

Re: Uranium availability

## Re: Uranium availability

---

*Source:* <http://sci.tech-archive.net/Archive/sci.energy/2007-05/msg00150.html>

---

- *From:* [dezakin@xxxxxxx](mailto:dezakin@xxxxxxx)
  - *Date:* 30 May 2007 13:59:55 -0700
- 

On May 30, 1:04 pm, T. Keating <[tkuse...@xxxxxxxxxxxxx](mailto:tkuse...@xxxxxxxxxxxxx)> wrote:

On 30 May 2007 12:19:15 -0700, bill <[ford\\_prefec...@xxxxxxxxxxxxx](mailto:ford_prefec...@xxxxxxxxxxxxx)> wrote:

On May 30, 2:39 pm, T. Keating <[tkuse...@xxxxxxxxxxxxx](mailto:tkuse...@xxxxxxxxxxxxx)> wrote:

On 30 May 2007 08:22:12 -0700, bill  
<[ford\\_prefec...@xxxxxxxxxxxxx](mailto:ford_prefec...@xxxxxxxxxxxxx)>  
wrote:

On May 29, 8:18 pm, Maximust  
<[maxi\\_m...@xxxxxxxxxxxxx](mailto:maxi_m...@xxxxxxxxxxxxx)> wrote:

dave.walt...@xxxxxxxxxxxxx  
wrote:

From  
the  
always  
good  
and  
informative  
"Nuclear  
is  
Our  
Future"  
blog  
at:

Re: Uranium availability

<http://blog.niof.org/>

More  
Russian  
Uranium  
Deposits

Worldwide,  
we "use"  
about  
67,000 tons  
of uranium  
per year,  
670 tons of  
which is  
actually  
used (the  
rest is  
stored).  
Nuclear  
power  
provides  
20% of  
world  
electricity,  
and could  
provide  
100%,  
requiring  
3,350 tons  
per year.  
The US,  
being 5% of  
the world's  
population,  
uses 25% of  
world  
energy;  
giving  
everyone  
American  
per-capita  
access to  
energy  
using  
nuclear  
power

Re: Uranium availability

would  
require  
another  
five-fold  
increase in  
uranium  
consumption,  
assuming  
that the  
proportion  
of  
electricity  
out  
of total  
energy is  
the same  
worldwide—totaling  
16,750 tons  
of uranium  
per year.

These eight  
Russian  
deposits  
contain  
320,000  
tons of  
uranium.

The math is  
not  
difficult: if  
their  
contents  
were used  
sensibly,  
these  
eight new  
mines could  
provide all  
the uranium  
needed to  
fuel all the  
nuclear  
power  
plants  
needed to

Re: Uranium availability

provide  
American-style  
quantities of  
electricity  
to everyone  
in the world  
for almost  
twenty  
years.

Be  
reminded  
that this is  
6% of  
worldwide  
uranium  
reserves.  
That's  
enough to  
last almost  
320 years.  
However,  
there are  
two other  
major  
sources of  
uranium:  
coal ash and  
seawater.  
Uranium is  
present in  
coal ash at  
an average  
level of 4.5  
parts per  
million. In  
the  
US—and  
this is just  
in the  
US—118  
million tons  
of  
new coal  
ash are  
available  
every year.  
That comes  
out to 531

Re: Uranium availability

tons—  
about 80%  
of the  
world's  
current  
uranium  
requirement.  
Seawater is  
the big one,  
though.  
Uranium is  
present in  
seawater at  
an  
average  
level of 3.3  
parts per  
billion. The  
oceans have  
about  
1,500,000,000,000,000,000  
tons of  
water and  
thus about  
4,950,000,000  
tons of  
uranium,  
with 35,000  
tons added  
per year by  
runoff from  
rivers. Quite  
simply, as  
long as we  
use less  
than 35,000  
tons of  
uranium per  
year,  
uranium  
from  
seawater is  
being made  
available  
faster  
than it is  
being  
consumed.  
Technically,  
it is a  
renewable

Re: Uranium availability

resource.

Technically, yes.

Practically, no. It takes way to much energy to extract uranium from coal dust and/or seawater for them to be a valid source. Beware of wishful thinking at a time when global crude production has peaked, as it did in May, 2005.

In a different thread, it is estimated that uranium extraction should be possible from sea water and coal ash at roughly \$200/kg. assuming that number is off by a full order of magnitude, and it will really cost \$2000/kg, that still only represents  $3\,500\,000 \text{ kWh/kg} / \$2000/\text{kg} = \$0.0005/\text{kWh}$  in fuel costs assuming reprocessing.

You're off by a factor of 118x.

Maximum current yield is ~35,000 kWh per kg..

Assumptions.

1GWe/3GWt reactor.

220,000 kg of U consumed per annual refueling cycle.

(includes

enrichment consumption.)

90% duty factor.

95% actual production factor.

\$2000 per Kg of U.

Math

$1\text{GWe} * \text{prod-f}(.95) *. \text{duty cycle} (.90) / 1000 \text{ /hr} =$

855,000kWh/hr

Est annual production  $855,000\text{kWh} * 365 * 24 = 7.49 \text{ GWh/yr.}$

$7.49\text{GWh/yr} / \sim 220,000 \text{ kg of raw U consumed} = 34,045$

kWh/kg.

## Re: Uranium availability

This number does not include any personal, capital, interest, shifted liability, construction, maintenance, enrichment, regulatory, manufacturing, reprocessing, transportation, storage, or waste disposal costs nor their respective energy inputs ! The above number also fails to subtract out the mining and refining energy inputs which increases rapidly as U ore concentration drops.

(Raw U fuel costs per kWh)  
\$2000 kgU/34045 kWh == \$0.059 per kWh.

Notes:

Estimated price of metallic U is around \$324 per Kg, Yellow cake U3O8 spot price is ~\$275 per Kg and climbing rapidly.

There is no rational basis to think that climbing U prices will peak out at \$2000 per kg. The market will charge whatever the reactor operators can pay.

Again, in my above calculation, I stated the \*assuming reprocessing\*. at anything above \$720/kg, reprocessing is economically feasible, and therefore MAY be factored in to these calculations when determining the energy produced by the extraction of 1 kg of natural uranium.

Bzzzt,,, (and snippy.)

Reprocessing yields only a small fraction of the original fuel load. I.E. Less than ~1/6th of the natural neutron emitters (U235, Pu, etc) remains. Thus reprocessing is not a sustainable method of fueling commercial reactors.– Hide quoted text –

Bullshit makes the flowers grow. Its almost true but meaningless.

Re: Uranium availability

## Re: Uranium availability

Enriched fuel before fueling is roughly 3.5% U235, and after its about 1% U235, and 1% fissile plutonium. Its simply a fuel multiplier. Reprocessing just once stretches the fuel resource over 50% with just LWRs. You can reprocess several times and get twice the fuel by spending more time in the enrichment cycle.

In CANDUs its much more dramatic...

.