Nuclear Power Plants and Uranium Prices

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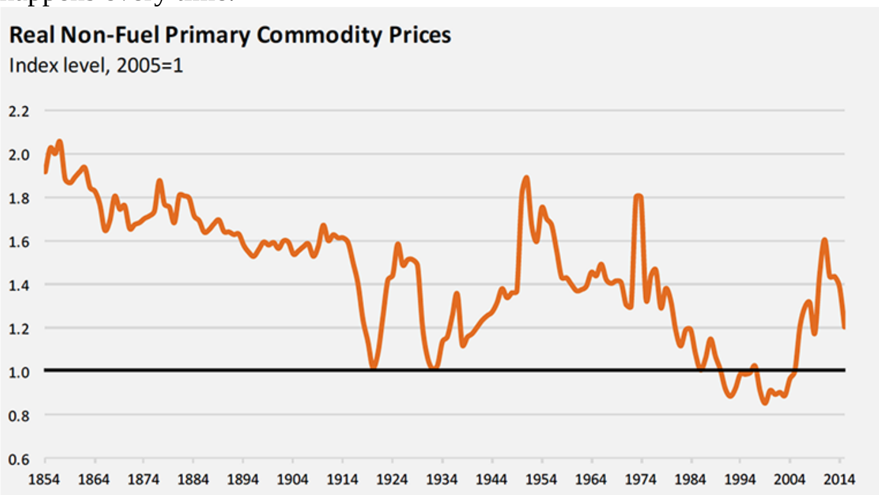
Abstract: - The recent UN Climate Talks in Paris have put forward the goal of limiting the global temperature rise to two degrees Celsius by the end of the century. This is providing a strong political base for expanding the nuclear power capacity because of the critical role that nuclear power plants play in the production of electricity without emissions of greenhouse gases. In all, more than a dozen countries get over 25% of their energy from nuclear power, with 437 nuclear reactors operating around the world. On top of that, there are another 71 reactors under construction, 165 planned, and 315 proposed. Global uranium demand is expected to rise 40% by 2025 and 81% by 2035. Mined supply of uranium will struggle to keep pace amid rising demand and falling secondary supplies. A cumulative supply deficit is expected to emerge by 2021 while 2016 marks a huge inflection point for the industry, beeing the first year that demand will actually exceed supplies, creating a 60,000-tonne shortfall by 2018. Over the next 10 years, we're going to see uranium prices more than double while the bull run will begin in earnest in 2016.

Keywords: - nuclear power, uranium supply, uranium demand, uranium prices.

1 Introduction

In 2015 the dynamics of supply and demand for industrial and precious metals were out of favor. The worst performer, with a decline in prices of about 40% is rhodium. The next two are nickel and iron ore, each down more than 30%. Tin, zinc, palladium, platinum and copper aren't far behind, each down more than 20%. Gold and silver were down about 5%. Uranium is one of the few commodities that hasn't gotten trounced. It's traded roughly flat over the past year. That's because, here, the supply-demand fundamentals have already begun to turn.

But here's the secret about commodities: They're elastic. As they get cheaper, demand increases and supplies shrink. It happens every time.



This chart shows how commodities have performed over the last 160 years.

As you can see, every sharp decline is followed by an equally dynamic rebound. Each boom and bust cycle lasts about seven or eight years. The down-cycle we're witnessing right now began back in 2010. So if the pattern holds we'll see another boom begin around 2017. That's not a given, of course. These cycles can be extended by overarching circumstances.

For instance, the boom cycle that began in 1933 was exacerbated by World War II. As a result, it lasted almost two decades. Similarly, the commodity price collapse that occurred from 1974 to the late 90s was exacerbated first by Fed Chairman Paul Volcker's war on inflation, and then the collapse of the Soviet Union.

These kinds of watershed events are atypical but they do happen. Still, it doesn't change the fact that the trend always reverses.

For instance, platinum and palladium are set for an annual deficit this year — 20.3 million tonnes for platinum and 13.3 million tonnes for palladium. Yet, these metals are at their lowest level in seven years. Copper and nickel will eventually come back into fashion, but not for a while. Silver is expected to double its present value of around 15$ per ounce in the next two years, but after a possible fall to 10$ per ounce.

There have only been two true eras of energy so far — the chemical and mechanical. Only recently have we started the transition to the third — the elemental.

The first two eras are marked by two tracts of knowledge. The first is chemistry, and the development and exploitation of fuel sources. The second is engineering, and harnessing potential through efficiency and transmission. In many regards, we haven't changed our ways since we started using wood fires for heat and light.

What we do to coal, natural gas, gasoline, and jet fuel is the same. We exploit the chemical structure of a fuel to break down molecules in an exothermic reaction.Then we use the heat however we can. The problem, to date, has been how much heat we end up losing in the process, or building something robust enough to contain the reaction.

If you have a fireplace, you aren't too far off from where we started when our ancestors learned how to burn wood. Only 10% of the heat released actually heats your house. The rest goes right up the chimney. With so much energy being lost, increasing the fuel supply is a terrible idea. The scaling at 10% efficiency is horrendous. A constant stream of incremental improvements resulted.

Using the same principles of mechanical force used for wind and water mills, engineers drove up efficiency by using turbines, coupled with closed steam pipe systems. The discovery of ideal fuel-to-air ratios led to efficient pistons that, when paired with camshafts, opened up even smaller engine designs that could be mounted on vehicles. Coolants and lubrication reduced friction and excess heat, allowing more efficient, higher RPM designs. Weight reductions from material changes drove down weight.

The dynamo transformed mechanical energy into a stream of electrons. Wires were thrown up worldwide to blanket the world in an electrical grid carrying power from chemical reactions. Even state-of-the-art batteries simply exploit unbalanced chemical reactions to generate a constant flow of electrons. So much has changed in recent history, but it has all been through incremental improvements upon tried and true chemical and mechanical laws of nature, often rapidly adopted whenever a new scientist's discovery or engineer's design is revealed.

It wasn't until the middle of the last century that the third era started to emerge, marking fundamental breaks from both the chemical and mechanical eras.

2 The Elemental Era

The new era of energy dives into our relatively new understanding of our universe. We are going beyond molecular reactions to exploit the fundamental properties of atomic forces and physics. Power generation from basic nuclear physics is becoming the norm. In regard to the nature of the fuel, nuclear and solar power, so different in public perception, must be lumped together.

Nuclear power, as we know it, approaches elemental power via ultra-heavy atoms that can be forged by nothing less than the crucible of the catastrophic explosion of ancient stars. No burning, no chemical reactions, no carbon pollutants. The fundamental, unstable nature of the radioactive isotopes we refine are enough to create constant heat to turn steam turbines.

The energy potential is unfathomably greater as well. By weight, uranium packs about 17,000 times the energy potential of modern fossil fuels.

Solar energy exploits the other end of the nuclear spectrum. Hydrogen and helium fuel the 10 billion year-long thermonuclear explosion, barely contained by gravity, commonly known as the Sun. We capture the tiniest hint of a fraction of the energy that rains down on us as solar radiation, with maybe 15-20% efficiency. Yet it is still enough to be economically feasible and capture over half of the total world energy market by 2050.

This third era is going to change so much that we cannot possibly imagine the full implications today. The latest designs for both power sources have shed their early limitations, and the world is rapidly moving to exploit element-based power sources as quickly as possible to reap unprecedented benefits. New generation designs for nuclear power, such as molten salt reactors, cannot melt down and can reprocess old fuel.

...there are several things that are making it more likely that we are going to see some real progress on the nuclear front. Certainly at the top of the list is the emergence of global concern over climate change issues. It's hard — even for the people who've long opposed nuclear power — to fight nuclear energy and global warming at the same time. People now recognize the critical role that nuclear power plants play in the production of electricity without emissions of greenhouse gases.

3 How long will our supplies of uranium and thorium last?

Ask a geologist how much uranium we have and he won't give you an easy answer. Or maybe he will, but then the answer is not of much use. The simple answer is: the earth's crust contains 2,8 parts per million (ppm). That's enough uranium to serve us until the time the sun turns into a red giant, more than a billion years from now. But it would mean ploughing over the planet and most people would want to avoid that – so let's get practical.

Uranium is literally everywhere, in rocks and in oceans. How much of it we can use, depends on how hard we look for it and on what we are willing to pay for it. Let's start with a moderate estimate of available resources of uranium. On world-nuclear, we see the known supplies of the world: 5.327.000 tonnes. In our extreme scenario, using 70.000 tonnes per year, this would last us 76 years. Not really a an impressive number. Even if we add the known supplies of thorium (3.385.000 tonnes worldwide), we would only roughly double this number to, say, 150 years. (To make things appear even worse, the number of tonnes per year in our extreme scenario is almost the same as the amount our present nuclear power plants use: 68.000 tonnes annually. That's mainly because conventional nuclear reactors use only about 0,5% of the energy content of the uranium)

But the quantity of thorium quoted above (5.327.000 tonnes) is the thorium that can be sold for the market price of 80$ per kg (and hence, must be produced cheaper). What if we are willing to pay more? How much more uranium and/or thorium does that make available? For instance for Thorium, the Atomic Energy Commission has studied the available resources in 1969. Of this thorium, we've hardly used anything since those days. The report raises the question how much thorium is recoverable at a price of 500$/kg in 1969 dollars, perhaps 3000$/kg today. The answer is 3 billion short tonnes or 2.700.0000.000 metric tonnes, enough to last us 40.000 years in our extreme scenario. For uranium, the figures will be not much different. (And no, 3000$/kg is not a ridiculous price. At this price, we'd need to pay $3.000.000 for the fuel to produce 1GWe-yr. And 1 GWe-yr equals 8.760.000.000 kWh, which means a fuel cost of $0,0004 per kWh.) This means that even in our extreme scenario, the combined uranium and thorium of the United States would be enough to power the world for about 100.000 years.

If that is not enough to be called 'sustainable', consider yet another option: seawater. Uranium forms soluble salts and the seas contain 0.003 ppm Uranium. Again, that doesn't sound like much, but according to Masao Tamada of the Japanese Atomic Energy Agency it adds up to about 4.5 billion tons, adding another 64.000 years of sustaining our extreme scenario. The technique of winning this sea-uranium is still in its infancy, but Japanese researchers have succeeded in winning it at a cost of $240/kg. And here's an article that describes the technique of extractring the uranium. The production speed is still very low and not nearly enough for the yearly refill of a single molten salt reactor, but we have all the time in the world to improve our technique… Still not satisfied on the sustainability? The concentration of the uranium in the sea is an equilibrium. Meaning: if we take some out, nature will refill the store through rivers and rock-weathering – it already does: rivers carry uranium to the sea all the time.

Charles Barton – a respected blogger on the subject of molten salt reactors estimates that dissolved natural uranium from terrestrial sources, that rivers continually carry to the seas, amounts to about 32,000 tons per year*. Finally, uranium in seawater is in equilibrium solution. 'Added dissolved uranium causes other dissolved uranium to precipitate out of sea water. The uranium precipitation is deposited on the sea bottom, but may re-dissolve at some future time.' In short: even in our extreme use scenario, we won't run out of uranium.

And remember, our extreme scenario was pretty extreme: energy produced by solar and wind, and saved by energy conservation, were all discarded. While in reality, these will fill in a substantial part of our energy demands. These sources combined will provide us with all the energy we need.

Uranium production

Uranium production figures, 2004-2014 *(July 2015)*

Country or area	Production (tU)											% change
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2013-14
Australia	8982	9516	7593	8611	8430	7982	5900	5983	6991	6350	5001	-21
Brazil	300	110	190	299	330	345	148	265	231	198	231	+16
Canada	11,597	11,628	9862	9476	9000	10,173	9873	9145	8998	9332	9134	-2
China ^	750	750	750	712	769	750	827	885	1500	1450	1500	+3
Czech Rep	412	408	359	306	263	258	254	229	228	225	193	-14
France	7	7	0	4	5	8	7	6	3	0	3	-
Germany	77*	94*	65*	41*	0	0	0	52	50	27	33	+22
India^	230	230	230	270	271	290	400	400	385	400	385	-4
Kazakhstan	3719	4357	5279	6637	8521	14,020	17,803	19,451	21,317	22,567	23,127	+2
Malawi	0	0	0	0	0	104	670	846	1101	1132	369	-67
Namibia	3038	3147	3077	2879	4366	4626	4496	3258	4495	4315	3255	-25
Niger	3282	3093	3434	3135	3032	3243	4198	4351	4667	4528	4057	-10
Pakistan^	45	45	45	45	45	50	45	45	45	41	45	+10
Romania^	90	90	90	77	77	75	77	77	90	80	77	-4
Russia^	3200	3431	3430	3413	3521	3564	3562	2993	2872	3135	2990	-5
South Africa	755	674	534	539	655	563	583	582	465	540	573	+6
Ukraine^	800	800	800	846	800	840	850	890	960	1075	962	-11
USA	878	1039	1692	1654	1430	1453	1660	1537	1596	1835	1919	+5
Uzbekistan	2016	2300	2270	2320	2338	2429	2400	3000	2400	2400	2400	0
Total	40,178	41,179	39,670	41,282	43,853	50,772	53,663	53,494	58,344	59,673	56,252	-6

World Nuclear Power Reactors & Uranium Requirements (*1 January 2016)*

This table includes only those future reactors envisaged in specific plans and proposals and expected to be operating by 2030.

The WNA country profiles linked to this table cover both areas: near-term developments and the prospective long-term role for nuclear power in national energy policies. They also provide more detail of what is tabulated here.

COUNTRY (Click name for Country Profile)	NUCLEAR ELECTRICITY GENERATION 2014		REACTORS OPERABLE 1 Jan 2016		REACTORS UNDER CONSTRUCTION 1 Jan 2016		REACTORS PLANNED Jan 2016		REACTORS PROPOSED Jan 2016		URANIUM REQUIRED 2015
	billion kWh	% e	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross	tonnes U
Argentina	5.3	4.0	3	1627	1	27	2	1950	2	1300	215
Armenia	2.3	30.7	1	376	0	0	1	1060			88

Bangladesh	0	0	0	0	0	0	2	2400	0	0	0
Belarus	0	0	0	0	2	2388	0	0	2	2400	0
Belgium	32.1	47.5	7	5943	0	0	0	0	0	0	1017
Brazil	14.5	2.9	2	1901	1	1405	0	0	4	4000	326
Bulgaria	15.0	31.8	2	1926	0	0	1	950	0	0	324
Canada	98.6	16.8	19	13553	0	0	2	1500	3	3800	1784
Chile	0	0	0	0	0	0	0	0	4	4400	0
China	123.8	2.4	30	26849	24	26885	40	46590	136	153000	8161
Czech Republic	28.6	35.8	6	3904	0	0	2	2400	1	1200	566
Egypt	0	0	0	0	0	0	2	2400	2	2400	0
Finland	22.6	34.6	4	2741	1	1700	1	1200	1	1500	751
France	418.0	76.9	58	63130	1	1750	0	0	1	1750	9230
Germany	91.8	15.8	8	10728	0	0	0	0	0	0	1889
Hungary	14.8	53.6	4	1889	0	0	2	2400	0	0	357
India	33.2	3.5	21	5302	6	4300	24	23900	36	41600	1579
Indonesia	0	0	0	0	0	0	1	30	4	4000	0
Iran	3.7	1.5	1	915	0	0	2	2000	7	6300	176
Israel	0	0	0	0	0	0	0	0	1	1200	0
Italy	0	0	0	0	0	0	0	0	0	0	0
Japan	0	0	43	40480	3	3036	9	12947	3	4145	2549
Jordan	0	0	0	0	0	0	2	2000			0
Kazakhstan	0	0	0	0	0	0	2	600	2	600	0
Korea DPR (North)	0	0	0	0	0	0	0	0	1	950	0
Korea RO (South)	149.2	30.4	24	21677	4	5600	8	11600	0	0	5022
Lithuania	0	0	0	0	0	0	1	1350	0	0	0
Malaysia	0	0	0	0	0	0	0	0	2	2000	0
Mexico	9.3	5.6	2	1600	0	0	0	0	2	2000	270
Netherlands	3.9	4.0	1	485	0	0	0	0	1	1000	103
Pakistan	4.6	4.3	3	725	2	680	2	2300	0	0	101
Poland	0	0	0	0	0	0	6	6000	0	0	0
Romania	10.8	18.5	2	1310	0	0	2	1440	1	655	179
Russia	169.1	18.6	35	26053	8	7104	25	27755	23	22800	4206
Saudi Arabia	0	0	0	0	0	0	0	0	16	17000	0
Slovakia	14.4	56.8	4	1816	2	942	0	0	1	1200	466
Slovenia	6.1	37.2	1	696	0	0	0	0	1	1000	137
South Africa	14.8	6.2	2	1830	0	0	0	0	8	9600	305
Spain	54.9	20.4	7	7002	0	0	0	0	0	0	1274
Sweden	62.3	41.5	9	8849	0	0	0	0	0	0	1516
Switzerland	26.5	37.9	5	3333	0	0	0	0	3	4000	521

Thailand	0	0	0	0	0	0	0	0	5	5000	0
Turkey	0	0	0	0	0	0	4	4800	4	4500	0
Ukraine	83.1	49.4	15	13107	0	0	2	1900	11	12000	2366
UAE	0	0	0	0	4	5600	0	0	10	14400	0
United Kingdom	57.9	17.2	15	8883	0	0	4	6680	9	11220	1738
USA	798.6	19.5	99	98990	5	6218	5	6263	17	26000	18692
Vietnam	0	0	0	0	0	0	4	4800	6	6700	0
WORLD**	2,411	c 11.5	439	382,547	66	70,335	158	179,215	330	375,620	66,883
	billion kWh	% e	No.	MWe	No.	MWe	No.	MWe	No.	MWe	tonnes U
	NUCLEAR ELECTRICITY GENERATION		REACTORS OPERABLE		REACTORS UNDER CONSTRUCTION		ON ORDER or PLANNED		PROPOSED		URANIUM REQUIRED

Sources:
Reactor data: WNA to 1/1/16 (excluding nine shut-down German units)
IAEA for nuclear electricity production & percentage of electricity (% e) April 2015.
WNA: Global Nuclear Fuel report Sept 2013 (reference scenario 2015) – for U. 66,883 tU = 78,875 t U_3O_8
Operable = Connected to the grid.
Under Construction = first concrete for reactor poured, or major refurbishment under way.
Planned = Approvals, funding or major commitment in place, mostly expected in operation within 8-10 years.
Proposed = Specific programme or site proposals, expected operation mostly within 15 years.
New plants coming on line are largely balanced by old plants being retired. Over 1996-2013, 66 reactors were retired as 71 started operation. There are no firm projections for retirements over the period covered by this Table, but WNA estimates that at least 60 of those now operating will close by 2030, most being small plants. The 2015 WNA Nuclear Fuel Report reference scenario (Table 2.4) has 132 reactors closing by 2035, and 287 new ones coming on line (figures include 28 Japanese reactors on line by 2035).
TWh = Terawatt-hours (billion kilowatt-hours), MWe = Megawatt (electrical as distinct from thermal), kWh = kilowatt-hour.
** The world total includes six reactors operating on Taiwan with a combined capacity of 4927 MWe, which generated a total of 40.8 billion kWh in 2014 (accounting for 18.9% of Taiwan's total electricity generation). Taiwan has two reactors under construction with a combined capacity of 2700 MWe. It was expected to require 972 tU in 2015.

4 The Economics of Nuclear Power

Nuclear power is cost competitive with other forms of electricity generation, except where there is direct access to low-cost fossil fuels.

Fuel costs for nuclear plants are a minor proportion of total generating costs, though capital costs are greater than those for coal-fired plants and much greater than those for gas-fired plants.

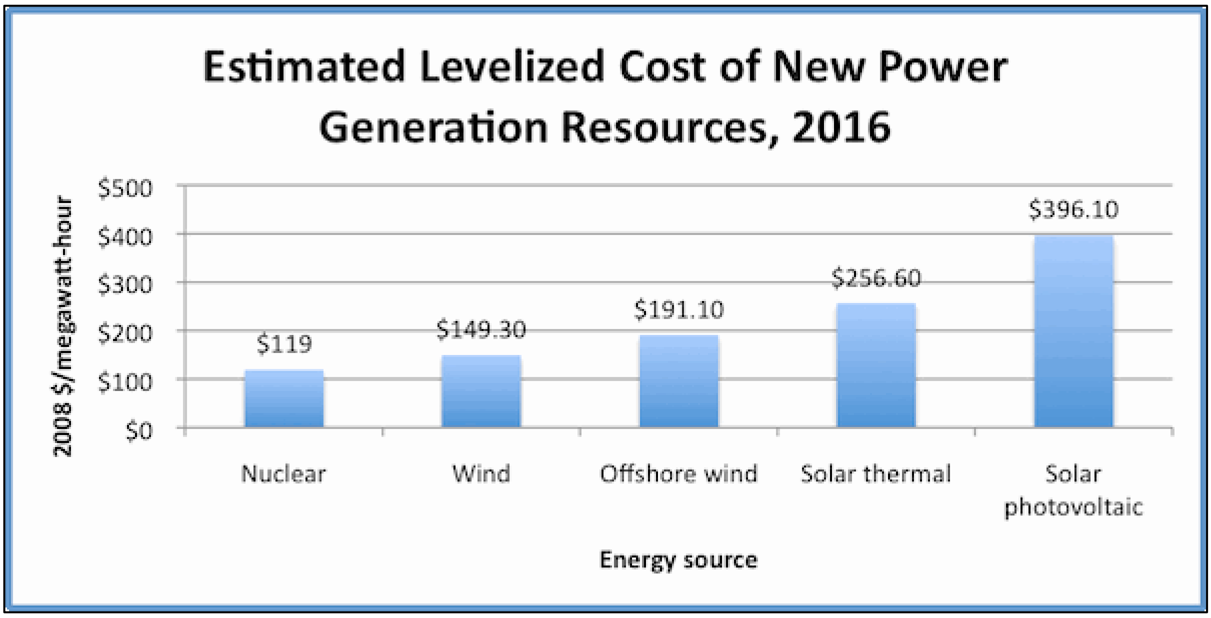
Providing incentives for long-term, high-capital investment in deregulated markets driven by short-term price signals presents a challenge in securing a diversified and reliable electricity supply system.

In assessing the economics of nuclear power, decommissioning and waste disposal costs are fully taken into account.

Nuclear power plant construction is typical of large infrastructure projects around the world, whose costs and delivery challenges tend to be under-estimated.

Assessing the relative costs of new generating plants utilising different technologies is a complex matter and the results depend crucially on location. Coal is, and will probably remain, economically attractive in countries such as China, the USA and Australia with abundant and accessible domestic coal resources as long as carbon emissions are cost-free. Gas is also competitive for base-load power in many places, particularly using combined-cycle plants, though rising gas prices have removed much of the advantage.

Nuclear power plants are expensive to build but relatively cheap to run. In many places, nuclear energy is competitive with fossil fuels as a means of electricity generation. Waste disposal and decommissioning costs are included in the operating costs. If the social, health and environmental costs of fossil fuels are also taken into account, the economics of nuclear power are outstanding.



It's far more efficient than solar, wind, and even coal in terms of levelized cost.

OECD electricity generating cost projections for year 2010 on – 5% discount rate, c/kWh

Country	Nuclear	Coal	Coal with Ccs	Gas CCGT	Onshore wind
Belgium	6.1	8.2	-	9.0	9.6
Czech R	7.0	8.5-9.4	8.8-9.3	9.2	14.6
France	5.6	-	-	-	9.0
Germany	5.0	7.0-7.9	6.8-8.5	8.5	10.6
Hungary	8.2	-	-	-	-
Japan	5.0	8.8	-	10.5	-
Korea	2.9-3.3	6.6-6.8	-	9.1	-
Netherlands	6.3	8.2	-	7.8	8.6
Slovakia	6.3	12.0	-	-	-
Switzerland	5.5-7.8	-	-	9.4	16.3
USA	4.9	7.2-7.5	6.8	7.7	4.8
China*	3.0-3.6	5.5	-	4.9	5.1-8.9
Russia*	4.3	7.5	8.7	7.1	6.3
EPRI (USA)	4.8	7.2	-	7.9	6.2
Eurelectric	6.0	6.3-7.4	7.5	8.6	11.3

* For China and Russia: 2.5c is added to coal and 1.3c to gas as carbon emission cost to enable sensible comparison with other data in those fuel/technology categories, though within those countries coal and gas will in fact be cheaper than the Table above suggests.
Source: OECD/IEA NEA 2010, table 4.1.

At 5% discount rate comparative costs are as shown above. Nuclear is comfortably cheaper than coal and gas in all countries.

Uranium Will Be 2016's Best-Performing Commodity

In a bad year for metals and commodities in general, uranium has been the lone bright spot. The glowing green stuff surged almost 40% since bottoming out at $28.25 per pound in 2014. It's currently trading around $37.

Uranium was drastically oversold in the wake of the 2011 Fukushima disaster. World energy demand is set to rise 37% by 2040, according to the IEA.

Not every country is blessed with massive reserves of natural gas and coal. And the ones that are are rethinking that model in light of climate change. Carbon emissions are no longer en vogue. They pose a serious risk to our health and our environment.

Of course, green energy sources — such as solar, wind, and hydropower — aren't capable of carrying the load on their own. They're too expensive, and they simply don't have enough juice to power the planet.

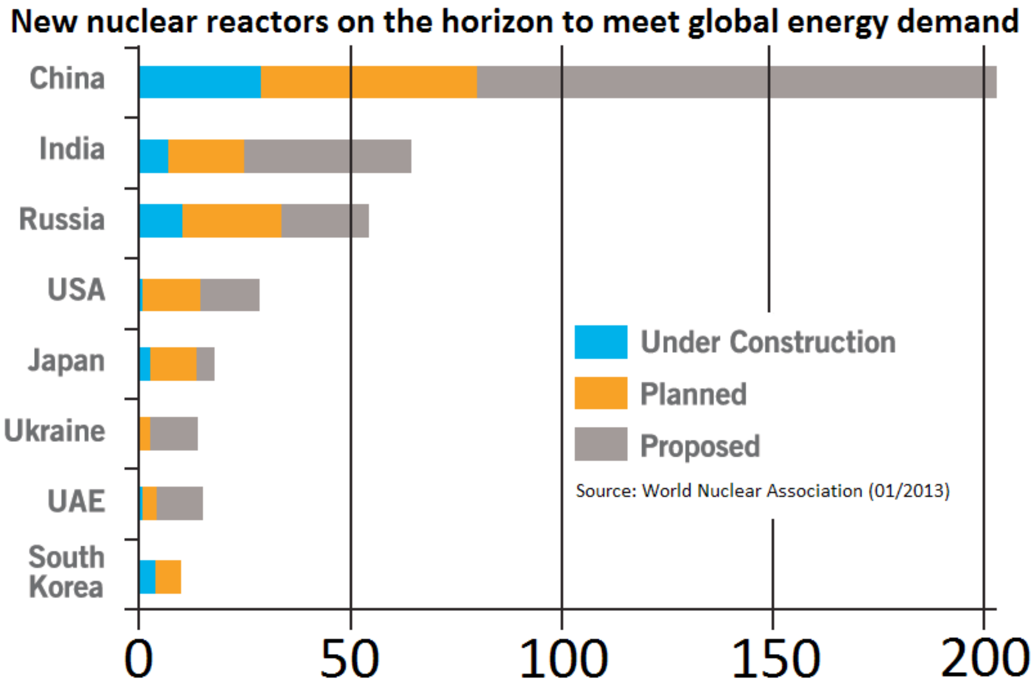
Nuclear power is necessary. It's cheaper than alternative fuel sources, and it emits no carbon. In that capacity, nuclear energy is actually good for the environment. Nuclear power has avoided the release of an estimated 56 gigatonnes of CO2 since 1971. That's almost two years of total global emissions at current rates.

In all, more than a dozen countries get over 25% of their energy from nuclear power, with 437 nuclear reactors operating around the world. On top of that, there are another 71 reactors under construction, 165 planned, and 315 proposed.

China is the biggest driver by far. The country currently has 17 reactors in operation, another 28 under construction, and more than 100 planned. Beijing is spending a whopping $2.4 trillion to expand its nuclear power generation by 6,600%.

India is in a similar situation. It's pledged to grow its nuclear power capacity from 5,000 megawatts to 63,000 megawatts by 2030.

And 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. In all, 15 Japanese nuclear plants housing 25 reactors have applied for permission to resume operations. Five reactors have already been cleared. This, predictably, has led to a sharp rise in uranium 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. And that may even be lowballing it.

An early 2015 *Morningstar* report declared: We expect global uranium demand to rise 40% by 2025. Annual growth of 2.8% might not sound like a lot, but is massive for a commodity that has seen precious little demand growth since the 1980s. Consider that average annual copper demand growth of less than 3% from 2002 to 2012 was enough to drive a 336% price increase.

Mined supply of uranium will struggle to keep pace amid rising demand and falling secondary supplies. Low uranium prices since Fukushima have left the project cupboard bare. We expect a cumulative supply deficit to emerge by 2021.

These shortfalls 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. We estimate prices must rise from $50 a pound to $75 a pound to encourage enough new supply.

No doubt, the five-year bear market in uranium prices was devastating for producers. Prices slid from $52 per pound to just $28.25 in June 2014. Mining the metal quickly 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. Now, 80% of the world's primary uranium supply comes from just 10 mines. And future global supply is dependent on just five newly proposed projects.

That hasn't been a problem up until this point, because the world had adequate reserves to cover for declining production. But 2016 marks a huge inflection point for the industry. This is the first year that demand will actually exceed supplies, creating a 60,000-tonne shortfall by 2018.

Over the next 10 years, we're going to see uranium prices more than double, surging from less than $40 per pound today to more than $80 per pound in just a few short years. That bull run will begin in earnest in 2016. You can expect the metal to rise to at least $50 per pound next year. That alone would be a 35% jump from current levels. After that, it's likely to hit $60 in 2017 and $70 or even $80 in 2018.

5 Conclusions

The recent UN Climate Talks in Paris have put forward the goal of limiting the global temperature rise to two degrees Celsius by the end of the century. This is providing a strong political base for expanding the nuclear power capacity because of the critical role that nuclear power plants play in the production of electricity without emissions of greenhouse gases. Nuclear power is also cost competitive with other forms of electricity generation, except where there is direct access to low-cost fossil fuels.

Green energy sources — such as solar, wind, and hydropower — aren't capable of carrying the load on their own. In all, more than a dozen countries get over 25% of their energy from nuclear power, with 437 nuclear reactors operating around the world. On top of that, there are another 71 reactors under construction, 165 planned, and 315 proposed.

In this context, a cumulative supply deficit is expected to emerge by 2021 while 2016 marks a huge inflection point for the industry, beeing the first year that demand will actually exceed supplies, creating a 60,000-tonne shortfall by 2018. Over the next 10 years, we're going to see uranium prices more than double, while the bull run will begin in earnest in 2016.

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