Mr. Maita's Notes

for Book Review 1

Chapter 5: Energy Surprises

Key energy facts that surprise most people:

- Gasoline delivers 15 times the energy of an equal weight of TNT.
- Coal is 20 times cheaper than gasoline, for the same energy.
- A square mile of sunlight at midday could provide a gigawatt of electric power - the same as a large coal, electric, or nuclear power plant.
- Gasoline has 1000 times as much energy as an equal weight of flashlight batteries, and 100 times as much as an equal weight of expensive computer batteries.
- Liquid hydrogen, the key fuel for a future "hydrogen economy," has 4.5 times *less* energy than gasoline has.
- Energy from nonrechargeable batteries costs about 10,000 times as much as from the wall plug.

...steak has almost four times the energy of TNT; chocolate chip cookies, eight times as much.
The following fuels do *beat* gasoline in energy per pound:

- *Natural gas* is 1.3 times better
- *Hydrogen gas or liquid* is 2.6 times better
- *Uranium or plutonium fission* is 2 million times better
- *Hydrogen fusion* is 6 million times better
- *Antimatter* is 2 billion times better

The 2.6 value for hydrogen gas is what inspires people to talk about the hydrogen economy. Yet a pound of hydrogen, even in its liquid form, takes up a lot more space.That's why hydrogen has 4.5 times less energy per gallon..

Power

TNT has less energy than gasoline, but it delivers what little is has with such speed that it can shatter rock. Gasoline has more energy than TNT, but TNT can deliver more power than gasoline can.
The energy that the hammer puts out is the same that you gave it with the swing, but because it gives up that energy much faster, we say it has more power. Of course, it delivers the higher power for a shorter time.
1 horsepower = 1 kilowatt
Solar power, for example, is about 1 kilowatt per square yard..
Intermediate-sized power plants produce 50 to 100 megawatts of electricity…
The largest electric power plants produce about a billion watts of electric power, called a *gigawatt*.

The total electric power of the United States averages about 450 gigawatts.
1 kWh ~= 1000 food calories

Energy Alternatives

...all you really have to know is that fuel is used in four different ways - transportation, electricity, heat, and industry - all in comparable amounts.

The Bottom Line: The Cost of Energy

...for the same energy, coal in the United States is 20 times cheaper than gasoline.
The following list compares the cost of energy per kilowatt-hour from the various sources.

- Coal: 0.4-0.8 cents
- Natural gas: 3.4 cents
- Gasoline: 11 cents
- Car battery: 21 cents
- Computer battery: $4
- AAA battery: $1,000

Chapter 7: The End of Oil

The maximum (production) is called the *Hubbert Peak*.
...demand has now outstripped the ability of the existing wells to keep up. In particular, the rapid growth of the economies of China and India.

Oil from Coal: Fischer-Tropsch

The Hubbert Peak for oil does not take into account the availability of the Fischer-Tropsch method.

Energy: Presidential Summary

...we are not running out of fossil fuels - but only out of oil. Our coal will last centuries.
From the environmental point of view, coal is perhaps the worst source of energy.

Chapter 21: Nonsolutions

Global warming is real.
With China now the leader in greenhouse gas emissions, the problem seems hopeless.

...problem in a nutshell:

- the cheapest and most readily available source of energy is coal.
- Coal produces more carbon dioxide per kilowatt-hour of energy than virtually any other source.
- China has enough coal to last more than a century, even with the expected increases in economic growth.
- china is currently building over 1 gigawatt of new coal plants every *week*.

That means that a permanent reduction in US carbon dioxide emissions, down 20% from our level in the year 2000, will delay global warming by only 3 years, nothing more.

Hydrogen Hype

Hydrogen does indeed have 2.6 times the energy of gasoline per pound - but because hydrogen is so light, a pound of it takes up a lot more space.
Here are two facts that a president needs to know: as a liquid,

- Hydrogen has about *three times more energy per pound* than gasoline
- Hydrogen has about *three times less energy per gallon* than gasoline.

Suppose you get 30 miles per gallon in your present car. If you filled the tank with liquid hydrogen, you would only get 10 miles per gallon.
...hydrogen has potential uses.
...large vehicles, such as buses and trucks…
...ultralight airplane…
Hydrogen could be useful for automobiles, if we could improve the mileage significantly, perhaps by making the cars much lighter in weight. If autos could get 100 miles per gallon with gasoline and 33 with liquid hydrogen, they could have a 330-mile range with only a 10-gallon tank.
...there are no hydrogen mines or other sources of the fuel.
We can obtain hydrogen by electrolyzing water - that is, breaking up H2O into its constituents of hydrogen and oxygen. But that takes energy, yielding no more than is put in, and typically less.
So think of hydrogen like this:
Hydrogen is not a source of energy.
It is only a means of transporting energy.

Electric Automobiles

...recharging a car by plugging it into the wall socket is equivalent to buying gasoline at under a dollar per gallon.

Fusion

Over the past 50 years, the prognosis has not changed: fusion power has always been predicted to be viable about 20 years in the future.
There will be no commercially viable fusion reactors in the next 20 years.

Solar Power

...the cells would have to last, typically, more than 22 years in order to save you money. Right now, solar is an alternative only for wealthy people who wish to reduce their carbon dioxide production. It is too expensive to replace coal as a source of energy for the developing countries of China and India.

Recycling

...it now turns out that you don't want to recycle newspapers or use biodegradable plastics - at least not as far as global warming is concerned. The process of biodegradation is basically one of bacteria consuming carbon compounds and converting them into carbon dioxide.

Kyoto

Kyoto Protocol
The treaty has been ratified by 164 countries...but not by the United States
...95-0 vote. The resolution states that the United States should not ratify Kyoto until the treaty is rewritten to include binding targets and timetables for developing nations.