relatively minor advances and may, in time, come up with a significant advance or advances in present day automobile fuel economy. However, today's vehicles are built so as not to be 'diddled with' and certainly not to have their computers and systems modified for economy, while at the same time lowering emissions even further than stock.

Wish these people the best but better still, think before you buy your next vehicle. Think fuel economy rather than power or that elusive and fickle 'prestige'. Favor the mfgs that give us fuel economy rather than brand recognition, powerfully imaged TV commercials or unnecessary power and weight. Big tanks are not safer. Top heavy vehicles roll over. It's your driving skills and attention to the road and other traffic that make a vehicle safe, not the vehicle itself. Think about it.

Union people note; Here we are NOT condemning American-built vehicles. We are only advising people to think 'fuel economy' in their choice of vehicle type.

The best fuel saver is not a gadget. It is a person. And that person is you. A change in driving habits, perhaps coupled with a minor lifestyle change using an alternative mode of transportation to replace some regular vehicle driving, and/or trading for a vehicle much more economical on fuel – as well as improving home heat and electric fuel economy as shown further on - will do more to downsize your total fuel bill than anything else could ever do without spending a lot of money for it.

People and planet

Each of us living souls represents a fraction of 1/6 billionth (.000,000,001 or 1 to the 9th) of the worlds population.

However, not all people use the same amount of fuel. There are many people in this world, who for all intents and purposes, use none. There are also starting to be many more families that produce their own sustainable energy (windpower, solar electricity and heat) rather than consuming non-sustainable energy (fossil fuels, anything that burns (oxidizes) carbon to produce energy).

To overbalance this, most of us use a great deal more energy than necessary. With an increasing world population, the energy needs of the planet must increase. The use of energy of almost all types represents an output of global warming, acid rain, and lung concern particulates and gases. From the primitive cooking fires of the aborigine to the fireplaces and furnaces of the homeowner, to the towering smokestacks of apartment complexes, industry, manufacturing, power production, and since about 1840 transportation, fuels that involve oxidation have long been fouling our atmosphere. It is only since the expansion of the industrial age that local air pollution (read of this in the history of power engineering) has been recognized as a problem. Quite a while passed before air quality measuring and analysis apparatus was invented, statistics generated, and the same local pollution was recognized as a global problem.

The Fuel Saver's Guide is more than a money saver. It is one of many tools to help people, one person – one family at a time, to change lifestyle a bit and to prioritize lower energy consumption which will definitely help to ramp down the effects of acid rain, lung concern particulates and gases and global warming gases. One person, even including family and friends, out of six billion doesn't seem like much but it is. Read on.

First of all; You will see a lot of 'tweaky little things' in this guide. If done by themselves singly, each doesn't do a lot. But you won't be doing them by themselves. You will be picking and choosing whatever suggestions are possible for you, and feels right for yourself (a 'hey, why didn't I think of that' approach) and implementing these all together, phasing them all in, and phasing more in as they become possible. The sum total of these will make an appreciable measurable (and often astounding) difference in your fuel use, therefore expense. Your family will join in, of course, multiplying the effect. Then, as you pass these on to friends and relations, these people will 'copycat' you. The key to it is you yourself, becoming proactive in fuel conservation. Everybody who does this wins. Nobody loses. And to implement most of the steps in this guide cost you nothing. And the ones that do cost will pay back their costs in fairly short order. And here's the biggie; Even a person who scoffs at the thought of 'global warming' being mainly caused by human beings burning fuel can follow this program of conservation and derive *all* the financial benefits from it. This program is for all people worldwide regardless of belief. It is a true revolution to benefit every individual that joins it by changing their fuel using habits towards burning less fuel. It is, among other things, a revolution against waste.

Secondly, you and your family will not be doing it alone.

Initial thought of the all-volunteer workgroup that formed the East Coast Fuel Saver's Coalition was to get a million or more copies of the Fuel Saver's Guide out there in the shortest possible time through the same method that 'jokes' are propagated through friends by Email forwards. Propagation costs nothing. Just a few clicks of computer keys doing single – or even multiple address - forwards of this file will get your friends and relatives all the benefits that you yourself will have obtained with this free guide. And many of them, perhaps most, will forward to their contacts.

Eventually, a huge number of people doing this same thing will add up to global consequence. With each person who implements the steps suggested in this guide, there will be less fuel taken from underground to be burned, therefore less harmful gases and particulates added to the atmosphere. And more of these irreplaceable underground natural resources left for our grandchildren and great grandchildren yet unborn.

But this distribution must start somewhere. And that is with you. Never believe the sly sotto voiced propaganda of the oil barons, that an individual can do nothing. He or she can. And we, as proactives ourselves, do. Please. Copycat us.

The English speaking countries, at present, are the major consumers of underground hydrocarbon fuels (coal, oil, and natural gas) These are all non-sustainable depleting natural resources. However, as this guide is public domain and there are no legalities or payments to or from anyone for copying or sending, it is only a matter of time before it starts to get translated into other languages and sent worldwide through the worldwide web.

Here, this writer urges anyone who has suitable language skills to translate it and propagate their translation. This would make an ideal school project for any advanced language study group. At present, the original FSG in embryonic form (30 pages), then periodically updated has been out there for about three years. This new (2/09) edition is much more comprehensive and is considered by us complete and ready to go for any translation.

Other ways to cut down on the amount of fuel burned in the world through more money saving fuel tips.

If you are an employer, consider hiring only people who have a short commute. In Chicago, one restaurant owner, in order to cut down city pollution and traffic glut, only hires people who live close enough to be able to walk to work.

More employers should think this way, modify their hiring practices towards cleaner air, less traffic, more parking space for customers in their own lots, less traffic on the thoroughways and byways through shorter commutes. Employers too can do their part in cleaning the air, reducing CO2 and preserving the world's limited supply of underground hydrocarbons by following this principle.

Let your fingers do the walking – or the driving. Many items of a 'shopping' nature can be handled over the telephone. Comparing prices by phone etc. Much shopping, especially in the less populated parts of New England and upstate New York happens by telephone.

Grocery stores are starting to have internet shopping/delivery services. Stop and Shop, for instance, has Peapod. These services are not only for people without cars or invalids, anyone can use them.

There are mixed reports about shopping for major items over the internet. Use extreme caution here as it costs a good bit to return large heavy items if necessary.

Shop for groceries on your way home from work. Or cellphone home to see if any 'emergency' food item is needed. This comes under the heading of 'concatenation' in the page 3 gas saving tips section.

'Buy ahead' long storage life consumables such as paper towels, toilet paper etc when they are on sale. Investigate the lower priced brands of these products usually found at dollar/discount stores etc. Large quantity 'sale price' buying of items like this can prevent many 'emergency runs' to the market as well as the money saved on the items.

Beware of large quantity buying of 'on sale' food items as the family may get sick of the item in question. However, such as canned tomatoes which have many different uses, or other likewise multi-use foodstuffs are candidates for this.

Look to your own 'frequently out of - emergency trip' items and stock extras if non-perishable. Items such as condiments, barbecue sauce, salad dressings and paper products are a good starter of a 'stock 2, buy another when the second one is opened' list.

These 'emergency runs' are mainly to small stores where prices are higher. Save a good buck by having a stock, doing no 'emergency runs' and only shopping where the prices are reasonable, consistent with good quality.

Reconsider your vacation. Jet planes and cruise ships burn huge amounts of fuel. Tourist traps burn huge amounts of money.

Our country is fortunately chock full of beautiful state parks with tent camping facilities, many even having motorhome type sites with electricity and onsite running water. Camping is an option here. More relaxing than those super expensive stressful jaunts.

This writer has found out after long and often painful experience that if you want to get away for vacation, 50 miles away is as relaxing and fulfilling as 500 or 5,000 and one heck of a lot less expensive. Also, it is not fun taking seven days of a two-week vacation far far away and being rushed around and often harassed by airport security or lost luggage, then jet lagged for 2 (or more) of those precious vacation days.

Buying fuel on a trip; Get off the turnpike to buy fuel – but not in a city. Turnpike and city prices are always higher, and lower in the suburbs a mile or so away from the turnpike exit. Some states have higher gas taxes than others so if you are planning a trip, check with the internet 'gas price watch' before you leave, and fill up before exiting a low price state or area. Even if you don't need gas yet, fill up when you see a low price. Incidentally; different states allow different amounts of ethanol in their gas (most use 10%). (15% is classed as 'gasohol' and injurious to vehicles not designed to burn it) Your fuel mileage goes down with more % of ethanol, up with less.

If you have cruise control, use it. It's not just a convenience, it's a fuel saver, as it's electronics and mechanisms are built to do the most economical 'easygoing' type of acceleration and deceleration to keep you at speed. When they get out of economical range such as when climbing long hills, they kick out, letting you take over. Cruise controls cannot anticipate hills that are coming, so anticipate them yourself as professional 'big truck' drivers do, increase speed gradually on the downgrade before them if you are in the clear to do so.

Manual transmission drivers; Lower the RPM of where you shift between gears. Faster RPM burns more fuel than slower. Don't go overboard though and 'lug' the engine. Most modern transmissions whether manual or automatic have overdrive. Be sure you are using it when on the thruway or over 45 mph. Check your instruction book.

If your exhaust smells like rotten eggs, your catalytic converter is clogged and is costing you miles per gallon. The 'service engine' light will be on if you have one. Newer cars won't have this smell, the converters are built differently. A bad O2 or mass airflow sensor will turn this light on and decrease your fuel mileage by as much as 25% It may pay you to buy your own OBDII scanner (they are about \$70). It will read the trouble code and tell you what area (or individual part in most cases) is in need of service. It will also reset the 'service engine' light.

What the future will bring

In the 70's, the fuel crisis was political in nature having to do with the Far East through OPEC attempting a unilateral massive raise in the wellhead price of oil.

It's solution was also political. Our government, among others, reacted quickly to this threat and put massive amounts of backing into programs to come up with alternative sources of power and advances in hardware that the public could use to burn less fuel.

You see the results of these 70's advances and alternatives today in many ways. Better insulation types, energy saving windows and doors, development of more efficient heating systems. Solar hot water system components were improved and prices became lower. Many other means by which home and industries could become more energy efficient were thought out and implemented. Many books were written at both engineering and homeowner levels. Building codes were changed to incorporate these newer materials and methods. Both government and industry cooperated in the backing of research and development towards change in the ways that the public uses energy.

The US government came up with incentives and programs giving tax credit subsidies to homeowners to make these changes. There was a tax credit program that ran for about 5 years that gave people, effectively, a free solar domestic hot water system. There were many programs and grants running towards energy conservation of all types.

Industry itself got into the picture with it's own incentives, especially the electric power and automotive industries. Gone were the gas guzzling muscle cars of the 60's. Development started through both government edict and industry choice to develop engines that burned less fuel and burned it cleaner. The US auto industry experimented with smaller cars and electric vehicles, and government agencies, universities, and power utilities became the 'test bed' for them. These smaller lighter higher fuel mileage gas cars began to sell bigtime, you saw them everywhere.

The effect on newly formed OPEC was predictable. They backed down and agreed to minor wellhead price raises. No longer did people have to wait in long lines to buy small amounts of higher priced gasoline, or heating fuel companies have to deliver high priced tankloads to their customers.

The 'emergency' was over. Government and public interest in alternative energy and fuel saving waned. But the fruits of all that subsidy and research are still here, in the better (but still not highest obtainable) energy efficiency that we have now at home and in transportation and in industry. Also, we have the availability of new designs and new hardware and the energy consciousness of industry that never existed before the 70's oil debacle.

However, the 'energy crisis' of today is not politically motivated as the '70's crisis was. It is driven mainly by the fact that oil is a depleting natural resource.

As underground oil depletes, there isn't any hope for a significant lowering of fuel prices except as a temporary 'up and down' thing having to do with stock bond and futures manipulation and oil industry politics more than anything else. Price gouging and profiteering happens at all levels in this climate also. However; underground crude oil (read that as to include all fossil fuels) are *depleting non-renewable natural resources being sold in an international sellers market for devaluating US dollars*. The price *must* go up as it depletes and the dollar devaluates. (People who burn wood and buy it have

already noted the huge increase in the price of wood. This is caused by dollar devaluation at all levels, inclusive of increased salary of the woodcutter, cost of transportation, taxes storage space etc even in a 100% domestic market).

The much heralded 'new sources' of crude oil are undrillable unproven and unpumpable now even at the present 'higher than ever' selling prices of motor and heating fuel. It will have to rise a good bit more, to somewhere between (USA) \$5 and 10.00 a gallon before these extremely hard to reach sources can be profitably proven, then tapped. These sources, if and when tapped, will then begin to deplete as all oil/gas wells and coal/mineral mines do. None are expected to be 'huge' fields. (North Sea oil, giving one example, is pretty much depleted at present. There are others in the world that have completely emptied)

By the same token, all underground fossil fuels are depleting non-renewable natural resources. Coal and natural gas come from the same burial, putrefaction and millions of years aging process as crude oil does. Yes, coal can be used as is or made into transportation fuel. Yes, vehicles are running now on natural gas. However, there is a limit to them also. They are non – sustainable also and when they are gone, like crude oil they will be gone forever, never to return.

The future of powered transportation and of home, process, and any other heating will necessarily have to look to electricity as fuel. And the generation of electricity will have to become sustainable.

Government and the electric power industry have pretty much developed all the hydroelectric power that is available in the US. There are only, at present, 4 sources of huge amounts of sustainable electric power left to be developed.

One is (and don't gag when you read this) nuclear. In the worldwide history of nuclear electric power (since about 1950) there have only been 2 incidents of catastrophic consequence. Cheyrmobile and Three Mile Island.

Both of these, along with a few others considered minor by comparison, have taught the industry a lot. By industry choice and by government mandate, the plants themselves have undergone great changes for the better because of these nuclear accidents. The operators receive the best training of any type of power production employees. Plant security is now better and quicker responding than Fort Knox. The plants have always been clean, emitting absolutely nothing but electricity and on occasion, clean steam (and are now designed to emit as little heat as possible). Waste is now kept on site in the US, plants are designed now and older plants have been modified to store their own waste products in a super safe and secure manner. All have fast acting evac alerts and proven evac routes by govt mandate for those 'what if' questioners.

For those who fear 'Twin towers' type attacks to turn nuclear powerplants into nuclear disasters; check with the Air Force. Ask specifically about 'interception routes and times' for any unidentified planes headed for any nuclear reactor in the country. Otis radar surveillance site on Cape Cod MA had their own interception map with times displayed this year (05) at the Barnstable County fair, at the Air Force booth. The Naval air arm likely has one too for all their operational areas. We are ready to intercept and destroy any plane likely to do a suicide terrorist attack on a reactor. And at ground level, an 'Oklahoma' type car bomb attack can't get close enough to do any but superficial damage

to the parking area, and a few broken office windows, this due to fairly recent (shortly after the Oklahoma bombing) NRC motor vehicle regulations and protections regarding nuke plants. These fears, once reality, are now groundless due to the concern of our government and the vigilance of our military.

Fuel for these plants, the radioactives themselves, are all around us in smaller quantities and are safely used in medical, in research, in manufacturing and food, plastics, and chemical processing as well as their use in missiles and in the powerplants.

Radioactives are the newest discovered natural resource capable of producing electricity in large quantities. And they do. A good example of this is France, which produces over 50% of the country's electricity using nuclear power.

There is opposition to nuclear power. The greatest part of this is based on 'fear tactics' promulgated by competing sources of energy, ie the fossil fuel industry. The 'anti Nuke' forces are, wittingly or unwittingly, promoting the many types of pollutions including CO2 (global warming gas) and waste of non-replenishable natural resources of the fossil fuel barons.

Asking here a question to those who are 'anti nuke' Would you rather see this beneficial natural resource be made into missiles and bombs or consumed slowly and safely, making steam to run turbines that generate electric power?

The second alternative is wind power. All over the world there is wind generated electricity. People of forward vision and through them, municipalities and utilities in the US have already put hundreds of wind turbines up, some individual and some in multiple arrays (called windfarms). For every large scale wind turbine put up anywhere, the electricity it feeds into the grid means that somewhere feeding the same electric grid, less fossil fuel is being burned. Less particulate pollutants get in the air and less global warming (co2) acid rain (sulfur) and 'lung concern' particulates and gases as well.

Even the smaller scale 'non-grid feeding' systems follow this same principle, give the same advantages. These generate electricity that otherwise would be generated by burning fuels. Both large and small scale solar photovoltaic systems likewise prevent fuel from being burned. All solar heating applications such as domestic hot water, likewise.

A wind turbine burns nothing, emits nothing. It is true 'clean power'. In Hull MA, the first large scale municipal wind turbine on the Atlantic coast is merrily cranking out over \$50,000 a year worth of electricity which runs all the street lights and traffic lights in the town through it's grid connection. When there's no wind, the grid runs them. When there's wind, the electricity is channeled into the grid. Effectively, this machine uses the grid the same way as a car uses it's battery, in 'charge - discharge' fashion. All modern medium and large scale wind turbines work this way. Meters log in power to and from the grid and power out from the turbine. A computer connected to them figures out 'who owes who'. Hull's municipal power company, who buys and sells power from and to the grid as well as manufactures their own power with the wind turbines then bills the people for it. Last year Hull Power both paid the town government's \$55,000 (a year's) light bill and gave the residents a discount on their own electric bills. From this one turbine. A photo of this first turbine (Hull 1) is on pg 82 of this guide.

For more info, crank 'wind' and 'windpower' into your browser. You will find that these turbines are put up mainly for financial advantage to the municipality or utility or private industry that owns them, the clean air and fuel saving benefits are a spinoff from that. Again, everybody wins, nobody loses but the big fuel outfits and the guys who wear bathrobes in public.

Hull MA is a good example of what can happen if both the people and municipal government think towards sustainability in electric power production. Hull erected this first municipal sized wind turbine on the East Coast several years back. Performing as calculated, it proved the point with the town government. Now there is another, 3x the output, and at this writing not operational a full year yet. This is projected to pay all municipal power costs including town hall, town barn, police and the school system. A third, which is a small 'home or farm' sized unit, runs the estuary center at the town's entrance. 3 more are planned, these to run a proposed sea water desalinization facility.

Most important of all, these fuelless power producers act as a hedge against rising fuel prices for all municipal purposes. Where the surrounding towns will need to raise taxes to support rising municipal power costs, the Town of Hull will not.

Say it again, there are very smart forward-looking people in the Hull Municipal power utility and in Hull's town government ! Any municipality that can't follow this example is behind the times, moribund, and it's voters had better start looking for and voting for people who look to their own municipality's sustainable future.

The third source is also an electricity producer. Solar collection through voltaics. You see these photovoltaic panels on poles along the highway making electricity to collect traffic data, and on road warning sign trailers. They are also on buildings. One system local to Boston is an example for all, a large modern split level residence with most of the South facing roof covered with these panels. These feed the grid like a wind turbine does, and as a result, the owner, producing more power than he consumes, has no electric bill at all and part of his heat as well. The system was expensive to install, but over the life of it, an estimated 25 years, will pay itself off and make a respectable profit. Photovoltaics can be used anywhere there is space with sun shining on it, and where it would be impractical or even impossible to put up a wind turbine.

(Inserted note, 6/08: Defining 'lifespan' as used above. Engineers figure the lifespan of this type system being over when it has lost 10% of it's rated output. Any of these systems will continue to output useable power to just about zero percent. Nobody knows the falloff curve of present day advanced technology panels with a rated lifespan similar. Suffice to say that the 'end of lifespan', a good part of the basis of figuring payback time, is 20 years. This gives the user more freebie beyond 20 years that could even outlast the structure they were installed on. (2) To get that 10% back if really necessary (with a 'stand alone' non-grid tied system it might be) just add a couple or so new panels to the system at that time. But it should not be really necessary as large scale systems are designed to give *more* power than actually needed to serve future uses and so they can pay back faster. (All large home/business systems except 'stand alones' pay back through the grid.). (Stand alones pay back through less or no use of fuel burning generators or less 'bought' electricity) (End insertion)

Many 'PV' systems (the 'stand alones') are self sufficient, the only source of electricity for their owners. Especially good for those who are offgrid, would have to bring in grid power at huge expense for poles and wiring or use fuel in generators. Farm outbuildings are a good example here. So are summer camps. These systems all charge batteries to make power available 24 hours a day. Grid connected systems do not need batteries but can have them as an added extra if the owner desires protection against storm caused electric service interruptions.

PV has many and varied uses. A small system in CA cattle range country runs a remote water pump that used to require gasoline – and a 5 mile 'jeep' trip every couple of days to deliver it. There is a small (150 watt) PV system in the Boston area that charges a battery operated lawn care tractor (see the reference to these on page 26) that converts to a snowblower in winter. The electric tractors (there are two) are also the owner's emergency 120vac electric power sources for hurricanes and other power outages by use of 2 inexpensive 12V/120vac inverters. And here's the biggie; not having to burn gasoline or do 'gas vehicle specific' maintenance for the tractors makes the battery/PV system much more cost effective and productive of income than just replacing electricity. The panels have already paid themselves down 100% at a highly accelerated rate and are presently a tax-clear and non-taxable income for their owner.

Opinion here. On the mind of this writer is the absolute necessity of every school, town hall, police, fire station and hospital in the entire US to have either wind or solar powered electricity not solely as a backup power source, but as a grid feeder to produce income for the municipality using already owned town property to do it. See poster of Hull 1 as example. These municipal locations can become gold mines to help reduce municipal taxes, stave off ever rising municipal energy costs, en passant helping to clean the air through less use of fuel at electric power plants.

The fourth source, geothermal, does not, in general, produce huge amounts of electricity except where there is a huge amount of geo available, as there is in Iceland. However, geo does produce heat. Where there is geo heat, we should be using it. Use can be as small as partial home heat, or as big as process heat in industry. Since the days when there were only 'Native Americans' in the USA, back before Columbus, geo heat has been used as therapy for arthritis and other illnesses at Glenwood Springs CO, Truth or Consequences NM, theraputic warm mud in GA and at many other locations from coast to coast. At Glenwood, the entire swimming pool complex is heated by geo. You can swim outdoors in a heated pool when it's snowing. However, many areas have these sources untapped and are using conventional fuels for heat.

Geo can even be 'manufactured' by storing summer heat or heat wasted by air conditioning buildings underground to use in winter. The technology is here, and mature. Architects who specialize in 'green' technology designs know about it, so if building or retrofitting, this, along with other energy saving technologies should be investigated.

Last on this list. The above four are 'active' sources of alternative energy, therefore new fuel. However, there is a 'passive' source of fuel that is being tapped presently by most everybody, the greatest majority of which are non-technical people, and will most

certainly be tapped more in the future. This is basically, even though passive, a source of new fuel, stretching the Earth's supply.

That source is the fuel that is not burned by individuals and companies through increased efficiency in fuel use. Giving an example: If last year you burned 800 gallons of heating fuel, and through better insulation and control of your heating plant this heating season burned 400, that extra fuel that you didn't burn is definitely a source. Because you didn't burn it, it is still underground, therefore still a part the world's supply. The same goes for your automobile. If you spent \$100 weekly for gasoline, and through economy steps that already have been mentioned in this guide now spend \$50, there is obviously \$50 worth of gasoline weekly still in the ground, unused. As well as \$50 a week more in your pocket.

These are the principles that governments and industries all over the world have been using for years, under the heading of 'plant efficiency'. It is only lately that individuals have found that they apply as much to individuals as they do to huge corporations. We, the little people, by saving money on our fuel bills are helping to stretch the available world's supplies of fuel. Simultaneously, the fuel we don't use, by not being used at all, decreases the total number of gallons burned a year and helps to clean our planet's air of noxious, acid rain, and global warming gases.

Everyone gains, nobody loses except the people who sell fuel. And as we strike back at the fuel moneygrubbers and look at our more healthy bank balances, we get that warm fuzzy feeling that we have finally learned to beat a heretofore unbeatable system. Same way as big industry does.

Regarding energy cost control for other than transportation purposes

Out there now are many different ways to save on fuel costs for your home. Some of these are incremental, that is, saving so little that it will take many years of this saving to pay back the expense of installing them. Others are bright shining examples with relatively small or even no investment that will pay back handsomely.

Here are a few of the 'elcheapo' or even 'free' things that you can do to beat the system here, even if you are an apartment dweller with rather low energy costs. There are also a few 'money saves' among the starred items below that don't deal directly with fuel. Money and fuel are alike in this respect: Both can be burned excessively.

Pick and choose suggestions that suit you and phase them in. As with the 'automotive' fuel saving measures, each will do its own small bit for your wallet and add up to major savings per year. Power and fuel prices can only rise with time.

- * Energy saving electronic light bulbs. Available at low cost mainly through government mandated power utility subsidy. The small ones, equal to a 60 watt bulb but drawing only 15 watts go for 49c ea here. Specialty types are a buck, and more complex such as complete light fixtures are \$5.00. Other areas than New England they may be a bit higher. On average, these draw 1/4 of the power of incandescents.

Again, they are not cheap because they are a cheap brand, but because the price is subsidized, mainly by electric power producers by government mandate.

Don't pay high prices, look for the cheapest place to buy them. Dollar stores are

usually good. A 5 gallon bucket full of these things will save their price in a year or less off your Electric bill. They are called compact fluorescents (CF's for short)

When they finally wear out (years later!) recycle them where other fluorescent types are recycled. (call your town hall or DPW to find that info).

The small amount of opposition to these new energy savers is based on the tiny amount of mercury that all fluorescent types contain. Recycling contains that, reuse means that less of it needs to be produced. Also, the amount of mercury put in the air by fossil fuel plants (especially coal) over the shorter lifespan and higher consumption of the replaced power hungry incandescent bulbs greatly exceeds that which is contained in a long life fluorescent of the same light output. The difference, translated into powerplant fuel (coal), over this longer lifespan means that for each old fashioned bulb replaced, 500 lbs of coal need not be burned in that time span.

People who oppose compact fluorescents do not understand this. (The thought is also out there that this opposition through misinformation is fostered by the fossil fuel industries. The more CF bulbs there are in use, the less fuel they will sell to powerplants. One billion is a small number when attempting to estimate the number of old fashioned high consumption light bulbs in use in just the USA). *Note that these same carping complainers do not dis the countless millions of big mercury containing fluorescent bulbs presently in use in the markets and malls, just the tiny ones in people's homes.* There is a principle at work here. And that is taking stock in advice from the naysayers, people who condemn before they investigate.

- * Cook more in your microwave rather than on your stove or in your oven. These require no long warm up also cook faster. This writers kitchen has had the big one for over 15 yrs and for about 5 yrs has had two, the second one a half pint.

In the warm months, between the outdoor grille and these 'nukes', the stove hardly gets used and the gas bill shows a good difference, electric bill doesn't show the nukes at all. The big one draws about 1000 watts. A thousand watts for an hour here costs about 17c. (one Kilowatt Hour or 1 kwh)

But it's never been on for an hour. Everything gets done in very few minutes. For most cooking, as is done here, say goodbye to that power hungry electric stove and oven and save in the vicinity of \$25 a month, or gas, about \$15. And minimize hot kitchens – which reduces a/c compressor run time.

Half pints go for about \$60 now at Wal Mart, these, or even full size models pay for themselves in fuel saved real fast.

(Note one advantage of also having a half pint. The little one uses less power than the big one, is used for all the 'little' jobs. (coffee warming, defrosting) while the big one does the rest of the meal. Meal prep time decreases accordingly.

- * Lever control hot/cold faucets. *Never* open them in the middle – as there they mix to make lukewarm water from both sides, causing piping loss of heated water. Heat comes up slower and wastes both water heat and water.

If you want hot, move the handle all the way to hot to get it up through the pipes faster. When hot is up, then mix it. You will be surprised at how much faster hot water comes up in the bath. (a long pipe run in most homes) If you want only cold, put lever all the way to the right to 'cold'. The whole family should learn this.

- * Don't use the kitchen exhaust fan in the heating or cooling seasons unless absolutely necessary. You'd blow heat or 'cool' out that you have already paid for. There are 'heat exchanger type' fans out there that don't, but they are pricey and need contractor installation. Well worth it in new home construction.
Likewise, the bath fan wastes heat. If it goes on when the light goes on, separate the circuits or use a different light. As with the kitchen, use the fan only when needed.
- * Limit hot water use. Use cold water detergents in the laundry and take showers rather than tub baths. The new 'water saving' shower heads save not only water, but the power used to heat it. Use less water in your bathtub. It's as relaxing as a full tub.
- * Hot water from tub, shower, laundry, and especially dishwasher can have it's heat extracted and recycled. See your plumbing contractor before you build or modify.
- * If you must drink bottled water, choose a brand produced close to home. (Less transportation needed for it, less fuel burned to get it to your local store. The same principle applies to all grocery items. Find sources of locally grown produce.
Why not make bottled water yourself? A simple charcoal type filter on the kitchen faucet will eliminate the 'swimming pool' or 'musty' taste of most street water systems and well systems and if used only for cooking /drinking water and ice cubes, will last a long time. Spring water bottles can be refilled this way and frozen for long lasting 'picnic cooler' ice that is, when half melted, drinkable. Icewater is in many cases more satisfying than soda pop. And cheaper when you make it yourself.
- * Use foam pipe insulation to insulate hot pipes that go through unheated spaces. More heat will get to the rooms that need it, and faster, with a shorter burner run. Also, use spray foam in the crack between the floor and wall on the first floor, pulling back the carpet if necessary. Adding insulation to cellar walls will save you expensive heat.
- * Teach everyone in the family that lights not needed should be turned off. Even electronic energy saving ones. TV sets not being watched should be turned off. a/c's and fans likewise. It costs a good percentage less to run a radio or stereo for 'noise' than a TV set. And you don't get 'sucked in' to watch it. Which gives you more time for yourself. It is up to us to instruct the young about responsible energy use. It is not taught in school. (update 6/08) It is now in many progressive schools)
- * It may pay you to rewire your heating system so that each individual room has It's own thermostat. There is no reason to heat (or cool) unused bedrooms etc. If you are or will be building, consider this type of heating control. Some retrofits can be accomplished by using bypass pipes and valves for hydronic, turnkey or sliding dampers for hot air systems manually controlled from the cellar.
- * Open shades on South facing windows to catch solar heat. Close them when there's no sun. Draw shades and drapes on North facing windows fulltime in the winter. Insulated shades are available their best use is North side, next best is South, to keep

the sun's heat out in summer. (North side air is normally cooler all year round)

- * Consider attic insulation. Look for drafts you can stop using foam spray or other means. Keep storm doors and windows in repair. If your windows are old and leaky consider replacement. A cheap alternative is putting those clear plastic film 'full window covers' on them indoors each winter. This saves heat considerably.
- * Outdoor plantings of tall bushy evergreens on the North side will break the force of the chill north winds that rob your home of heat. Wide overhangs on the south side shade your house, especially picture windows, from the sun in Summer and let the sun shine through in winter. Many architectural designers specialize in this and other types of energy efficient design. You can find them at builders energy shows or 'Earth Day' type shows (mentioned later in this guide).
- * Windows, even the new energy saving type, do not seal completely unless they are locked shut. Check this at the start of every heating (and cooling) season
- * The new type 'indoor storm windows' of clear sheet plastic that heat shrink with a hair dryer seal much better and tighter than the older types. It pays to put them on North side windows or any drafty window even if you already have double paned glass. In Russia, noted for it's cold, they use triple paned glass. Plexiglas is better than plastic sheet but takes longer to pay back it's cost. Use this on the 'lossiest' windows that you have. It's better looking and more durable, lasts for many years.
- * A quick cheap yearly tune-up for your heating system. If hot air, replace it's filter and vac inside all removeable registers. If ducts are uninsulated in the cellar, insulating them puts more heat upstairs faster making burner run times shorter.
If hydronic (baseboard) heat; Vac underneath all baseboard heaters, inside if necessary. Make sure they are clear of airflow restrictions (rugs etc) underneath. Swivel the louver more open for more heat where you need it, or closed for less. Louver adjustment is also the way to balance the heat between bedrooms.
- * Realize that money that you save on fuel can be put into more fuel saving measures for your home. This increases your home's efficiency, and pays for itself
- * An easy project for the homeowner; a solar heated outdoor shower. Cape Cod (MA) has many solar outdoor showers. Solar heating them is no big trick. Essentially a 30 gallon or more uninsulated black painted tank in an insulated box, one side exposed through glazing to the sun. Shiny foil inside the box reflects sun to the back of the tank. Feed it with a garden hose, Use a 'water saving' showerhead and get several warm showers a day from 30 gallons. Tank should be a hot water tank rescued from the dump with insulation removed so the sun can heat it. Drain the system in winter. For more heat and a longer season of use, put a door on the front that gets closed at night and rainy days as these radiate heat away when the sun isn't shining on them.

- * If you have a ceiling trapdoor or folding stairway going to the attic; Insulate it. There is likely insulation in the ceiling (attic floor) but none for the trapdoor – which is not sealed against heat loss either. Heat rises. Don't let it rise out of your living space.
- * Don't buy a bunch of battery operated geegaws for children's presents, batteries are expensive energy and usually don't get recycled properly. Besides, most of this stuff is pure junk and doesn't last long. Consider educational gifts instead. The old fashioned 'erector set' type plaything – and the newer equivalent, Legos – have created a lot of future engineers. Books develop children in uncountable ways. (Just be sure you know what the books are saying) The older classic children's books develop imagination and a love of reading. The newer ones don't appear to do that.

Neither does TV programming in general. Be careful of what your youngster is seeing on TV. The very young do not know that much of what's on there is not real life as it should be. Especially daytime 'soaps' and evening 'thrillers'. The seamy side of life is often portrayed. Don't let it become the 'norm' for your youngster.
- * Holiday lights on Christmas are a tradition here. But there doesn't have to be a big mess of them just because the neighbors have them. Our tradition in this house is a single candle in the most prominent window on Christmas eve, and a small plastic tree in a different window for 2 weeks before and several days after with tiny lights on it. Even though small, it is on a timer.

Several neighbors near here use a couple thousand watts of spotlights for over a month, most go to the end of January. Also those people mainly appear to drive big gas guzzlers. This shows thoughtlessness, but they will learn to think as energy prices spiral up.
- * There is no reason to join in the latest fad, Halloween lights. A bunch of expensive orange and black plastic stuff from China and lots of spotlights (wasted watts).

(edit 08 – fad seems to be almost over as of 07 – Boston area. 'Faddy' stuff most often winds up in the trash. (Hope it all gets recycled)
- * A computer tip; All computers 5 yrs old or less have energy saving features built in. But the features won't work unless they are turned on.

Having a screensaver does not save energy. You save only if your computer is, instead, set to put itself and your monitor in 'standby shutdown' (sleep).

There are settings in your ROM to shut the hard drive motors off after a set time and to do the other stand by's. If your machine completely blacks out the screen after a few minutes if you don't type or use the mouse, you are likely using all the features. If not, it is best to have your 'computer nerd of choice' do this setting. Only an expert should change ROM settings. Meddling with it could put the machine in a rather expensive hospital. Windows itself must also be set for an 'Energy Star' monitor which when in standby, turns it's 'on' light orange, showing low power use. If your computer is less than 3 years old, it likely has these features implemented.

- * While on the subject of 'standby'. There is a new electronic measuring tool available named 'Kill A Watt'. This tells you how much power any 120VAC device draws, and best of all it has a clock built in that gives you cumulative time that the device has been run. You can find out, for instance, exactly how many kilowatt hours your TV set (or any other plug-in appliance) uses a month, and from there determine it's monthly power cost by using the rate sheet in your electric bill.

This tool sells anywhere from \$69.95 down to \$39.95 if on sale. If you want to document your savings for a report or anything, or compare various items as to their thirst for power, it's the thing to have. Instance; it told this writer to use this computer rather than the other one to do this 'Fuel Saver's Guide' edit along with everything else possible at about half the power consumption.

Electricians will also find this handy for other uses as it calculates power factor. It is not necessary for everyone to have one of these to save money on power, common sense along with pertinent fuel saving information will suffice. However, this is the tool that will tell you exactly why your light bill is so high.

Incidentally; you will find that your audio system 'rated and advertised' watt figure is far above the amount of power that it draws. Reason: Audio watts are measured and calculated on a different scale than 'AC power' watts. Example here, a pretty hi class Sony all in one with a subwoofer. Rated audio power is 460 watts. It doesn't draw near that from the power line even wide open with loud music.

AC input Readings; off (Standby for remote control) 18W. Normal volume playing a CD 39W. Wide open, same CD passage (too loud to stay in the same room with) 74-107 W varies with music. *All audio systems have this disparity of figures between measurement and advertising.* A true 460 watts of audio would easily drive a dozen or two big horn speakers in an amusement park. And fry the three loudspeaker arrays that came with this stereo.

As a standard feature this stereo has a 'power saver' function that kills the clock display when turned off but still allows the remote to turn it on. Surprisingly, it's clock and display used much more power than the remote receiver. Check any 'newer' electronic items you may have for power saving features – and use them. In the market for new? Favor new items that have a 'power save' switch or setting.

- * All those little transformers used around the house for toys, radios, phone and tool chargers etc draw power whether the item is being used or not. Unplug them from the wall rather than just shutting off the item or unplugging the phone or tool. Also, look for transformers built into the house electrical system to run items no longer used, such as intercoms, disused alarms, or old doorbells. The thermostat on your furnace draws power all summer long. Shut it's power off at the main electrical box or with the burner's 'emergency switch' when heating season is over. Anything with a remote control draws a good bit of power to keep the remote receiver alive.

Electrical engineers and electricians call these 'phantom loads'. A phantom load is something that draws power but gives you nothing in return.

A good example here, a stereo receiver that has been measured at 18 watts when it is shut off. This phantom load runs 24 hours a day (as they all do) 365 days a year, and with electricity here costing 17c per kilowatt hour, it costs quite a few dollars a year to keep it ready to receive it's remote control signal.

Seeing as the remote is either lost or has dead batteries most of the time, and unneeded for all but the more complex functions, It got plugged into a multi outlet spike protector with switch and is turned on now with that switch. No more phantom load from this stereo. As a bonus, it's now lightning protected.

This writer has seen many 'home theatre' type arrangements that need 3 or 4 remotes in order to give full use of all components. All could be put on the same multi outlet switched spike protector, why run several remote receivers when everyone's asleep or when nobody's home?

- * Your refrigerator will use less power if you keep its condenser clean. With a vac and a long brush, carefully clean the louver and fan area underneath or at the rear. This area picks up a lot of dust, clean it yearly.
- * For winter, check your outside door seals and door closing. This may need repair or adjustment. New seals are standard hardware. If there's a draft at the bottom, get a door sweep or make a 'door snake' to put down at the gap to minimize the draft. Incidentally; door sweeps that use double-sided tape to stick on won't stay on. Stick them on, then drill small holes in them for #4 or #6 flathead wood screws to keep them on. Interior doors going to unheated spaces can be done the same way. Feel for a cold draft under the door in winter. if one is there put in a snake or sweep.
- * To find a draft, use a cigarette like the pros do, even if you don't smoke. Seeing which way the smoke goes will also tell you a lot about air circulation in your home.
- * As to drafts and heat losses; Homeowners are beginning to discover 'thermal imaging'. This is a photograph of your home in the heating season, where a special camera picks up areas of heat that get wasted outdoors by such as poorly designed or sealed windows and doors, insulation voids, vents, attic issues etc. In 'hot' climates the photo will show the same thing as to cooling losses when taken on a hot Summer day.

Many heating and insulating contractors do this. Here in Southeastern MA the charge is nominal, \$50 for most single homes which becomes a credit towards any work done by the same contractor. There is no obligation beyond payment of the nominal photography charge.

Thermal imaging in the past was quite expensive before modern digital techniques were developed. Only science and industry used it, industry mainly to control the cost of process heating.
- * If you use an old TV set with a lot of vacuum tubes in it, throw it away. It takes about 3x the power to run an old tube type TV than a newer solid state TV uses. And . . . the solid state TV will give you a clearer picture.
- * When boiling spaghetti etc, don't turn the gas flame up 'high'. This sends the heat beyond the side of the pot where half of it gets wasted. Heat should be on the bottom where most all of it is used to cook. The control knob $\frac{3}{4}$ of the way up is fine here but you should eyeball your own burner and pots to find the amount of heat needed.

- * Another cooking tip; Size your pot to the amount of food cooked. A pot too large takes a longer time to boil. Have a small frypan for individual meals, a couple of hot dogs or eggs etc. Faster cooking using less fuel.
- * Mystery packages of leftovers at the back of the refer get thrown out. Why make them at all? Cook smaller amounts – and if a meal does create a package, make a priority of serving it as part of the next meal. Food waste is a dollar drain that can be beat too, just like energy waste.
- * Eat at home more. If cooking is a bore or a chore, you're doing something wrong. Take advantage of supermarket prepared foods for the complex time consuming stuff. Develop the boring recipes into something new and flavorful. Try out different ways to prepare – such as steaming veggies corn etc. instead of boiling, grilling different items on a skewer, doing 'quick baked potatoes' in the microwave (punch holes in them with a fork first so they won't 'rupture' etc. Cooking can be fun and always less expensive than phone orders and tips for delivery. Get the kids into this, and Dad too. Reserve restaurant (or restaurant take out) meals for only the special occasions.
- * Bring your lunch to work. As above, vary the routine and menu, take 'special occasion' days to eat lunch out. Homemade lunches can be creative! Experiment.
- * Be sure that you understand and can compare grocery store unit pricing. Store brands are usually lower per unit. Price per unit is also the reality check on a sale item, or a bigger than standard size box, especially cereals and detergents. Use math as a reality check on food prices (see math section below)
- * Dining out? Make your own appetizers, have them before you leave for the restaurant. This can be a fun thing, less expensive than restaurant version and if you desire, bigger (or smaller for dieters). It also leads to much less of a tab when you get there, less appetite all around. Variant; Make a peach melba, giant shortcake or some such for dessert after the restaurant meal.
- * Eat healthy. Even with medical insurance, doctors are expensive and time consuming. Consider vitamin supplements, at least a good multi and additional vitamin C. One Gram (1000 mg) of vit C per day along with a good adult multi can't hurt you and may prevent a week of agony in the cold and flu season, or lesser colds anytime.
- * Anyone who travels by auto and has a laptop computer should install 'wi fi' on it. This allows free internet and email right from your vehicle from the parking lot of establishments that have the service. Whole Foods, Panera bread, newer McDonalds restaurants and many motel and hotel chains have it. All you need is a detector costing you perhaps \$12.00 at Wal Mart to find the signal. There are also 'guides' that list free WiFi sites. When your detector gets the signal, boot up, look onscreen for the one that uses no encoding, that is the free one. If you get the message 'cable not connected' while attempting internet access it means that the company presently has the 'outside line' disconnected or is having trouble with it. It could also mean that

your own network is not allowing your browser to properly talk to your wifi setup.

Naturally, you must have a provider to use this service. If you don't have one, you usually get the same 'cable not connected' message.

Of course there are 'satellite' services that enable wireless internet service from anywhere, but you pay additional monthly for this service and need the hardware for it. Most hardware is just a tiny USB transceiver.

- * Don't keep the coffee pot heater on all morning. It burns the coffee to an acrid taste if on too long and burned coffee costs watts to burn it plus watts for another pot to drink. If coffee needs heating do it 'in cup' in the half pint microwave, about 1 ½ min.
- * Never run the dishwasher unless it's real full. To save power here, interrupt it's cycle when it goes on 'dry', open the door and shake off excess water from cup bottoms. Remove all plastic items to a 'dish drying' area as they retard drying. Keep door open until everything is dry. Here, dishwasher stays open to dry all night. The electric heater inside (and fan in most) use more power to dry than the wash cycle uses.
- * Another dishwasher tip. To minimize it's use (these take a lot of energy) use recycleable paper or plastic products. Coffee cups and spoons were a big issue here. Now, using paper mainly (biodegradable, also town accepted into the commingled recycle pickup) has cut dishwasher use and hand dishwashing better than half. Lots of visitors here and they have accepted the change, most are copying the philosophy.
- * Set your lawnmower's cutting height a bit shorter. Let your grass grow a bit longer before you mow it. You could save up to 10 gallons of gas a year this way, and save time for yourself, too. Put your season's end leftover lawnmower gas in the car so it won't get stale, giving your mower a start up problem in the Spring.
When it's time to replace it, consider electric power, especially rechargeable battery types. Gas mower engines are not as efficient as automobile engines and have no emission standards or specification, therefore emit more VOC's, CO and lung concern gases per horsepower than cars or trucks do. Not to mention the stink and danger of spilled gasoline while filling them.
- * Wash your car with a bucket and sponge. Only prewet and rinse with the hose. Get a nozzle that shuts off when not squeezed. Water is expensive, why waste it?
- * Buying new appliances: Only buy 'Energy star rated' appliances. Price is slightly higher but you will make it back in saved energy, even more now as home energy goes up in price. All new computers are 'energy star' by design. But not all appliances. As to video and audio; they are more efficient now than ever, but still best to check the watts they draw (on the sticker in back or embossed in the plastic) before you buy a new one. Some cost less power to run than others.

- * The icemaker in your refrigerator uses electricity. Shut it off when ice is not needed in quantity, old ice gets stale. Also, shut the door quickly when inserting or removing items, as losing cold you have already paid for is as bad as losing heat. If you need ice in the wintertime and it's cold enough, put your trays outdoors. It costs nothing for electricity and often freezes faster.
- * Put up a clothesline for small washes, don't use the dryer. Small washes can be done by hand in a plastic tub or even in the kitchen sink
- * It is actually less expensive to do your laundry at a laundromat – if it's real close by than to do it at home, if you don't have a lot of it. AND educate the youngsters not to throw one or two small items in the washer to do them, wait for a full load.
- * People doing yard sales, tag sales, or flea marketing used goods, both sellers and buyers, are recycling these useable items and this is good for the planet.
- * Heating systems; Remove cover of your thermostat, adjust it to 'longer' – saves lots of fuel as with short cycles, heat continues going up the chimney every time the burner shuts off unless an automatic damper is installed. (2) Drop one nozzle size on oil burners if stack temp is over 400 degrees after running 15 minutes or more. No difference in the amount of heat, as the extra heat was being wasted up the chimney.
- * Seal hot air duct / floor interfaces with mastic or duct seal – or HVAC type (not Hardware store type) duct tape. (HVAC type withstands heat better).
- * Rather than letting water run to get it cold to drink, keep a couple of jugs of filtered (buy a filter for your faucet) water in the refrigerator. By conserving water you can often beat the 'stepped rate structure' based on gallons consumed that most municipalities use. Check the small print on the back of your water bill for this structure. Also; Putting large containers of water (many small bottles of water in plastic containers will do) in your refrigerator section reduces wasteful 'short cycling' of the refrigerator's compressor. And you will always have ice cold water to drink. Another trick; freezing bottled water gives you ice for tonics in your picnic cooler as well as icewater to drink when the tonic's gone. See other 'bottled water' tips.
- * If you will be building, employ a designer who is familiar with passive solar and other energy saving concepts. These don't cost much at all when designed in. Consider a vented skylight above the stairwell to get rid of summer heat.
It works. This writer has one. Hot air rises to exit there, pulls in cooler air from cellar and North side open windows even if there's no breeze.
- * Tape down light switches that are often turned on unnecessarily by mistake. Porch lights, pole lights, outdoor spotlights etc.
- * Not particularly an energy save – but a money save. Everyone who watches DVD movies is apt to have DVD's in their collection that need not be seen again. How

about setting up a 'DVD swap' among friends? This could also be done as a fun activity for a church group or fraternal org, either as the informal ongoing type, or on a regularly scheduled evening set up for it. Everyone brings in DVD's and lays them on a table and others who also have them laid out walk around and make choices. No money changes hands, just DVD's. This could also be worked with CD music or even video or music tapes.

- * Another DVD/CD tip. Many public libraries have both CD and DVDs that can be borrowed as if they were books at no charge. All you need is a library card. As with rented DVDs there's a hefty late fee so prioritize quick return.
- * Your utility bills often contain other printed items that many people just throw away. Read these items, they often contain energy saving tips, discounts on energy star rated home appliances, energy saving home improvements etc.
- * People who rent, by conserving fuel and water normally paid for by the landlord, can often 'hold off' a rent increase caused by higher costs to the landlord. If a multi family, mention this to and cooperate with the other tenants on this.
- * Put up your storm windows earlier in the season, well before the furnace needs to run. You will be warmer on those first chilly nights without requiring heat.
- * Computers; Your laptop uses about half the power that your desktop uses. With a USB wireless mouse and keyboard and a cooler added below, these will do a lot of real work with the feel of a desktop. Huge capacity external hard drives are available for USB. This edit of the Fuel Saver's Guide is being done on a laptop so equipped. Incidentally, this laptop sits on a small wire cake cooling rack which cost 50c at a dollar store instead of a \$30 cooler at a computer store, uses no power to cool it.
- * Woodburners; Store your wood so as to let it dry – as dry wood gives more heat and less creosote. A loose tarp over an outdoor pile allowing the breeze in on all sides may be all you need.
- * If you have central air, shorten it's season by installing an attic fan to draw hot air up into the attic and out the attic vents, draw in cooler air through open windows on the North side or from the cellar. An attic fan is a good retrofit for any home and will reduce the number of days the air conditioner(s) needs to run. In many parts of the US, it may completely stop the need to run the air conditioners.
- * Consider a 'geothermal heat pump' climate control system for your home. These are electric and use the Earth's underground temperature as both a heat source and heat sink, allowing the system to both heat and cool with higher efficiency. If you already have conventional central air conditioning, a heat pump, or a water well, half of it's already there. The new 'geo' aided systems are a great source for radiant floor heating. These both should be considered when building.

- * Consider *alternative energy* for your home. *Passive solar energy* involves design of your home (and in many cases the grounds) to take maximum advantage of the sun's action and natural airflow to help to both heat it and cool it. Such items as overhangs on the South side to shade big windows in Summer but let the sun enter in Winter, trees to screen Northside winds, convection cooling with opening roof vents. This and more can be retrofitted to many existing homes. Information on passive design can be found on the Energystar website. Some architects specialize in it.

Active solar energy for the home involves using such as roof or ground mounted panels to collect the sun's energy and use it for water or air heating. A different type of panels are used to make electricity. It is more cost effective with faster payback to put in solar domestic hot water preheating than to put in solar electricity. Some custom designed newer houses – or even retrofit systems - use both.

Solar photovoltaic panels: This home-generated electricity pays back handsomely if you are offgrid and must use a gas or diesel generator for power. The most cost-effective use of solar electricity is to replace gasoline or diesel fuel.

It's major use in 'ongrid' homes is an emergency power source in rural areas with frequent outages. These uses also hold true for small wind turbines on the order of a kilowatt. All 'small' wind power or photovoltaic (PV) panel systems also have a 'full time' use, ie to run computer equipment, water pumps, chick brooders, 2 way radio equipment etc. This way, the 'emergency' system pays back by less 'bought electricity' use when power is up.

Many of these systems charge relatively large battery arrays at 12 or 24 volts. Some are 48 volts. The largest of them, in addition to or even in lieu of battery charging, run synchronous inverters that put electricity into the grid when the battery is full giving payback over a long period of time. These are called 'grid feeders'.

The most common larger 'ongrid' systems don't require a battery, their inverters run the electric meter backwards (literally and legally) when the sun shines. Battery backup can be added to these later for emergency power. PV systems are completely automatic, requiring no attention.

Solar systems heat water excellent, work great even here in chilly New England. However, you still need a regular powered hot water tank. When the solar is operating, it feeds the regular tank so it's burner need not come on when you draw water. Recovery time is less, you get more hot water storage as you would be feeding solar heated water to your regular tank. Solar domestic hot water systems operate year round. They, like PV, are completely automatic. As to where to get the parts for these systems; Most alternative energy contractors will sell individual components to 'do it yourselfers'. And, being in your locality, can give you 'area specific' information such as proper angle of collectors.

- * It seems that a lot of progressive schools – primary mainly – have lately (08) gotten into 'enviro and energy use education' either as a segment of regular science classes, special auditorium programs, or as an after school activity.

Here is a chance to dialog with your children and partner with them as to implementing various 'energy saves' in your family. When these 'little people' talk referring to what they have learned on these subjects in school, they are talking about their own futures in a world with diminishing energy supplies and higher costs of

whatever sources will be obtainable. Listen to them, partner with them, and as a result, get closer to them at a time when other families are drifting apart due to outside influences. Let them 'teach you' a bit about the enviro education they have even if you know it already. Make it a two way discussion. You will add to their knowledge too when you explain to them the enviro reasons why you put in all the CF bulbs or why you are doing less trips in the car. (They may misinterpret the financial reasons due to lack of maturity). Don't let enviro awareness become a passing fancy to your children. Help them to make it a lifestyle change.

- * A good cheap 'hot water helper' using no energy or solar panels is a preconditioning tank – some call it a 'tempering tank'.

Essentially this is a water heating tank without insulation on it, not connected to a fuelling source, which picks up ambient temperature where it is located. This is piped between the main cold water line and the existing water heater's cold water input. It increases water heating system efficiency, therefore decreases burner run time, also decreases recovery time. Many of these are near the hot water tank.

A lot of them are in hot attics, especially in the South, and if you are building, consider this location for yours. This tank location needs reinforcement, and should be at an outside wall, as even a 30 gallon tank of water is quite heavy. There also should be a drain pan underneath, draining to outdoors to catch any possible condensate or leakage. Cellar or garage location needs no drain pan. Do not put it where it could freeze in the winter.

Size should be about the same size as your regular tank or a bit smaller. Many laundromats use real big ones or multiple small ones and duct the dryer outputs to a box built around them to recover dryer heat, keep water heating costs down.

- * Building? A new home heating unit, proven effective in chilly Northern Japan, uses a small diesel engine to make electricity to run your electric meter backwards (legally) while the engine is producing heat for your home. If you must burn oil here's a new way to do it. The electricity you make subsidizes the price of the fuel. Note that this guide is not recommending the burning of fuel, only showing you an alternative and reportedly more economical way to burn it.
- * Have you ever noticed that people who turn lights on never seem to turn them off? Unless, of course, that person is the one who pays the electric light bill. Educate your family as to this, as well as other good energy-saving moves.\
- * Flatscreen TV's having a 'plasma' display draw a lot of power. Don't buy one.
- * All rich people stay rich because they 'think yearly'.
- * Recycle, recycle, recycle. Bring your own durable bags to the grocery store. Find out everything about your town's recycling programs and use them all. Yard sale/ tag sale your unneeded or outgrown items or contribute them to local charities. Contribution of durable items is recycling too. The obverse, cruising the yard sales and flea markets, church fairs and secondhand shops to buy needed items is also

recycling, the other half of it. Both halves of this are also a form of recreation. It is fun, also rewarding.

- * Educate your children not to follow the latest fads as to clothing toys etc. The child is an individual with his/her own talents which may never surface and get developed if that child gets into 'herd mentality'. Besides, those fads are only devices used to mass market items of questionable value directly to the young – to make them want something that has a limited (by fad, fashion, or shoddy construction) lifespan.

Choose instead durable educational items. Choose clothing that will highlight their best features as the young ladies and gentlemen that they are. Introduce them to good orchestral music rather than the all too common 'superstar with loud guitar' type.

Children pick up a lot of habits and desires – both good and bad types – before the age of 10. Endeavor to make these 'good' habits (including, of course, the responsible use of energy).

- * Try 'generic' or 'store brands' of supermarket food paper goods etc items. The reason that they are less expensive is that generic or store brands do not have any separate distribution networks or advertising which the consumer has to pay for,
- * Don't look down on 'dollar stores' but check out what they have to offer. It's nice to pay a buck for a two dollar item – examples, dishwashing liquid, paper plates. But don't get caught up in 'impulse buying' of items which might seldom or even never be used. Or 'dollar candy bars' mainly on low shelves. (Hint – don't bring the kids)
- * Too much trash to deal with? Help yourself and help the planet by recycling. Most every municipality has some sort of program, and recycling helps make a cleaner more sustainable planet, saves valuable natural resources.
Opt out of junk mail making your preference known at DirectMail.com/junk mail. Be sure to check **all** the 'no' spots. That will take you off the master address list that 99% of the time will bring you more throwaway mail than you get now. There are other lists too that have an 'opt out' both mail and telemarketing. Seek these out.
- * Defining 'getting high'. Addiction. It is an unrecognized medical problem. Seek medical treatment. Even 'weekends or parties only' is a health problem that must be treated until it goes away. Addiction wastes your valuable time, your health, and your money and supports a system of people who know this, and don't care a bit about your reduced health or your decreased lifespan due to your use of their products. All they want from you is your money, their profit, regardless of what they say to sell their product. Users are losers. Don't be one.
- * Examine your lifestyle for unnecessary expensive habits. Example; A thermal mug of coffee made at home to drive to work with instead of bought coffee saves time and money. Have a couple less beers watching that football game on TV. Don't go to that rock concert. Stop that 'impulse buying' such as gossip magazines at the supermarket checkout. Finding out where the little (and often big) habitual dollar drains are and

squashing them gives a big return yearly.

Realize that a lot of people don't have to spend small (or sometimes large) amounts of money pretty much constantly to 'feel good'.

Consider that the best feeling a person can have in these troubled times – other than freedom from health issues - is financial security, freedom from financial worry. With the steps given in this guide, you have a start in that direction. Look for ways that you and family can change lifestyle a bit and have relaxation, recreation, and fun costing you little or even for free. It's out there.

And while on the same subject – a lot of companies seem to be marketing what they call 'financial security'. Don't think these a panacea – as proved by the recent stock market bobbling and needed govt bailouts. Your own bank account with interest and stable government-backed short term CD's from your own bank are the best bet for any of us in the 'working class'. Say it again, shop the banks.

Human factors

Literature and media, especially TV programming on the subjects that adversely affect us the most, especially in the pocketbook, should be the most prominent. They are not.

However, popular literature has affected us. Over many years, slick image advertising of high energy use products in both popular literature and on TV seem to have developed a mindset in the public that favors high energy use products. Especially automobiles.

Note the autos you see on TV. Powerful, new, expensive. Not like in real parking lots in your own location. The people who drive them are rich, comfortable, happy. The auto commercials reinforce this image. Success as seen on TV and in any type of advertising equates to the ownership of a shiny new overpowered expensive gas guzzler.

It is unfortunate that the public has bought into this fantasy. On the 'wish list' of most any of us humans is the same as we have been seeing on TV for years. But somehow, it becomes reversed. The big heavy gas guzzler comes first. Success will follow. This is a baldfaced lie and the whole point of image advertising. Get the public to believe that they can't get along without some product in order to be successful and happy.

With the energy use realities we face today, this mindset has to go away. It's a fantasy viewpoint. With it, the obverse, the image of smaller economical cars as belonging to either cheap or unsuccessful people must go away.

This changing of the public mind has started with the rousing success of the hybrid cars, notably Toyota's Prius. And of 'plug-in electrics' – even the smaller ones, especially in CA Scandinavia and Europe. Thinking people are moving to lower energy use and alternative energy as a way to shift their hard earned dollars from wasted dollars towards the things that really bring success and comfort for their families. Items such as saving with today's higher CD rates, becoming debt-free, future education for the children, or retirement security. People are learning to do the simple grade school mathematics that save them money in the grocery stores and that expensive clothes or toys do not make a happy well adjusted child. Or adult.

People are learning that they don't have to 'follow the crowd' any more, or follow the fantasy of a brand name image. But this learning is making a slow start.

Here, in the Fuel Saver's Guide is a jumpstart on that. Use your own mind. It's a good mind (as proven by the fact that you are a computer user). Don't let image fantasy or fashion drag you around. You got a start here too. Go for it.

In the far future – 50 yrs from now - Where will power come from?

The next stages of the depletion of fossil fuels will likely be heralded by fuel rationing, as happened during WWII. Then, each 'family head' was issued 'gasoline stamps' which had to be given to the gas station along with the purchase price. No stamps, no fuel.

The future may bring us a 'swipe card' similar to a store bought phone card for a similar use. When it's empty, like a phone card, it won't work any more. That person will have to walk until the next month's card is issued.

You may see this as a 'gloom and doom' prophecy. However, it is the historical way our government was able to provide the massive amounts of fuel that was needed to win World War II against Hitler and Tojo and simultaneously allow sufficient fuel to the civilian sector with the least amount of disruption of public function.

In the following stages of fossil fuel depletion, conventional fossil fuel of all types will be depleted to the point that only the barest of emergency services will be allowed to use it. Electricity will have to be the fuel source for the rest of the people. And – the massive amounts of electricity now generated by fossil fuels must, by necessity, switch to other sources, sustainable sources, to run their generators.

As it stands now, the world is rediscovering wind as an electric power source. However, population is growing and we will need massive amounts of power to feed this growth.

As much of the world's land area is politically or terrain-wise unsuitable for windpower, there is research going on now to find other sustainable sources of electric power. So far, results have been negative.

Magnetohydrodynamics (the Tokamaks) have only recently been able to put out a tiny bit more power than they consume. Billions of dollars have been spent to do this. Results are still inconclusive regarding the whole concept. Even if these do become viable, they will require huge investments of materials to build and huge investments to maintain. In the opinion of many including this writer, the yet unproven science of magnetohydrodynamics is going nowhere but to the scrap yards.

Tidal power is only available in a few coastal areas. This would take gigantic construction effort over many years, and the biggest project of this type envisioned so far in the US has been calculated to consume much more energy to build than it would eventually produce over 50 years of operation. Closing up the Bay of Fundy to make tidal electricity sounds good and also sustainable. The media seems to love the concept but it could never be cost effective. And the power produced would only serve a portion of a growing New England. Not the 'Eastern half of the country' as distorted by word of mouth transmission (or in some cases, by the media). Small tidal projects may be cost-effective but there are many ecological (and financial!) reasons why other 'fuelless power' systems such as windpower should be developed in the same area first.

At present there is small mainly unfunded research going on in many parts of the world in a new area which is showing promise in the labs. For want of a better name, it is called '*cold fusion*'. Transmutation such as happens within nuclear facilities is taking place, but without the emission of radiations and without using radioactives. One form of this has been described as 'you heat up a closed container, measuring the heat input, and get more heat than what was measured out of it, but nothing inside burns'. A different experiment happens in a thin film layer, measurable energy gets released. Neither type is a chemical reaction or phase change, or shows material depletion.

About two years ago one of these tabletop demonstration was set up at MIT Boston (Massachusetts Institute of Technology, the East's equivalent of Cal Tech) and this performed well for its week long test period. The media, however, bypassed it. An article in Playboy magazine a few years back gave cold fusion a black eye and ever since, the media won't touch it.

The people involved in this are PhD level, nucleonics or particle physics. There is a worldwide gazette where these people report their findings called '*Cold Fusion Times*'. Reading the articles, the average college grad would understand about every 6th word. Even Tech grads, unless they are Nucleonics people.

This science is too young yet, and almost unfunded as well to come to any major findings that would impact the near future energy scene. However, if it got funded, things could happen fast in this field.

There are huge corporations controlling energy lobbies in all governments worldwide attempting to retain their 'status quo' in regards to the present main energy sources of fossil fuels. These 'powers that be' in worldwide energy distribution only see their own programs as valid and will go to any means to prevent any new source out of their control being funded if discovered. Therefore, politics being in control of all countries, and being lobbied into a 'status quo' position on energy, the likelihood of even one country starting their brightest scientific minds on this quest for a new source is moot.

Scientific research has its own politics. That seems to follow the 'not invented here' or 'follow the leader' type of thought. As a result, the scientific community itself, except for a few independents such as the '*cold fusion*' school, will not get off their haunches and open up discourse on possible unresearched energy sources. Neither will the big universities who fund these people.

What is needed is a massive worldwide effort, no expense spared, to find a sustainable energy source in the field of what is normally a science fiction buzzword, and that is *fusion*. Hot or cold fusion, it doesn't matter. Fusion is defined as matter to energy conversion. The direct implementation of Einstein's formula ' $E=MC$ squared. Direct conversion of matter to energy.

The matter of choice to be converted? You guessed it. Nuclear waste. A permanent solution to both HLW and LLW nuclear waste disposal.

Actually, anything could be converted. Grass clippings, bottle tops. Calculations using the Einstein equation comes up with such a gigantic number of ergs, the unit of energy measurement, suggest that, not to be facetious, a pot of cold coffee using this not yet implemented conversion principle could yield half of the electric power needed by the US for a year. A paper clip, if all of its atoms were converted into energy, would put out more power than the Hiroshima atomic bomb. But in the form of electricity.

The effort to develop fusion as a new source would need to parallel the all out effort of the 'Manhattan project' of WWII that sparing no costs, involving countless university and industry scientists and resources and even duplication of effort during some parts of the project, developed the bomb of Hiroshima.

As a project type this is what it would take. But there would be a major difference. No secrecy. Up to the minute findings communicated between all involved research labs in the world. Massive involvement of the scientific branches of all universities, and of all industry worldwide. Here, we would not be looking for something of military value, but something to feed the growing power hunger of the entire Earth. Something clean and green, and most of all, sustainable.

But it hasn't started. And this search won't start until people, being fed up with the pollutions and the wars and the damage to the Earth's atmosphere, oceans, and land masses being caused by the present energy source, fossil fuels especially crude oil ask for it. We, the 'little people', have to advise our elected as to this vital priority.

The first steps towards a sustainable future are each individual person who reads this, along with their family, getting into energy conservation as shown here in this document and others similar that are picked up along the way, and a massive switch to municipal, industrial, and home windpower, solar power, and geo power. Immediate programs that can happen now and will benefit us in our lifetimes and in our children's and grandchildren's lifetimes.

Yes, you can do both of these steps now. You now have sufficient information for the conservation part. There is also a good start here for alternative fuels in your life. And you have power in both your ability to back proven pro-enviro candidates (not just promised, but proven) and in your vote.

These will not only be a benefit to you yourself, but multiplied by the millions who will transmit and receive this by forwarded Email attachment, learn about this also and implement this in their own lives, the sum total effect being a significant benefit to the planet. This is an 'action' program, not just 'book knowledge' to store up. All who read this will act on it

Again; The first step is to use the knowledge enclosed here to save money for yourself and to let others know how to do that also by forwarding this Ebook
Print it out. Share it with other people both in print and by email. Let them know the web address where you downloaded it from. Make CD copies and give them to your friends. CD's in bulk (100 lot) are cheap, perhaps 15c. Is a friend neighbor or relative worth that?

The next step is up to you. Through your communication with your local government, your Senators, your Congressmen, and local govt officials. We need fuelless windpower. We need new sustainable energy sources. We need them **now**.

END section I

Section II Additional Resources

A little mathematics

C'mon. Get real. I'm running a computer and you want to do baby talk?

All grade school stuff. However, applied a bit differently. Applied to real life to help you save a few more dollars here and there. Giving a couple of examples;

Every metalworking machinist in the world has a 'quick lookup' table that gives decimal equivalents of fractions and vice versa. Experienced people in this trade don't need the table, they have it right in their heads. It's easy to learn this head math. The secret is that everything a non-machinist needs of this table is based on the thirds (.333) and sixteenths (.0625) and eighths (.125) and derivatives such as quarters (.125x2=.250 = 1/4) Look at a table closely, you will see a pattern there. Believe it or not, this can save you money in the supermarkets. Instances;

Oranges are on sale this week, 6 for \$2.00. How much each? (Is this a real sale or not?) Easy – the answer pops into your head. That's 3 for a buck, 33.3c each. But how does it pop in there?

What you actually did was to (1) simplify the problem quickly as the number is a nice 'divide by 2' – then you inverted the resulting number (3/1 becomes 1/3) and converted it to decimal. Think about that process. Invert then convert. Often you must do the same thing a little different but it's still the same 'quick head math.' process.

Giving the example here of 3 items for \$5.00. Obviously, over a buck each. Invert makes the number 5/3 (5 thirds) .which expressed in money is also over a buck. Convert makes it 1 2/3. The 2/3 converts to the decimal .666 or 66 2/3c. So it's \$1.67 (actually \$1.666 rounded off)

If you've never thought of it this way and don't know your decimal/fraction table, carry one with you. Practice makes perfect. Or carry a calculator $5/3=1.666666 = \$1.66$.

There are quite a few people shopping in the markets using calculators but you won't notice them until you are aware of that and start looking for them. Sometimes a lady who looks like she is fishing in her handbag is actually using a calculator.

Yes – this will certainly save you dollars in the markets. But how does this simple mathematical 'trick' among others based on simple Junior High School math save you on fuel?

Example; Going to a store that is miles away from your regular store just because it has a sale – the oranges as an example. If you factor in the price of gas to your expected purchases it may not be a sale at all, just more driving time for you and perhaps a loss.

Remember, it's a round trip with the first 5 miles of each leg (going out/coming back) getting about half of your normal 'city' mileage due to 'cold engine/chassis' driving.

If your vehicle gets 20 mpg 'city' and the store is 10 miles away, that a total of 20 miles round trip, 10 of them (cold miles) at 10 mpg the other 10 (warmed up) at 20mpg. That

10 mile away store at today's fuel price (\$4.00 as of 6/08) will cost you (looking at the fuel chart on page 4) 40c/mile for 'cold' miles, and 20c/mile for warmed up miles. That's a total of \$4.00 +\$2.00 or \$6.00 for fuel (not the \$4.00 that you quick estimated). Oranges are normally 50c ea. Each one you buy you save 16.7 (17c). Buy 10 you save \$1.70. But pay \$6.00 for fuel. And when you get there, they might not be 'eating' oranges, just juice oranges.

For this reason alone you can see why this writer prefers to shop in town or at least close by and concatenates all shopping to one day (perhaps every 10 days). There are several others but not getting into them here.

Here's another way to save a good dollar on grocery items. Suggesting to all readers that they get on the mailing lists of all big grocery stores within a 5 mile radius. Better still, the ones in the same direction close to each other.

Go in and register at the service desk. Getting a check cashing card puts you on the mailing list. Weekly, get these flyers together from your mail and pick and choose bargain priced items, make a list for each of those markets on one sheet of paper. Then, having a list showing all the bargains at every market, shop them all together at the same time on the same trip. Concatenate the weekly grocery sales and simultaneously concatenate the grocery trips. Now, all put together, you save big. This writer has been doing that for perhaps 30 years, - much of that carpooling with a friend to save even more - and estimates that thousands of dollars and hundreds of gallons of fuel have been saved by the process. And the shopping flyers go into the recycle bin here, again helping sustainability of the planet.

One more 'quickie' on the same subject. Every area seems to be sprouting what is best described as a 'yuppie and rich people's shopping malls. Some have grocery stores. It has been found by more than a couple of ECFSC people that there are no bargains at these malls, they seem to prey on the 'hi end' income people in their areas. Another, the obverse - shopping areas for 'working class' people are apt to have the better prices.

It's not about being a cheapskate. It's about common sense. Smart shopping makes sense.

Thinking yearly

This is what all industry, even small business and all municipalities have to do to survive. Before these entities do anything, they count the cost. If they ran the way many people, even many families do, they would soon go bankrupt. As many people and families have.

Individuals, even families today mainly run in a haphazard manner. This starts by buying items that appear affordable but in truth, only lead to more consumer debt, the digging of a financial black hole and jumping into it with no way out.

Basically, in an individual or family situation, unlike big industry, there is no need to have professional bookkeeping skills or make reams of paper projecting yearly costs. Applied Jr High School mathematics and the use of a hand calculator, and an old

fashioned ledger book and a scratch pad will do. And it can start any time, not just at the years beginning. .

There is an old saying applied to personal or business finances of any type that goes '*if your outgo is more than your income, your upkeep will be your downfall*'. Income as stated here is net paycheck coming in, and outgo of course means 'total expenses'.

It is not our purpose here to give a course in individual or family bookkeeping. Our purpose has already been well-defined.

You have already been given many good examples in this guide of how to cut that 'outgo' down by doing things that you may never have thought of before – which at first seem to be trifling tweeky little things. But when added together and thought of on a yearly basis, these add up to serious money yearly.

A person will start to see it as a bit more balance in each monthly bank statement. The one you use to pay your utilities and gas credit card with. The amount is variable and dependent on the number of different 'energy saves' you implement. It won't show as a 'blazing star' because bank statements are monthly you will only see 1/12, less than that the first few months you start, and this is hard to discern, as in most cases it is within normal variation. And the upward curve on this is not linear. The upward trend of this curve rises as over the weeks and months you continue to implement the same 'tweaks' and add new ones.

A heating fuel save only shows in the winter. Cash gasoline buys will show as less or smaller cash withdrawals or one less bill to pay (gas credit card – or less balance owed on your regular card. That is, if you still use a card for gas which was recommended against previously).

You will only see this if you can resist the 'all too human' urge to splurge and blow away the estimated saving. A small surplus growing monthly into a larger bank balance than is normal for that account. In a relatively short time it will equal an extra week's pay (but tax and FICA clear, non taxable). Continuing the program will grow other non-taxable 'phantom paychecks'

Don't fritter that money away. The most efficient thing you can do with it is to decrease the amount of consumer debt service you pay. In other words, pay off your visa or other card accounts as they are charging you *a lot* for owing them even if you buy nothing new on the card. If you don't owe on a card, decrease your debt service (interest charged to you) in other ways, perhaps by getting a 'payoff figure' from the company that handles your automobile financing or auto insurance. Many companies give a figure lower than the total of payments if paid ahead. (Some don't want to lose you as a cash cow and actually charge you more than the total if paid ahead. Beware – refuse that figure and when finally paid, never do business with that finance company again!)

An option would be, if your financing agency allows it, would be to 'double pay', each month sending two payments. But if you do, save your 'proof of payment' in case their records can't keep up with this inflow.

'Pay in full' can't be done immediately, as it will take a year or so for an appreciable 'surplus balance' to grow. Consumer loans are expensive. The point is to not make any new ones and as quick as possible, pay off the ones you already have.

After this has been done, perhaps that surplus balance (which will still grow as you are still spending less on energy) can be used to enter into other forms of energy saving as well, for instance insulation, a newer more efficient heating plant or even an

alternative such as solar aided domestic hot water. Perhaps it will be large enough in time to leverage you into a new (or by that time preowned) fuel efficient hybrid.

Again, the first thing you must do is to lower – or better, eliminate completely - your consumer debt. It is not efficient to pay up to 20%, one dollar out of five, as a ‘service charge’ on your revolving loan for mainly household items. To pay that same loan, a continuation of it, long after the item you originally bought on it is worn out or even thrown away. Yes, that payment if regular enough helps your ‘credit score’. However, the point is to make a change, to be able to run your household (or individual life) so as not to normally need credit, to be your own banker. The goal is to slowly grow and maintain a bank balance big enough to draw on if say you need a bigscreen TV or car repair or some other unexpected item. And also have also a savings account (or one or several CD’s) that grows through interest. Many people have run their lives so as to be able to do this including this writer. If you want to go on vacation, or buy a big item, by all means use the card, but be sure to take advantage of any ‘no interest for 30 days’ offer and pay it off from your expanded bill pay account when you get home. If you don’t, as of the 31st day you will get a ‘surprise’ unnecessary expense. Note that computers count weekends even holidays as ‘days’. Real people no longer are involved in any efforts to extend a time limit.

In the same category, monthly bills. Never pay them late. The ‘demand and interest’ (late payment fee) on a homeowner’s quarterly real estate tax, water bill, or motor vehicle excise is no laughing matter, a totally unnecessary expense as long as you keep aware of due dates – better still, pay the same day you receive them in the mail. All household bills; the key it, prioritize.

Exhorting you to ‘think yearly’ and count the cost in other matters as well. Drop expensive habits, even if it means saying good bye to people - even relatives - who use you, or cause you to spend a pile of money.

Example here in New England, a friend invites you to take a trip with them to Foxwoods (a huge casino). The odds are that it will cost bigtime. Gambling is not fun, It’s time consuming work which costs you money. In the long run it is always an expense even if you win. Which is rather rare. (If you want to gamble, it could also be an addiction and there are support groups and cures for that, seek them out) (A lot of people have satisfied their gambling urge by playing penny poker, kitty whist, hearts or blackjack with friends on a regular weekly basis).

A lot of the common pursuits of the average person (parties, football games, chic restaurants, gambling etc) are in reality, totally unnecessary drains on the bank account. Choose instead, economical forms of recreation and vacation. Don’t be a sap for a sales pitch. Or run with ‘expensive’ crowds. Establish yourself whether an individual or family into a sound financial position as a priority using your own bank account to do it rather than depending on any corporate investment promise.

All the better to meet the struggles of the future as the costs of living, especially energy, rise.

END section II

Section III

Recommended reading

SUPERSHIP The story of the supertanker By Noel Mostert

isbn# 0-394-49480-6 Published by Alfred Knopf inc, NY distributed by Random House Inc, New York Copyright 1974

This book takes you for a trip on Ardshiel, a British registry supertanker. Even though the copyright date is old, the entire story is the same today. However, today's supertankers are much larger and there are more of them. A 'must read' to understand the transportation of crude oil and the reasons why for the good of our oceans and atmosphere it must diminish or even cease. LNG tankers are also discussed here.

THE HYDROGEN ECONOMY The creation of the worldwide energy web and the redistribution of power on Earth. By Jeremy Rifkin printed 2002

This has a misleading title. It's really about OPEC and the politics of big oil. Bin Laden is mentioned along with a gaggle of others having to do with oil's upward spiral. The 'hydrogen' part of this is meant as a primer as this is mainly a study in politico-economics relating to energy. At any rate, hydrogen is seen now by the engineering community as only a temporary solution to only a few of the world's energy storage needs. If you run across people who try to blame our government, even our President(s) for our high fuel prices, ask them to read this book.

THE EMPEROR'S NEW HYDROGEN ECONOMY Daryl McMahon. General alternative energy – including the reasons why the much touted 'hydrogen power' is not, and never will be a world solution for energy storage. Available from Barnes and Noble website or from website listing below.

ENERGY TECHNOLOGIES and CONVERSION SYSTEMS Keinbach-Salvagin

isbn 0-13-277344-99-00 copyright 1986 Prentice-Hall

College level (but an easy read) overview of different alternative energy systems many of which were developed – or studied and improved in response to the 70's energy crunch. A good starting place for those interested in alternative energy.

PRODUCING YOUR OWN POWER 1974 Rodale Press isbn 0-87857-08808 (in the organic gardening farming series) As above, for home and farm. Includes construction details of a quite decent flat solar panel design for domestic hot water on pg 229-232.

This writer built one almost identical using corrugated panels from a wrecked garden shed and other 'recycled' material well before this period. Total parts cost bout \$100. Energy save, \$15/month off the electric light bill (back when electricity was a nickel a KWH) This 'home handyman' project is one of the few major 'energy cost cutters' which can pay back it's own cost in less than a year. Homeowners, if you're not all thumbs and you can solder copper pipe fittings and can do reliable potable water plumbing you gotta try this. It's quick, cheap, and works super.

Contrary to popular opinion, solar panels need not be on the roof. Mine were on the ground at the proper azimuth and elevation. Anything you put in the sun is going to get

hot. The trick is to design it to get real hot, make it big enough to do your job, and to take the heat, with minimum loss, indoors to be stored so it works at night too, and put it to work.

A tank full of domestic hot water being heated is it's own 'storage system' which makes solar hot water the easiest and cheapest solar system to build. (Piping diagram used here, but with a small electric 'zone' hydronic heating circulator added to the loop and timer to run it from 10 to 3 days is on pg 238. Piping around the added tank for heat transfer to the domestic water was about 100 ft of garden hose wound tight semi flattened out then the whole thing was insulated with fiberglass batting. Circulating fluid was boiler (not automobile !!) antifreeze solution). (auto antifreeze gums up hydronic circulators in a short time) (A separate tempering tank as mentioned here previously was a first stage before the solar heat exchanger tank) (Both tanks came from the dump)

One thing not said in these builder's plans; Cover your panel so the sun won't shine on it until your water is circulating to cool it. Otherwise the collector will get hot enough to burn you and to melt plastic.

Also, green blackboard (chalk board) paint proved itself more efficient than readily available flat black paint for the collector absorbing surface. Particle size of the pigment of special black solar finishes are different than those of commercially available flat black paints and the particle size of this green blackboard paint did the trick about 30% better than flat black.)

For the electrical/electronic/tech crowd; A solar hot water heating panel is only a heat sink built to sink the sun's heat to your domestic hot water tank's cold feedwater supply. Simple and not even slightly technical. (Solar air heating is also covered in this book in a simple non technical way.)

MOTHER EARTH HANDBOOK OF HOMEMADE POWER Mother Earth Press, from the '70's energy crunch' era. No ISBN number. This one emphasizes the home handyman / backyard mechanic construction / application of alternative energy. Great general reference. A thick paperback red cover many libraries still carry it.

THE HOMEOWNERS HANDBOOK of SOLAR WATER HEATING SYSTEMS Rodale, 1983 ISBN 0-87857-444-1 or 0-87857 445-X. great for professional installers, water and PV panels. 246 pgs, antifreeze system as described here on it's pg 31. All 'collector orientation' data and shadow prediction methods and formulae given here for all US and Canada installations. Note that most all normal installations do not need this shadow prediction math/geometry, only the difficult 'crowded by buildings and trees' installations do.

In the 70's, a design came out called the 'I.S.C. Solar furnace. A book was written about how to build it, a paperback. This design was somewhat like a garden shed in the back yard with a transparent sun-facing oversized angled roof/wall and a cellar, with it's inside and cellar full of rocks to store heat. Rocks heated by circulated air and it could use that hot air or heat exchange it to water to duct or pipe the heat to where it is needed. A great design, easy to build. Unfortunately, moved and lost the book so no publisher or ISBN data. Perhaps you can find one.

LOW CARBON DIET /LOW CARBON LIVING Empowerment Institute NY.- Ecoteam- By David Gershon. ISBN 13: 978-0-9630327-20 ISBN 10 0-9630327-2-0 copyright 2006. An exceedingly easy to use and to understand workbook for all ages and group types. This both teaches an individual how to lower a family's carbon footprint, mainly by energy saving, and recycling, contains check blocks and other fill-ins to add up and calculate the amount of global warming gases that these actions have removed from the atmosphere. A great action program for enviorgroups, schools, scout activities summer camps, adult enviro education etc. Group purchases get a discount.

All you need for the program is a workbook for each individual, there are no other costs. Best yet, a single individual can do the whole program themselves, this is not necessarily a 'class' activity. Then start a group, go on to teach others. See website listing.

BLUE COVENANT – The Global Water Crisis and the Coming Battle for the Right to Water By Maude Barlow. ISBN 978-1-59558-186-0 copyright 2007 Water is threatened too for many reasons, especially potable water which takes energy to process and distribute it. Don't take this as 'just another gloom and doom book, as there are answers locally and globally, such as watershed protection. Governments worldwide need to act. And the answer *is not* 'privatization' ie corporate ownership of water rights and distribution.

The PARTY'S OVER – Oil, War. and the Fate of Industrial Societies by Richard Heinberg ISBN 13: 978-0-86571-529-5 or (10) 0-86571529-7 copyright 2005. A striking cover picture, a man with a gun to his head about to blow himself away, but the gun isn't a gun. It's the fuel nozzle of a gasoline pump. Need not tell more., but this is heavy on 'what shall we do in a future world without oil?

A good look at the Hubbert mathematical analysis of our underground oil reserves in this one. Applied science and math. A look ahead giving resources and alternatives, not just 'gloom and doom' forebodings..

There have been many books published recently on the subject of energy and especially alternative energy. These are mainly college texts for engineering courses. Another series of books are for the installers, practical guides. These tend to be expensive and are not presently available through public libraries. However, an internet search will reveal these if you are interested in digging deeper than this guide covers.

Resources for energy saving hardware and information;

This fuel savers guide is by no means a complete reference. Neither is this resources section. Inviting the reader to investigate further, make the gathering and implementation of info on this subject a 'hobby'. It's fun, It will all save you dollars, and at the same time, be good stewardship of the Earth and it's sustainable future.

All over the country there are such as called 'Earth Day shows' (Earth Day was Fri Apr 22 in 05,. the shows are usually on the weekend closest to the 22nd) or 'Energy Fairs'.

(which can happen any time of year) These are apt to be on the premises of, or allied with universities or area 'green' or 'Sustainable Earth' organizations. The big show South of Boston, for instance, is on Earth Day weekend and is called 'Sustainable Living Festival' in Hull MA. There is also an Enviro/energy related show in Weymouth MA, about 10 miles away, part of Weymouth Rec Dept's 'Summer Sizzle'.

There is much to be gained by attending these shows such as local sources of hardware for solar and energy saving applications, demonstrations of new products in the field, Scooters, electric scooters and bikes, hybrids etc, organic gardening and food suppliers are liable to have displays.

There are apt to be short free seminars on many energy-related subjects along with educational activities for youngsters, food, and music to make a fine, inexpensive, and educational family outing. In Hull MA, there is a bonus. Across the street from the show there is a full size indoor merry go round for adults and young alike, and the area is well known for it's fine restaurants to fit any budget.

The organizations that run these shows are headed by people of forward vision looking to the future of the Earth, the only planet that we have. Not only energy, but the planet itself must be made sustainable for future generations. Don't put these people down as 'hippies' or 'fringe radicals', or joke about them as 'tree huggers' or 'world savers'. That's exactly what the fossil fuel barons want you to do. Many are degree engineers, Earth scientists, or educators who understand the long term effects of global warming on climate and weather change and sea level rise. These people have the solutions as to what the general public must do to help ramp these effects down.

This energy revolution is not political, neither left nor right wing, nor is it any political party's platform. It is mainly individuals, families, and both large and small business people mainly unknown to each other finding new ways of saving dollars on fuel costs.

It is also a loose coalition of concerned people, each doing their own part of what is necessary to achieve a sustainable planet for the future of generations yet unborn, and educating the public without charge so that each person will have the information necessary be a part of this effort. These are the 'sustainable' and 'green' groups.

There may be a group like this in your own area. If so, you might like to attend a meeting, perhaps join in one of these independent groups. Meeting times and places are often found in the 'what's doing' sections of local papers. Note the website listing for MA which lists many town and area groups. Google your own area for enviro oriented sites which may have similar listings.

In New England; (and likely under other names in other parts of the country) Altwheels, New England's largest alternative transportation show. This show from it's very beginning and throughout it's history has greatly helped to popularize the concept of alternative vehicles, especially hybrid automobiles when little was known about them. Presently (09) the show's focus is on 'fleet' vehicles both large and small. Their website, even filled with photos of previous shows, could not possibly display all of the innovations in ground transport that had their premier East Coast public showings here. (see website listing)

There are apt to be energy shows or energy fairs. In New England, NESEA (Northeast Sustainable Energy Association) has a yearly 'contractors energy show' called 'Building Energy'. This runs 3 days in midweek at the huge expo pier in Boston, showcases the latest energy saving hardware for buildings and homes, also energy efficient building materials. The focus here is sustainability - with short (up to an hour) seminars on how to apply different mfg's products to new construction and to retrofit the new materials and equipment. Seminars required advance registration, but the floor show was the real attraction here. At least half the show was demonstrating different systems by various manufacturers whereby a home could produce it's own electric power, hot water, and even it's own pretty close to fuelless heat. The movie 'Transforming Energy' had it's New England premier at this show, a free auditorium showing to attendees, many who afterwards bought the CD with performing rights.

Both active and passive solar is king here, with second going to small wind turbines starting at 400 watts to the multi kilowatt 'home and farm' range. There were a whole gaggle of energy savers too, both design in and retrofit, such as advanced insulation. Some was for 'big commercial building' contractors as well as home builders or homeowners. Much of the hardware could be installed or implemented by a fairly proficient 'do it yourselfer'.

Midweek shows are apt to be sparsely attended, but this one had a fantastic crowd, all prospective and ready customers from as far away as New Jersey wanting to bone up on these new technologies. This year, (07) the show has it's third day as 'public admission' day (not limited to builders) on Mar 15th. Look it up for following years on the NESEA website (listed). This type show is the bellwether of more to come all over the country and Canada. Watch for them. The 70's energy crunch had energy related shows. This era's crunch will certainly spawn more

Hardware dealers are involved in home energy improvement

National chains such as Home Depot, Lowes and Ace Hardware have pamphlets, even free seminars on how the homeowner can increase the energy efficiency of the home. This saves money compared to contractor installation of the same hardware. Farm supply catalogs offer many new insulation products, pellet and corn kernel stoves etc. Manufacturers of energy saving items and alternative energy hardware have brochures. Considering building? Some architects specialize in low energy use designs using both older well proven techniques as well as this new technology hardware.

County library systems

Many libraries in any given area are connected by computer so that a person can access the whole system, and have a book delivered free to their own area library. There are many books on all aspects of energy in libraries. Much was written in the 70's 'fuel crunch' period that is of value today. (See above book recommendations, only a sample).

Also, back issues of National Geographic' magazine have much documentation in regards to our planet's changing weather patterns, ocean currents, sea level rise, and other physical evidences of the phenomena generally known as 'global warming'.

Movies

Highly recommend seven movies, all available on DVD. For sources, see the website listing on the following pages. There are more, google the subjects. However, these 7 are 'must sees' to understand the total picture regarding the damaging effects of fossil fuels to our planet.

- (1) **An Inconvenient Truth.** This gives documentation regarding the effects of global warming. The media in general will not touch this controversial subject. If they do, it is with bias. Get the information here, unvarnished and accurate.
- (2) **Transforming energy.** This one is about the absolute necessity of alternative energy as a solution to the problems of global warming and the end of cheap oil and gas. It clearly shows that we can, and we must eliminate our dependence on fossil fuels.
By Chuck Davis. See website listing. 1 hour.
- (3) **Who Killed the Electric Car.** This tells the story of GM's highly successful EV1 Plug-in electric sports car and why all of them were recalled from lease, never hit the open market. (Regardless of GM's recall and crushing of these vehicles, plug-in electrics are out there now on the highways and are being built by others, so the electric car is not dead. Only GM's are, and California's tough emissions law has had it's teeth pulled through GM's political clout) The implications, political and industry wise, of GM's move are something everyone should know about.
- (4) **Six Degrees Could Change The World.** Here, we see how global warming has already affected different parts of the world including the coral reefs of Australia, the ice fields of Greenland, and the Amazonian rain forest., all vital parts of our ecology . Clearly shown, how existing technologies and remedies, when applied, can help to dial back the global thermometer. A National Geographic production aired on the National Geographic channel. ISBN listed, 978-1-4262-9302-3 90 minutes
- (5) **Kilowatt ours.** Shows you how to save energy and reduce your carbon footprint. This movie is being shown, among others as appear here, publicly by local 'green groups'. 55 minutes.
- (6) **Human Footprint.** Our carbon footprint. What we consume, where it comes from and how much does the average person use in a lifetime.
- (7) **Saved by the Sun.** Our children yet unborn are subsidizing our excessive use of energy. PBS – Nova

(5) (6) and (7) For these and other environmentally oriented CD's, check out both the National Geographics website and the PBS (public broadcasting, aka educational TV.) websites. PBS here is **shop.WGBH.org** Your own local PBS may have a similar site.

All the movies from both these sources are recommended for public viewing, no 'public viewing license' necessary.

Beware of becoming enamored by the few developed but not yet mass - produceable energy solutions (futuretech) shown in several of these films. Today's solutions are, however, perfected, clearly shown and readily implemented, and if hardware is needed, it is available.

Buzzwords to crank into your browser; (one at a time)

scoot, scooter, scooter parts, EV, electric vehicle, EV parts, windpower, Hull MA, biodiesel, emerging vehicles, CO2, climate change, sea level rise, windfarm, NEV or LSV (low speed vehicle), alternative energy, solar electric, electric ox, Sustainable, solar energy, solar hot water, greaseburner, biofuel, geothermal, Tesla Prius Hybrid rain forest long John (long Tom to some people) Some of these have thousands of references.

Websites of interest in no particular order. Note; Follow the links on these sites. The http:// www. prefix of all of these is normal default inserted by most computers. If it's not inserted, do it yourself as in http://www.xxxxxx. A period must be after the www but not printed here you must put it in when you type the address.

www altwheels.com	the Altwheels festival Boston MA
www evworld.com	Daily news on alternative transportation and energy.
www world.org	Links to top 1000 environmental sites.
www massclimateaction.org	Network of communities working for 'clean and green' in MA. Most MA 'sustainable' groups are allied with and get resources from this network.
Note the above site is a source of Ecoteam's 'low carbon diet' workbook	
www hullwind.org	Hull wind turbine info (also see the town of Hull website)
www eaaev.org	Electric Automobile Association, national
www acpropulsion.com	The EBOX – revolutionary new plug-in automobile
www neeaa.org	New England Chapter, Electric Automobile Association
This is also a source of the newest edit of this document	
www izip.usa	Electric assist bikes and commuter Escooters
www homepower.com	Alternative energy, Home Power magazine
www nesea.org	Northeast Sustainable Energy Assoc
www eere.energy.gov/	US Govt energy site
www throughlineproductions.com	CD, 'Transforming Energy'. A 'must see'.
www gasbuddy.com and gaspricewatch.com	gas prices local and national
www energystar.gov	What the Energy Star rating is all about
www aps.com/my community/Future Fuels/FF 8.html	(NEV's in actual use in AZ getting

275 miles per gallon equivalent)

www empowermentinstitute.net Low Carbon Diet workbook

www brightgreen.us Technical info on motor fuel. Also, expanders.

www SolarEnergy of CT.org Alternative energy represented here, NESEA affiliate

www himacresearch.com Fish Covey etc vapor carbs. The J. Bruce McBurney technical treatise. **Note, experimenters: *danger in messing with vaporized gasoline***

www fuelvapors.com More on vapor carbs, patent copies, all expired on this CD. See above warning

www econogics.com/TENHE/ Alternative energy, hydrogen facts / debunk

www massbike.org bicycle advocacy (MA website)

www commute.com carpooling (MA website)

www nedra.com electric drag racing – dates places pix etc.

www nevoc.org veggie oil conversion for diesels

www fueleconomy.gov US Govt energy site. Publishes yearly automotive fuel economy ratings. Check this site before considering a new vehicle, and download the entire yearly listing each yr and file listing to keep track of ‘used vehicle’ rated fuel economy.

www greengreasemonkey.com recycled cooking oil as diesel fuel. conversions

www nationalgeographic.com/channel Movie – Six Degrees

www greenerchoices.org Lots of green and energy saving hardware

www vectrixusa.com Futuristic electric scooter styled motorcycle.

www.floridaeaa.org Battery Beach Burnout info (or try nedra.com)

www greencar.com Green Car Journal, quarterly magazine. All the latest developments. Futuretech, but has some good info regarding what’s out in the marketplace today.

www. solartoday.org Bimonthly magazine, solar systems, developments, contractors etc.

www zapworld.com all kinds of scoots and NEV’s

shop.wgbh.org (note periods) Enviro CD’s

cleanmpg.com developments in vehicle mpg. Hybrids

Also, check out the MIT Boston website and the new prefab house designed there which produces more power through it’s solar heat / photovoltaic electric roof than it uses. Prefab, portable and affordable, it comes on 2 trailers and has several options as to mounting needed for setup. At this point (10/07) It is mostly built (in one of MIT’s parking lots). It will be dismantled and trailered to a big energy symposium in Washington DC in early ’08. Hopefully, this design will be picked up by a major mfg of prefabs and be in production. Perhaps you might see it offered in the prefab market by ’10. It takes a good while for a prototype to become a product.

Don't get off the track and look to a future 'pie in the sky' to solve our energy problems in the near future. That's a cop out, and will save you no money. We, the little people, through our actions concerning our own use of energy and our vote, have more power than the government does to make this world sustainable, one family at a time.

Above sites etc have practical solutions for the present beyond those covered in this guide. But start with the easy and low or no cost suggestions given in these pages.

The participants of ECFSC thank you for your help in creating a sustainable planet.

UPDATE NOTE: Numbers in filename and on the title page bottom indicate later or earlier edits by ECFSC. Higher number is the latest. Example, this document is Revision 49, Feb 09, previous edit was R48.

This is an ongoing project, and the newest edit can be downloaded from the web at NEEAA.ORG.

Permission granted to carry the Fuel Savers Guide only as a complete unedited document with no commercial attachments or innuendo as a free download on any enviro oriented site. Not to be used to sell anything.

NOTE that the Fuel Savers Guide is updated periodically. If yours is over four months old suggest checking the website you got it from for a later filename than the one you have. (this one is R49 next will be R50)

ADDENDUM as of R46 6/08

Additional 2 pages are examples brought to our attention by a fellow who actively promotes FSG at various shows he goes to (he is an exhibitor) and at every other opportunity. We are asking people to share this free public domain guide, he is doing a terrific job at it. A short conversation with him showed that he and family are happy as the proverbial clams – having fun and making a good number of bucks by finally being able to beat the fuel tyrants.

page 85: MS Word (Office 7) (or many other WP programs such as open office) macro of a std business card, giving the name of the website he downloaded FSG from. Pull this up in your word processor and change the wording on each card to the site YOU got it from, print on green paper (he does but white will do), cut it up with a paper cutter into business cards and distribute to individuals – ask them first ‘have you got a computer that does internet?)

page 84 This is also distribution paper but gives 2 websites. It also came printed on light green paper Done 2 on a page then cut and margined with a paper cutter.

Thank you. These will certainly help our distribution. **The editor**

NOTE: !n the MS Word file, photos on p 82-83 may not show unless the ‘view’ is set to ‘page layout’. However, they will print when called for.

NOTE Page numbers given in text and printing instructions refer to the MS Word file only. The PDF may be different by one number due to pagination changes needed for the conversion process.

NOTE Pg 84 giveaway has been edited from ‘70’ to 80+ to better describe this (2/09) edit as well as other future inclusions/edits of Fuel Saver’s Guide.

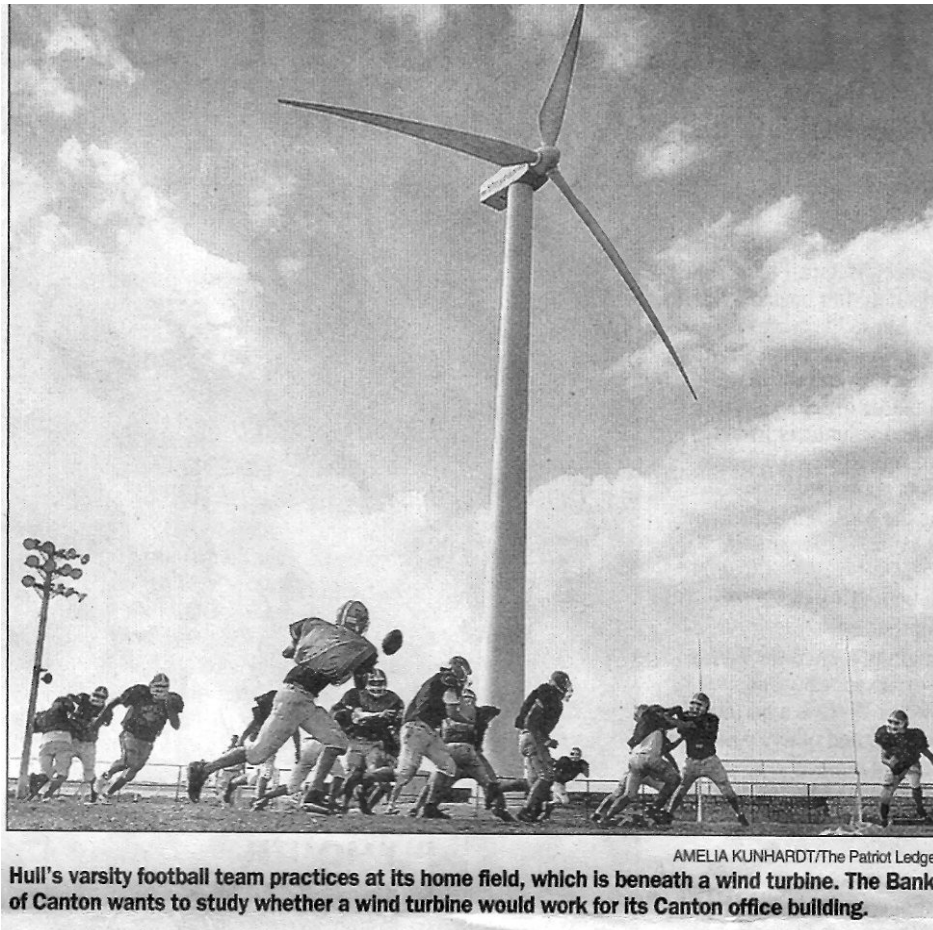
NOTE: On some computers especially laptops or older ones, the logo on the promo cards on page 85 will load slowly. This is normal, the machine has a lot of work to do to show these.

NOTE: Correct page number is on bottom left. The middle bottom one sometimes gets lost or garbled in internet transmission.

NOTE: on pg 85, in the MS Word file. the 'blue outlines' do not print, only the black parts do. The PDF file doesn’t show the outlines. They are unnecessary for printing.

Why is this photo so important?

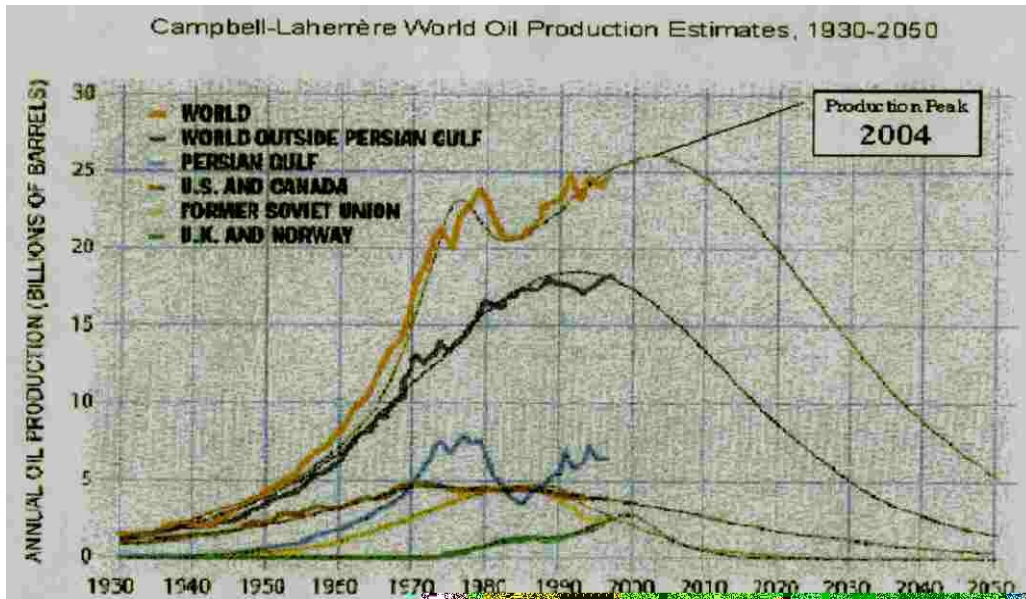
(think about it for a bit before you read below)



Yes, windpower is vitally important to our planet's sustainable future. However, siting of a turbine can be difficult due to opposition of people not educated in the subject, stating objections that time and again have stymied town governments and 'tabled' windpower proposals. Siting is usually the issue that comes up and NIMBY (Not In My Backyard) opposition prevails. Second issue, that of acquiring real estate quant suff in an 'unopposed' area to plant the tower is a costly thing, beyond many town governments.

This picture shows that a turbine can be planted on already owned town property (right next to the High School athletic field) and does not impact the property it is on, given thought to it's proper siting. A football thrown from the field at the tower by a player will most certainly hit it. This is not a 'trick' photo. For further info go to Hullwind.com or the Hull MA website. (photo credit, Quincy MA Patriot Ledger)

HUBBERT'S CURVE The limit of petroleum supplies



Note the top line. The tan roughly superimposed on the greenish brown and black. The thick tan one is the total of all the world's output of crude oil that has been pumped which continues as a thin greenish brown downcurved line to show future pumpable oil, which is the 'Hubbert' mathematical projection. Different oil rich areas that make up this total are the colored lines below.

The thin black demand line goes right along behind both the mathematical projection and actual pumped oil figure. So far, supply has kept up with demand.

However, this curve predicts that the sources (including any untapped at present) will dry up and will not be able to supply demand. Note the 'mountain peak' then downcurve on the 'total supply' line. At the beginning of the peak the thin black demand line behind it continues upward, going off the chart. This happens because we live in an ever expanding world with ever expanding needs for petroleum as countries industrialize and the world's population continues to increase.

We cannot continue to remove non-replenishable natural resources – which are the three fossil fuels (coal, crude oil, and natural gas) from the ground forever. This is not an opinion. It is not a 'right or left wing' philosophy or election platform plank. It is cold hard simple mathematics.

We must stretch our energy supplies through energy conservation and alternatives while a coalition of the world's finest scientific minds search out a permanent solution to what the energy for all time to come is to be, and start to develop it. This coalition hasn't even started yet.

Wake up, people. Wake up your governments. Our grandchildren and their grandchildren yet unborn need you to act now.

Spending too much on gas/diesel lately? How's your heating bill been lately?

Two websites;

- * **NEEAA.ORG** Download the 80+ page *Fuel Saver's Guide*. This is free, public domain and shareable, loaded with tips websites, book references and information about how to decrease both your carbon footprint and fuel expenses. Totally non-commercial, most tips cost you nothing to implement.
- * **BRIGHTGREEN.US** Download technical information about motor fuels and info on a simple aftermarket devices that reduces fuel consumption. Commercial site, wealth of free info.

It's up to us individuals to beat the systems that have been beating on us for years and to *spread the word to others on how to do it.*

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The FUEL SAVER'S GUIDE

A FREE DOWNLOAD FROM



New England Electric Auto Association

See what these are all about – browse our site

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NOTE: This is a phantom page caused by the card macro, and in some cases is blank, others won't show cards just outlines. Discard it.