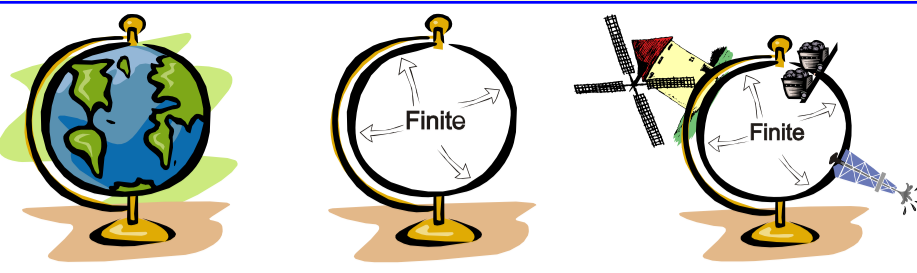


**The Earth is a sphere. All spheres are finite. Therefore, the Earth is finite.**

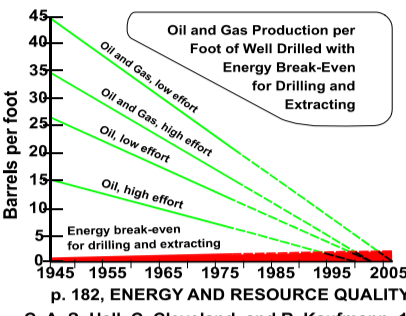


If the Earth is finite, then the Earth's energy resources must be finite too: **finite energy stocks** such as oil, coal and uranium — and **finite (rate) energy flows** such as wind and solar. It's physically impossible to increase these finite resources.

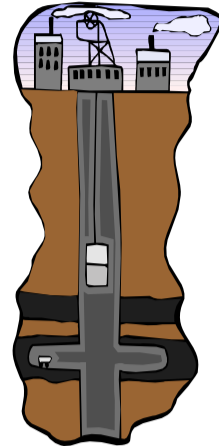
**A LOOK THROUGH THE "NET ENERGY" WINDOW**

One seldom thinks about the energy that is consumed in systems that supply energy — such as oil-fired power plants. Energy is consumed when exploring for fuel, building the machinery to mine the fuel, mining the fuel, building and operating the power plants, building power lines to transmit the energy, decommissioning the plants, and so on. The difference between the total energy recovered from the mining process, minus all of the energy consumed, equals the "net energy" (in other words, the net amount of energy actually available to society to do useful work).

We mine water, minerals and fossil fuels from the Earth's crust. Just to lift 15 Kg out of the ground, and overcome gravity, requires about 735 joules of energy — and the higher the lift, the greater the energy requirements.



The most concentrated and most accessible energy resources are produced first; thereafter, more and more energy is required to produce resources that are of poorer and poorer quality.

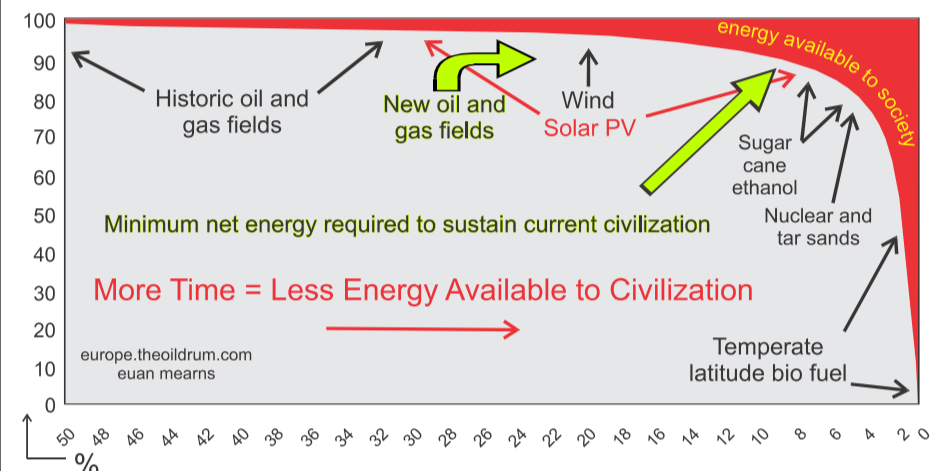


As time goes on, a larger and larger fraction of the energy produced must be reinvested in energy production to keep the same level of energy available for consumer goods and services. This means that energy companies must spend more energy tomorrow to produce the same amount of energy as they did today and the "net energy" fraction will fall.



**THE "NET ENERGY" FRACTION HAS BEEN FALLING FOR DECADES!**

As low-energy-cost "conventional oil" has been replaced by high-energy-cost non-conventional oil (offshore oil, heavy oil, etc.) and alternatives (wind, solar), a greater fraction of the energy produced is consumed by the energy production process itself — a lesson driven home with the "Deepwater Horizon" tragedy. Indeed, the net energy fraction of the global energy mix has been falling for decades!

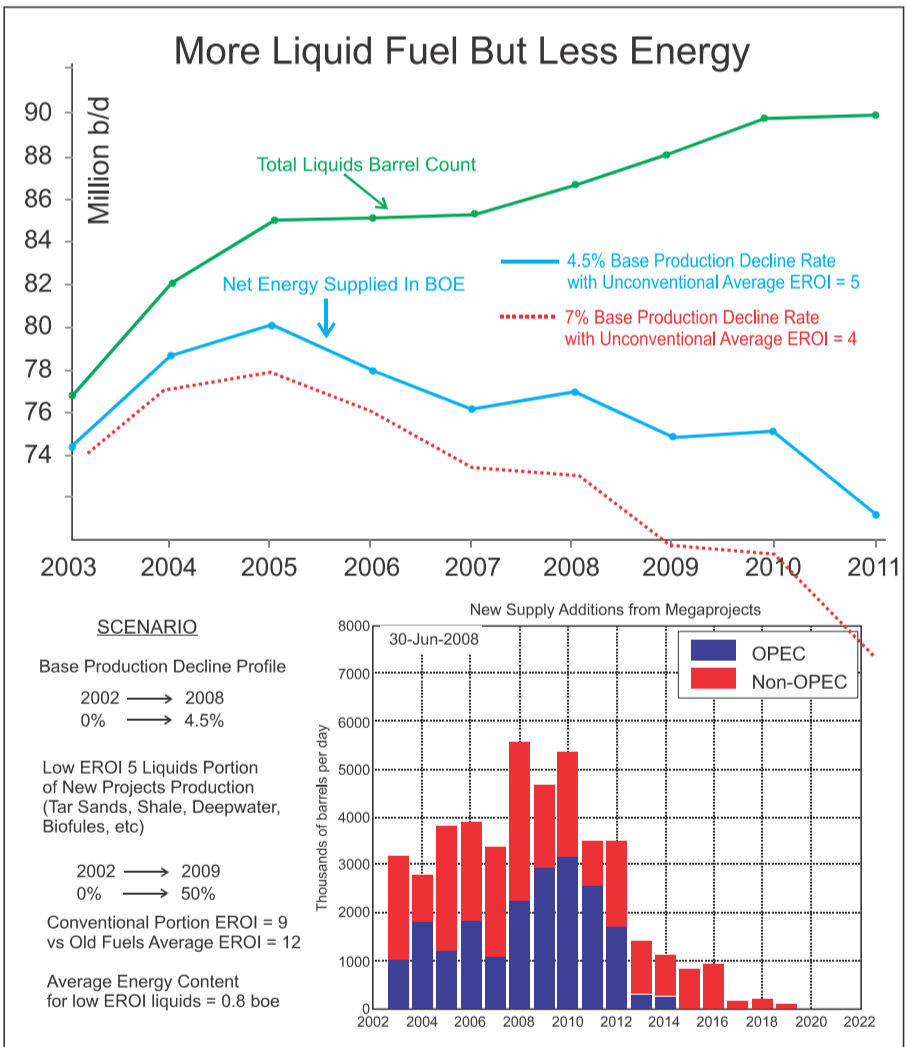


**NOW THAT CONVENTIONAL OIL PRODUCTION HAS "PEAKED," NET ENERGY IS CONSTRAINED!**

Prior to "peak oil," producers could compensate for declining net energy by simply pumping more oil. However, conventional oil peaked in 2005, so it is now physically impossible to overcome the decline. The energy available for economic development — the net energy — will decline for many decades as low-energy-cost, conventional oil is replaced by high-energy-cost, un-conventional oil.

**In the 1930's, the net energy fraction for new production was about 100:1**  
**By the 1970's, that fraction had slipped to about 25:1**  
**The present net energy fraction has declined to about 20:1**  
**The laws of thermodynamics tell us, that no matter what is done, this fraction — and global net energy — will fall until a new Dark Age is upon us.**

**Net energy will fall faster than it can be replaced by new production! This is neatly illustrated in the chart below:**



**The money price of energy will no longer matter. Bankers can print money but they can not print energy!**



**Even if one paid a ton of gold per barrel, one still could not get net energy out of a well that consumes as much as it produces!**

**We read every day that there are hundreds of millions of barrels of oil left in the ground — and hundreds of millions will be left in the ground due to the high energy cost of production!**

**Ultimately, violence must emerge as our final strategy to maintain living standards because it's genetic.**

