

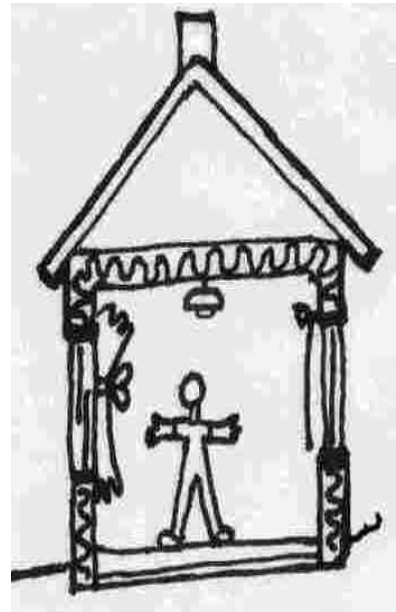
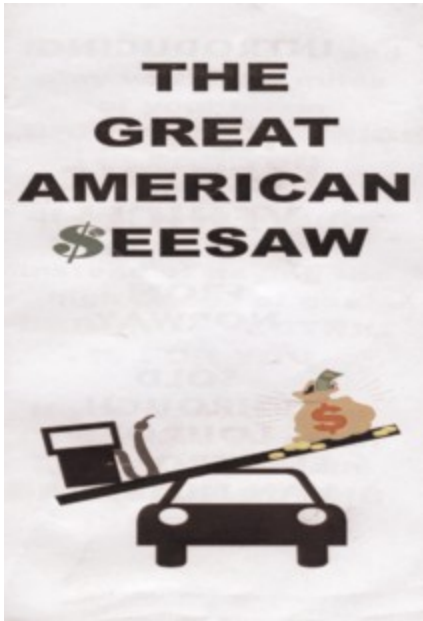
The Fuel Saver's Guide

Subtitle: beating the system 4th edition, 2008

An Ebook for the new millenium

Updated
To 3/08

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 oscillating home and transportation fuel prices. This guide is designed to help you control fuel costing as an individual. If you are a business regardless of 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 pollutants, thereby saving wasted fuel dollars that could be better used for other purposes.
- * 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 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. NEVER make a trip out 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?
- 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 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 per100 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 ½ 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 an engine (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 doesn't show 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. If you are able to fill it to where visible gas is showing in the filler neck, do it for best accuracy.

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, same way as before. Record the number of gallons read on the gas pump including decimal figures. Record your mileage or record your trip indicator. Subtract to get the difference. For best accuracy repeat this same procedure as you want to do this procedure twice in a row, once is not enough for best accuracy. 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 mileage test 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.

REMEMBER that the fuel mileage given when you bought the car (city/country) was 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 can still save using many of the hints in this document and in 'gas saving tips'. It is possible to, by adopting more economical driving habits, do a good bit better than published.

There are exceptions. Mileage varies between summer/winter (better in summer except when using climate control (a/c) which takes fuel to run. 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 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. 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.

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.

The only purchases that you will need to set up monthly time payments on will 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 image advertising 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?

You will find that it really pays – with the average person 15 to 25% 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%. This will be explained later 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 (cold engine driving) 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 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/or 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 economy, as others given here, adds up to serious money yearly.

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. Perhaps a hybrid. Then use the fuel saving info to do better on that ! It’s image, and it’s smart. New vehicles; note that engines over 3.0 liters are never particularly good on fuel (excessive unnecessary power.)

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.

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. 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 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 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 twice 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 every 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. Saves fuel. 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 big loud boom boom radios while parked.

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.

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.

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 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. Their axle ratio is too high, factory chosen for power 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 '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. These new 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 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. This 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 (near \$3.00) he would be throwing away \$37.50 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 untaxable yearly income did this couple earn?

(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.

Another type of car pooling; Informal, single vehicle, between friends. Essentially, a private 'bus' for a specific purpose, if you have such as a 6 or 7 passenger van, minivan, or station wagon big enough. Everybody else kicks in a buck 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 a buck 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 a buck 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, two bucks each 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 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, that means every 20 'scooting' miles this writer saves \$2.50-\$3.00. To charge the scoot for 20 miles takes about 15c worth of electricity. 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 this short trip driving would be cold miles at ½ the mileage) \$90. x 2 = \$180.00 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 '07. There were!)

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.

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) are out there as well as numerous smaller personal vehicles as described above in example (3) and the following pages. Also, of course, we have the microminis, most of them LSV's as described below for the states that allow their use (ME, 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 would not be an option. 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 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 guzzler to see if there is a place for this clean and relatively inexpensive form of alternative in your life.

A) Mopeds and scooters

There is very little info out there regarding this alternative. We will expand it here. Mopeds are actually lightweight low powered 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 and 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-specific legal parameters.

Some of these are plug-in electric, battery operated. The scooter mentioned above (in example 3) is DOT approved and classed as a moped in most states, quality is sufficient for anyone familiar with Vespa scooters or motorcycles to approve. Example; to class as a moped in MA, top speed can be no more than 25 mph. Compulsory insurance is not required, nor is a motorcycle license. Registration fees are cheap (\$40 for a 2 yr RMV sticker in MA). Best to check your own state MV laws before considering one.

All in the moped (25 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.

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 120 MPG and the adult 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 for commuting. The most reliable of them at present appears to be those 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 the same company (among several others) markets DOT approved scooters and Ebikes.

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. And heavy to put in a car. Some malls and communities are banning them. Decent 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 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 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.

A word about range. Gas mopeds usually go 100 miles before they require refuelling. 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, effortlessly. Short trips are all that will ever be done on a moped or scooter and as mentioned on the 'mpg chart, short trips are expensive in fuel. For the 'scooter' example given on pg 11, the longest trip ever taken for these shopping etc trips 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.

. 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, 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 \$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 (maybe 75c a month). Gas version of the same brand and type scooter is about 110 mpg 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.

As to MPG averaging an electric scooter (Escooter) with a car. In the above 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 price spike) This is the example spoken of earlier. Averaging gas cost down almost 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. 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 a 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 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.

As to riding these; You would think that the low 25 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.

B) Human Power

Never put down the lowly bicycle. With dual 'pannier type' carriers astride the rear fender a bike will carry groceries, school paraphenalia, or much sports equipment. So what if some teenagers don't think they are cool. They are!

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 Wal Mart special with good carriers added to it or even a good used one from a bike shop or yard sale. Only bike racers 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' shifters haven't been out long enough to make a report on.

Bicycles can be easily electrified using a motorwheel, most of which come from China as kits. Early ones were unreliable junk. The newer motorwheel kits are excellent. A tip is don't go for speed, go for a max of 15 MPH 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 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 will be relatively short (bikes can't carry a lot of battery weight)

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 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.

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 moped or scooter, and most problems on an electric bike or scooter are the bike part itself, not the electric part, like worn tires or brake shoes, brake cable adjustments etc. so bike shops can work on them too.

There are also *adult tricycles*. 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 must be slowed 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..

There is one company (Ebike) that made a different design trike. As the 2 rear wheels were small and 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.

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 manual thoroughly, or treat them roughly expecting them to be toys or hot rods rather than workhorses, commuters, and fun vehicles. Also, they are habit forming. You will find that you would *rather* go out on the scooter doing the short trips and small shopping than in the car, and you will often find people admiring it and questioning you about it so be prepared to answer questions.

C) Other small alternative vehicles

Motorcycles are a giant step beyond scooters and are good commuting vehicles. However, the greatest majority are heavy powerful vehicles only getting 35 to 60 MPG. The light ones (250cc or so) do much better on fuel and most light ones can keep up with 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 as cheap to ride as moped/scooter types.

Handicap trikes are not just for the handicapped. Used 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 garden tractor batteries. They will go 2 miles, some of them more, at 5 -7 mph, or up to 5 miles using expensive HP vehicle batteries. If your grocery run is a mile roundtrip, and you install a big carrier basket, you are in. Have seen these haul bike trailers and even a couple with big 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 car to do a little trip.

Golf carts are good large plant maint vehicles, some are used as NEV's (below). Most are 36 volt and will do 25 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 50-70 miles a gallon on the road. Golf carts are banned from public roads in most states. However, GA allows them, and the area around Peachtree City is full of them.

There are a lot of 'little electrics' of all types 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.

Neighborhood electric vehicles called NEV's are also called LSV's (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 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 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 NEV's. In the USA, golf carts classify as NEV's where they are road legal..

Fullsize battery electric vehicles are no longer made in quantity 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..

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 vehicles converted to plug-in electrics by their owners (or in some cases especially in CA by specialty custom conversion shops). One of note is a 'production' car built to order for the customer, the Ebox. A topnotch conversion of a Scion which will do 85 MPH and go 150 miles on a charge (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 them as design exercises – and in New England there is Northeast Sustainable Energy's '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 now based in New Jersey.

NHRA has racing classes for electrics, they drag race mainly at Hagerstown MD and at Woodburn, Las Vegas, Fl in the glades and the Bonneville Salt Flats out west. 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!). Racing is the way that gas vehicles have traditionally been developed and proved out and through it, became 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 race track 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 have the dates. Winter vacation in FL? Check out the 'Battery

Beach Burnout' for both the electric drag racing and an EV motorcross on the same weekend. Also there are regular plug-in commuter vehicles attending and on display. Bonneville Salt Flats plans an international plug-in electric vehicle event some time in '08.

Any plug-in (or pure) electric vehicle (PEV) only has 3 Basic parts in it's drivetrain. A battery, an electronic controller, and a motor. Most use conventional (stock) manual transmissions. Some have onboard battery chargers. Full size 3 or 4 wheeled vehicles can have heaters, power steering and brakes, even air conditioners. Electric is the simplest way to build a vehicle, using the least number of parts. There have been many different types of vehicles converted to electric by both factories and backyard mechanics. Even powerboats and light airplanes have been converted. Parts to do this are pretty much standardized and available from several sources. There are a couple of good 'how to' books on vehicle conversion available (See the EAA website).

One factory design of note is the electric lawn and garden tractor sold by GE, New Idea, and Wheelhorse during the 70's energy crunch. These are 'estate size' use 6 golf cart batteries and sport a 42" front mower deck, a 40" snow blade, even a 42" snowblower with it's own motor. Rear accessories were also offered including a separate motor driveway 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 hedge shears and grass trimmers were also there for the little jobs. These were built sturdy, estimate half of those built are still in use today. Their gas operated cousins of the period have long since burned or rotted out. There is a company in Canada presently building this type estate tractor using the latest technologies, it is called the 'Electric OX'.

Most of the 70's factory and backyard conversions are still with us. Fullsize 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 95% of all discarded lead acid batteries today winds up at highly regulated recycling plants. The other 5% are the ones that are not disposed of properly by uncaring individuals. 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.

The newest full size pure electrics do not use lead acid batteries. They use hi tech (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 and many people in the auto industry look forward to such vehicles as the futuristic and sporty Tesla getting down to 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 plug-in EV 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://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!

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 politics, 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.

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. A question to those people. Seeing as that our expanding population must have new sources of electricity in the proposed area of the new wind machines, would you rather see dirty smokestacks in their place? The fuel producers would.

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. This is pie in the sky stuff for rich companies to buy and to make other companies rich and the average person could never afford one. Even if we could, most commercial hydrogen is refined from natural gas and we would then be back in the clutches of the fossil fuel barons. Until there's no more fuel left to refine. Likewise, the much heralded 'at home' hydrogen source extracts hydrogen slowly from natural gas. The supply side of hydrogen is not sustainable unless electrolysis is used to make it from sustainable electricity such as wind or hydropower. Electrolysis is inefficient, therefore costly.

The media seems 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.

Hybrid cars; In every hybrid by any mfg, an electric motor 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 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 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 (originssl) 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 (2008 model) does a bit better on gas and has other improvements as well.

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. People keep these hybrids.)

A fine solution for a gas hog owner to eliminate present 'gas price' woes and prepare for a future with higher gas prices is to trade in the guzzler for a hybrid.

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 mpg. Fantastic for a full featured SUV. He must be pretty good at economical style driving.

Honda just 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) 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.

For those who think the hybrid is a new concept. Yes it is, for automobiles. 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 over 100 years. Over 50% of all mainline railroad trackage in the world has been electrified, uses pure electric locomotion. Both the 'Chunnel' and the bullet 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 are being 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 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. 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, people come from all over the East coast with live steam launches on trailers 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 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 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 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* 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 gas hogs.

In general, automobile manufacturers (and buyers) need to restructure their thinking as to the ‘image’ of 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.

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) 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.

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.

Third; a vital support system is that is so fragile that every fuel user in the entire country is 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 couple of days.

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 alternatives.

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 than 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 is 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.

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 about \$1500 including a heated fuel system for those well known New England winters.

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.

At present, the cost of 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. 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. The exhaust 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. 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 200 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, also lowers power and miles per gallon. The supply side 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, 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.

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.

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.

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, or 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 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, 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). Also, there are many electric NEV (30 mph) delivery vehicles mainly in Scandinavia, Europe, China, Japan, and the UK.

In addition to being a clean motor fuel, electricity is 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 world's mainline trackage including the hi speed 'Chunnel' and bullet trains are electrified.

A look at the 'MPG chart' 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 PEV users are association members. Mainly, members are the individuals who have converted their own vehicles or drive vehicles converted by other individuals. Hybrid people are there too if they have an interest in the technical aspects of their vehicles. The New England chapter presently has close to 30% hybrid members.

Electricity was the 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. The last three have no ownership or limitations, and are 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 it’s use 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 WWII Germany England France and Spain as transportation fuels by onboard generation from coal and wood, the burning of resulting carbon monoxide/methane rich gas in modified gasoline engines at much lower power outputs. 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 submarines WWII Germany built. These were called 'Walter boats'. It is definitely not cost effective as a transportation fuel.

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’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.

*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 -1800 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 'whole city' heating systems and not available everywhere in the world. Where there is a lot of it, geo is used to make electricity. 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 most alternative heating systems available. And . . . the electricity to run it can be sustainable if your utility provides it.

Solar power can be used by anyone, from big industry to the small homeowner. 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 installed. 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.

Windpower is a sustainable land based or transportation fuel older than 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 water 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, advance without preignition) and the

newer ones timing is done by the onboard computer, we 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 liquids’ 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, automotive enamel solvents, work as well and are much cheaper. As in the instructions for these miracle liquids, add 2 oz of xylol to every 5 gallons of gasoline as a mileage booster. Acetone is an alternative 3 oz to 10 gallons. 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. 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. Don’t overdose.

To this writer, any 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 Lappens, Pep boys, 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 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 a good part of the gas mileage increase.

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 - 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 starting to be 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, many 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 towering smokestacks of 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. 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 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 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 through Email forwards – and that is by the 'pyramid' principle. One person sends to three, those in turn forward to three more which makes a total of 13 (including the originator) in the first two steps. The nine fwd to 3 ea. That's 40 total.. See what happens?

Eventually, a huge number of people doing this same thing will add up to global consequence. With each person, there will be less fuel taken from underground to be burned, therefore less harmful gases and particulates added to the atmosphere.

But this mathematical progression 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 has been out there for about two years. This new (3/08) 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, and to do their part in cleaning the air, reducing CO2 and preserving the world's limited supply of underground hydrocarbons.

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.

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 jet lagged for 2 (or more) of them.

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 alcohol in their gas (most use 10%). Your fuel mileage goes down with more % of alcohol.

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 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.

Stay out of the fast lane on the thruways. Leave it for people who want to pass, or for those who think they can save time with it, disregarding the high fuel cost of doing it and the higher likelihood of having or causing a fatal accident. (Do the t/s/d math on this. Very little time is actually saved) (Some people don't think. Math applies to real life)

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 hardware that the public could use to burn less fuel.

You see the results of these 70's advances 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. 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 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 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 gasoline, or heating fuel companies have to deliver half tankloads to their customers.

The 'emergency' was over. But the fruits of all that subsidy and research are still here, in the efficiency that we have now at home and in transportation and in industry. Also, 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 happens 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. (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 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 wells 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 will necessarily have to be with 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, 3 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. Cheyrmoble and Three Mile Island.

Both of these, along with a few others considered minor in 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. 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, this due to fairly recent (shortly after the Oklahoma bombing) NRC motor vehicle regulations 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 it does. 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 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.

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 spinning 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 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 power with the wind turbines then bills the people for it. Last year Hull Power both paid the town government's \$55,000 year's light bill and gave the residents a discount on their own electric bills.

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 even 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.

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 planned 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 electricity 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 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.

Many 'PV' systems 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. Farm outbuildings are a good example here. So are summer camps.

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 runs a battery operated lawn care tractor (see the reference to these on page 16) 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. 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 back at a highly accelerated rate and are presently tax-clear and non-taxable income for their owner.

Last on this list. The above three are 'active' sources of alternative energy, therefore new fuel. However, there is a 'passive' source of fuel that is being tapped presently by some pretty smart people, the greatest majority of which are non-technical people. This is basically, even though passive, a source of new fuel.

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.

This is the principle 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 it applies as much to individuals as it does 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 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. Pick and choose what suits you and phase them in. As with the 'automotive' fuel saving measures, each will do it's own small bit for your wallet and add up to major savings per year. Power and fuel of all types is going up soon if it hasn't already done so in your area, and as stated previously, 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 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.

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 bulb greatly exceeds that which is contained in a long life fluorescent of the same light output.

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).

- * 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 two, 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 don’t show the nukes at all. The big one draws bout 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. Say goodbye to that power hungry electric stove and oven to the tune of about \$25 a month, or gas, about \$15. And hot kitchens – which reduces a/c use. Half pints go for about \$60 now at Wal Mart, these, or even fullsize ones pay for themselves in power saved real fast.

In the cold months there is more stove use here as the heat is not wasted, helps to warm the house. (Note one advantage of 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.
- * 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 (to remove excess humidity).
- * 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. Bathtub sized hot tubs, all of which need to be used full are extremely wasteful of energy, must fill with hot water each time. Limit their use.
- * Lever control hot/cold faucets. Never open them in the middle – as they mix 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. If you want only cold, put lever all the way to the right to ‘cold’.
- * If you must drink bottled water, choose a brand produced close to home. (Less transportation needed for it, there less fuel burned to get it to your local store. The same principle applies to all grocery items. Find sources of locally grown produce.
- * Bottled water; Why not make it 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, even frozen for long lasting ‘picnic cooler’ ice.

- * 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.
- * Limit thermostat setting to 68 degrees max. Get a 7 day programmable set back thermostat to set temp down when everybody is at work or at school, or at night. If it seems chilly at 68, put a sweater on, that's what sweaters are for. Set temp down a few degrees when there's nobody home. Also - these programmables work with central a/c's and heat pump systems.
- * Hot water from tub, shower, laundry, or dishwasher can have it's heat extracted and recycled. See your plumbing contractor before you build or modify.
- * 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.
- * 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. (in the cold months, of course. North side air is normally cooler all year round)
- * 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 t be put into more fuel saving measures for your home. This increases your home's efficiency, and pays for itself !
- * 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.
- * 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, and mix your solar heated and cold water with a pair of faucets. Use a 'water saving' showerhead and get several warm showers a day from 30 gallons. Tank need not be new, can be a hot water tank rescued from the dump with insulation removed so the sun can heat it. Drain the system in winter.
- * If you have a ceiling trapdoor 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.
- * If you have 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 that a newer solid state one uses. And solid state ones give you a clearer picture.
- * 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, they go well into January. Also those people 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).

- * 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 has 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 childrens books develop imagination and a love of reading. The newer ones don't appear to do that as well.

- * Another 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 blanks 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 \$29.95 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 me to use this computer rather than my 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 up to 15 amps draw.
 - 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 power is 460 watts. It doesn't draw near that 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.

- * 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 several dollars a year to to keep it ready to receive it's remote control signal.. Seeing as the remote is either lose or has dead batteries most of the time, It got 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. An example of the money saving that is claimed by the advertising of the 'Kill A Watt' electric parameter measuring tool mentioned above.

This writer has seen many 'home theater' 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 a remote receiver when everyone's asleep or when nobody's home?

- * Your refrigerator will use less power if you keep it's 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.
- * In winter, check your outside door seals and door closing. This may need repair or adjustment. New seals are standard hardware. If there's a big 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 flathead wood screws to keep them on. 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.
- * 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.
- * 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 heat.
- * 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 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 talk to your wifi setup. Naturally, you must have a provider to use this service. If you don't have one, you get the same 'cable not connected' message.

- * 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 a cup in the half pint microwave, bout 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. Keep it open until everything is dry. Here, dishwasher stays open to dry all night.
- * 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.
- * Wash your car with a bucket and sponge. Only prewet and rinse with the hose. Water is going up too as municipal costs go up.
- * 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. Likewise, chill tonics etc outdoors but be careful not to let them freeze.
- * 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.

- * 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.
- * Put up a clothesline for small washes, don't use the dryer. Some small washes can be done by hand in a plastic tub or even in the kitchen sink
- * 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).
- * Tape down light switches that are often turned on unnecessarily by mistake. Porch lights, pole lights, outdoor spotlights etc.
- * Your utility bills often contain other 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, before the furnace needs to run. You will be warmer on those chilly nites without requiring heat, and still have the option to ventilate wherever necessary.
- * Computers; Your laptop uses about half the power that your desktop uses. With a USB mouse and keyboard and a cooler added below, these will do a lot of real work with the feel of a desktop. Need more space? Huge capacity external hard drives are also available for USB. This edit of the Fuel Saver's Guide is being done on a laptop so equipped.
- * 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. Hot air rises to exit there, pulls in cooler air from North side open windows even if there's no breeze. Check out the Energy Star website for builders info.

- * 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.

- * Consider a 'geothermal heat pump' climate control system for your home. These are electric and use the Earth's underground constant temperature as both a heat source and heat sink, allowing the system to both heat and cool with high 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. Special panels can be 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 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-efficient use 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. Most '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.

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 partial payback.

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. 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.

- * 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 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 in the basement, next to or 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 one.

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.
- * 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. But before you do, opt out of junk mail by making your preference known at www.DirectMail.com/Junk_Mail.. Be sure to check the 'no' spots. They will take you off the master address list that 99% of the time brings you only more throwaway mail *than you get now.*

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 for years. But it is reversed. The big heavy gas guzzler comes first. Success will follow. This is 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. Obsolete. 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 already a computer user). Don’t let image fantasy or fashion drag you around. You got a start here. 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 the war 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 scrapyards.

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 estimated 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 by in some cases, the media).

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 yrs ago one of these tabletop demonstration was set up at MIT Boston (Massachusetts Institute of Technology, New England's equivalent of Cal Tech) and this performed well for it's 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 mainly 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 it's 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 it's 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 on 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 getting into energy conservation as shown here in this document and a massive switch to windpower and solar 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 now. You now have sufficient information for the conservation part. There is also a good start here for alternative fuels in your life.

These will not only be a benefit to you yourself, but multiplied by the millions who will transmit and receive this by forwarded Email, 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 a new sustainable energy source. 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). 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 $1\frac{2}{3}$. The $2/3$ converts to the decimal .666 or 66 2/3c. So it's \$1.66 (actually \$1.67 but we don't have anything smaller than a penny so we don't deal with the third decimal place) apiece.

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 $5/3=1.666666$. 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.

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 – if you factor in the price of gas to your expected purchases it may not be a sale at all, just additional 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' driving.

If your vehicle gets 20 mpg 'city' and the store is 10 miles away, that a total of 20 miles, 10 of them at 10 mpg the other 10 (warmed up) at 20. That 10 mile away store at today's fuel price (\$3.00) will cost you (looking at the fuel chart on page 4) 30c/mile for 'cold' miles, and 15c/mile for warmed up miles. That's a total of \$3.00 +\$1.50 or \$4.50 for fuel (not the \$3.00 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 \$4.50 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 concatenate all shopping to one day. There are several others but not getting into them here.

However; here's a 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, 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 and estimates that thousands of dollars and hundreds of gallons of fuel have been saved by the process.

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

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. Quite a good starting place for those interested in alternative energy.

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.

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 3:00 days is on pg 238. Piping around the added tank for heat transfer to the domestic water was bout 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). (A separate tempering tank as mentioned on pg 32 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) (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.)

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 pg 31. All 'collector orientation' data and formulae given here for all US and Canada installations.

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 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. Perhaps you can find one.

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.

LOW CARBON DIET 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 envirogroups, 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.

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 22nd weekend) 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 show South of Boston, for instance, is called 'Sustainable Living Festival' in Hull MA.

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, electric scooters and bikes etc are liable to have displays there. There are short seminars on many energy-related subjects along with educational activities for youngsters, food, and music to make a fine, inexpensive, and educational family outing.

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 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 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 so that each person will have the information necessary be a part of this effort.

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.

In New England; (and likely under other names in other parts of the country)
Alt wheels, New England's largest alternative transportation show. This is a 2 day weekend museum show at Larz Andersen Auto Museum in Brookline MA. The information to be obtained regarding all available types of alternative transportation for individuals, families, and fleets at this show is staggering. Dealers were represented in all categories, seminars were there ranging from the basics and specifics of alt-T for the novice to the seasoned engineer to the fleet purchasing agent. This year which was its third year, over 4,000 people viewed (and some even drove) the latest in energy saving transportation. One display area was a late condensing Stanley steamer (which drove in) set up right next to an affordable commercial 2 passenger electric scooter adapted for solar power and on the other side, several biodiesel converted vehicles along with their fuel supplier. Many different brands of the new electric bikes and scooters were there, along with a Boston dealer who sells and rents these (mainly to commuters and students). The normal price of museum admission also covered this weekend show, making it a 2 for 1 special for attendees. Public transportation using a brand new LNG bus ran a special route from Boston right to the museum's door. An alternative transportation infifest without peer on the East Coast. For 07 -08, the show has expanded beyond the space available at the museum and moved to Boston at City Hall Plaza. Admission is now free to the public. The show's website is in the site listing below.

There are apt to be energy shows or energy fairs. In New England, NESEA (Northeast Sustainable Energy Association) has a yearly 'contractor's energy show' called 'Building Energy'. This runs 3 days in midweek at the huge expo pier in Boston, showcases the latest in hardware for alternative energy, designs of energy efficient buildings and homes, and energy efficient building materials. The focus here is sustainability - with one 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.

Both active and passive solar is king here, with second going to small wind turbines starting at 400 watts to the multi kilowatt range. There were a whole gaggle of energy savers too, both design in and retrofit, such as advanced insulation. Some was for 'big 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 additions 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)

Movies

Highly recommend three movies, all available on DVD.

(1) An Inconvient 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) 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.
- (3) 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.

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

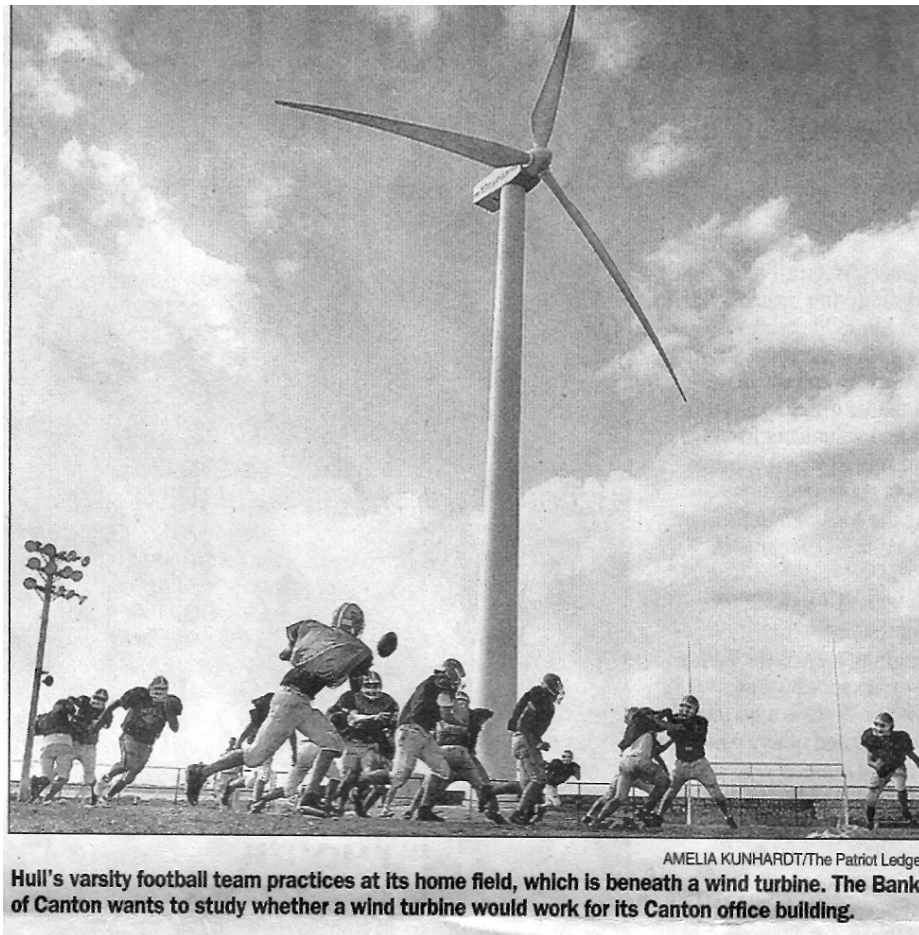
scoot, scooter, scooter parts, EV, electric vehicle, EV parts, EV conversion, windpower, Hull MA, biodiesel, emerging vehicles, CO2, sustainable, climate change, sea level rise, global warming, windfarm, NEV or LSV (low speed vehicle), alternative energy, solar electric, solar energy, solar hot water, greaseburner geothermal greengreasemonkey biofuel, geothermal, Tesla Prius Hybrid

Websites of interest in no particular order. Note; Follow the links on these sites.

www. Info@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 on climate action in MA.
 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 the source of the newest edit of this document
 www izip.usa Electric assist bikes and Escooters
 www homepower.com Alternative energy, Home Power magazine
 www nesea.org Northeast Sustainable Energy Assoc (and Tour de Sol)
 www eere.energy.gov/ US Govt energy site
 www throughlineproductions.com CD, 'Transforming Energy'
 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

Why is this photo so important?

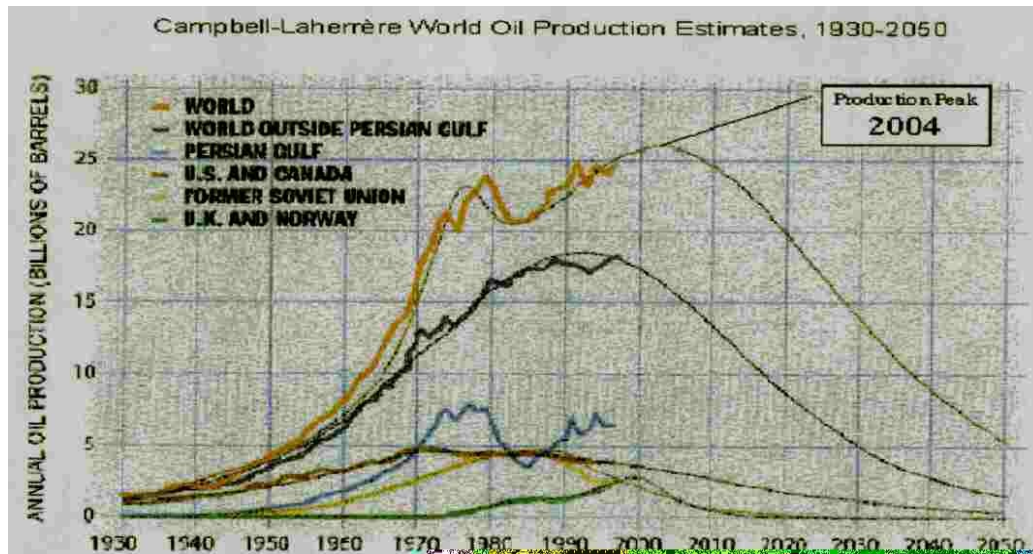
(think about it for a bit before you read below)



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 can 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.

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.