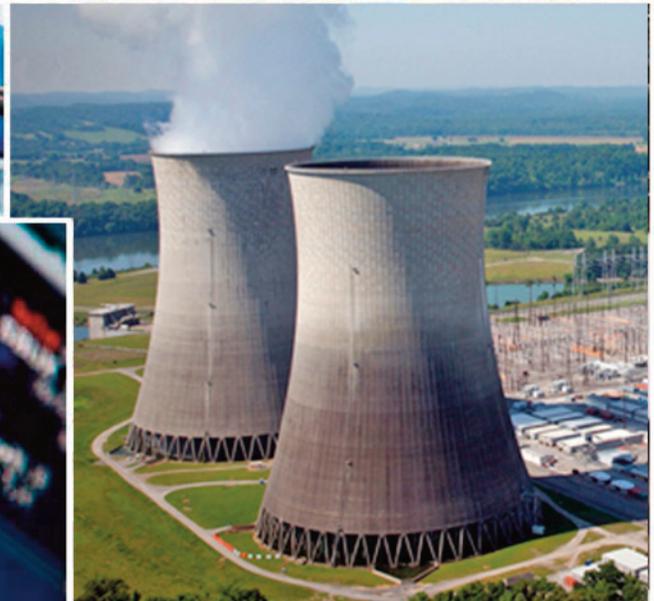


A Gold Newsletter And Mercenary Geologist  
Joint Report on Uranium

# The Path To Enrichment

The next big boom in uranium,  
and how you can profit from it.

By Mickey Fulp and Brien Lundin



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**A** lot of money has been made by investing in junior uranium stocks. Unfortunately, not so much has been made recently.

But that's about to change, according to a mounting pile of evidence.

The uranium market has always had compelling fundamentals. In fact, the supply/demand argument for higher prices has been irrefutable for years — it's just the timing that has been in question.

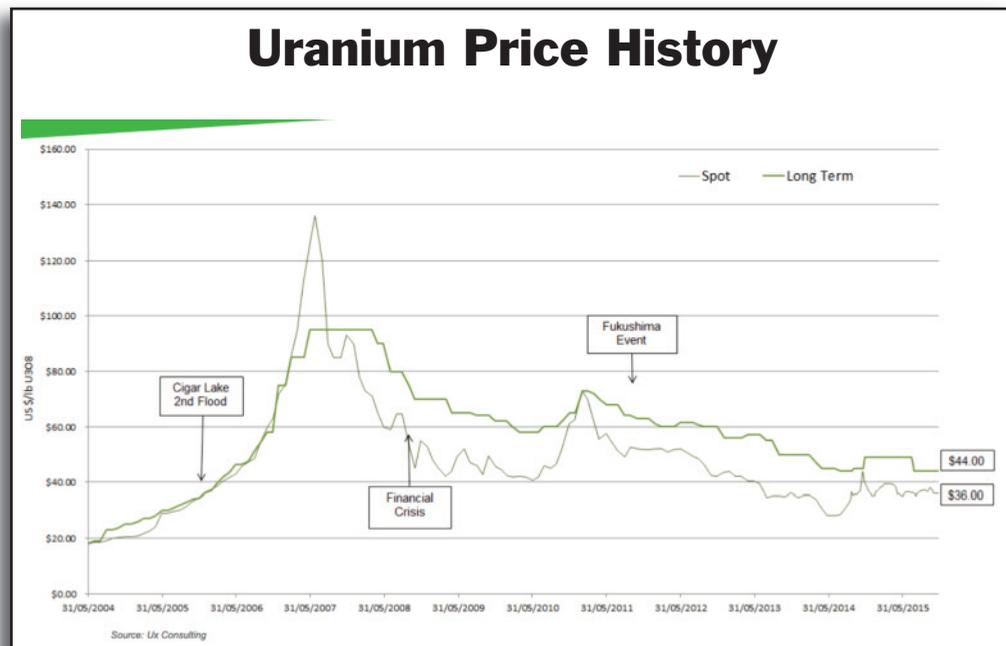
But it's not like those powerful fundamentals haven't impacted the price before. In 2007, for example, the price briefly hit \$140/pound, or nearly quadruple today's levels. But then came the global financial crisis to toss the prices of all commodities into the dumpster.

Once we got past that train wreck and the global monetary reflation kicked in, the fundamentals for uranium began to kick in once more. The price of uranium was steadily climbing back

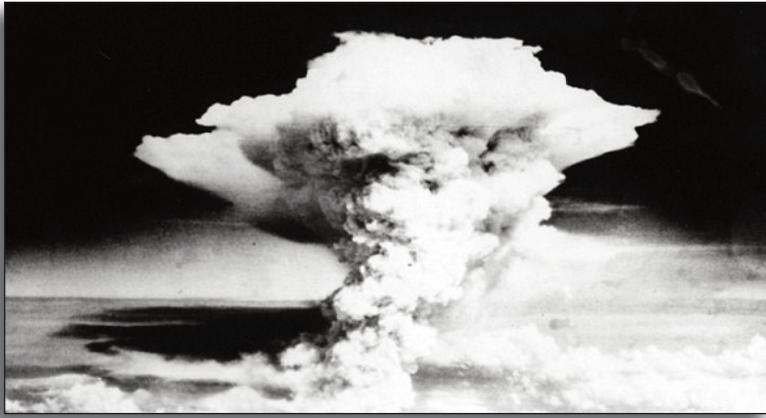
up...until the Fukushima accident sent the price reeling once again.

That's an unfortunate run of bad luck, to be sure. But the Fukushima accident was specific to the uranium market. And, as you are about to see in this report, the lesson from that event is that the benefits of nuclear power make it hard, if not impossible, to replace this crucial source of energy.

*(Continued...)*



Source: Ux Consulting, Uranium Energy Corp.



The mushroom cloud from the bomb dropped on Hiroshima, Japan.

And today, once again, the powerful and irreversible supply/demand fundamentals are about to come into play. The result, according to our latest research as well as that of a number of highly respected analysts, will be the return of a global uranium supply deficit and substantially higher prices just ahead.

And these developments promise to bring a re-enactment of the fortune-making run of a decade ago, when junior uranium mining companies began their big run, eventually multiplying in price.

Over the next few pages, we'll explain this extraordinary situation, and highlight some of the most aggressive and exciting junior uranium plays out there — companies that have demonstrated by their participation in the most recent New Orleans Investment Conference that they have smart management, solid resources and important stories to tell.

But first, a little background...

## URANIUM 101

Named after the planet Uranus, uranium is the heaviest of the naturally occurring elements. Once considered relatively rare, uranium is actually quite abundant. In fact, the Earth's crust contains as much uranium as it does tin, zinc or molybdenum. You can find traces of it almost everywhere, including granite (4 ppm U), sedimentary rock (2 ppm U) and even seawater (0.003 ppm U).

The key, of course, is finding concentrations of sufficient size and grade for economic extraction. And that is rare indeed.

“Natural uranium” is composed primarily of two isotopes, the more abundant U-238 (99.3%) and the more valuable U-235 (0.7%). U-235 is more valuable because its atomic structure makes it a prime candidate for the fission process that powers nuclear reactors and gives atomic weapons their awesome firepower.

## A BRIEF HISTORY OF URANIUM

As a commodity, the uranium story now and in the future revolves around the nuclear power industry, which consumes the vast majority of annual production. However, to understand the story completely, its seminal role in the development and proliferation of the nuclear weapons has to be taken into account.

Uranium's potential as a power source was not apparent when Martin Klaproth, a German chemist, discovered it in 1789. Up until the late 19th century, it was primarily used as a yellow dye. Towards the close of that century, however, a series of discoveries made in conjunction with the advance of modern atomic theory opened scientists' eyes to the ability of sub-atomic particles to generate massive amounts of energy.

The big breakthrough came in 1905, when Einstein put forth his Theory of Relativity, which established an equivalency between mass and energy. Einstein's theory paved the way for the creation of the atomic bomb by planting the notion that mass could be converted to energy.

## BUILDING THE BOMB

Over the next three decades, scientists made steady progress toward harnessing the power of the atom. World War II accelerated these efforts, as Germans and the Allies engaged in a race to build the first super-weapon.

The Germans made the most progress at first. Their scientists built on the work of U.S.-based scientist Enrico Fermi, who in the mid- and late-

1930s had successfully created both heavier, man-made elements (artificial radionuclides) and lighter, naturally-occurring elements by bombarding uranium with neutrons.

In 1939, Otto Hahn and Fritz Stassman demonstrated that the lighter elements produced in Fermi's experiments were, in fact, a mixture of barium and several other elements with atomic masses roughly half the mass of a U atom. Their findings proved definitively that atoms could be split.

A team led by Niels Bohr, one of chemistry's giants, advanced fission theory still further by accurately predicting and measuring the amount of energy released by splitting a single uranium atom. More importantly, his team hypothesized that stray neutrons emitted by this process could spark a self-perpetuating "chain reaction" that would multiply exponentially the energy released by fission.

The Allies, led by Rudolf Peierls' team in Great Britain, were perhaps a step behind the Germans during this period. But once World War II began in earnest, the defection of German scientists like Otto Frisch, who had a hand in many of the aforementioned discoveries, gave them a decided edge.

In 1940, Peierls and Frisch released a uranium memorandum, which posited that a bomb could be built by initiating a chain reaction within a concentrated, five-kilogram ball of U-235. Though it would be another five years before a bomb rolled off the assembly line, this memo provided the Allies with the road map to get there.

Over the course of the bomb's development, scientists made parallel discoveries about uranium's usefulness as a power source. Indeed, prior to its entry into the war in late 1941, America focused more on the commercial power applications of uranium than on its weapon-making potential. The bombing of Pearl Harbor changed this focus overnight, and by early 1942, America had initiated the Manhattan Project, an all-out, highly classified effort to build the first atomic bomb.

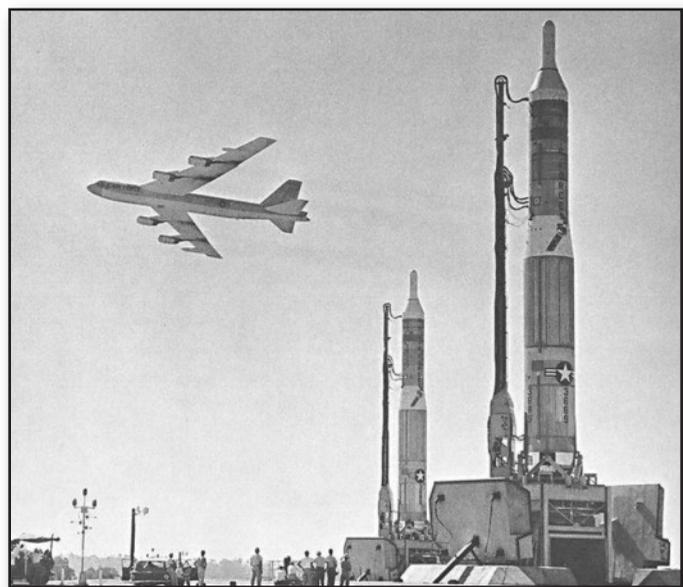
The Manhattan Project had one overriding

goal: to produce enough fissile material to create a weapon. And while the British, with a big assist from German and French scientists, had constructed much of the theoretical framework for the bomb, only the Americans had the industrial and economic firepower to make it a reality. In the end, a war-ravaged Germany could not compete with the resources the U.S. could bring to this arms race.

Despite the advantages America afforded the allies, producing a bomb proved a daunting task. Using uranium drawn primarily from mines in the Belgian Congo, the Americans, British and Canadians used electromagnetic separation and gaseous diffusion processes to generate weapons-grade concentrations of the two most promising fissile elements — Uranium-235 and Plutonium-239. This latter element is an artificial radionuclide created when U-238 absorbs two additional protons during the fission process.

By the spring of 1945, the Manhattan Project had produced enough P-239 and highly-enriched U-235 for Robert Oppenheimer and his team in Los Alamos, New Mexico to build and test a bomb. On July 16, 1945, they successfully detonated a plutonium device at Trinity, New Mexico. The explosion ushered the world into the Atomic Age.

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The Cold War fueled uranium exploration and production.

Soon thereafter, President Harry Truman, in an attempt to bring the war with Japan to an early close, ordered U.S. armed forces to drop atomic bombs on two Japanese cities. On August 6, 1945, the Enola Gay dropped the first bomb, made of U-235, on Hiroshima. Three days later, a second, plutonium-based bomb destroyed much of Nagasaki. The horrific destruction and loss of life the bombs inflicted had their intended effect. On August 10, 1945, the Japanese surrendered.

## THE COLD WAR WEAPONS RACE

Russia was working on its own nuclear weapons during World War II, but was still a couple of years away from completion when it received word of the bomb at Hiroshima. The news spurred Russia to redouble its efforts. In doing so, it leaned heavily on the expertise of German scientists acquired after the Russian occupation of Berlin.

### IN THE WAKE OF A TSUNAMI

On March 11, 2011 a 9.0 earthquake — the fourth largest in recorded history — struck northeastern Japan. The effects were horrifying to watch in action and in retrospect, as the death toll of the earthquake and resulting tsunami rose to nearly 16,000 souls.

In the wake of such a human disaster, it seems distasteful to focus on how the tragedy affected the uranium market. But there is no denying that, from the standpoint of the nuclear industry, the effects were also devastating.

As we all know, the tsunami knocked out power to nuclear power plants at Fukushima-Daiichi, and also crippled back-up generators, resulting in the failure of cooling systems. Over the following months, all of Japan's nuclear reactors are brought offline.

But it didn't take long for the repercussions to be felt in the investment markets. Uranium stocks crashed en masse over the next few market sessions following the disaster. And for good reason: Over the next three years, the spot price of uranium fell from a high of \$73 to a low of \$28/lb, a loss of over 70%. Meanwhile the term contract price dropped from \$75 to \$40/lb.

The uranium price crash was directly related to the decrease in demand from Japan. Before the incident, Japan used about 12% of the world's uranium in its 55 reactors and was the third largest consumer in the world behind the USA and France.

For the past three years, the 48 remaining operable reactors have been shuttered for safety in-

spection, modifications, and new permitting. Five have been retired. Two reactors were restarted by November 2015, and two more should be online by the end of the year. An additional 19 have applied for restart approval, and it is generally thought that about 25 reactors will eventually generate electricity.

The effect of the Japanese shutdowns was striking:

- In 2010, worldwide nuclear power plant demand was 167 million pounds  $U_3O_8$ . There were 142 million pounds mined and 23 million pounds of secondary supply from conversion, enrichment and government stockpile sales, resulting in a 2-million-pound deficit.
- In 2014, demand was 175 million pounds. There were 148 million pounds mined and 43 million pounds of secondary supply to the market, resulting in a 16-million-pound surplus.

According to the World Nuclear Association, Japan consumed on average nearly 22 million pounds per year from 2007 to 2010. Germany also shut down eight of its 17 reactors in the wake of Fukushima, and that cut its annual demand by half.

The removal of demand from Japan and, to a lesser extent, Germany from 2012-2015 has been devastating to the uranium market. It has also been devastating to the Japanese economy, with an additional \$40 billion per year in imported fossil fuel costs.

By 1947, it successfully tested its own weapon. The nuclear build-up that defined the Cold War between the United States and Russia had officially begun.

The weapons race drove uranium demand between 1945 and 1969, a period during which the U.S. government was by far its biggest customer. In order to prime the supply pump, the Atomic Energy Commission kept prices artificially high so producers could earn an adequate return on their investment.

Beginning in 1948, miners delivered their uranium to various buying stations across the country, at prices that averaged around \$45/lb. in current dollars. By 1969, the industry had produced 337,000 tonnes of uranium, only 4% of which had been sold to commercial power plants.

### **NUCLEAR POWER COMES INTO ITS OWN**

Although nuclear power plants had been generating electricity since the 1950s, it wasn't until the early 1970s that commercial nuclear power surpassed weapons in uranium consumption. The oil crises during that decade greatly accelerated interest in nuclear power as a clean, affordable energy source. At one point, the United States planned to build 250 nuclear power plants. (By way of comparison, it only has 103 currently in operation.)

Then the accident at Three Mile Island, though largely contained, put the brakes on domestic interest in nuclear energy. Subsequently, a new power plant was not built and commissioned in the U.S. for three decades. Recently, a new power plant was commissioned in Tennessee and four more are under construction in Georgia and South Carolina.

Today, the world has 437 nuclear plants operating in 30 countries, with an aggregate production capacity of 372 Gwe (372,000 Mwe). Nuclear power plants provide 13.4% of the world's electricity, and 13 countries rely on nuclear energy for at least one-quarter of their electricity.

Today, commercial nuclear power is the overwhelming consumer of the world's uranium sup-

ply with the United States using nearly 30% annually.

### **THE FUEL CYCLE**

The opportunities that define uranium's current supply-demand dynamics emanate from the way it moves through the fuel cycle, a path that takes uranium from ore in the ground to power-generating fuel to depleted radioactive waste. Because a basic knowledge of this process is critical to understanding the investment case for uranium, a brief overview is in order.

Let's take the case of a large, 1,000 Mwe light-water reactor (LWR), which can generate enough electricity to power a city of one million. The fuel needed to generate all that electricity can come from a variety of sources (more on these later), but for the sake of this example, we will assume that the power company that owns the LWR fills its annual fuel requirements entirely by purchasing  $U_3O_8$  from miners.

### **MINING AND MILLING**

Our 1,000 MWe LWR needs around 200 tonnes of  $U_3O_8$  annually. Producers receiving an order for this amount of uranium oxide will extract it from either an open-pit or an underground mine. In most cases, this ore is shipped to a mill, which crushes it and then leaches out the  $U_3O_8$  using sulfuric acid. When the resulting concentrate dries, it forms a khaki-colored powder known as yellowcake.

Even in concentrated form, yellowcake retains its naturally occurring levels of isotope composition — 99.3% U-238 and 0.7% U-235. Since the fuel assemblies that power LWRs require U-235 levels between 3.5% and 5.0%, the yellowcake leaving the mill must undergo a series of industrial processes to become suitable for power generation.

### **CONVERSION**

The first of these is conversion, which turns yellowcake powder into a gaseous form known as uranium hexafluoride ( $UF_6$ ) or "hex." Conversion takes place at a relative handful of plants

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The powerful growth of nuclear power worldwide has continued despite the Fukushima disaster.

scattered across the globe. This set-up is the same for the enrichment and fuel fabrication steps discussed below, allowing the world's nuclear powers to keep close tabs on inventory and making it more difficult for terrorists and rogue states to get their hands on nuclear fuel and technologies.

### ENRICHMENT

Because “hex” exists in liquid form at room temperature and pressure, it can be transported in steel cylinders to one of the world's enrichment plants. There, it is converted back into a gas and run through a long series of gaseous centrifuges or diffusion units, which gradually separate the U-235 from the more-prevalent U-238.

This process removes around 85% of the U-238 from the final “product,” a quantity of UF<sub>6</sub> enriched to 3.5% U-235. By contrast, the “by-product” or “tails” contain less than 0.25% U-235.

### FUEL FABRICATION

The enrichment plant will then ship its finished product to a fuel fabrication plant. There, the enriched UF<sub>6</sub> is baked into small, ceramic pellets of uranium dioxide (UO<sub>2</sub>). These pellets are then packed into four-meter-long zirconium alloy tubes, which are then bundled into the fuel assemblies that power the reactor.

### AT THE REACTOR

A light-water reactor contains several hundred

such fuel assemblies. Once loaded in, these assemblies undergo a fission process that is a less-intense, more-controlled version of the process that causes a nuclear explosion.

Once the U-235 atoms within the fuel rods begin to split, they emit neutrons, other radioactive elements, rays and enormous amounts of heat. The particles not only split other U-235 atoms, they also convert a portion of the U-238 into plutonium. Half of this plutonium also fissions and, in doing so,

provides about one-third of the reactor's energy output.

As it would in a coal-fired plant, the heat generated in a nuclear plant produces steam, which turns the turbines that generate electricity — about seven billion kilowatt hours worth annually. In the process, a reactor of this size will consume about one-third of the roughly 75 tonnes of fuel in its core.

Once removed, the spent fuel rods continue to emit a great deal of heat and radioactivity. To dissipate that heat and to facilitate future handling, the assemblies are temporarily stored in on-site storage tanks, where they await either reprocessing or final disposal.

### IRREVERSIBLE DEMAND GROWTH

Drawing back from the fuel cycle, we see a demand environment for uranium driven almost exclusively by the demand for nuclear power. The end of the Cold War 25 years ago sent the demand for nuclear weaponry (except for a few well-known rogue states) into steep decline. That said, Cold War weapon stockpiles continue to play a critical role on the supply-side of the equation.

As we noted, nuclear power plants currently provide about 13.4% of the world's electricity. Coal (40.8%), natural gas (21.3%) and hydro (16.2%) are responsible for most of the balance of global baseload electricity, with renewable en-

ergy sources like solar and wind power making token contributions.

Because nuclear plants take a long time to get permitted and built (between five to 10 years, depending on the country) and because they produce power and consume fuel at relatively predictable rates, the growth of the nuclear industry is both methodical and relatively easy to predict.

And for the same reasons, once the market gets headed in one direction it is — like a massive oil tanker — hard to change course.

That is why, despite the setback of the Fukushima disaster, the upward slope of global uranium demand remains largely unchanged. According to the World Nuclear Association, 66 nuclear reactors are now under construction worldwide. And that's just the start: Another 484 are in planning or being proposed.

While many naysayers focus on Germany and Japan moving away from nuclear energy, China is leading the world in the other direction. It has 26 reactors currently under construction, with more to come. The current five-year plan calls for the nation to multiply its nuclear-sourced electrical production more than six-fold, from 12 GWe currently to about 75 GWe in 2020.

The country plans on having 200 GWe in capacity by 2030, so this is not a short-term trend.

The biggest issue to weigh on the uranium market recently was the Fukushima disaster, and Japan's supposed abandonment of nuclear power in its wake.

But the reality is 180 degrees from the public perception: Today, there are four more operable nuclear power plants worldwide than before Fukushima, and more reactors under construction or planned as well.

Just since the Fukushima event, the UK has announced it will build five new reactors, Saudi Arabia has announced 16 reactors,

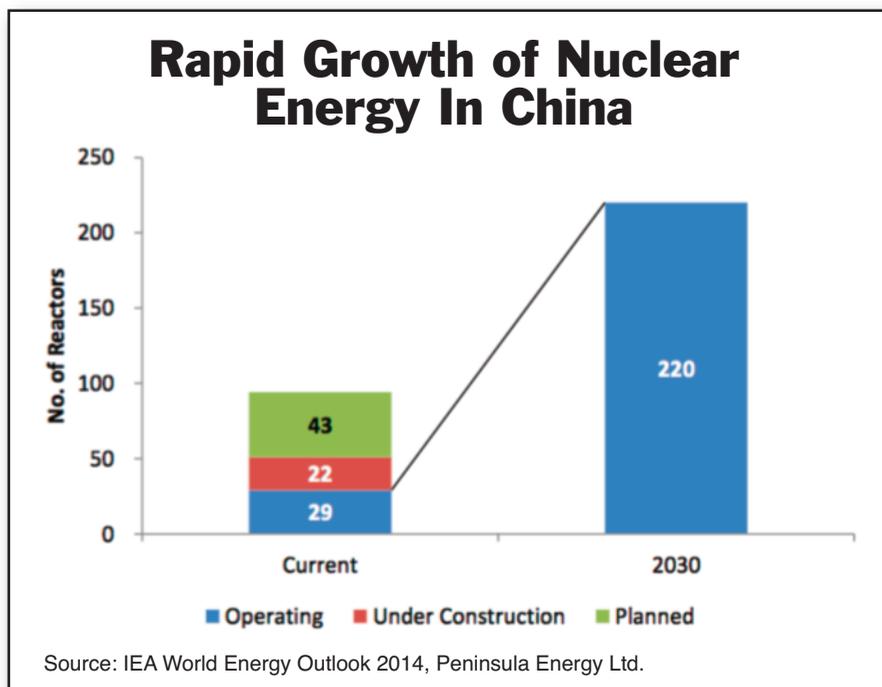
Brazil has begun construction on one reactor and plans for an additional eight, the U.S. has recently commissioned and is constructing another four new nuclear plants (the first in 34 years), and Russia, China and India have all pronounced their support for nuclear energy, with their plans contributing half of the projected new construction.

According to the World Nuclear Association, there are 66 nuclear power plants under construction and another 166 are currently planned, i.e., approved with funding completed or committed. The world averages one new reactor coming on-line every two months.

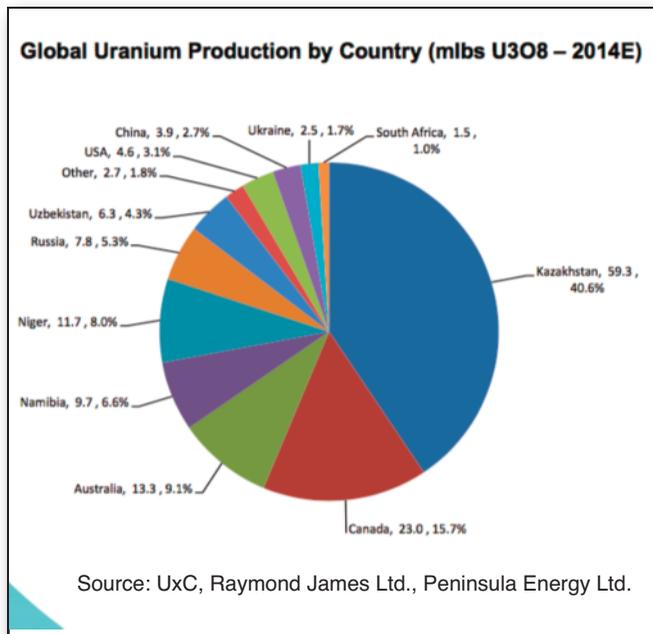
The ongoing nuclear build-out will result in increasing demand for yellowcake, with annualized growth projected at 3%-4%.

And it is in Japan, especially, that the reality is at odds with perception. While most of the public still believes that Japan has permanently terminated its nuclear energy industry, the nation is in the process of restarting the bulk of its fleet of nuclear reactors. Two reactors were restarted by late-summer 2015, another two have been approved for restart, and safety inspections and per-

*(Continued...)*



The Chinese government plans to build seven new reactors per year to 2020, and reach 220 operating reactors by 2030.



Much of the world's uranium production comes from the countries where the security of future production is questionable.

mitting are in progress on another 12-14 reactors.

Add it all up, and world-wide demand is projected to grow from around 200 million pounds U<sub>3</sub>O<sub>8</sub> currently to 226 million pounds by 2020. By 2030, demand is expected to reach 280 million pounds.

In short, the steep trajectory of global uranium demand has, if anything, only grown steeper after Fukushima. But while demand is growing relentlessly, the story is much different on the supply side of the equation.

### CONSTRAINED SUPPLY GROWTH

The argument for uranium investing encompasses more than the demand-side case — the supply case is also quite compelling.

Consider the accompanying chart of global

## URANIUM DEPOSIT TYPES

Mineable uranium occurs in a number of geologic settings, including igneous, hydrothermal and sedimentary structures. Of these, unconformity-related deposits host many of the world's most prolific deposits. An unconformity is a boundary separating two or more rocks of markedly different ages. Uranium mineralization usually lies below the unconformity in faulted and brecciated metasedimentary host rock.

These deposit types generate all of Canada's production and account for 20% of Australia's known resources. And while most uranium deposits average between 0.1% and 2.0% U<sub>3</sub>O<sub>8</sub>, unconformity-related ore grades can be exceedingly rich — the deposit at the proposed Cigar Lake mine in northern Saskatchewan averages 20% U<sub>3</sub>O<sub>8</sub>, including some areas with grades in excess of 50%.

Iron Oxide Copper Gold deposits lie on the other end of the scale. Though capable of hosting massive resources, their ore grades are typically quite low. The uranium remains economic to mine because it is viewed as a by-product of the vast quantities of copper and gold these deposits

can produce.

Australia's Olympic Dam is the prototypical IOCG. Even with uranium grades that range between 0.04% to 0.08% U<sub>3</sub>O<sub>8</sub>, it still contains one of the world's largest uranium deposits and accounts for two-thirds of Australia's known reserves.

Sandstone deposits host 18% of all known uranium reserves. Though typically higher in grade than IOCG deposits, most sandstone-hosted deposits contain ore bodies of low- to medium-grade (0.05% to 0.4% U<sub>3</sub>O<sub>8</sub>) and small- to medium-size (up to 50,000t U<sub>3</sub>O<sub>8</sub> at a maximum). Producers initially mined and milled these deposit types using the conventional methods described in our discussion of the fuel cycle, but are now more likely to use cheaper in situ recovery methods.

Geologists have also encountered uranium in surficial, volcanic, intrusive, metamorphic and quartz-pebble conglomerate deposits. Though less common than the above-mentioned structures, all are capable of hosting ore-grade mineralization.

uranium production by country. A quick perusal gives one pause with respect to the certainty and security of future Western World supplies of  $U_3O_8$ :

- 62% of the world's uranium supply came from these six countries: Kazakhstan, Niger, Russia, Uzbekistan, China, and Ukraine.
- These six of the top ten producing countries have corrupt and/or unstable governments and must be considered unfriendly to the USA.
- Kazakhstan alone produced 41% of the world's uranium.
- In 2014 the United States consumed 51 million pounds of yellowcake yet produced only five million pounds, less than 10% of its annual demand.

Analyst consensus projects a significant deficit for mined uranium and secondary supplies in the mid- to long-term. Opinions differ as to when the deficit will commence but are generally in the range of 2017-2021.

The sources of new supply are problematic because conventional underground uranium mining and milling requires significantly higher prices to be economic, generally estimated at \$65-\$80/lb. Most lower-cost mines, either in-situ recovery (ISR) or open-pit heap leach, are around break-even at current prices.

The logical conclusion is that uranium prices must nearly double to meet projected demand by the later part of this decade.

Meanwhile, sovereign stockpiles are dwindling...higher cost mines continue to cut production or are being shuttered...major new projects have been and will continue to be delayed or shelved...and the Russia-USA supply deal thru 2023 is just half of the amount supplied by downgrading of weapons-grade to reactor-grade  $U_3O_8$  from 1993-2013.

So where will new uranium supply come from to meet the growing demand?

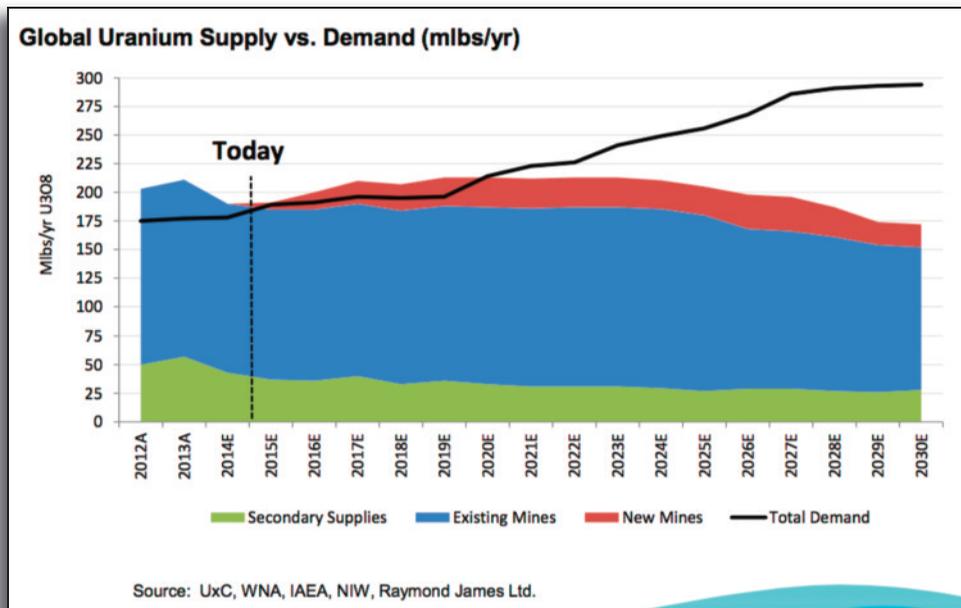
Mined uranium and secondary supplies will both be parts of the solution. Recycling and re-processing are increasing every year but they

still produce only a minor amount of the world's total uranium supply. Enrichment underfeeding will continue to contribute to supplies. Mining, however, will remain the major contributor to future supply and prices must increase for new mines to be developed and come on stream.

That said, every major established uranium district in the world faces unique challenges that make new developments problematic in terms of economics, sustainability, and/or timing to production:

- Since the uranium renaissance of the mid-2000s, increased demand has been mostly met by Kazakhstan, which has gone from 11.5 million to 61.1 million pounds of  $U_3O_8$  production over the past decade. However, its shallow and high-grade ISR mines in the north are being depleted and production is increasingly moving to southern districts that are deeper, lower-grade and more difficult to recover. Therefore, there are doubts if Kazakhstan's current production level is sustainable.
- Canada's Athabasca Basin boasts the world's largest and highest grade uranium mines. Exploration success continues in the Basin, but these deposits require high capital expenditures and very long lead times through discovery, development and mining (now estimated at 15-20 years).
- There are world-class sandstone uranium mines and development projects in Niger, but the country is plagued by a corrupt bureaucracy and unstable government. In addition, its mines have been repeatedly targeted in civil wars and Islamic terror attacks over the past decade.
- The open-pit mines in Namibia are very low-grade, unprofitable at current prices and have water supply issues in the world's second driest desert. Projects require desalinization plants on the coast with pipelines to mine sites in the country's interior, entailing high capital expenditures.
- The western United States is the world's second-most endowed uranium province.

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A large and growing uranium supply deficit will emerge over the next few years. Well in advance, utilities will fight to secure long-term supplies.

Two sandstone uranium deposits in the Grants Mineral Belt of New Mexico contain giant, high-grade resources, but will be underground mines that require higher prices for financing and development.

- Smaller, moderate-grade sandstone-hosted deposits occur in Utah, Colorado and Wyoming, but again are relatively high-cost underground mines. High-grade resources occur in breccia pipes of the Northern Arizona Strip, but most of this prospective ground has been removed from mineral entry by the U.S. government. A huge, high-grade sandstone deposit in Virginia is sub-

ject to a state government moratorium on development.

- ISR mines in established districts in Wyoming and South Texas are low capex and low cost, with relatively fast timelines to permitting, development and production. However, these are small sandstone uranium deposits, generally in the range of 1-10 million pounds, and require sequential well-field development and ongoing sustaining capital to maintain production. Larger (20 to 100 million pound) ISR-amenable deposits in New Mexico are burdened by

long lead times to permitting.

- Unconformity deposits in the Northern Territory of Australia are high-grade giants, but face geopolitical hurdles stemming from ongoing governmental and aboriginal opposition to the mining of uranium, and have no current timeframe for development.

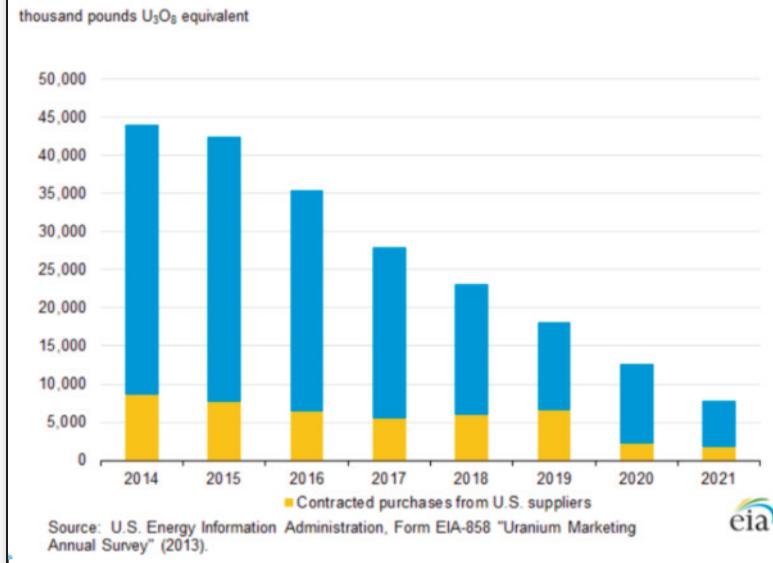
As you can see, the discovery, development and operation of new uranium mines is a difficult proposition. It has always been problematical for uranium production to react to spikes in the price and, given the lack of exploration over the past few years as prices have fallen, the min-

## MINING TECHNIQUES

Depending on the depth and grade of the deposit, uranium can be extracted by using either underground or open-cut techniques. Underground methods are usually reserved for higher-grade deposits at depths below 120 meters. In general, open-cut methods are usually low-grade, bulk-tonnage deposits and employ traditional mining and milling methods.

Some lower-grade and deeper deposits are increasingly being mined via the low-cost in situ recovery (ISR) method. Instead of mining the deposit and hauling rock to the surface, in situ recovery essentially “mines in place.” Oxygenated water is pumped down boreholes to the deposit, where it dissolves the uranium-bearing mineralization. The resulting solution is then pumped to the surface, where the recovery process extracts the native  $U_3O_8$  as it would be using conventional methods. This method works best with porous rock, which explains why sedimentary deposits are good candidates for ISR.

## Forward Uranium Supply Contracts



Uranium supply contracts by utilities will roll off rapidly over the next few years, forcing them to come back into the market in a big way

ing industry is getting even further behind the curve.

And unlike many commodities, higher prices are likely to have little impact on demand, for one very important reason...

### INELASTIC FUEL PRICES

Could the nuclear power industry withstand a steep escalation in fuel costs? By all accounts, it can do so easily. The high capital costs associated with building a nuclear plant comprise the vast majority of its Levelized Cost of Electricity (LCOE).

Delivered fuel assemblies, on the other hand, contribute only 10% to the LCOE. And almost half of that fuel cost stems from the energy expended during the enrichment process. U<sub>3</sub>O<sub>8</sub> counts for, at most, a third of total fuel costs. As a result, the nuclear power industry is largely indifferent to price increases in yellowcake.

That kind of price inelasticity could pay off enormously, because a price two

or three times today's levels may be necessary to address the production shortfall going forward. Current prices are simply not high enough to encourage the massive level of exploration needed to fill that gap.

### AN HISTORIC OPPORTUNITY IN THE MAKING

As we indicated earlier, analysts are forecasting that a significant supply deficit will emerge in the uranium market in the 2017-2021 timeframe, and grow rapidly from there.

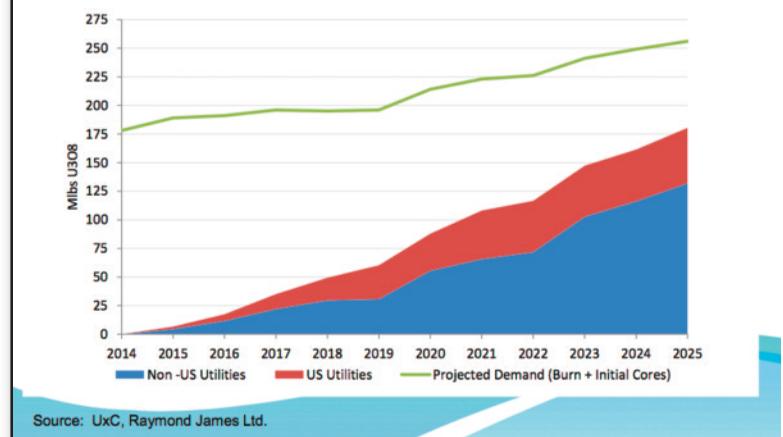
But far in advance of this supply deficit, we should begin to see dramatic gains in the uranium price.

That's because utilities simply cannot allow themselves to run out of uranium fuel, or get anywhere close to such a situation. So they look far ahead to secure their uranium supplies, and buy most of their fuel via long-term contracts.

Given the persistent malaise in uranium prices in recent years, however, the utilities have shown uncharacteristic patience in coming back

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## Uncovered Uranium Requirements Estimate



The uranium requirements of nuclear power plants that are not covered by supply contracts with producers are about to soar.

to market to renew their long-term contracts. They've been content to merely top off their supplies here and there via the spot market.

In the near future, however, they will be forced to return to market as their reserves run down. As you can see from the accompanying chart, the uranium requirements of both U.S. and non-U.S. utilities that are "uncovered" by existing supply contracts are set to grow dramatically over the next few years.

Today, they may not be shopping for uranium in size. But analysts agree that, at some point over the next two years, they will have to. And the price of uranium will simply have to rise significantly in response.

Cantor Fitzgerald senior analyst Rob Chang is one of the most respected experts in the uranium sector, and he predicts that the upcoming price shock will rival anything seen in the "uran-

mania" of the mid-2000s.

"We are going to see it jump \$5 to \$10 every week, like we saw before, because it just has to happen that way," notes Chang. "I'm not sure exactly when this will happen, but there frankly is just not enough supply. It's a very thin market, and once you get two, three, four utilities trying to buy at the same time, you are going to see large jumps."

All by themselves, the supply-side fundamentals for uranium make for a compelling investment thesis. Combine them with the upside that nuclear power contributes to the demand-side, and it becomes a slam dunk.

If you believe, as we do, that the future for uranium is exceedingly bright, then the question of how to cash in on that future should now be top-of-mind. In the pages ahead, we intend to answer that question in a way that maximizes

## CONVERSION FACTORS, ETC.

To understand the nitty-gritty of uranium mining and investing, you need to familiarize yourself with a few technical nuances. Chief among these is the difference between uranium oxide ( $U_3O_8$ ) and what the industry refers to as "natural uranium." Also, because the literature on uranium tends to bounce around between metric and avoirdupois units of measure, a brief review of the relevant conversion factors used to describe deposits is also needed.

When producers send  $U_3O_8$  to the conversion facility, it contains a little more than 80% uranium by weight. The term "natural uranium" allows the industry to equate the amount of uranium contributed by secondary sources (i.e. weapons-grade, enrichment tails, etc.) with the amount contributed by yellowcake, the concentrated ore.

To convert "natural U" to its  $U_3O_8$  equivalent, simply multiply the "natural U" figure by 1.18. As an example, let's take the United States' demand for "natural U" in 2003. That year, its nuclear power industry consumed 22,379 "tonnes U." If it had met that demand

entirely from primary sources, it would have needed to purchase 26,428 tonnes of  $U_3O_8$ .

Producers concern themselves primarily with the quantity and grade of  $U_3O_8$  in their reserve and resource bases. Power companies and intermediaries purchase almost 90% of all  $U_3O_8$  through long-term contracts, but the financial and trade press usually quote the spot price, expressed in terms of U.S. dollars per pound.

To be able to conduct a back-of-the-envelope valuation on junior, you will need to move deftly from tonnes to tons and from kilograms to pounds. The relevant metric-to-avoirdupois conversions are as follows:

1 metric tonne = 1,000 kilograms = 0.9071 short tons = 2,204.6 pounds

Let's apply these numbers to a hypothetical company with a defined resource of 15.0 million tonnes grading 0.30%  $U_3O_8$ . The total resource in pounds would be 100 million pounds ( $15,000,000 \times 0.003 \times 2,204.6$ ). At a  $U_3O_8$  spot price of US\$40, it would be worth \$4 billion, or \$268/tonne of ore in the ground.

your leverage on what has all the makings of a secular bull market for uranium.

Since it does not trade on a futures exchange, the only viable way to play uranium is to invest in companies that mine and explore for it. Simply put, if you want to hitch your wagon to uranium's star, you'll need to familiarize yourself with the inner-workings of this relatively small corner of the mining universe.

And here's where it gets truly exciting. You see, the current opportunity for uranium investors is magnified by the fact that there are relatively few well-positioned companies remaining in the sector.

During the 2004-2007 surge in the uranium price and the resulting mania in junior uranium companies, over 500 new uranium ventures suddenly emerged like mushrooms after a rain-storm.

In the early stages of the uranium land rush, resource accumulation provided the clearest path to share price appreciation. Indeed many companies enjoyed multi-bag gains based solely on their ability to amass sizable chunks of property with historic resources.

But as the price of uranium came back to earth over the following years, the rules of the game changed. In short, the sector went through a Darwin-esque experience, with only the fittest companies surviving.

Now, a full decade later, only about a dozen junior companies remain. The good news is that these survivors were the companies run by very capable and resourceful management teams. These are the talented groups that consistently grew their resources by absorbing other companies and high-quality projects, and advancing them along the development curve.

The result is that most of these survivors are either in production or very close to it, and can therefore provide investors almost immediate leverage to rising uranium prices. Of those companies that are still in the exploration phase, a few have uncovered truly exceptional, world-class deposits.

Let's review some of the best of the lot.

## PUTTING IT ALL TOGETHER: SIX WAYS TO PLAY URANIUM

There are not only far fewer companies involved in the uranium sector today, but the survivors generally boast market capitalizations significantly lower than before the last big run in uranium stocks.

With the global uranium market running headlong into its first major supply deficit, there has never been a better time to speculate in high-quality uranium stocks.

So what are the best opportunities in the sector? A number of top companies are covered and recommended in our publications, *Gold Newsletter* and *Mercenary Geologist*.

In this report, we'll focus on a subset of those companies — the ones that have separated themselves from the rest of the pack by participating in the most recent New Orleans Investment Conference.

The most serious resource investors gather every fall at the New Orleans Conference. So the uranium companies that chose to present their stories to these elite investors have, obviously, demonstrated that they are actively advancing their ventures.

Here, then, are six companies that fit the bill in all respects. Enjoy their intriguing stories, visit their websites, give them a call, and seriously consider the opportunities they now present.

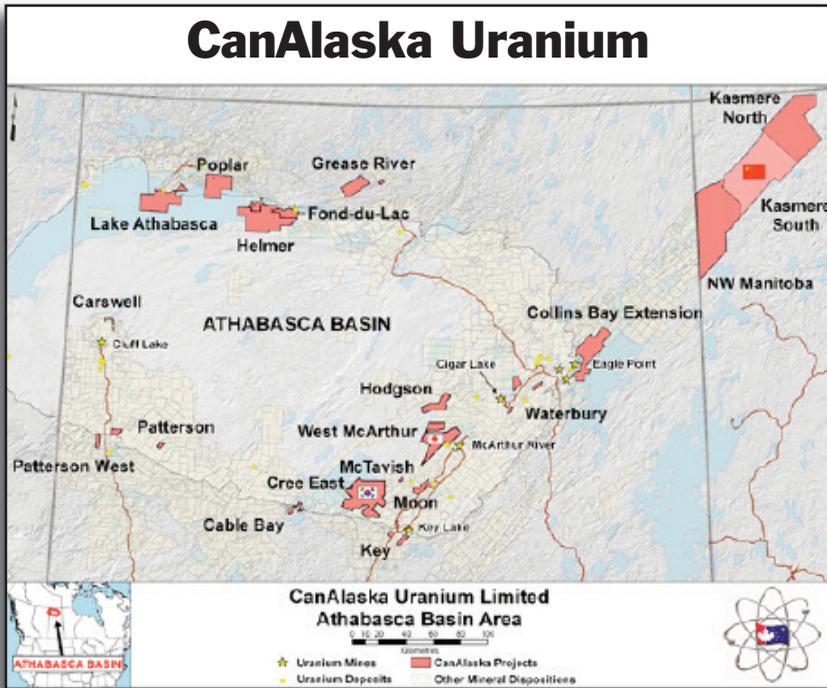
### CANALASKA URANIUM LTD.

CVV.V  
canalaska.com

In the resource game, the highest potential rewards are offered by the exploration companies...but the risk rises concurrently. One way to mitigate that risk is for a company to have a large project portfolio, and to use "other people's money" to explore it.

In this regard, you can't find a better option than Athabasca Basin prospect generator CanAlaska Uranium.

(Continued...)



CanAlaska began assembling a large portfolio of properties in the Athabasca Basin in 2004 and the company now controls over 700,000 hectares. About \$85 million has been spent on exploration, with the majority funded by major international partners. CVV currently has five joint venture uranium projects and another 13 projects in the province available for joint-venture, sale or option.

These projects run the gamut from grassroots, drill-ready targets, advanced drill projects with uranium intercepts, to projects with historic resources. Flagship projects are West McArthur and Cree East, with their respective Japanese and Korean partners.

In addition, CVV uses its in-house technical team to identify prospects in other regions in western Canada. It holds several claim blocks in the Pikoo diamond region of east-central Saskatchewan and base metal projects in British Columbia and Manitoba that are for sale or option.

Thanks to a share roll-back in 2010 and despite the four-year bear market for juniors (especially for uranium stocks post-Fukushima), CanAlaska has a very favorable share structure with just 22.1 million shares outstanding and 26.4 million fully-diluted. Management controls

3.8% and the company classifies positions in strong hands at about 23%. There are no large institutional holdings, and the vast majority of shares are held in small retail positions.

Thanks to its prospect generator business model, CanAlaska has minimal exploration and landholding costs, and the company funds operations with sales and joint-ventures of non-core properties.

The company is led by CEO Peter Dasler, a New Zealand-born and educated geologist with over 30 years in Canada's junior resource sector. VP of exploration Dr. Karl Schimann is a longtime uranium geologist with 20 years of experience at AREVA and is credited as a discoverer of Cigar Lake. Other directors of note include COB Thomas Graham, Jr., a former U.S. ambassador specializing in arms and nuclear treaty negotiations, and Washington, D.C.-based lawyer and politician Kathleen Kennedy Townsend.

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#### CanAlaska Uranium Ltd.

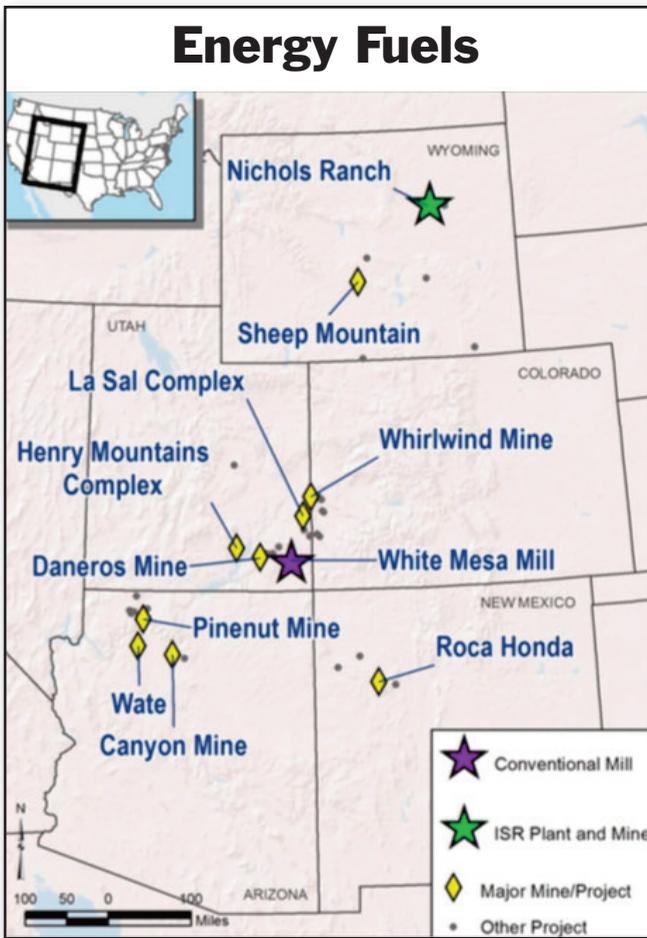
Recent Share Price: .....C\$0.12  
 Shares Outstanding:.....22.1 million  
 Market Cap: .....C\$2.7 million  
 Shares Outstanding  
 Fully Diluted: .....26.4 million  
 Market Cap  
 Fully Diluted: .....C\$3.2 million

#### ENERGY FUELS

UUUU.NYSE-A  
[energyfuels.com](http://energyfuels.com)

You wouldn't expect the second largest producer of uranium in the United States to be a microcap company, but it is. And that's just one important aspect of the Energy Fuels story.

An integrated uranium producer with operations in Utah, Wyoming, Arizona, New Mexico and Colorado, Energy Fuels operates the only conventional uranium-vanadium mill in the United States, and also produces uranium via the



in-situ recovery process (ISR).

EFR has two uranium production centers: the White Mesa mill in southeastern Utah and the Nichols Ranch ISR operation in northeastern Wyoming. White Mesa is permitted for 2,000 tons of ore per day and is licensed to produce eight million pounds of U<sub>3</sub>O<sub>8</sub> annually. It also contains separate circuits to recover vanadium from its Colorado and Utah mines and to recover uranium from low-cost alternate feed materials. Nichols Ranch is a growing ISR project in the Powder River Basin that is licensed to produce two million pounds per year.

Energy Fuels Inc has sold over 1.0 million pounds of yellowcake annually over the past five years, which helped it rank as the second largest producer in the U.S. in 2014. It has four existing term contracts that average \$59/lb U<sub>3</sub>O<sub>8</sub> with expiries ranging from 2017 thru 2020. Sales totaling 1,075,000 lbs of U<sub>3</sub>O<sub>8</sub> are expected for 2015. For 2016 and 2017, the company forecasts sales under existing long-term contracts of 550,000 pounds and 620,000 pounds respectively. Spot

sales are undertaken on occasion to fund ongoing operations and exploration activity.

In addition to its current operations, Energy Fuels has a high-grade mine in development in Arizona, past-producing mines on standby in Utah, and numerous projects in various stages of permitting and development, including three large deposits in Utah, Wyoming and New Mexico. Total measured and indicated resources are 96 million pounds U<sub>3</sub>O<sub>8</sub>. With its licensed capacity and ability to ramp up production, EFR is highly leveraged to a rising uranium price.

Energy Fuels is led by CEO Stephen Antony, VP of conventional operations Harold Roberts, VP of ISR operations Paul Goranson, CFO Dan Zang, and VP of marketing Curtis Moore. Directors include Ron Hochstein, ex-CEO of Denison Mines, and Joo Soo Park of KEPCO, South Korea's largest power utility.

**Energy Fuels**

Recent Share Price: .....	US\$2.50
Shares Outstanding: .....	45.1 million
Market Cap: .....	US\$112.8 million
Shares Outstanding	
Fully Diluted: .....	53.2 million
Market Cap	
Fully Diluted: .....	US\$133.0 million

**FISSION URANIUM CORP.**

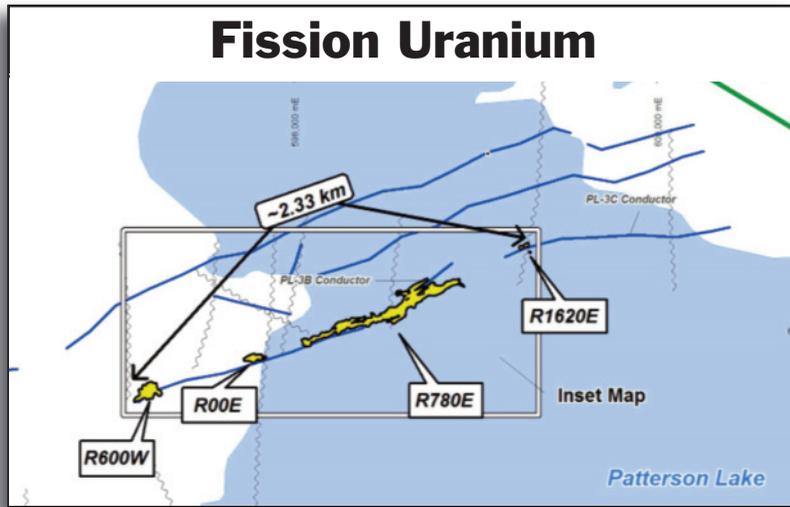
FCU.TO  
fissionuranium.com

Unlike most of the other companies featured in this report, Fission Uranium is an explorer, and it's exploring using its own funds. But you can blame the company for that: Every dollar put into the ground has been consistently multiplied many times over as the company expands what already stands as one of the greatest uranium discoveries in recent history.

And it seems to get bigger with every drill hole.

Already extending about 1.4 kilometers in total strike length in three major zones, the company's Triple R deposit boasts 79.6 million

*(Continued...)*



pounds in indicated uranium resource, in addition to 25.9 million pounds in inferred resources. The deposit is most notable for its world-class grades: The indicated resources include 44.3 million high-grade pounds at 18.21%  $U_3O_8$ , and the inferred resources feature 13.9 million pounds at an eye-popping 26.35%  $U_3O_8$ .

Importantly, exploration has begun to rapidly expand the R600W zone which, unlike the other zones, lies on land and holds the potential to dramatically lower capital and operating expenses.

The good news is that the project already boasts exceptional economics. The maiden preliminary economic analysis, which excluded R600W, projected a base-case, post-tax NPV of C\$1.02 billion, a post-tax IRR of 34.3% and average operating costs of just US\$14.02/lb  $U_3O_8$ .

For comparison, those operating cost projections show that Triple R could become the lowest-cost source of uranium in the world. And remember, the addition of R600W will only serve to make these production numbers even better.

Given the high level of success of Fission's drill programs, PLS stands to get larger, and it could get *much* larger. Thus, the company is not only a play on uranium, but a truly exciting discovery play.

A recent attempt to merge with Denison Mines was rejected by shareholders, and Fission's share price sold off during the accompanying turmoil and investor dissatisfaction with the proposed deal. The price has rebounded since then, and the company has announced a C\$82 million

financing with a major Chinese uranium mining and trading group.

The company is now well-positioned to develop the Triple R deposit if it so chooses.

### Fission Uranium Corp.

Recent Share Price: .....C\$0.73

Shares Outstanding: .....386.7 million

Market Cap: .....C\$282.3 million

Shares Outstanding

Fully Diluted: .....421.2 million

Market Cap

Fully Diluted: .....C\$307.5 million

### PENINSULA ENERGY

PEN.AX  
pel.net.au

As I noted, junior uranium companies that are in production offer instant leverage to rising uranium prices. If there's anything better than this, it might be a company that is entering production as we speak, and set to enjoy a re-rating by the marketplace once it achieves that benchmark.

Not only that, but Peninsula Energy is nearing a U.S. listing of its shares through ADRs on the NYSE MKT platform, dramatically expanding its profile in the market.

That's two important — and imminent — factors working in an investor's favor right now. But there's more coming down the road.

Peninsula's flagship holding is the Lance Project in Wyoming, an in situ uranium mine now entering production that will yield 600,000 to 800,000 pounds of annual  $U_3O_8$  production during its first stage of development.

Importantly, the project's stage 2 and stage 3 ramp-ups will coincide with the expected tightening of the uranium market (and resultant uranium price rise) over the coming few years. At that point, Lance should reach 2.3 million pounds of annual production at an all-in production cost of just \$29 per pound.

That will be a prodigious production rate, but shareholders won't have to worry about Peninsula running out of uranium anytime soon, because Lance is *big*. It's JORC (Australia's

reporting standard) resource stands at 54 million pounds of U<sub>3</sub>O<sub>8</sub>.

And Peninsula’s resources don’t end there, as the company also controls the 56.9-million-pound Karoo project in South Africa. Positive economic scoping studies have triggered a preliminary feasibility study that is ongoing.

But for the time being, emphasis will be on production, and the cash flow it will bring. Peninsula is in the enviable position of not having to wait for higher uranium prices to boost its revenues, as the company has long-term sales contracts for up to 3.85 million pounds of uranium through 2024.

A million pounds of these sales will be at a price ranging between \$73 and \$75 per pound, with the weighted average price for all of its committed production standing at \$59/lb — far above today’s current prices.

In short, Peninsula Energy is on the verge of big achievements and, hopefully, big gains for its shareholders.

**Peninsula Energy Ltd.**

Recent Share Price: .....A\$1.08  
 Shares Outstanding: .....174.0 million  
 Market Cap: .....A\$187.9 million  
 Shares Outstanding  
 Fully Diluted: .....239.8 million  
 Market Cap  
 Fully Diluted: .....A\$259.0 million

**URANIUM ENERGY CORP.**

UEC.NYSE-A  
 uraniumenergy.com

As an emerging ISR producer in South Texas controlling a portfolio of 20 exploration and development projects in Arizona, Colorado, New Mexico and Paraguay, Uranium Energy Corp is a company that stands to benefit significantly — and immediately — from the coming uranium supply crunch and potentially far higher prices.

UEC’s core holdings in South Texas include over 18 million pounds

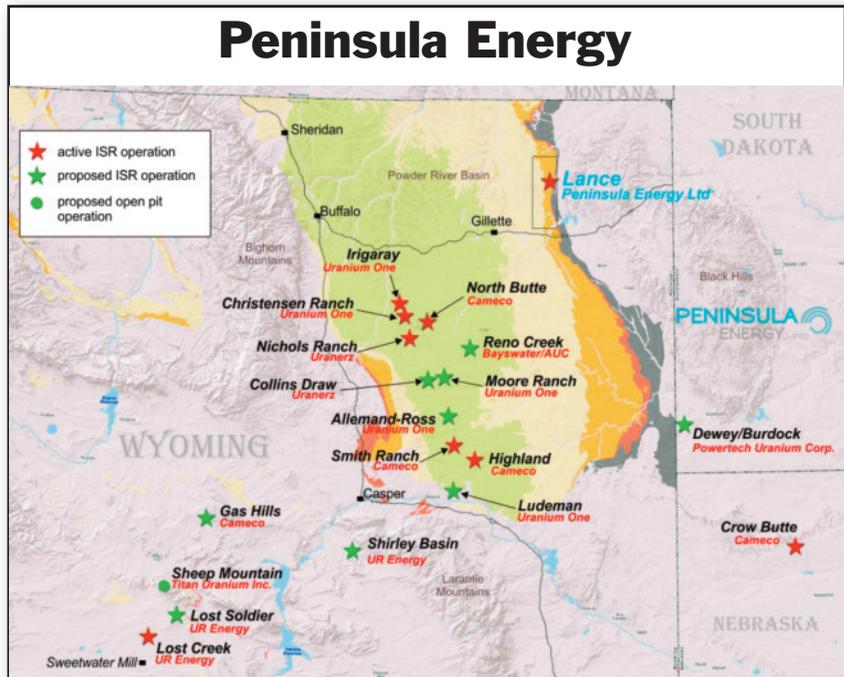
of U<sub>3</sub>O<sub>8</sub> resources. The company’s ISR operations employ a “hub and spoke” strategy. It consists of a central ISR production hub at Hobson, currently licensed for 1.0 million pounds but with capacity to produce 2.0 million pounds annually. Six deposits comprise the spokes to feed uranium for processing.

One of these deposits has produced over 575,000 pounds of U<sub>3</sub>O<sub>8</sub> since 2011, a second is permitted for production, and a third is advancing through permitting. With no production hedges, the company is one of the most highly leveraged U.S. producers to a significant rise in the price of uranium.

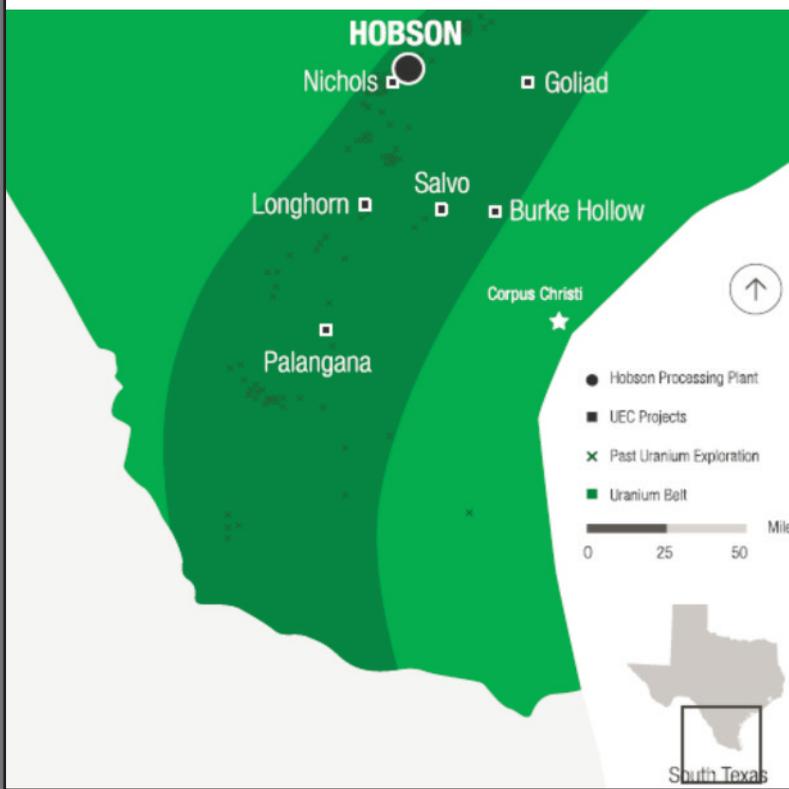
The UEC team, including management, insiders, and employees, own 10% of the stock. Institutions control about 30-35% of issued shares, and the public float is around 45-50%. Key investors and backers include Asia’s richest man, Li Ka-shing, Sprott, and Blackrock. UEC carries \$20 million in long-term debt via a credit facility. Cash as of their latest filing is \$10.1 million. Total burn rate per month moving forward will be about \$700,000.

Uranium Energy Corp is known for its top-flight management team. Led by highly respected CEO Amir Adnani, the company also boasts Spencer Abraham, formerly U.S. Secretary of

*(Continued...)*



# Uranium Energy Corp



be a company that is not only producing uranium, but is actively working toward expanding that production right now.

Ur-Energy, an in-situ recovery uranium mining company operating the Lost Creek ISR facility in south-central Wyoming's Great Divide Basin, offers precisely those qualities.

Ur-Energy commenced production at Lost Creek in August 2013 and sold its first yellowcake that December. Since operations started, it has produced over 1.2 million pounds  $U_3O_8$ . Its ISR processing facility has a licensed capacity of two million pounds with an annual production rate of one million pounds planned from Lost Creek.

As we hinted, URG isn't standing pat with that production, as the company is also advancing the past-producing Shirley Basin project south of Casper, Wyoming. The project boasts

drilled-out resources and UR-Energy has initiated permitting for future ISR production.

The company's Lost Creek and Shirley Basin projects contain measured and indicated resources of 22.07 million lbs  $U_3O_8$  with 6.4 million pounds in the inferred category. Other assets include satellite projects in the Great Divide Basin with 12.2 million lbs measured and indicated resources at Lost Soldier, and a fully licensed radioactive waste disposal facility at Shirley Basin along with multiple third-party agreements in place.

Ur-Energy has long-term sales contracts with several U.S.-based utility companies thru 2021. The company has sold forward 2.8 million pounds  $U_3O_8$  at an average price of \$49.60 — including 630,000 lbs at \$50.10/lb in 2015 and 662,000 lbs at \$47.61/lb in 2016. URG also anticipates making spot sales into the market as inventories and uranium prices warrant. All of this adds up to real money, and the company expects to generate \$6 million in free cash flow for the 2015 fiscal year.

Ur-Energy is led by founder and executive chairman Jeff Klenda. Other key personnel include VP operations Steve Hatten, VP geology James Bonner, and VP regulatory affairs John

Energy, as its executive chairman. Other key management personnel include Executive Vice-President Scott Melbye, a veteran uranium executive and former CEO of Cameco Inc. A director of note is Ganpat Mani, former CEO of Converdyn. Its technical teams are led by Vice-Presidents Robert Underdown, Clyde Yancey, and Andy Kurus; these men each have over 30 years of experience in uranium production, geology and resource development respectively.

## Uranium Energy Corp.

Recent Share Price: .....US\$1.01  
 Shares Outstanding: .....97.5 million  
 Market Cap: .....US\$98.5 million  
 Shares Outstanding  
 Fully Diluted: .....116.3 million  
 Market Cap  
 Fully Diluted: .....US\$17.5 million

## UR-ENERGY

URG.NYSE-A; URE.TO  
 ur-energy.com

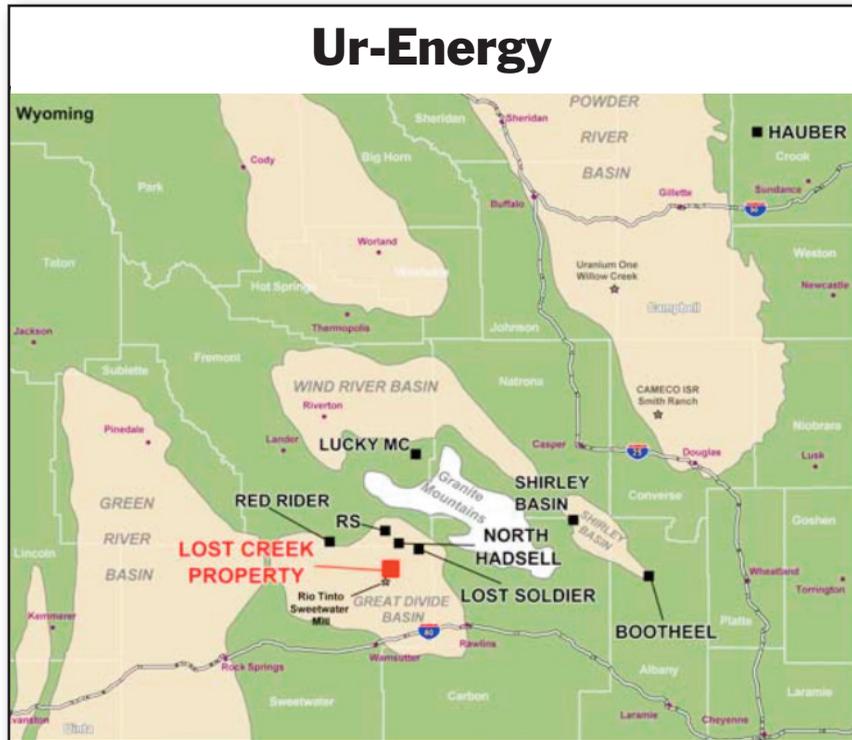
If you're looking for leverage to rising uranium prices in the near term, an ideal option might

Cash. A director of note is uranium industry veteran Bill Boberg.

**Ur-Energy**

Recent Share Price: .....US\$0.65  
Shares Outstanding: ..130.2 million  
Market Cap: .....US\$84.6 million  
Shares Outstanding  
Fully Diluted: .....148.0 million  
Market Cap  
Fully Diluted:.....US\$96.2 million

**Disclosure:** Mickey Fulp personally or beneficially owns positions in CanAlaska Uranium, Energy Fuels, and Uranium Energy Corp. Energy Fuels and Uranium Energy Corp. are current sponsors of MercenaryGeologist.com. Brien Lundin personally or beneficially owns positions in Energy Fuels and Fission Uranium.



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