

# RADIATING

# GAINS: URANIUM'S CORE ROLE IN THE ENERGY FUTURE



92



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**In 2014,** I wanted to travel to an exotic location – a region that offered incredible attractions for outdoor lovers, awe-inspiring nature sights, like lush forests and dramatic mountains, but also clear water beaches, a summer atmosphere, and even architectural beauty.

I was so surprised to find out after a thorough search that former Yugoslavian countries Slovenia and Croatia offered the visitor all of these things.

The real beauty of it all was that when I looked online, I saw that these weren't popular destinations yet. There were very few reviews, a tiny number of pictures, relatively small selection of hotel chains, and little publicity. It appears that these countries were suffering from a bad reputation that carried with them the days of the civil war in the '90s. This sort of misconception made it possible for such an amazing place to stay cheap and not full of tourists, like popular Spain, Greece, and Italy.

**Misconceptions are a blessing for people who do in-depth research into the facts.**



My wife and I flew to Slovenia and stayed at picturesque villages, enjoying outdoor attractions like canyoning (rappelling in waterfalls) in Triglav National Park, trekking and cycling, all for a fraction of the cost of France. Of course, we had to spend a magical night in Lake Bled.

Then we rode a rented BMW GS 1200 all throughout Croatia. The absolute high point of the trip was a little island by the name of Brac, and on it, a tiny beach town by the name of Bol. There aren't more than a few hotels there, and you won't find it in any top-10 list.

Croatia today reminds me a lot of what Thailand was 30 years ago: a country blessed with world-class beaches, an abundance of islands full of touristic potential, a great atmosphere, and tasty foods. Obviously, there are quite a few differences as well, but we all know how Thailand has become a world leader in tourism today because of their many assets.

**The “Croatia” of the energy market is, without a doubt, uranium.** This metal suffers from many misconceptions because of the fact that it is associated with nuclear threats and radioactive disasters that occurred in Chernobyl and Fukushima.



# RADIATING GAINS: URANIUM'S CORE ROLE IN THE ENERGY FUTURE

## How To View Troubles With A Long-Term Mindset

When the first cars came out at the turn of the 20th-century, there were many accidents because of faulty brakes, bad tires, and broken parts, and these included quite a few fatalities.



It's very fortunate that governments or activists did not stop the car industry or protest, because it would have slowed the improvement cycle, fine-tuning, learning from past mistakes, and becoming a much safer product, as a consequence of early imperfections. The same holds true for airplanes and just about any life-changing product or technology that has some risk involved with it.

We have come a long way from the days of these pioneers, but only because they were able to use their creativity and usher in an era of immense progress.



The free market and the competitive enterprise system work so well and create such enormous standards of living for people in the western world, and now in the emerging markets, because what industries do in order to stay on top and gain market share is look for cheaper and safer ways to deliver superior products.

Uranium mining is an industry on the rise, and just like Thailand was a country full of potential but very little practical touristic infrastructure 30 years ago, and today is considered a must-visit destination for beach lovers, uranium will be considered a must-have energy source in our future on this planet.

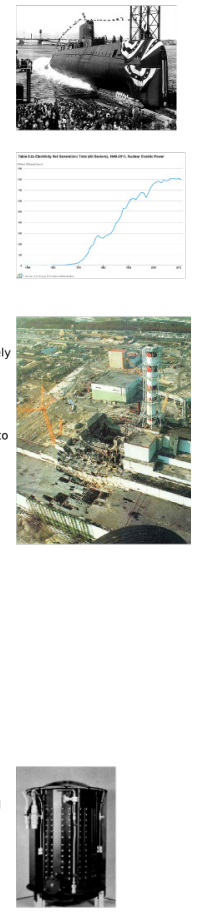
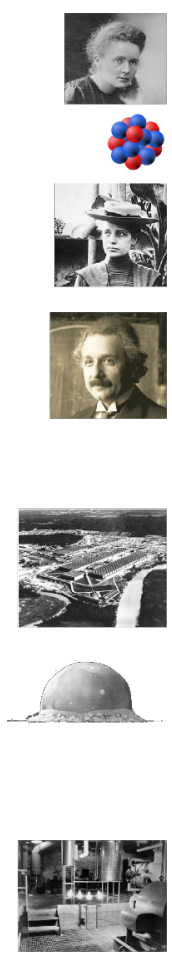
Uranium's history doesn't tell a story that goes back thousands of years, like copper, nickel, tin, or any of the ancient elements that have been in use for thousands of years. It tells, rather, the story of the early development of what will be a critical metal and energy source in the 21st-century.

# RADIATING GAINS: URANIUM'S CORE ROLE IN THE ENERGY FUTURE

## The Development of Nuclear Energy

- **1895** Roentgen discovers X-rays
- **1896** Becquerel discovers rays emitted spontaneously from uranium salts
- **1898** The Curies identify 2 radioactive nuclides, coin term "radioactive"
- **1899** Rutherford distinguishes alpha and beta radiation and discovers half-life
- **1909** Rutherford discovers that most mass is concentrated in a small nucleus
- **1920** Rutherford theorizes a "neutron"
- **1932** Chadwick identifies neutrons
- **1938** Hann and Strassman split uranium atoms with neutrons, Meitner and Frisch explain what's happening and name it "fission"
- **1939** Fermi and Szilard measure neutron multiplication, conclude that a nuclear chain reaction is possible
- **1939** Szilard, Wigner, and Teller convince Einstein to sign a letter warning Roosevelt of possibility of nuclear weapons
- **1939** Roosevelt authorizes creation of Advisory Committee on Uranium, begins US nuclear bomb effort (though not vigorously)
- **1942** Fermi achieves first nuclear chain reaction in a squash court at U. of Chicago. Manhattan project in full swing. Secret cities are built in Oak Ridge TN (to enrich uranium), Hanford WA (to produce plutonium), and Los Alamos NM (to design and assemble bomb)
- **July 1945** The world's first nuclear weapon test, the Trinity shot, is successful
- **Aug 6 & 9, 1945** Atomic bombs Little Boy and Fat Man dropped on Japanese cities, Hiroshima and Nagasaki. Up to 240,000 people died.
- **Aug 15, 1945** Japan surrenders unconditionally, ending WWII.
- **1951** EBR-1 reactor is the first to generate electricity in Arco, ID
- **1953** Eisenhower gives Atoms for Peace speech, launching civilian program

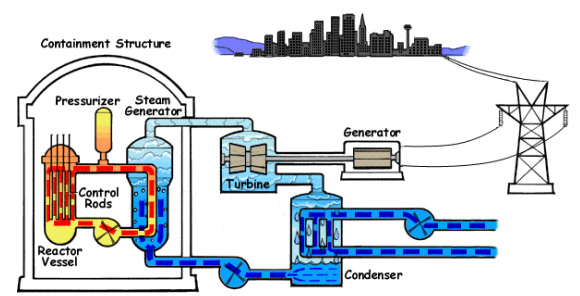
- **1954** USS Nautilus launches, the first nuclear-powered submarine
- **1954** Obninsk reactor in the Soviet Union becomes the first commercial nuclear power plant
- **1957** Shippingport reactor begins operation, first commercial nuclear power
- **1974** French Prime Minister Messmer launches huge nuclear power program in response to oil crisis. In 2004, 75% of France's electricity is nuclear
- **1979** Three Mile Island reactor suffers a partial meltdown. Radiation largely contained
- **1986** EBR-II reactor demonstrates that advanced, sodium cooled reactors can passively shut down without backup systems
- **1986** Chernobyl reactor suffers a large power excursion resulting in the release of large amounts of radiation. 50+ firefighters die, up to 4000 civilians estimated to die of early cancer
- **1994** Megatons to Megawatts program started, turns 20,000 nuclear weapons into electricity. By 2000, ~10% of US electricity comes from dismantled Russian warheads
- **2004** After decades of electricity generation with no deaths in the US, a Nuclear Renaissance discussed, with talks of more reactor builds to offset carbon emissions
- **2011** 4 reactors at Fukushima Daiichi lose backup generators due to tsunami and suffer core meltdowns, hydrogen explosions. Radiation release estimated 10-30% of Chernobyl. Zero people's health affected by dose, but land is evacuated
- **2013** Climate guru James Hansen publishes paper claiming nuclear has saved 1.8 million lives total (including worst-case estimates for all accidents) by offsetting air-pollution related deaths
- **2013** Voyager I enters interstellar space after traveling the solar system for 36 years. It is powered by a Plutonium-238 radioisotopic thermal generator



## Uranium Energy Today

About 12% of the world's electricity is generated from uranium in nuclear reactors – the same amount that powered the entire planet in 1960.

It comes from some 430 nuclear reactors, with a capacity of about 375,000 megawatts, produced at 31 different countries. Over 70 more reactors are under construction, and another 170 are planned.



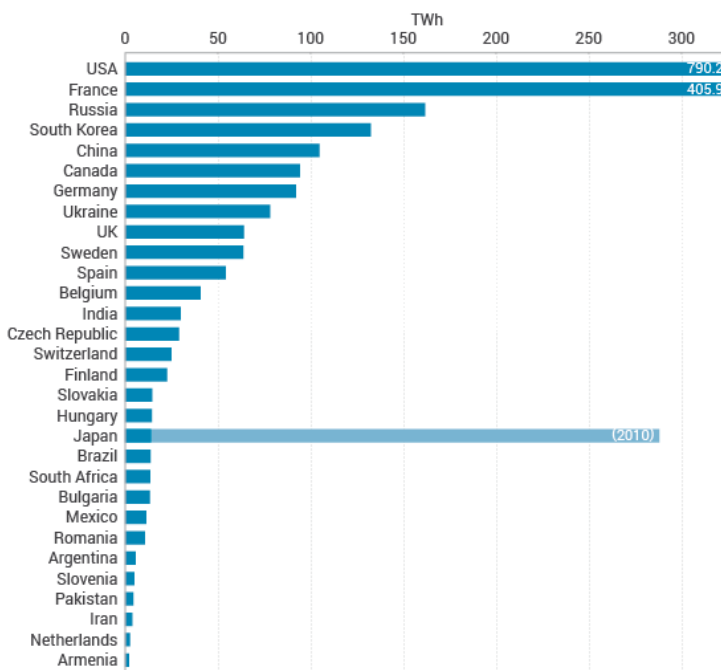
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Belgium, Bulgaria, Czech Republic, Finland, France, Hungary, Japan, South Korea, Slovakia, Slovenia, Sweden, Switzerland, and Ukraine all get 30% or more of their electricity from nuclear reactors.

The U.S has 100 reactors operating, supplying 20% of its electricity.

France receives 75% of its electricity from uranium.

Nuclear Generation by Country 2013



Source: IAEA PRIS Database

Australia's resources are almost 33% of the world's total, Kazakhstan's are 12%, and Canada's and Russia's are each 9%.

Other countries have significant uranium resources. Apart from the ones mentioned, there's also Brazil, China, Mongolia, Namibia, Niger, South Africa, the U.S.A., Ukraine, and Uzbekistan. Kazakhstan is the top uranium producer, along with Canada and then Australia as the largest producers of uranium to global markets. Uranium is sold strictly to countries that are signatories of the Non-Proliferation Treaty, and which permit inspectors to check that it is used only for peaceful uses.

## Why is Uranium an Important Part of the Future?

1. It emits nothing into the environment except hot water. The spent nuclear fuel can be disposed of without affecting the environment in any damaging way (nuclear waste). The reactors are safe, as well. Former NASA scientist James Hansen published a paper demonstrating that nuclear energy has saved 1.8 million lives in its history by displacing air pollution.
2. Many countries can approach energy self-sufficiency with it. Being oil-dependent is a major security challenge for many reasons. Uranium can reduce oil demands radically, thus contain geopolitical turmoil and too much dependency on fossil fuels. Many governments are seeing this as a major step in the right direction, since they aren't blessed with oil reserves.

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### 3. It's sustainable:

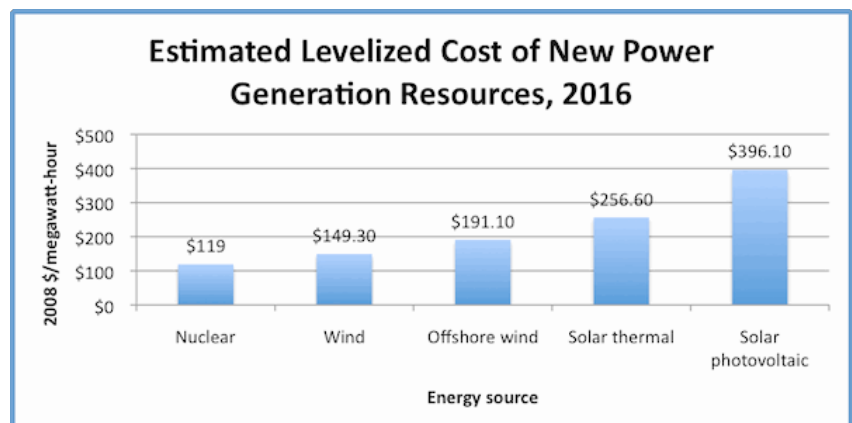
Material	Energy Density (MJ/kg)	100W light bulb time (1kg)
Wood	10	1.2 days
Ethanol	26.8	3.1 days
Coal	32.5	3.8 days
Crude oil	41.9	4.8 days
Diesel	45.8	5.3 days
Natural Uranium (LWR)	$5.7 \times 10^5$	182 years
Reactor Grade Uranium (LWR)	$3.7 \times 10^6$	1,171 years
Natural Uranium (breeder)	$8.1 \times 10^7$	25,700 years
Thorium (breeder)	$7.9 \times 10^7$	25,300 years

**4. The difference between coal-fired and nuclear power stations also affects their financial bottom line.** The cost of fuel for a nuclear power station is much less than for a coal-fired power station, even enough to offset the higher capital cost of constructing a nuclear plant. Coal deals with negative headwinds and the prospect of economic constraints on its emissions, so nuclear energy looks increasingly attractive.

### The Uranium Opportunity

Green energy sources, such as solar, wind, and hydropower, aren't capable of carrying the load the world needs. They're too expensive and they simply don't have the efficiency to power the planet. Nuclear power is necessary. It's cheaper than alternative fuel sources, and it emits no carbon.

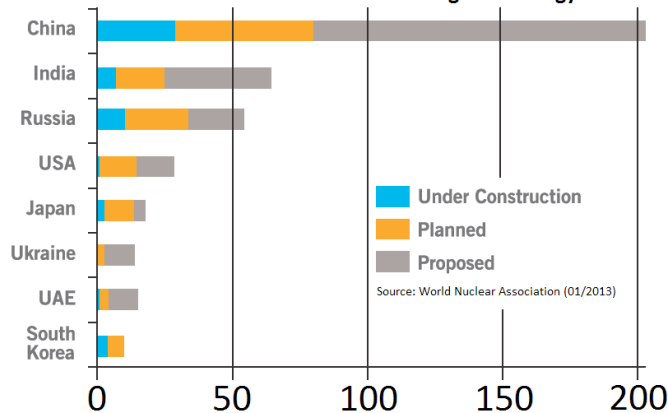
One of biggest sources of future demand comes from none other than China. According to Beijing's most recent five-year plan, China will build 40 nuclear power



# RADIATING GAINS: URANIUM'S CORE ROLE IN THE ENERGY FUTURE

plants in the next five years. Currently, the country already has 17 reactors in operation, another 28 under construction, and more than 100 planned. That's just the start. In all, Beijing is spending a whopping \$2.4 trillion to expand its nuclear power generation by 6,600%. India is in a similar situation. It has pledged to grow its nuclear power capacity from 5,000 megawatts to 63,000 megawatts by 2030. Russia aims to boost the share of electricity it gets from nuclear power to 25% in that time, up from 16% now. Even Japan is restarting reactors.

New nuclear reactors on the horizon to meet global energy demand



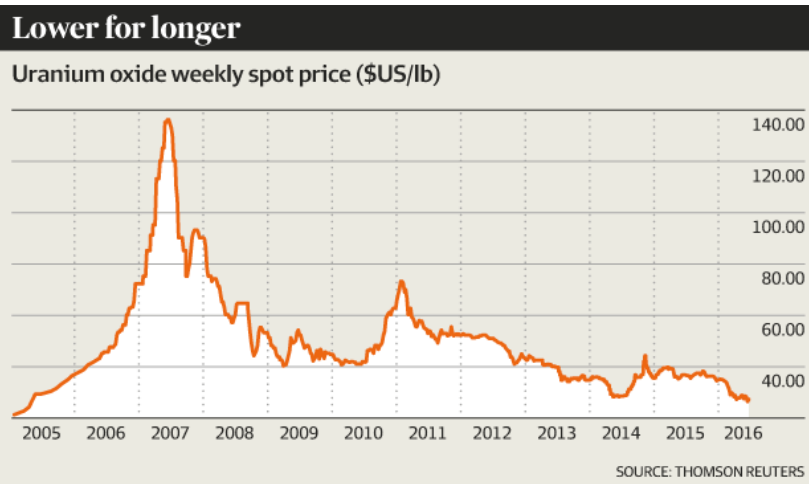
**Industry consulting group UXC Consulting believes uranium demand will grow 61% by 2035 to 238 million pounds, up from 173 million pounds in 2014.**

Mined supply of uranium will struggle to meet market requirements because of rising demand. Low uranium prices have delayed the opening of new mines. This will cause a supply deficit to happen by 2021, if not sooner. This should begin to have an impact on price negotiations in 2017 because utilities tend to secure supplies three to four years prior to actual use.

The five-year bear market in uranium prices was devastating for producers.

Mining the metal became unprofitable, leading to mine closures, and even bankruptcies. Several years ago, there were 500 companies mining uranium. Today, there are just 20. The uranium crash removed 96% of suppliers from the market. 80% of the world's uranium supply is produced by only 10 mines. Future global supply is dependent on just five newly-proposed projects.

2016 marks a critical turning point for the industry. This is the first year that demand will actually exceed supplies, creating a 60,000-tonne shortfall by 2018. There's not enough supply to meet that demand.



At Wealth Research Group, we are actively identifying those few select companies that are going to be the next fortune creators. When the uranium bull makes his return to center stage, we will alert you, as our member, immediately so we can position ourselves months before the opportunity reaches the screen of less sophisticated investors and the general public.



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