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Uranium Market Outlook

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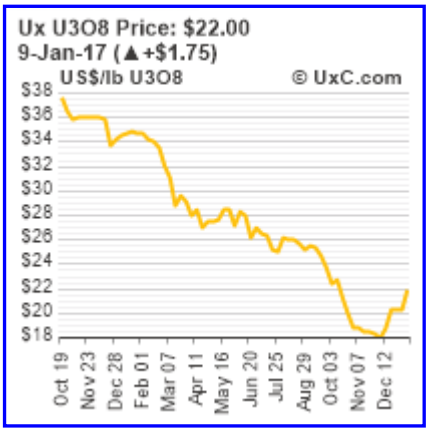

► Improving nuclear energy sentiment offers prospective uranium market outlook for 2017

In my **Uranium Market Outlook** December 2016 I said that the U3O8 spot price appears to have bottomed finally, after having touched a 12-year low of $ 18.25 on November 25, 2016. Since then, as a result of an improving nuclear energy sentiment, the spot price started to recover to a current level of $ 22.00.

Positive news came from Kazakhstan, the world's largest uranium producer, which plans to produce less uranium in 2017 due to on-going oversupply in the uranium market.

OVERVIEW OF U3O8 PRICES

	Spot		Long-term		Spot	Long-term
2017						
January 9	22.00		30.00	**Year-end 2016**	**20.25**	**30.00**
2016				Year-end 2015	34.25	44.00
December 26	20.25		30.00	**May 31, 2015 (year high)**	**39.50**	50.00
December 14	18.75		30.00	Year-end 2014	35.50	49.00
November 28	**18.25**	*	33.00	**May 14, 2014 (year low)**	**28.25**	49.00
October 31	18.75		35.50	Year-end 2013	34.50	50.00
September 26	23.75		38.00	Year-end 2012	43.50	56.50
August 29	25.25		38.00	Year-end 2011	61.75	64.00
July 25	25.00		40.50			
June 27	27.00		40.50	Pre-Fukushima accident		
June 20	26.15		41.00	March 11, 2011	67.75	73.00
May 30	27.25		41.00			
April 25	27.50		43.50			
March 28	29.15		43.50			
February 29	33.50		44.00			
January 31	34.75		44.00			

* *spot price 12- year low*

The improved uranium market sentiment is underpinned fundamentally by the strong recovery of oil and gas prices in the course of last year, enhanced by President-elect Trump's energy policy, which will be executed by the nomination of Rex Tillerson (CEO of Exxon Mobil) for Secretary of State and Rick Perry (former Governor of Texas) as Energy Secretary.

The policy protects the US fossil fuel industry which derives a 30% share from coal-fired plants and 28% from natural gas.

In addition, nuclear energy contributing 19.5% to making the US self-sufficient, demonstrates its important share in electricity generating in the US, leaving only a minor share for renewable energy and as such is not to be considered as a priority issue in the US energy policy.

Considering the prominent role of the oil and gas industry, there is no economic need to change national energy mix, including nuclear power accounting for more than 30% of worldwide nuclear generating of electricity.

It is noteworthy that the use of nuclear energy in electricity generating has become more competitive, as a result of the increase of the national gas price by approximately 50% in 2015, against which the U3O8 spot price collapsed 59% by year-end 2016.

It is noteworthy that while US nuclear power plants in 2015 produced 3.4 million pounds of U3O8, representing only 6% of the total 56.5 million pounds demand of total nuclear utilities.

As a result, with nuclear energy representing more than 60% of emission-free electricity, this underpins the importance of protecting the strong position of nuclear energy in the total electricity generating mix of the US, and the support of the national uranium industry to increase its share in national supply.

From this perspective it is striking to see that the Obama-government did not have an open eye for the problems of the nuclear industry which has suffered the last few years from the collapse of the uranium price, being responsible for negative operational cash flows and long-term delivery contracts coming under water.
As a result, market valuations of the 4 listed US producers collapsed to six year lows (see overview).

MARKET VALUATION OF UNITED STATES FOCUSED LISTED URANIUM PRODUCERS

(in US$ million)

Country focus	Company Name		Year-end 2016	Year-end 2015	Year-end 2014	Change in % 2016/2014	Year-end 2013	Year-end 2012	Year-end 2011	Year-end 2010	Change % 2016 / 2010
United States	Uranium Energy	*1)*	132	105	160	-18	179	218	253	421	-69
	Energy Fuels	*2)*	109	134	121	-10	111	123	167	158	-31
	Ur-Energy	*3)*	76	85	110	-31	170	101	96	303	-75
	Peninsula Energy	*4)*	75	138	113	-34	60	122	122	158	-52

1) ISR production commencement in November 2010; no production in 2014 and 2015

2) Acquired in May 2012 all of Denison Mines' US uranium assets in exchange for 425.44 million shares valued at Cdn$ 81 million; premium of 37%; including takeover of Uranerz completed on June 19, 2015

3) ISR production commenced 1n August 2013

4) First ISR production commenced in December 2015

To prevent funding from foreign investors, in particular from Asia, which would affect national uranium supply as is currently the case in Canada (strategic joint ventures entered into by NexGen Energy and Fission Uranium), it is of strategic importance that the Trump-government supports the country's uranium industry.
This can be effectuated by a national uranium fund buying uranium in the open market to compensate for the longer than anticipated restarts of Japanese reactors, which is mainly responsible for the short-term oversupply.

Considering tat commercial operation has been resumed at only 3 nuclear reactors of Japan's 48 operational nuclear reactors that were gradually taken offline following the March 2011 accident at Fukushima Daiichi, it is not a question of if but when the uranium piece will recover to the economically viable pre-Fukushima level of $ 65 – 70/lb.

To facilitate achieving this level again, with nuclear energy to be recognized as the only large-scale emission-free energy source, the Trump-government should follow a comparable protecting policy as for the oil and gas industry by building uranium stock through the open market to secure future supply rather than to remain dependent on foreign supply.

With Donald Trump having threatened to reverse the signature of the US under the Paris Climate Agreement, this would be in conflict with his "America first" policy to protect the gas and oil industry. This represents approximately 67% from electricity generation, 19.5% from hydro and only 7% from other renewables.

These figures demonstrate that also in case the USA would not withdraw from the Paris Climate Agreement, their signature is of symbolic nature only, like it is for China, which remains for more than 60% dependable from coal supply.

United Nations change report calls for World action on carbon emissions and leaves nuclear power as the only mature source

The report requires the global share of low-carbon options for electricity supply – nuclear power, renewable, bio-energy and carbon capture and storage (CCS) from fossil fuels collectively to increase from current levels of 30% to reach 80% by 2050, hence effective quadrupling them. The report notes that particularly mitigation technology from the mix would lead to substantially increased costs.

However, CCS is unproven and its economic practicality is simply a hope, bio-energy to replace fossil fuels raises questions of scale, wind and solar renewable are well-proven along with their intrinsic limitations leaving nuclear power as the only mature viable clean and cost-effective alternative for fossil fuels (oil, gas, coal) providing power and demand regardless of weather or time of day.

British Petroleum expects nuclear power to grow by 50% in the period between 2014 and 2035

In the 2016 edition of its Energy Outlook **BP** expects global energy demand to grow by 34% between 2014 and 2035, with nuclear power's share of primary energy to grow 50% in total over the same period.
Coal's share of global primary energy production is expected to drop from 30% in 2014 to 25% in 2035, its lowest share since the industrial revolution, according to BP.

In the base case of the Energy Outlook **BP** says world energy consumption will grow by 34% between 2014 and 2035, from 12,928 million tonnes oil equivalent (toe) to 17,307 million toe.
Some 95% of this growth will come from non-OECD countries.

Fossil fuels will remain the dominant factor of energy providing some 60% of the additional energy and accounting for 80% of total energy supplies in 2035, the study says. They accounted for 86% of energy supply in 2014.

By 2035, **non-fossil fuels** will make up 21% of global primary energy compared with the current 14%. Mining non-fossil fuels, renewables (including bio fuels) are forecast to grow 6.6% per year, taking their share of primary energy from around 3% today to 9% by 2025.

More than half of the growth in global energy consumption is used for power generation "as the long-run trend towards global electrification continues". The share of energy used for power generation is expected to increase from 42% today to 45% by 2035, **BP** said.

In the same period, the share of **coal** in power generation drops from 43% in 2014 to around one-third in 2035.

The **global use of nuclear energy** is forecast to grow by 1.9% per year from 574.0 million tonne in 2014 to 859.2 million tonne in 2035, which is an overall increase of 50%.

Nuclear output in the European Union and North America is expected to decline 29% and 13%, respectively, as ageing reactors are gradually retired and "the economic and political challenges of nuclear energy stunt new investments". However, output in China is forecast to increase 11.2% annually.
BP says Japan's nuclear output will reach 60% of its 2010 level by 2020 as reactors restart over the next 5 years.

The rate of growth of carbon emissions between 2014 and 2035 is expected to more than half relative to the past 20 years, reflecting gains in energy efficiency and the changing fuel mix. BP CEO Bob Dudley said "Despite this, carbon emissions are likely to continue to increase, indicating the need for further policy action".

► Paris Climate Agreement confirms essential contribution of nuclear energy to limit global warming

With 195 countries having adopted the first-ever universal climate agreement which sets out a global action plan to put the world on track to avoid dangerous climate changes by limiting global warming to 1.5C, due to enter into force in 2020, executing the plan is in conflict with a variety of national directives in many countries to cut CO2 emission through the transmission of electricity generating from fossil fuels to renewable energy and the Paris climate agreement also recognizing the essential contribution of nuclear energy as the only large-scale alternative to replace fossil fuels.

In other words, it will not be possible to change the current mix of energy sources of major industrial countries, applying both to the United States and Europe, in particular Germany, and emerging countries, led by China, India and Russia, with most of these countries heavily dependent on coal energy as the dirtiest energy provider.

In this respect, it is noteworthy that the Kyoto Protocol in 2009, which targets a 20% cut in CO2 emission by 2020, did not result in any improvement to date and the situation actually worsened due to the rise of worldwide industrial output, with the United States and China the biggest climate contaminators.

On the side line of the Paris Agreement it is good to learn that nuclear energy remains an essential component in the action plan, thereby recognizing that in the Western world the share of nuclear energy is approximately 30% of total world consumption and approximately 11% worldwide. With China and India representing only 2.6% and 3.5% respectively, these countries have ambitious plans to multiply the share of nuclear energy in total energy consumption. In addition, a growing number of emerging countries have planned construction of nuclear plants to diversify their pallet of energy providers.

In this respect, it is noteworthy in memory of Tsjernobil in 1996 due to human failure and strengthened by the Fukushima disaster in March 2011, these two disasters have fed out-dated views on the safety and environmental impact of nuclear reactors, thereby not recognizing that today's third generation of nuclear reactors meets the highest possible safety requirements and also the disposal of nuclear waste fully secured under governmental supervision.

European Union, profiling itself as a leader in promoting action on climate change but does not act accordingly

In March 2007, the European Council endorsed the European Commission's Strategic Energy Review and agreed on a unilateral cut of 20% in EU greenhouse gas emissions by 2020, relative to the 1990 levels. The Council also set a target of meeting 20% of EU energy needs from renewals by 2020, leaving individual countries to decide their own policies in such a way as to allow nuclear power as part of their energy mix to be taken into consideration in allocating individual country targets for renewables.

The Council noted the European Commission's assessment of the contribution of nuclear energy in meeting the growing concerns about safety of energy supply and CO2-emitting energy source.
The 2008 policy was set "20-20-20" – 20% reduction in CO2 emissions, 20% of electricity from renewable and 20% improvement in energy efficiency by 2020.

The European Commission's 2030 Policy Framework for Climate and Energy in January 2014 moved away from major reliance on renewables to achieve emission reduction targets and allows scope for nuclear power to play a larger role.
The board is focused on CO2 emission reduction only, not the means of achieving that, and allows more consideration for cost-effectiveness.

The centerpiece is a binding 40% reduction in domestic greenhouse gas emissions by 2030 (compared with a 1990 baseline) which will require strong commitments from the 28 EU member states.

►European Union nuclear trade body calls for 100 new reactors by 2050

The nuclear trade body for the EU, **Foratom**, has stated the target after submitting a position paper for the European Commission, which expects at least 14 EU Member States to be operating nuclear power plants (NPPs) in 2050. A revised version of the Illustrative Program for Nuclear Energy, known as PINC, is intended to be published by the end of this year.

When built, new NPPs have many advantages in the electricity market:

- Designed to operate for a long time (60 to even 80 years, subject to national safety regulator's approval) Relatively low fuel and other operating costs can be centrally and flexibly attached and
- Provide predictable output

While the financial crisis, the Fukushima accident and the tensions in Ukraine have all had impact on the energy sector as a whole, as well as on the nuclear sector, nevertheless, global interest in nuclear power is growing and there are currently more nuclear power plants under construction around the world than there have ever been. These total 67 reactors, led by China (26), Russia (9) and India (6).

Nuclear energy by the Intergovernmental Panel on Climate Change confirmed as "an effective greenhouse gas mitigation option to be underlined in the PINC" contributes to all three objectives of U energy policy. These are security of supply, decarburization of the electricity sector and competitive power prices.

The European Commission acknowledges in its Policy Framework for Climate and Energy in the period from 2020 to 2030, published in January 2014, that nuclear energy contributes to a competitive, secure and sustainable energy system in the European Union, according to Foratom with the EC to be asked to apply a technology neutral approach which will facilitate investment in all low-carbon technologies including nuclear, and provide a stable regulatory and investment framework.

The EU should facilitate nuclear development projects by providing a stable regulatory and investment framework given the importance of nuclear power for achieving the EU's climate action goals.
Confidence needs to be built among equity investors in nuclear power projects to maintain Europe's leadership role in nuclear technology and innovation, according to Foratom.

Expected to have high competitive and sustainability advantages, advanced nuclear reactor technology, including Generation IV, should be provided with adequate funding for development ad demonstration at EU level, taking into account the EU potential in terms of human and financial resources, according to Foratom.

European energy targets are out of reach

With Western Europe for approximately 30% dependent on the import of Russian gas, the energy targets of the EU with the primary focus on renewable, in conjunction with Germany having phased out nuclear energy, are not realistic and as such not achievable.

This view is emphasized by the European Council having set a target of meeting 20% of EU energy needs from renewals by 2020, individual countries *have* been left the decision on their own policies in such a way as to allow nuclear power as part of their energy mix to be taken into consideration in allocating individual country targets for renewables.

In this respect, it is striking to see that major European countries have totally different views on the energy mix to follow.

While **France** with a share of 76% represents by far the highest share of nuclear energy, which it intends to bring back to 50% to the full benefit of renewable energy, **Germany** has decided to fully phase out nuclear power. After already having shut of its originally 17 old plants, nuclear's share in total electricity generation is currently around 14% of total electricity.

More than half of Germany's electricity is generated from coal which is subsident by some € 2.5 billion (US$ 3.3 billion) each year (no subsidies), while the combined subsidies from wind and solar plants total some € 5 billion per year.

The decision to shut all its nuclear plants will cause dramatic economic and environmental consequences. Despite the massive investment in renewable energy, this will create an extra 300 million tons of CO2, by 2020 due to increased use of fossil fuels. That will virtually cancel out the 335 million tons of CO2 savings required under the terms of the European Commission's 2011 Energy Efficiency Directive.

Germany: Energiewende will affect future consumer prices and competitiveness of industry

In September 2011, a study from KfW Banken Gruppe said that about € 25 billion per year will be required to meet the government's Energiewende nuclear phase-out goals. It puts the total investment at approximately € 250 billion by 2020. This includes up to € 10 billion on fossil fuel plants, € 144 billion on renewable plants and as much as € 29 billion on 3,600 km of high-voltage transmission lines.
These costs come for the account of German tax payers.

Taken these costs into account, which will have a negative impact on future end consumer prices and having a material impact on the competitiveness of the German industry in Europe, in particular compared to France, I expect the Energiewende to face a growing resistance in the next few years.

Also to be considered is the dependence on supply from Russian gas and intended shale gas drilling in Germany, having been shelved for the next seven years.

European Union: 128 nuclear reactors operating in 14 countries

	Number of reactors	in percentage of total electricity generating
France	58	76.3
UK	15	18.9
Sweden	9	34.3
Germany	8	14.1
Spain	7	20.3
Belgium	7	37.5
Czech Republic	6	32.5
Finland	4	33.7
Hungary	4	52.7
Slovakia	4	55.9
Romania	2	17.3
Bulgaria	2	31.3
Slovania	1	38.0
the Netherlands	1	3.7
	128	

No nuclear reactors operating in 14 EU countries

Italy
Portugal
Poland
Ireland
Croatia
Austria
Denmark
Luxembourg
Greece
Estonia
Latvia
Lithiania
Malta
Cyprus

Switzerland has 5 nuclear reactors generating 23 TWh nuclear power equivalent to 34% of Swiss total electricity generating production, with hydro supplying 59%. A lot of electricity is imported from France, Austria and Germany. While there are no current plans to build more nuclear plants, $ 12 billion investment in hydro projects is reported.

In November 2016 a referendum brought by the Green party proposed that nuclear plants to be closed after a maximum of 45 years in operation. This would have meant three of the five reactors closing in 2017 and the other two in 2024 and 2029. The outcome of the referendum failed by about 54 : 46, with voters expressing confidence in both operations and the safety authority, despite a major anti-nuclear campaign.

United Kingdom

In 2015, 338 TWh of electricity was produced in the UK. This comprised of 100 TWh (29.5%) from gas, 26 TWh (23%) from coal, 70 TWh (29%) from nuclear, 2 TWh from oil, and 85 TWh 25% from renewables of which: 40 TWh (12%) from wind, 7.5TWh from solar, 9 TWh from hydro and pumped storage, 29 TWh from bio-fuels and 4 TWh from wastes.

Net electricity imports – mostly nuclear were 21 TWh from France, 8.0 TWh from the Netherlands and 0.9 TWh net was exported to Ireland .

North Sea oil has been a major energy and revenue source for the UK, but the resources are now depleted. The decommissioning cost is about £ 30 billion with the government liable for 60% of this.

France's EDF, 85% owned by the French government, successfully bid for government-owned British Energy, completing the £ 12 billion acquisition in January 2009. EDF Energy, plans to build to EPR nuclear reactors at Hinkley Point C in Somerset, linked to some extent with its plans to build two more at Sizewell in Suffolk. The company applied for consent to construct and operate the first two (3,260 MWe) at Hinkley Point in October 2011.

By mid-September 2010 EDF Energy had led £ 50 million in contracts for site works at Hinkley Point, and by February 2013 pre-development costs there had reached almost £ 1 billion. In March 2013 environmental permits were granted for the plant operation, and planning permission was received.

In October 2013, the government announced that initial agreement had been reached with EDF Group on the key terms of a proposed £ 16 billion investment contract for the Hinkley Point C nuclear power stake.
In October 2014, the European Commission decided that revised UK plans to support the construction and operation o the project were in line with the European Union State and rules.
In October 2015, a strategic investment agreement was signed committing China General Nuclear Corporation (CGN) to take 33.5% of the Hinkley Point C Project and EDF initially being responsible for 66.5%, with a view to selling this down to near 50%.

In November 2015, Wintime and China General Nuclear ("CGN") signed a frame work agreement to form a partnership aimed at developing nuclear power and other clean energy project worldwide. The two companies will additionally develop two AP 1000 units at Lufeng in China's Guadong Province.

Late in July 2016, EDF made its decision to proceed with the project, with full construction to begin in mid-2019. After seven weeks of uncertainty, the government gave approval after reaching an agreement with EDF, signed at the end of September, which means that the government will be able to prevent the sale of EDF's controlling stake prior to completion or construction.

On January 3, 2017, it was announced that shareholders of China coal miner Wintime Energy have approved its proposed investment in Hinkley Point C ("HPC") – EDF and China General Nuclear's project to build two European Pressurised Water Reactors (EPR's) in Somerset.
Wintime Energy (Wing Tai Energy in China) announced its plan to invest up to 3 billion Yuan ($ 440 million) in HPC through a wholly-owned subsidiary of New Energy, Huayuan New Energy on December 13, 2016.

No material impact from Fukushima accident in March 2011 on future nuclear energy demand

Country	Nuclear generating 2015 (billion kWh)	in % total consumption	Operable reactors	Under construction	Planned	Proposed	Uranium required 2016 (in tonnes U)
January 1, 2017							
China	161.2	3.0	35	22	40	136	5.338
India	34.6	3.5	22	5	20	44	997
Russia	182.8	18.6	35	7	25	23	6.264
USA	798.0	19.5	99	4	5	17	18.161
Japan	*4.3*	*0.5*	*x*	-	-	-	*680*
x before Fukushima accident 48 operable reactors; 3 reactors restarted; 24 reactors in the process of restart							
European Union	815.2	NA	128	4	12	16	20.100
of which 70% applies to:							
France	*419.0*	*76.3*	*58*	*1*	-	*1*	*9.211*
UK	*63.9*	*18.9*	*15*	-	*4*	*9*	*1.734*
Germany	*86.8*	*14.1*	*8*	-	-	-	*1.689*
Subtotal	1.991.8		319	42	102	236	51.540
World total	2.441.0	11.5e	447	60	164	347	63.404
China, India, Russia and EU in % of world total	81		71	70	62	68	80

source: WNA

Institute of Energy Economics Japan expects 19 nuclear plant units to be restarted by March 2018

Nuclear Energy accounts for just 1.1% of Japan's electricity production and commercial operation has been resumed at only 3 (Sendai 1, Sendai 2 and Ikata 3) of the country's 48 operational nuclear reactors having been gradually taken offline following the March 2011 accident at Fukushima Daiichi.

In its Economic and Energy Outlook of Japan through 2017, the Institute of Energy Economics Japan (IEE) has considered the economic impact in financial years 2016 and 2017 (ending March 2017 and 2018, respectively) of various scenarios for the restart of reactors in japan.

The organization estimates that if restarts take place according to the current schedule – "the reference scenario" – 7 reactors could restart by the end of fiscal year 2016 (ending March 2017). By the end of fiscal year 2017 (ending March 2018) 19 units could be restarted, generating some 119.8 TWh of electricity annually, compared with total nuclear output of 288.2 TWh in fiscal year 2010 (ending March 2012), the year prior to the accident at the Fukushima Daiichi plant on 11 March 2011.

Under this scenario, compared with fiscal year 2010, total spending on fossil fuel costs, feed-in-tariffs and grid stabilization costs, increased by about Japanese yen (JPY) 100/MWh, relative to the same period, energy-related carbon dioxide emissions to 1,094 million tonnes CO2.

Under the best "mix scenario" – which reflects the generation mix of the Ministry of Economics, Trade and Industry's long-term energy supply and demand outlook – nuclear output reaches 195 TWh by the end of fiscal year 2017.

Total fossil fuel import spending falls by JPY 1.2 billion (US$ 1.68 billion) and energy-related emission drops by 114 million tonnes CO2. However, the average electricity unit cost increases by JPY 600/MWh, reaching JPY 6900/MWh, which is the highest among four scenarios having been presented.

As a rule, if one nuclear plant with a capacity of 1 GWe stops operation for one year in an area where annual demand is about 100 TWh, total fossil fuel costs increase by JPY 60 billion (US$ 84.3 billion) and the energy-related CO2 emission increased by 4 million tonnes CO2.
The average electricity unit cost will increase by JPY 400/MWh

Gradually, the 'passing of safety checks and the process of restarting reactors under the new regulation standards is proceeding", the IEEJ said. And yet, there still is much ambiguity on judicial ruling and/or local acceptance which will influence the pace of restart.

Consequently, the restart of 19 reactors by the end of March 2018 as estimated by the IEE, is too optimistic and is to a large extent due to the collapse of the uranium market.

In this respect, it should be considered that the restarts are urged to meet its climate goals, as was said by Akio Takahashi, president of the Japan Atomic Industry Forum, held in the last week of December 2016.

USA accounts for more than 30% of worldwide nuclear power generation of electricity

The **USA** is the world's largest producer of nuclear power, accounting for 33% of worldwide nuclear generation of electricity. The country's 100 nuclear reactors produced 798 billion kWh in 2015, accounting for 19.5% of its total electricity generated. At the end of 2016 there are now 99 nuclear power reactors operable generating 99,535 GWe net and 4 under construction.

Following a 30-year period in which few new reactors were built, it is expected that 6 new units may come on line by 2020, 4 of these resulting from 16 licence applications made since mid-2007 to build 24 new reactors.
However, lower gas prices since 2009 have put the economic viability of some existing reactors and proposed projects in doubt.

Government policy changed since the late 1990s have helped pave the way for significant growth in nuclear capacity. Government and industry are working closely on expedited approval for construction and new plant design. The industry invests about $ 7.5 billion per year in maintenance and upgrades of the plants.

By February 2016, the Nuclear Regulatory Commission (NRC) reviewed the operating licences of 83 reactors (79 still operating), over 80% of the US total and about 30 were actually I their 40-60 year age bracket.
The NRC is considering licence renewal applications for 11 further units, with ore applications expected.

The NRC is now preparing to consider extending operating licences beyond 60 to 80 years, with the Subsequent Licence Renewal (SLR) programme.

Despite a near halt in new construction of more than 30 years after the Three Mile Island, Pennsylvania accident in 1979, US reliance on nuclear power has grown. In 1980, nuclear power produced 251 billion kWh accounting for 13% of the country's electricity generation. In 2008, that output had risen to 890 billion kWh and nearly 20% of total generated electricity.

Most of the increase came from the 47 reactors all approved for construction before 1977, that came online in the late 1970s and 1980s, more than doubling the US nuclear generation capacity. The US nuclear industry has also received remarkable growth in power plant utilisation through improvement refuelling, maintenance and safety systems of existing plants.

In 2015, the US electricity generating was 4,094 kWh (billion kWh) net, 1,582 TWh (39%) of it from coal-fired plant, 1,138 TWh (29%) from gas, 797 TWh (19.5%) nuclear, 259 TWh (6%) from hydro and 279 TWh (7%) from other renewables. In 2015, 727.5 TWh (19.3%) was generated from nuclear energy.

Coal is projected to retain the largest share of the electricity generation mix to 2035, though by 2020 about 29 GWe of coal-fired capacity is expected to be retired due to environmental constraints and low efficiency coupled with a continued drop in the fuel price of gas related to coal.

Given that nuclear plants generate nearly 20% of the US's electricity overall and 63% of its carbon-free electricity, even a modest increase in electricity demand would require 13.2 GWe of new nuclear capacity by 2025 in addition to the 5 nuclear pans currently under construction in order to maintain this share.

If today's nuclear plants retire after 60 years of operation 22 GWe of new nuclear capacity would be needed by 2030, and 55 GWe by 2035 to maintain a 20% nuclear share.

▶ U.S. uranium mill in production		Operated by:	Annual capacity tU
White Mesa Mill	Utah	Energy Fuels	4,000
▶ U.S. uranium in-situ-leach plants in production			
Smith Ranch - Highland Operation	Wyoming	Cameco	2,100
Lost Creek Project	Wyoming	Ur-Energy	770
Willow Creek Project	Wyoming	Uranium One *(wholly ownd by Russia's **ARMZ**)*	500
Crow Butte Operation	Nebraska	Cameco	385
Nichols Ranch ISR Project	Wyoming	Energy Fuels	300

Uranium Energy (NYSE – UEC)

Uranium Energy's fully-licenced Hobson Processing Plant is central to all of its uranium projects in South Texas, including the **Palangana in-situ recovery (ISR) mine** and the permitted **Goliad ISR** and **Burke-Hollow ISR projects**.
Additionally, UEC controls a pipeline of advanced-stage projects in Arizona, Colorado and Paraguay.

Production at **Palangana** commenced in November 2010, from which significant revenues from sales of U3O8 were realized in 2012 and 2013, but with not having any long-term delivery contracts left since 2014, **UEC** has a history of operating losses resulting in an increasing cumulated deficit balance up to more than $ 200 million.

On December 13, 2016, **UEC** announced that the Company's **Burke Hollow in-situ recovery ("ISR") Project** has been issued the Final Mine Area Permit by the Texas Commission on Environmental Quality ("TCEQ").
Burke Hollow is the third project to be developed after the **Palangana** and **Goliad** projects to be developed a part of UEC's hub-and-spoke strategy that is designed for low-cost ISR mining operations.

Burke Hollow's Mine Area Permit authorizes over 11,000 acres for mining multiple production sands within two large confirmed production areas discovered to date. TCEQ has earlier issued the final Class 1 disposal well permits for the Project, Concurrently, the Radioactive Material Licence is in technical review and the Aquifer Exemption request has already been submitted to the United States Environmental Protection Agency ("EPA").
The receipt of these permits in addition to the already approved disposal well and mine permits, would allow for production development to commence at Burke Hollow, one of the Company's largest ISR projects.

UEC began operation drilling at **Burke Hollow** in 2012, and discovered three mineralized trends later the same year. Subsequently, the Project has been expanded to its current size of almost 20,000 acres. To date, uranium mineralization has been discovered in two distinct and separate trend areas of the Property, resulting in an Inferred Mineral resource of 5.12 million pounds of U3O8 grading 0.09% U3O8.

During 2016, a drilling campaign was conducted to extend the first area scheduled for production at Burke Hollow, Thirty-two wide spread exploration holes were completed for a total of 17,020 feet. The primary objective of these holes was to bracket the projected mineralized trend extending from the resource area.
Detailed delineation of the bracketed trend and further trend extension drilling occur in the next drilling campaign.

Energy Fuels (TSX – EFR) is a leading integrated US-based uranium mining company, supplying U3O8 to major nuclear utilities. The Company holds three of America's key uranium production centers, the White Mesa Mill in Utah, the Nichols Ranch Processing Facility in Wyoming, and the Alta Mesa Project in Texas.

The White Mesa Mill is the only conventional uranium mill operating in the US today and has a licenced capacity of 2 million pounds of U3O8 per year. Alta Mesa is an ISR production center currently on care and maintenance.

Energy Fuels also has the largest NI 43-101 compliant uranium resource portfolio in the US among producers and uranium mining projects located in a number of Western US states, including mines on standby and mineral properties in various stages of permitting and development.

The Company also produces vanadium as a co-product of its uranium production from certain of its mines on the Colorado Plateau.

On January 10, 2017, **Energy Fuels** announced that the U.S. Bureau of Land Management ("BLM") has issued a Final Environmental Impact Statement ("EIS") and Record of Decision ("ROD") for the Company's 100%-owned Sheep Mountain Project. The Project, located in the Crooks Gap Mining District of central Wyoming is a large-scale, formerly producing conventional uranium mine with the potential to become a long-term uranium production center in a higher price environment.
Energy Fuels also holds a Mine Permit for the Project, which was issued by the State of Wyoming in July 2015.

The issuance of the EIS, ROD and Mine Permit are the last major government approvals required to commence mining at the Sheep Mountain Project, as the Company continues to evaluate options for processing the resources that may be mined at the Project, including toll processing at other facilities in the region.

UR-Energy (TSX – URE)

Ur-Energy is operating the Lost Creek in-situ recovery uranium facility in south-central Wyoming, which has a 2 million pounds U3O8 per annum name plate design capacity. The Company's Pathfinder Mines assets were acquired in 2013. Applications for permits and licences to operate Shirley Basin have begun to be submitted to regulators.

On January 11, 2017, **Ur-Energy** reported operational results for Q4 and yearend 2016. For the quarter 103,558 pounds U3O8 were captured within the Lost Creek plant; 111,049 pounds U3O8 were packaged in drums and 98,775 pounds U3O8 of drummed inventory were shipped from the Lost Creek processing plant to the converter.

Production was controlled at lower levels as the market remained depressed and contract commitments were largely met earlier in the year. At December 31, 2016, inventory at the conversion facility was approximately 84,689 pounds U3O8.

Contract sales from Lost Creek production totaled 100,000 pounds U3O8 at an average price of $ 32.70 per pound for sales revenues of $ 3.3 million. No spot sales were made during the quarter due to the continuing low spot price environment.

For the year, **Ur-Energy** had 662,000 pounds U3O8 under contract at an average price of $ 47.61, 200,000 pounds 3O8 of the contract were assigned to a third party in Q1, 2016.
The Company recognized $ 2.6 million in deferred revenue from the first half of the assignment transaction in Q3, 2016 and will recognize an additional $ 2.5 million of deferred revenue from the second half of the assignment transaction in Q4, 2016.

Excluding the assignment transaction, **Ur-Energy** sold 562,000 pounds U3O8 in 2016 at an average price of $ 39.49 per pound, which includes 462,000 pounds from contract sales and 100,000 pounds U3O8 of spot sales.

Ur-Energy retired its last remaining debt facility with RMB Australia Resources in December 2016. The debt facilities were used to continue the construction of Lost Creek uninterrupted and to make the Pathfinder Mines (Shirley Basin/Lucky Mc) acquisition.

Guidance for 2017

Ur-Energy has contractually committed 600,000 pounds U3O8 during 2017 at an average price of approximately $ 51 per pound. The Company has established the schedule for those commitments for the year and will provide further guidance in the first week of March when its Annual Report on Form 10-K will be filed.

Peninsula Energy (ASX – PEN)

On October 31, 2016, **Peninsula Energy** ("Peninsula") published its Q3 2016 activities report. Having begun in-situ uranium recovery operations from the Ross Permit Area at the **Lance Projects** in Wyoming in December 2015, production for the 2016 calendar year is expected to be between 135,000 and 160,000 pounds U3O8 and is now aligned to delivery commitments under existing term contracts rather than the currently weak spot market. Completed Stage 2 expansion is expected to reduce projected all-in sustaining cash by US$ 9-10/lb

On October 14, 2016, **Peninsula** reported that further project funding had been secured to continue Lance Projects development. Major shareholders Resource Capital Fund and Pala Investments continue their support of the Company by having increased the convertible loan facility from US$ 15 million to US$ 20 million. The US$ 20 million total loan amount is comprised of a US$ 12.84 million convertible loan provided by RCFVI and a US$ 7.16 million convertible loan provided by Pala.
A final binding agreement is nearing completion on a US$ 25 million Revenue Streaming Facility.

With seven headed houses online and producing, **Peninsula** will continue with the roll out of additional header houses, as construction of header house 8 to 10 will allow flow rates across all production wells to be varied, optimizing operating costs and increasing average uranium head grades.

Lower operating costs combined with high value term contracts will see **Peninsula** move to sustainable cash flow generation in the first half of 2017.

At full capacity the Lance Projects development plan comprises a 3-stage ramp-up:

- Stage 1 – production rate of between 500,000 and 700,000 pounds U3O8 per annum
- Stage 2 – production rate of up to 1.2 million pounds U3O8 per annum; and
- Stage 3 – production rate of up to 2.3 million pounds U3O8 per annum

The Lace Projects have a minimum mine life of at least 20 years, underpinned by a resource of 53.7 million pounds U3O8, the largest uranium ISR JRC-Code compliant resource in North America.

On December 8, 2016, **Peninsula** reported that it has completed its streamliner operational strategy to enhance its business performance, funded by the A$ 8.5 million private placement and its A$ 5.0 million intended to be raised via a Share Purchase Plan.

The operational strategy is expected to: enable continued production ramp-up and meet existing contract deliveries; see 500,000 pounds U3O8 delivered in 2017, delivered at a cash price of approximately US$ 53/lb; provide A$ 36.3 million of revenue in 2017; deliver sustainable positive cash flow; defer Stage 2 capital expenditure until receipt of additional contracts; and create a platform for rapid production expansion.

China to equal US nuclear energy production by 2025

China produced 161.2 billion kWh or 3% of its total electricity production in 2015. This represents 6.6% of the world's nuclear electricity, compared with the almost 33% share of the United States in current world production.

China has presently 35 nuclear reactors in operation, 20 under construction and 42 planned. By 2020-25 China is expected to generate 59 GWe from nuclear power and 150 GWe by 2030, compared with having generated 162 GWe in 2015 compared with 3% of total electricity generating of 5,374 GWe in 2015.

China's nuclear power development program is not dependent on is economic growth as the development program is a focused government commitment to meet massive base load energy demand and do so in an environmentally acceptable manner with reduction in air pollution being the number one public policy priority,

Most of **China**'s electricity of 5,374 TWh in 2015 is generated from fossil fuels (75%), predominantly from coal. In 2013, gross electricity generating was 5,433 TWh, this being 4,091 TWh (75%) from coal (73%), and 1.8% from gas, 920 TWh (17%) is generated from hydro, 3.3% from wind energy and 3.0% from nuclear energy.

China's rapid growth in demand has given rise to power shortages and the reliance on fossil fuels has led to much air pollution. The economic loss due to pollution is put by the World Bank at almost 6% of GDP

China's State Council expected CNY 2.37 trillion (US$ 380 billion) to be spent on conservation and on emission costs in the five years through 2015 In August 2013 it said that China should reduce its carbon emissions by 40-45% by 2020 from 2005 levels and would aim to boast renewable energy to 15% of its total primary energy consumption by 2020.

The February 2015 edition of the BP Energy Outlook 2035 projects that by 2035 **China** becomes the world's energy importer, overtaking Europe, as important dependence rises from 15% to 23%. China's energy production rises by 47% while consumption grows by 60%. The country's fossil fuel output continues to rise with increases in natural gas (+200%) and coal (+19%), more than offsetting declines in oil (-3%).

China's CO2 emissions increase by 37% and by 2035 will account for 30% of world total with per capita emissions surpassing the OECD by 2035.

By 2025, **China** is expected to operate 100 nuclear reactors which will be even with the current number of operable reactors in the United States.

As a result, uranium required to feed the reactors will grow by almost 300% from 5,338 tonnes required in 2016 (according to WNA figures) to up to 20,000 tonnes in 2025, compared with 18,161 tonnes U required by the US in 2016.

India aims to supply 25% of electricity from nuclear power by 2050

Because **India** is outside the Nuclear Non-Proliferation Treaty due to its weapons programme, it was for 34 years largely excluded from trade in nuclear plant of materials, which has hampered its development of civil nuclear energy until 2009. Due to earlier trade bans and lack of indigenous uranium, India has uniquely been developing a nuclear fuel cycle to exploit its reserves of thorium.

Electricity demand in India is increasing rapidly and the 1,128 billion kilowatt hours (TWh) gross produced in 2012 was more than triple the 1990 output, though still represented only some 750 kWh per capita for the year. With large transmission losses of 193 TWh (17%) in 2012, this resulted in only about 869 billion kWh consumption.

Gross electricity generation comprises 801 TWh from coal (71 %), 94 TWh from gas (8%) 23 TWh from oil (2%), 33 TWh from nuclear (3%), 126 TWh from hydro (11%) and 50 TWh (46%) from other renewables.

India has a flourishing and largely indigenous nuclear power programme and expects to have 14 GWe nuclear capacity on line by 2024 and 63 GWe by 2032. It aims to supply 25% of electricity from nuclear power by 2050.

The 2015 edition of BP's Energy Outlook projected India's energy production rising by 117% to 2035, while consumption grows by 128%. The country's energy mix evolves very slowly over the next 22 years with fossil fuels accounting for 87% of demand in 2035.

India's priority is economic growth and to elevate poverty. The importance of coal means that CO2 emission reduction is not a high priority and the government has set targets ahead of the recently held Climate Change Conference in Paris. The environment minister of India in September 2014 said it would be 30 years before India would be likely to see a decrease in CO2 emissions.

Russia to commission 15 further reactors by 2030

Russia is moving steadily forward with plans for an expanded role of nuclear energy, including development of new reactor technology. An average of one large reactor per year is due to come on line to 2028 balancing restricted capacity. Efficiency and nuclear generation in Russia has increased dramatically since the mid-1990s. In 2015, Russia's 35 operating nuclear reactors generated 182.8 billion kWh, representing 75% of the world total. 7 reactors are under construction and 25 reactors planned.

Over 20 nuclear power reactors are confirmed or planned for export construction. Russia is a world leader in fast neutron reactor technology. Exports of nuclear goods and services are a major Russian policy and economic objective.

Russia's nuclear electricity generation represents almost 19% of total electricity consumption, compared with approximately 49% from gas, 16% from coal and 16% from hydro.

Top 10 countries of world's uranium production

	Production in tonnes U	in % world total				in % world total
	2015		**2014**	**2013**	**2010**	
Kazakhstan	23.800	39	23.127	22.451	17.803	33
Canada	13.325	22	9.134	9.331	9.783	18
Australia	5.672	9	5.001	6.350	5.900	11
Niger	4.116	7	4.057	4.518	4.198	8
Russia	3.055	5	2.990	3.135	3.562	7
Namibia	2.993	5	3.255	4.323	4.496	8
Uzbekistan (est)	2.385	4	2.400	2.400	2.400	4
China (est)	1.616	3	1.500	1.500	827	2
USA	1.256	2	1.919	1.792	1.660	3
Ukraine (est)	1.200	2	926	922	850	2
Top-10 total	**59.418**	**98**	**54.309**	**56.722**	**51.479**	**96**
Others	1.100	2	1.908	2.648	2.192	4
Total world production tU	**60.518**	**100**	**56.217**	**59.370**	**53.671**	**100**
Total world production U3O8	71.369		66279	70015	63295	

source: WNA