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# 2016 Winter Uranium Survey: Acknowledging New Market Realities

UxC has been collecting responses to our Winter Market Survey over the past two months. We are grateful to all those who participated and provided their views on the current state of the nuclear fuel markets. In this week’s cover, we will review the results for the questions related to the uranium and reactor markets. In a future cover, we will examine the survey responses on conversion and enrichment-related topics.

Several important observations can be made from our latest survey results, but perhaps the most important is that it appears that most market participants are now fully aware that the uranium market (and the nuclear power market in general) is in a very different place than where it was before Fukushima. People understand that demand growth will remain muted while inventories of all forms abound. These factors are driving new market activity (e.g., the preference for mid-term deals over long-term contracts) as well as future expectations for uranium prices.

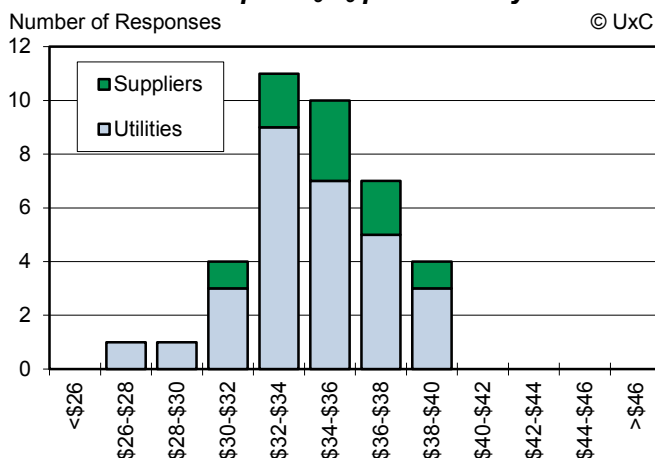
**Spot Price Expectations for 2016** – Our first question relates to year-end spot uranium price expectations. As the bottom left chart indicates, there is a reasonably wide range of views on where the spot  $U_3O_8$  price will end up this year, with the broader \$32-\$36 range seen as the most likely. It should also be noted that the spot price fell considerably during the course of the survey. Still, most respondents saw price increasing from the price level existing at the time of their response. Among those that expect price to remain low throughout the year, the view is that the spot market continues to be oversupplied – some even referred to a “glut of materi-

Ux Price Indicators					
<b>Weekly Ux <math>U_3O_8</math> Price<sup>®</sup> (4/4/16)</b>		<b>\$28.00 (-\$1.15)</b>			
<b>Month-end (3/28/16)</b>					
<b><math>U_3O_8</math></b>	Spot	<b>\$29.15</b>	<b>UF<sub>6</sub> Spot</b>	NA Price	<b>\$82.00</b>
	Long-Term	<b>\$44.00</b>		NA Value*	\$82.66
<b>Conversion</b>	NA Spot	<b>\$6.50</b>	<b>SWU</b>	EU Value*	<b>\$83.16</b>
	NA Term	<b>\$13.00</b>		Spot	<b>\$59.00</b>
	EU Spot	<b>\$7.00</b>	Long-Term	<b>\$70.00</b>	
	EU Term	<b>\$14.00</b>	<b>EUP</b>	NA Spot*	<b>\$1,212</b>
				NA Term*	<b>\$1,744</b>
*Calculated values					

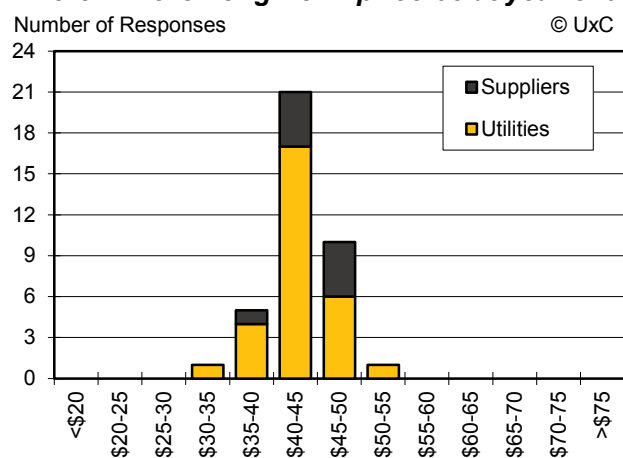
al” present in the market. Other negative factors that people point to include the strength of the dollar relative to producer-country currencies as well as the general slide in global commodity prices. The lack of significant reduction in mine production coupled with anemic growth in demand, especially considering continued delays of Japanese reactor restarts, were also highlighted. Of the few respondents that expect spot price to rise quite a bit higher before year-end, the most common arguments included expectations for producers to become bigger buyers as well as for utilities to enter the market more aggressively either through buy-and-hold or carry-trade strategies. Some even think that another mine closure could be announced this year.

**Long-Term Price for Year-End 2016** – Shifting to the long-term (LT) price, the chart at the bottom right shows that

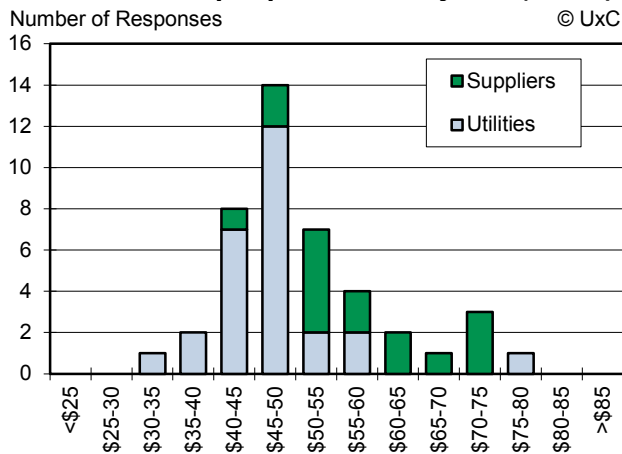
**Where will the spot  $U_3O_8$  price be at year-end?**



**Where will the Long-Term price be at year-end?**



**Where will the spot price be in 5 years (2021\$)?**



the vast majority expect price to be relatively unchanged (i.e., around \$44) at the end of the year.

Commentary to this question indicates that there is a general appreciation that LT market activity is quite low, and thus base-escalated pricing data is sparse. This lack of activity is also seen as a reason for prices to remain flat, but some mentioned that they could still see some downward movement this year. On the other hand, a minority of comments expressed the view that new LT contracting could pick up later this year as utility expectations shift towards the possibility of a supply shortage in the future.

**Spot Price in 2021** – As we move to the outlook for spot price in five years, we see from the chart above left that there is much less agreement among market participants. While nearly everyone expects prices to be higher in 2021, utilities are clearly less sanguine than suppliers about price increases.

Among utilities, most believe that prices will rise as the supply/demand situation becomes more balanced over time, but many still think that various secondary supplies, including large levels of inventories, will remain in the market in the coming five years thereby suppressing any large upward price movements. Several respondents, however, expect Japanese reactor restarts to play a bigger role in the coming years in terms of increasing demand.

Suppliers are more bullish about the future and point to the potential for current low prices to suppress investments in new mines thus setting the stage for a new price spike once inventories are used up and supplies become tighter.

**Impact of the Mid-Term Market** – Given the importance of mid-term market activity, we asked participants to evaluate the impact on the uranium market. The chart on the bottom right of this page depicts that the largest percentage of respondents view the mid-term market as positive and only a very small number view it as negative.

Commentary to this question showed that whether people view the mid-term market as positive, neutral, or negative, nearly everyone agrees that it is a natural progression and response to the realities faced in the market today. Many comments noted that mid-term deals, whereby currently

available material is financed and held for delivery at fixed prices at a certain point in the future (i.e., 2-4 years forward), are a way to efficiently clear the market of its current excess supplies. As such, the word “efficient” was used by many to characterize the mid-term market.

While some view this as a positive development that helps to reduce the current inefficiencies in the market, others, especially producers, argue that the mid-term market is harming the long-term market and ultimately producers themselves. The critics claim that, while the emergence of mid-term activity is explainable, it results in persistently low prices, destruction of future demand, and a loss of market signals in the long-term market that would otherwise create the necessary conditions for investments in future mine production.

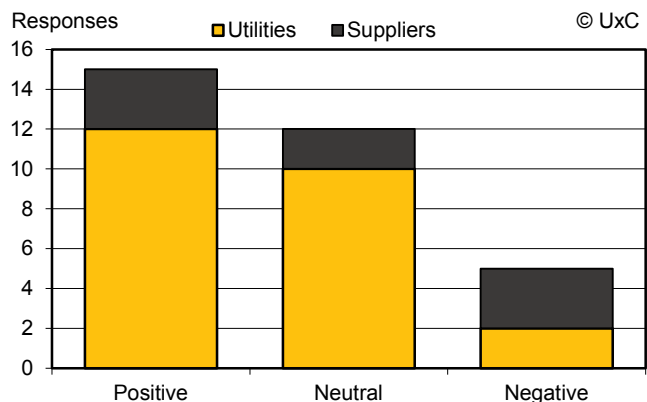
Ultimately, it is clear that nearly everyone agrees about the reasons for the increasing role of the mid-term market over the past several years, especially in the inventory-driven market that has emerged since Fukushima. At the same time, perceptions of the impact of the mid-term market vary quite a lot depending on your position in the industry.

**Paying Higher Prices to Prevent Mine Closures** – Another question we asked focused on utilities’ willingness to sign contracts at elevated prices (i.e., above current spot and term levels) in order to help prevent mine closures. As the chart at the top left of page 3 shows, roughly 85% of utilities told us they would not.

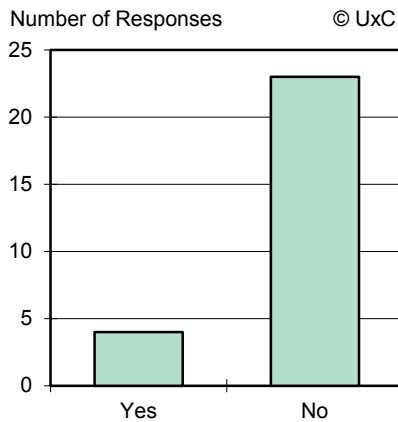
Starting with those who did say “yes” to this question, the main comments indicated that they would be willing to pay above current spot prices to support mines, but paying a premium over current LT prices was even too much for them.

On the other hand, myriad reasons were provided for why utilities are uninterested in supporting miners so directly as through above-market prices. Quite a few, especially those in the U.S. and Western Europe, mentioned their own difficult economic situations as power markets and policies are making them “fight for their own lives.” Another argument we heard referred to the fact that most utilities are currently already subsidizing miners through long-term contracts signed pre-

**Mid-term market activity has increased in importance in the past few years. How do you view the impact on the uranium market?**



**Production costs for a number of uranium projects are higher than current spot and/or term market indicators. If a utility, would you consider signing new contracts above current spot and term indicators to prevent future mine closures?**



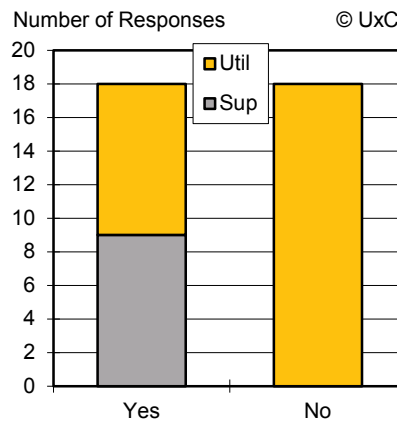
Fukushima at much higher prices. In fact, some went further to say that doing something like paying above market price would harm the market as this would lead to inefficient mines staying open when they probably should not, and thus exacerbate the oversupply situation. Of course, these are probably not the kinds of things that miners would like to hear.

**Concerns over Kazakhstan’s 40% Market Share** – The next question referred to Kazakhstan’s share of global uranium production, which in 2015 was about 40%, and whether this high share was of concern. As the second chart at the top of this page shows, the results were 50/50, although all suppliers showed concern, while utilities were split.

The many comments received on this question indicate that Kazakhstan’s market share is certainly a hot topic for many. We found quite a few arguments stating that Kazakhstan’s large role in uranium production was a potential vulnerability. One of the most frequent concerns raised was that of geopolitics, both in terms of Kazakhstan’s internal government situation and a lack of clear succession plans from the current all-powerful president as well as the country’s geographical position and relations with its key neighbors, especially Russia and China. The fact that this land-locked country is also experiencing issues with its economy given the drop in oil prices adds to this uncertainty. Some comments also indicated a concern that Kazakhstan’s vast market share allows it to influence the uranium price in a much bigger way than any other center of production. In general, it appears that quite a few market participants worry that the nuclear industry has put “too many eggs in one basket” when it comes to production concentrated so much in one country.

On the other hand, there were quite a few that took the opposite position and view Kazakhstan’s outsized role in the uranium industry as a natural development given its vast and economically accessible uranium resources. Those who expressed little concern still think the world market is well-diversified, and several noted that, even though Kazakhstan

**For 2015, Kazakhstan will account for ~40% of global uranium production. Does this large share of uranium production from one country concern you?**



and resource access methods are expected to be pursued, but the most likely first choice in the coming years is expected to be investment in mines abroad. The least likely is significant increases in domestic mine production in China.

Nearly everyone we asked agrees that China’s first and foremost objective is security of supply, and thus all avenues will continue to be pursued to ensure long-term uranium supplies for its growing reactor fleet. However, doubt was raised by many that a doubling of domestic mine production is possible given China’s low-grade ore deposits. Still, everyone expects China to try. At the same time, the area that market participants expect the Chinese to place the most effort is in foreign mining projects, as that is viewed as the best way to ensure access to uranium supplies over the very long-term.

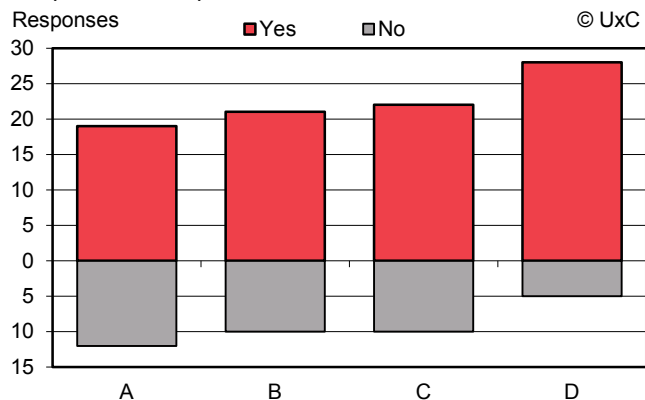
is a large center of production, its uranium is sold through many different companies given all the joint ventures with Kazatomprom. However, even these participants indicated that a level far above 40% of world production from Kazakhstan could be quite unfavorable. The hope by most is that new production will come from other parts of the world.

**China’s Next Market Moves** –

Shifting from the major uranium production center to the new major demand center, we asked for views on what moves China might take next to enhance its uranium security of supply. The chart at the bottom of this page shows that all four procurement

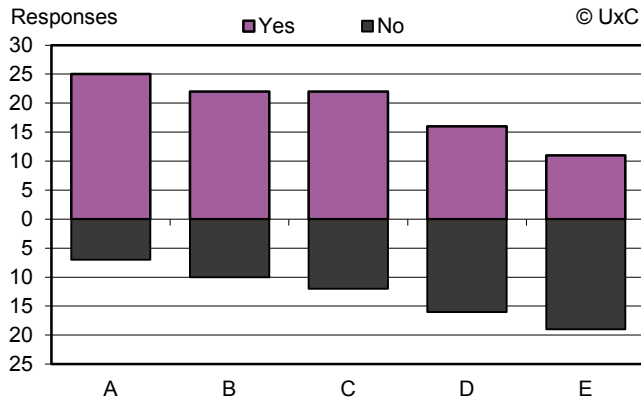
**China has been a major factor in the uranium market. Which of the following moves do you expect China to make next?**

- A-China’s domestic mining will increase from 4 million pounds to 8 million pounds by 2020
- B-China’s major utilities will renew their long-term U<sub>3</sub>O<sub>8</sub> contracts similar to those signed in 2010
- C-China’s major utilities maintain or increase annual spot contracting to support strategic reserve levels
- D-Chinese companies will invest in additional uranium mining/exploration companies abroad



**Which of these major developments do you envision in the reactors markets in the next 1-2 years?**

- A-China will sign additional contracts for international projects
- B-Japan will restart six reactors in 2016
- C-Up to four more reactors will be prematurely closed in the U.S.
- D-Hinkley Point C will begin construction in the UK
- E-Turkey & Russia will begin construction on Akkuyu



At the same time, many spoke of the “three-legged stool” approach that China is taking to procure uranium, and thus there is a general expectation that Chinese utilities will continue to sign long-term contracts as well as take advantage of the spot market on an opportunistic basis.

**Major Reactor Developments** – As we move to our reactor-related questions, the first issue we covered relates to market expectations for nuclear power developments in the next 1-2 years. As the above chart indicates, we asked for probabilities for five separate events occurring in various key nuclear markets (e.g., China, Japan, U.S., UK, and Turkey).

The results show that the development most likely to occur is additional Chinese involvement in international reactor projects. Additional reactor restarts in Japan and more premature reactor shutdowns in the U.S. got nearly the same scores, while start of construction of Hinkley Point C in the UK and Akkuyu in Turkey received the lowest probabilities.

China’s growing role in the global reactor markets is seen by most as a foregone conclusion, and a few people noted that the focus of competition will be between Russia and China for new reactor projects around the world.

As for additional Japanese restarts, several commented that the number may not be as high as six in 2016 as we noted in our question. Alternative restart counts given were in the 4-5 range for this year.

Regarding the U.S. nuclear market, we received comments on the lack of proper incentives from the federal and state governments, including from the new Clean Power Plan, as reasons why more shutdowns are likely. Most people also seem to agree that markets will dictate the future of nuclear in the U.S., not government actions.

As for the new projects at Hinkley Point C and Akkuyu, there were varied opinions on why these may or may not proceed, but further delays for both seem to be the expectation either way.

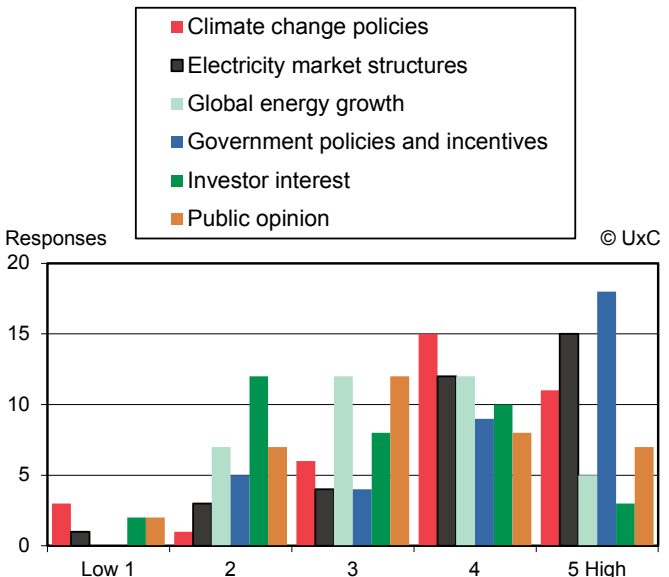
**Factors Shaping the Future of Nuclear Power** – The second reactor-related question focused on the key factors that are shaping the global nuclear power markets. The results are found in the chart on the bottom right of this page. Those factors that received the highest ratings include government policies/incentives, electricity market structures, and climate change policies. The factors that are viewed as least influential are investor interest, global energy growth, and public opinion, although none of these was viewed as entirely without impact.

Comments to this question focused on the huge importance of government policies in helping to support and promote reactor development. Many also noted how climate change has continued to grow in importance for all major countries in the world, especially after last year’s COP21 agreement in Paris. The role of governments in shaping electricity markets was also highlighted.

**Conclusions** – This year’s Winter Survey was conducted during a time of continuously dropping uranium spot prices, and while the effects of this shift in the market were certainly noticed (e.g., in the low expectations for year-end spot price), there continues to be a general sense that the future of nuclear power and the uranium market are not entirely grim either.

For the uranium market, the most important factor on most people’s minds is the need to reduce inventories so that supply/demand fundamentals can become more balanced. Comments indicate that this can only be achieved with demand growth (e.g., Japanese restarts, Chinese new builds, etc.) as well as some production responses. Nearly everyone sees prices increasing in the future; however, significant increases are now only expected after 2020 by most. Meanwhile, in the nuclear market, there are many critical factors that will shape the future, but many of these appear to be highly dependent on government decision-making.

**Which factors are most critical in shaping the future of the nuclear power market? Rate each on a scale of 1 (low importance) to 5 (high importance).**



## News Briefs

### Two CPR-1000 units connected to the grid in China

*World Nuclear News* reported on March 30 that Unit 4 at the Ningde nuclear power plant, a CPR-1000 reactor, was connected to the grid in China. Construction on Ningde 4 first began in 2010, and the reactor attained initial criticality on March 16. Full commercial operation is expected to start within the next few months. Ningde 4 represents the last reactor for the first phase of the Ningde nuclear power plant. In a planned second phase for the plant, two more CPR-1000 reactors are expected to be built. China General Nuclear holds a 46% stake in the Ningde nuclear power plant, another 44% interest is held by China Datang Corporation, and Fujian Provincial Energy Group owns the remaining 10% stake.

On April 1, another CPR-1000 reactor in China, Unit 4 at the Hongyanhe nuclear power plant, was connected to the grid. Full commercial operation is expected to occur sometime during the first half of 2016. Hongyanhe 4 represents the last reactor in the first phase of the Hongyanhe nuclear power plant. A second phase for Hongyanhe is in progress with two 1,080 megawatt ACPR1000 reactors now under construction.

### China General Nuclear announces cooperation agreement with Czech utility CEZ

In a March 30 press release, China General Nuclear (CGN) announced that it signed a memorandum of understanding (MOU) with Czech utility CEZ for cooperation in renewable energy and nuclear power. The MOU covers an exchange of information on procurement, construction, operation, maintenance, and training for nuclear power plants along with other nuclear related matters. CGN is looking to market its Hualong 1 reactor design in the Czech Republic and also to take part in building new reactors at both the Temelin and Dukovany nuclear power plants.

“CGN is very keen to forge partnerships with leading businesses like CEZ in the Czech Republic to support the country’s national new energy strategy,” said CGN Chairman He Yu. “We look forward to working with local players across the industry supply chain to promote the application of Hualong 1 Technology to achieve mutual success while contributing to the local economy.”

### EDF says Hinkley Point C is still expected to start in 2025

EDF Energy has responded with a press release on March 30 to rumors and news articles claiming a delay in its Hinkley Point C project in the UK. *Financial Times* claimed last week that Hinkley Point C would be delayed and cited alleged dissent from unnamed EDF engineers that called for the start date for the first reactor to be postponed until 2027. EDF reaffirmed it still expects that the first new reactor at Hinkley Point C will begin operation at the end of 2025. “EDF would

like to reiterate that the Board, or its committees have already met on multiple occasions to consider the Hinkley Point project, based on detailed and exhaustive information,” EDF stated in the press release. “The Board will have at its disposal all the necessary information to make a decision once the time has come to take the Final Investment Decision.”

### TVA to apply for early site permit in support of potential small modular reactors

In May, the Tennessee Valley Authority (TVA) plans to apply with the U.S. Nuclear Regulatory Commission (NRC) for an early site permit in support of possible small modular reactors at a the Clinch River site near the Oak Ridge National Laboratory, according to a March 29 press release from the NRC. On April 12, NRC staff plan to hold two public meetings to discuss its process for reviewing Early Site Permit applications. “We’re coming to Oak Ridge to inform people near Clinch River how we examine a site to see if it’s suitable for a nuclear power plant,” said the head of the Environmental Projects Branch for the NRC’s Office of New Reactors, Jennifer Dixon-Herrity.

If the NRC grants an early site permit for Clinch River, it would mean that it has determined the site is suitable to host a nuclear power plant, but TVA would still need to apply for a license before it can start construction. TVA previously had a partnership with Babcock & Wilcox (B&W) for potential mPower Reactors; however, in 2014, in response to questions over whether B&W had sufficient investment to pursue the mPower reactor design, TVA shifted its focus to allow for multiple small modular reactor designs to be considered at the Clinch River site.

### EDF, AREVA, and CEA establish organization to determine shared goals for nuclear industry

In a press release issued on March 31, EDF, AREVA, and France’s Atomic Energy Commission (CEA) announced the establishment of a tripartite body, the French Nuclear Platform (PFN) to discuss key topics of concern for the French nuclear industry. PFN will meet once per quarter with the objective of creating a shared vision for medium and long-term goals for France’s nuclear industry. Six representatives from EDF, AREVA, and the CEA including the chairman of each organization will take part in PFN, and the chairman of PFN will be selected annually on a rotating basis with AREVA’s chairman serving as the first chairman of PFN. The press release states, “The PFN will establish by the end of 2016 a working agenda that will cover the current priority topics: the prospects for the French nuclear sector in accordance with France’s Energy Transition law, the sector’s international strategy established in cooperation with the French Ministry of Foreign Affairs and International Development and other concerned ministries, the review of technological options for the EPR NM, the consolidation of relations with [small- to medium-sized enterprises] in the sector in coordination with the French Industry Strategic Committee, and the

coordination of positions on regulatory changes notably regarding safety requirements and objectives.” Other objectives of the PFN include cooperation on spent nuclear fuel management and reprocessing policies and issues, technology development for decommissioning, and fourth generation reactor research and development.

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### Wisconsin repeals moratorium on building new reactors

Wisconsin Governor Scott Walker has signed a bill into law on Friday that appeals the state’s previous moratorium on the construction of new reactors. The new law removes a previous requirement that would only permit new reactors to be built in Wisconsin once a federal spent fuel repository is open. “The nuclear energy industry welcomes Governor Scott Walker’s approval lifting the long-standing moratorium on new nuclear energy in Wisconsin,” said Nuclear Energy Institute Senior Vice President of Government Affairs Alex Flint. “This law also formally amends state policy to list nuclear among a host of conservation, efficiency and non-emitting technologies for state and local decision-makers to consider in meeting new energy demand.”

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### Kazatomprom and ConverDyn to launch joint UF<sub>6</sub> marketing program

Today, NAC Kazatomprom announced that company Chief Executive Askar Zhumagaliyev and ConverDyn President and CEO Malcolm Critchley signed a Cooperation Agreement that establishes a framework for the companies to jointly offer uranium hexafluoride (UF<sub>6</sub>) to global utilities. The agreement seeks to combine the strengths of both Kazatomprom and ConverDyn and provides a competitive, reliable, and integrated source of UF<sub>6</sub> feed to the nuclear industry. Furthermore, the companies reported that joint UF<sub>6</sub> supplies will be made available to the market immediately.

Kazatomprom Chief Executive Askar Zhumagaliyev said, “For Kazatomprom this provides the opportunity to access new markets with a further integrated product offering. The ability to match our uranium capabilities with a respected supplier like ConverDyn will pay dividends for both companies.” In turn, ConverDyn President and CEO Malcolm Critchley said, “The capabilities and objectives of Kazatomprom and ConverDyn are both perfectly aligned and complementary. As the largest uranium producer in the world and a significant supplier of uranium ore concentrates to the Metropolis conversion facility, Kazatomprom is a natural strategic fit for ConverDyn. By combining our products and expertise we will add value and increased supply options to our customers.”

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### Cameco files Cigar Lake NI 43-101 Technical Report

Cameco Corp. announced March 29 it filed an updated NI 43-101 Technical Report on its majority-owned Cigar Lake uranium project in Saskatchewan’s Athabasca Basin. This

latest Technical Report is an update to the previous Report filed in February 2012 and accounts for activities that have occurred at the project since then, including: brining the mine into production, commissioning, and initial ramp up. The Report shows an estimated pre-tax Net Present Value (NPV) at an 8% discount rate to Cameco of \$2.1 billion for its share of current mineral reserves. Pre-tax internal rate of return (IRR) is estimated at 9.5%, using Cameco’s share of the total capital invested, along with the operating and capital cost estimates for the remainder of mineral reserves.

Average cash operating costs per pound have increased slightly since the 2012 Report to \$18.75 per pound U<sub>3</sub>O<sub>8</sub> from a previously estimated \$18.57 per pound U<sub>3</sub>O<sub>8</sub>. Cameco’s share of remaining capital costs have also risen from \$150 million in the 2012 Report to \$619 million today due to general cost escalation and changes made based on mining and milling experience gained since the last report. Cigar Lake’s updated proven mineral reserves (100% basis) now total 109.3 million pounds U<sub>3</sub>O<sub>8</sub> at an average grade of 21.93% U<sub>3</sub>O<sub>8</sub> and probable reserves are 112.3 million pounds U<sub>3</sub>O<sub>8</sub> at an average grade of 13.55% U<sub>3</sub>O<sub>8</sub>.

First ore slurry was achieved in March 2014, and the first packaged yellowcake occurred in October 2014. First commercial production at Cigar Lake was declared in May 2015. At year-end 2015, total packaged uranium topped 11.6 million pounds U<sub>3</sub>O<sub>8</sub> since the first ore cavity was mined in December 2013. Mining at Cigar Lake is ongoing utilizing jet boring system (JBS) machines, which were commissioned in October 2013, April 2014, and June 2015. The new Report also shows the adoption of surface freezing as the exclusive means to freeze the orebody for the remainder of the life of the mine, thereby significantly reducing the quantity of underground development required.

Construction of all major permanent underground development and process facilities required for the duration of Phase 1 mine life at Cigar Lake are complete, although a number of underground access drifts and crosscuts remain to be driven as part of ongoing mine development to sustain production rates. The remaining mine life at Cigar Lake based on current mineral reserves will be approximately 13 years, with estimated full annual production of 18 million pounds U<sub>3</sub>O<sub>8</sub> recovered from the mill. The current mine plan for Cigar Lake shows less than full annual production in 2016 and the latter years of the mine life with full production reached in 2017, a year earlier than forecast in the 2012 Report.

Total mill production is estimated at 218.3 million pounds U<sub>3</sub>O<sub>8</sub>, based on an overall milling recovery rate of 98.5% at an average mill feed grade of 16.7% U<sub>3</sub>O<sub>8</sub>. The McClean lake uranium mill is currently being expanded to process and package all Cigar Lake ore. Construction of the expanded McClean Lake mill commenced in 2013 and is expected to be completed during 2016.

The Cigar Lake mine is owned by Cameco (50.025%),

AREVA Resources Canada Inc. (37.1%), Idemitsu Canada Resources Ltd. (7.875%), and TEPCO Resources Inc. (5.0%), and is operated by Cameco. The McClean Lake uranium mill is owned by AREVA Resources Canada Inc. (70%), Denison Mines Inc. (22.5%), and OURD Canada Co. Ltd. (7.5%), and is operated by AREVA.

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## Denison and GoviEx to create African-focused uranium company

Denison Mines Corp. announced March 30 that it executed a Definitive Share Purchase Agreement with GoviEx Uranium Inc. to combine the companies' respective African uranium mineral interests to create an African-focused uranium development company. Under the transaction's terms, GoviEx will acquire Denison's wholly owned African subsidiary, Rockgate Capital Corp. ("DML Africa"), which holds all of Denison's African-based uranium properties in exchange for 56.1 million shares of GoviEx, plus 22.4 million common share purchase warrants of GoviEx. Upon completion of the transaction, Denison will hold 25% of GoviEx's shares outstanding and 28% of the company's shares on a fully diluted basis.

The combined company's asset portfolio will include GoviEx's Madaouela project in Niger and Denison's Mutanga project in Zambia. The company will also hold title to Denison's Falea project in Mali and the exploration-stage Dome project in Namibia. Following completion of the transaction, GoviEx will control one of the largest uranium resource bases among publicly listed companies, with combined measured and indicated resources of 124.29 million pounds  $U_3O_8$ , plus inferred resources of 73.11 million pounds  $U_3O_8$ .

Under the agreement, GoviEx will acquire DML Africa from Denison for 56 million consideration shares and 22.4 million consideration warrants. Each consideration warrant will be convertible into one common share of GoviEx at a price of US\$0.15 per share for three years. At closing of the transaction, Denison will ensure that DML Africa is capitalized with a minimum working capital of US\$700,000, which is the forecasted annual budget for DML Africa's assets. Furthermore, as part of the transaction, GoviEx will undertake a concurrent equity financing by means of a non-brokered private placement to raise gross proceeds of not less than US\$2 million of which Denison will provide the lead order for 25% up to a maximum of US\$500,000. The transaction is expected to close on or about May 17, 2016.

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## Denison reports Wheeler River PEA

Denison Mines Corp. announced April 4 the results of a Preliminary Economic Assessment (PEA) on its 60%-owned Wheeler River uranium project in the Athabasca Basin. The PEA considers the potential economic merit of co-developing the Gryphon and Phoenix deposits at Wheeler River as a single underground mining operation, and assumes processing at Denison's 22.5%-owned McClean Lake uranium mill.

The Wheeler River PEA utilizes a base case scenario with a

long term uranium price of \$44.00 per pound  $U_3O_8$ , which denotes a pre-tax internal rate of return (IRR) of 20.4% and a pre-tax Net Present Value (NPV) of C\$513 million (100% basis) with the company's 60% share totaling C\$308 million. Initial capital is estimated at C\$560 million at an average operating cost per pound of US\$19.01. Payback is estimated at approximately three years.

The Wheeler River PEA's strategic development plan calls for conventionally mining the basement-hosted Gryphon deposit first, followed by the unconformity-hosted Phoenix deposit. Denison said this development strategy is designed to minimize risk, generate higher up-front margins, and reduce initial capital funding requirements. The Gryphon deposit is expected to produce 40.7 million pounds  $U_3O_8$  over a seven year mine life at a cash operating cost of US\$14.28 per pound  $U_3O_8$ . The Phoenix deposit is expected to produce 64.0 million pounds  $U_3O_8$  over a nine year mine life at a cash operating cost of US\$22.15 per pound  $U_3O_8$ . Pre-production activities are estimated to begin in 2021 with first production from Gryphon in 2025.

Denison intends to proceed with the commencement of a Preliminary Feasibility Study (PFS) for the Wheeler River project and associated Environmental Assessment studies as part of the budget approved by the Wheeler River Joint Venture. The company expects the PFS will take 12-18 months to complete and will cover areas including: the potential for mineral resource growth; the potential to optimize the project for increased rates of production; a formal review and evaluation of toll milling and other processing options; a detailed evaluation of key engineering designs; and the inclusion of environmental baseline information. Wheeler River is a Joint Venture between Denison (60% and operator), Cameco Corp. (30%), and JCU (Canada) Exploration Company Limited (10%).

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## Australia signs agreement with Ukraine for uranium supply

Multiple news sources reported last week that Australian Foreign Minister Julie Bishop signed an agreement with Ukraine's Energy and Coal Industry Minister Volodymyr Demchyshyn that clears the way for Australia to export uranium to Ukraine. The agreement was signed on Wednesday, March 30, during a global nuclear security summit in the U.S. Ukrainian President Petro Poroshenko attended the signing at the Ukrainian Embassy in Washington, D.C. Additional areas of cooperation under the agreement include: nuclear materials transfers; nuclear reactor basic and applied research; spent nuclear fuel and radwaste; nuclear safety; and geological and geophysical exploration and development of uranium resources.

Australian Minerals Council spokesman Daniel Zavattiero said of the agreement, "Access to growing Ukrainian uranium demand creates opportunities for more tonnes, more exports, and more jobs in mine construction and operations."

## Russia and Ukraine to ink 2016 uranium contract by May

TASS reported March 29 that the International Uranium Enrichment Center (IUEC) plans to finalize a contract with Ukrainian partners for the supply of uranium. IUEC Commercial Director Gleb Efremov told TASS that Ukraine will send uranium produced in-country to Russia for enrichment and eventual fabrication by Russia's TVEL. Both countries have agreed on the basic price and quantitative parameters of the uranium deal as well as supply chain logistics, said Efremov. He also noted that due to declining uranium and enrichment prices since Russia concluded its last delivery with Ukraine in 2015, there will be a noted reduction in "the total turnover of transactions with Ukraine." However, the volume of SWU used to enrich Ukraine's uranium has remained unchanged at 60,000 SWU.

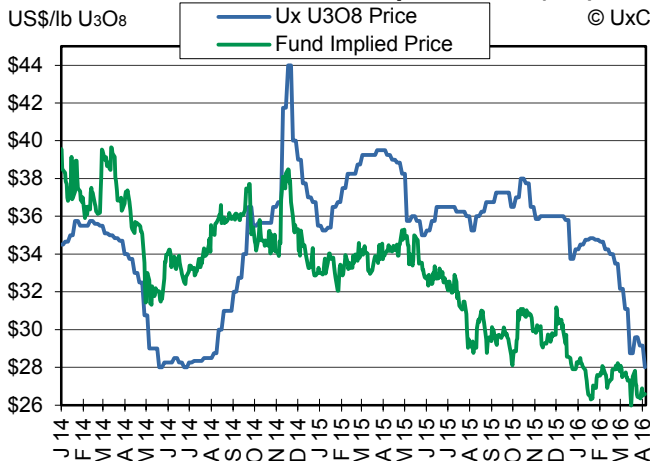
The shareholders of IUEC are Russia's state nuclear corporation Rosatom (70%), Kazakhstan's NAC Kazatomprom (10%), the Armenian Nuclear Power Plant (10%), and Ukraine's Nuclear Fuel state concern (10%).

## Uranium One reports 2015 financial results

Uranium One Inc. reported March 30 financial results for the year ended December 31, 2015. The company reported that headline revenues for 2015 were \$324.7 million based on attributable sales of 12.3 million pounds U<sub>3</sub>O<sub>8</sub> at an average realized sales price of \$36 per pound. The average total cash cost per pound sold of produced material was \$11.40 per pound during 2015, compared to \$14.00 per pound in 2014. Total attributable production during 2015 was 12.5 million pounds U<sub>3</sub>O<sub>8</sub> compared to 10.4 million pounds U<sub>3</sub>O<sub>8</sub> in 2014. For a complete breakdown of Uranium One's production results for 2015, please see *Ux Weekly 30-08*, Feb. 22, 2016.

Gross profit in 2015 was \$4.4 million, compared to a gross loss of \$11.4 million in 2014. Attributable gross profit, including Uranium One's share of gross profit from joint ventures totaled \$204.5 million in 2015, an increase of 83% mainly due to an increase in sales volume and higher sales prices of U<sub>3</sub>O<sub>8</sub>. Net earnings totaled \$70.7 million in 2015 or

**Ux U<sub>3</sub>O<sub>8</sub> Price vs. Fund Implied Price (FIP)**



\$0.07 per share, compared to net losses of \$170.3 million or \$0.18 per share in 2014.

## Fission reports drilling at PLS

Fission Uranium Corp. announced March 31 the receipt of assay results from nine holes drilled at the company's PLS project in the Athabasca Basin. These assays were collected from holes drilled at the newly-discovered R840W zone, the R600W zone, and the R780E zone. Fission reported that high grades were intersected by all holes drilled across these three zones. Assay highlights include: 29.0 meters grading 1.14% U<sub>3</sub>O<sub>8</sub>, 37.0 meters grading 0.72% U<sub>3</sub>O<sub>8</sub>, 44.0 meters grading 4.08% U<sub>3</sub>O<sub>8</sub>, and 4.5 meters grading 23.03% U<sub>3</sub>O<sub>8</sub>.

Uranium mineralization at PLS occurs within the Patterson Lake Conductive Corridor and has been traced by core drilling approximately 2.58km of east-west strike length in five separated mineralized zones. From west to east, these zones are: R840W, R600W, R00E, R780E, and R1620E. Thus far only the R00E and R780E have been included in the Triple R deposit resource estimate. The 31,039 hectare PLS project is 100% owned and operated by Fission Uranium Corp.

## Berkeley Energia's Salamanca uranium mine obtains water use permits

The Duero River Basin Authority reported last week that it has granted Berkeley Energia Ltd. two separate water use permits for the company's Salamanca uranium project in western Spain. These permits, which were originally filed by Berkeley in September 2013, allow the company an annual use of up to 1,337,445 cubic meters of water at the Salamanca project. One permit was issued for surficial water usage and the other covers aspects related to groundwater usage.

The Salamanca uranium project is being developed in an historic mining area in western Spain near the country's border with Portugal. Under Berkeley's most recent Pre-Feasibility Study published in November 2015, the Salamanca uranium project has a Net Present Value of US\$871.3 million with an Internal Rate of Return of 93% based on an 8% discount rate and a \$65 per pound U<sub>3</sub>O<sub>8</sub> long-term uranium price. The mine life is estimated at 18 years at a production rate of 3.0 million pounds U<sub>3</sub>O<sub>8</sub> per year (life of mine). Life of mine C1 cash costs are estimated at US\$17.5 per pound U<sub>3</sub>O<sub>8</sub> and C2 cash costs are US\$19.8 per pound U<sub>3</sub>O<sub>8</sub>. Conventional open pit and transfer mining methods will be used to mine the Retortillo, Zona 7, and Alameda uranium deposits at Salamanca.

## UPC reports NAV

Uranium Participation Corp. announced today its estimated Net Asset Value (NAV) at March 31, 2016, which was C\$566.3 million or C\$4.90 per share. This is based on 9.47 million pounds U<sub>3</sub>O<sub>8</sub> at a fair value of C\$358,066,000 and 1.9 million kg UF<sub>6</sub> at a fair value of C\$201,182,000.



# The Market

## March Market Review

March spot activity picked up somewhat over February's volume but was still less than half of what was posted for the month in 2015. A total of 25 transactions were reported, of which 23 were as U<sub>3</sub>O<sub>8</sub> and two transactions as UF<sub>6</sub>. There were no conversion or SWU transactions. For uranium content, there were a total of 25 transactions involving 3.5 million pounds U<sub>3</sub>O<sub>8</sub>e, bringing the annual volumes to 8.8 million pounds U<sub>3</sub>O<sub>8</sub>e under 61 transactions. For term, with the exception of one longer-term award announcement, four of the remaining five contract awards reported during March involved smaller mid-term deliveries. All five awards were for U<sub>3</sub>O<sub>8</sub> involving about 4.8 million pounds U<sub>3</sub>O<sub>8</sub>, and no conversion or enrichment term awards were reported.

## Uranium Spot Market

While new term demand has emerged and several other utilities have noted potential entrance during the second quarter, the spot U<sub>3</sub>O<sub>8</sub> price continued its downward trajectory over the past week, although offers backed up somewhat today (Monday). Even with the lower prices, trading activity has been very light over the past week as few sellers appear willing to move material at current price levels. Based on recent activity as well as current bids and offers, the Ux U<sub>3</sub>O<sub>8</sub> Price falls \$1.15 this week to \$28.00 per pound.

## UxC Broker Average Price

The UxC Broker Average Price (BAP) began the week on Tuesday up \$0.50 to \$28.88. However, that increase to start the week would be the only positive movement in the mid-point throughout the remainder of the week. By Friday, the

indicator slid to \$27.33, down \$0.80 on the day. Today's UxC BAP is \$28.00, up \$0.67 on the day but down \$1.38 from last Monday's \$29.38. The BA Bid is \$27.50, down \$1.50 from last Monday's \$29.00, and the BA Offer is \$28.50, down \$1.25 from last Monday's \$29.75.

## Fund Implied Price (FIP)

Fund Implied Prices (FIP) began last Tuesday down \$0.05 to \$26.35. After gaining over the midweek, the Implied Price dipped by \$0.39 to finish Friday at \$26.50. Today's FIP is slightly higher at \$26.59, up \$0.09 on the day and up \$0.19 from last Monday's \$26.40 (see chart on page 8).

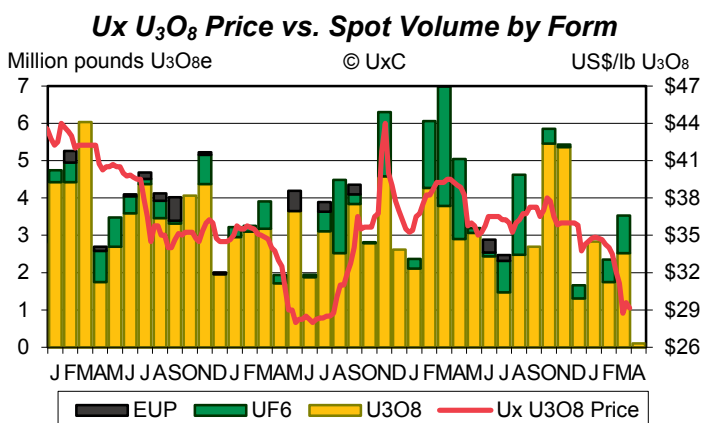
## U<sub>3</sub>O<sub>8</sub> Futures Market

Contracting activity on the CME Group uranium futures market remained strong during the last week of March. On-market activity occurred on March 28 with 121 contracts (30,250 pounds U<sub>3</sub>O<sub>8</sub>) booked for the June 2016 contract month at \$29.50. Over the counter (OTC) contracting occurred over the next three days with deals done for 40 contracts (10,000 pounds U<sub>3</sub>O<sub>8</sub>), 400 contracts (100,000 pounds U<sub>3</sub>O<sub>8</sub>), and 300 contracts (75,000 pounds U<sub>3</sub>O<sub>8</sub>). Since these contracts were all OTC, prices were not reported. Finally, April got off to a rousing start with two contracts (500 pounds U<sub>3</sub>O<sub>8</sub>) booked for the December 2016 contract at \$28.70. Pricing for the week was downward trending with the strip declining an average of \$1.82 by week's end. With the addition of 863 contracts (215,750 pounds U<sub>3</sub>O<sub>8</sub>), March volume totals 3,119 contracts (779,750 pounds U<sub>3</sub>O<sub>8</sub>) thus making it the most active month since June 2011. Contract volume for 2016 is now 3,921 contracts (980,250 pounds U<sub>3</sub>O<sub>8</sub>), which surpasses the 2014 annum total of 3,453 contracts. Open interest increased by 698 contracts during the week and now stands at 7,183 contracts (1,795,750 pounds U<sub>3</sub>O<sub>8</sub>).

UxC Market Statistics				
Monthly (Mar)	Spot		Term	
	Volume	# Deals	Volume	# Deals
U <sub>3</sub> O <sub>8</sub> e (million lbs)	3.5	25	4.8	5
Conv. (thousand kgU)	W	2	0	0
SWU (thousand SWU)	0	0	0	0
2016 Y-T-D				
	Spot		Term	
	Volume	# Deals	Volume	# Deals
U <sub>3</sub> O <sub>8</sub> e (million lbs)	8.8	61	10.7	16
Conv. (thousand kgU)	W	6	>2,000	5
SWU (thousand SWU)	0	0	W	4

Key: N/A – Not available. W – Withheld due to client confidentiality.

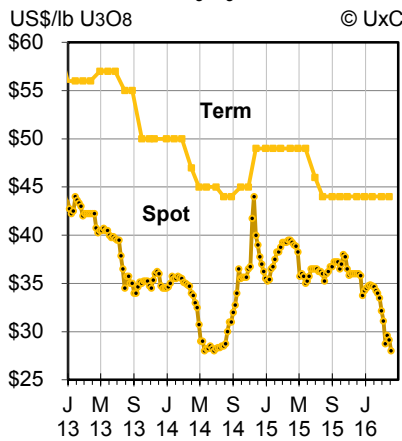
UxC Leading Price Indicators	
Three-month forward looking price indicators, with publication delayed one month. Readings as of Mar. 2016.	
Uranium (Range: -17 to +17)	-8 [down 2 points]
Conversion (Range: -16 to +16)	-5 [unchanged]
Enrichment (Range: -18 to +18)	-9 [unchanged]
<b>Platts Forward Uranium Indicator</b>	<b>\$27.50-\$28.75</b>
A forward one-week outlook.	As of 4/1/16 (US\$/lb)



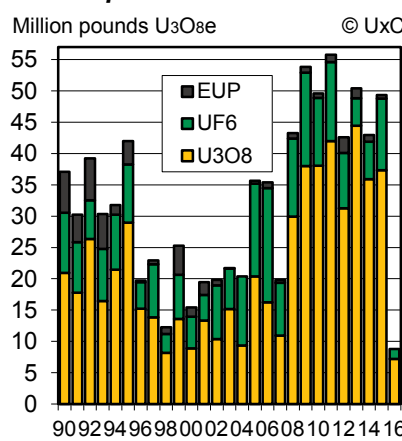
**You're Not a Kid Anymore When...**

You don't remember when you got that mole...or the one next to it. The phone rings and you hope it's not for you. You quit holding in your stomach, no matter who walks into the room. You're proud of your lawnmower. You consider coffee one of the most important things in life. Neighbors borrow your tools. You write thank you notes without being told. You start singing along with the elevator music.

**Ux U<sub>3</sub>O<sub>8</sub> Prices**



**Annual Spot Uranium Volumes**



**Ux Price Indicators (€ Equiv\*\*)**

<b>Weekly (4/4/16)</b>		1 US\$ = .87736€	
<b>Ux U<sub>3</sub>O<sub>8</sub> Price</b>		<b>\$28.00</b>	<b>€24.57</b>
<b>Mth-end (3/28/16)</b>		1 US\$ = .89327€	
<b>U<sub>3</sub>O<sub>8</sub></b>	Spot	<b>\$29.15</b>	€26.04
	Long-Term	<b>\$44.00</b>	€39.30
<b>Conversion</b>	NA Spot	<b>\$6.50</b>	€5.81
	NA Term	<b>\$13.00</b>	€11.61
	EU Spot	<b>\$7.00</b>	€6.25
<b>U<sub>3</sub>O<sub>8</sub> Spot</b>	EU Term	<b>\$14.00</b>	€12.51
	NA Price	<b>\$82.00</b>	€73.25
<b>U<sub>3</sub>O<sub>8</sub> Value*</b>	NA Value*	<b>\$82.66</b>	€73.84
	EU Value*	<b>\$83.16</b>	€74.28
<b>SWU</b>	Spot	<b>\$59.00</b>	€52.70
	Long-Term	<b>\$70.00</b>	€62.53
<b>EUP</b>	NA Spot**	<b>\$1,212</b>	€1,083
	NA Term**	<b>\$1,744</b>	€1,558

**Uranium Term Market**

Last week, a non-U.S. utility submitted its request for offers due April 29 involving delivery in the 2017 to 2019 time period and quantities that could total between 1.6 and 4.8 million pounds of U<sub>3</sub>O<sub>8</sub> or uranium contained in UF<sub>6</sub> or EUP depending on the option. A U.S. utility has offers due April 22 for delivery in the 2019 to 2022 time period and quantities that could total 2.5 million pounds of U<sub>3</sub>O<sub>8</sub> or uranium contained in UF<sub>6</sub> depending on the option. A non-U.S. utility has requests out to a limited set of sellers seeking offers for up to one million pounds U<sub>3</sub>O<sub>8</sub> per year with delivery over the 2016 to 2029 time period. A non-U.S. utility is finalizing its selection of preferred sellers based on its request for U<sub>3</sub>O<sub>8</sub> with two distinct delivery periods, 2017-2019 and 2023-2026. Maximum quantity over the entire term is about 7.9 million pounds U<sub>3</sub>O<sub>8</sub> (3,600 t U<sub>3</sub>O<sub>8</sub>). A U.S. utility is finalizing its decision based on term offers for UF<sub>6</sub> totaling about 2.7 million pounds U<sub>3</sub>O<sub>8</sub> equivalent with delivery over the 2019-2024 time period involving four reloads of material. A non-U.S. utility is expected to enter the market in Q2 seeking UF<sub>6</sub>/EUP with delivery of five or six reloads starting in 2017.

submitted a request that could total 600,000 to 1.5 million kgU of conversion contained in

UF<sub>6</sub> or EUP depending on options. A U.S. utility has offers due April 22 for conversion contained in UF<sub>6</sub> with delivery over the 2019-2022 time period and volume, depending on the option, totaling upwards of 1.2 million kgU. Another U.S. utility is finalizing its evaluation of offers involving just over one million kgU of conversion contained in UF<sub>6</sub> for four reloads with delivery in 2019-2024. A non-U.S. utility is seeking notable quantities of conversion for delivery in 2016-2029. A non-U.S. utility is expected to enter the market seeking term UF<sub>6</sub>/EUP involving up to six reloads.

**Conversion & UF<sub>6</sub>**

While the spot market remains quiet, a non-U.S. utility

**Enrichment & EUP**

A U.S. utility is now evaluating offers for a small quantity of SWU with spot delivery later this year. For term, a non-U.S. utility entered the market last week seeking EUP with delivery in 2017-2019 with bids due April 29. A non-U.S. utility has SWU/EUP offers due in mid-April with delivery in 2016-2029. A non-U.S. utility is expected to enter the market with a term SWU/EUP request involving five or six reloads.

**Ux Price Indicator Definitions**

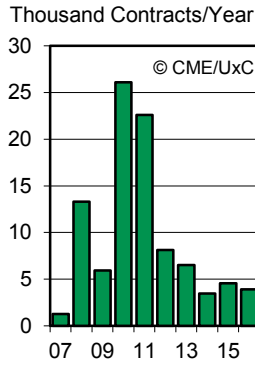
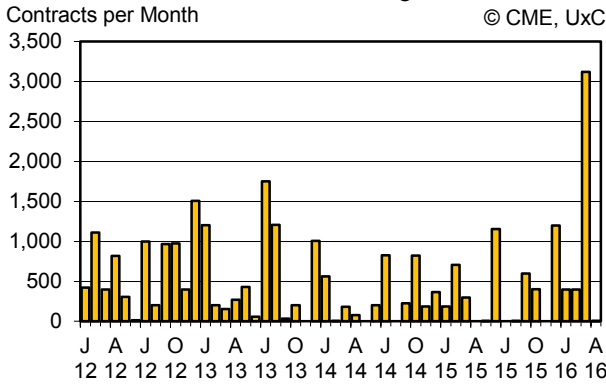
The Ux Spot Prices indicate, subject to the terms listed, the most competitive offers available for the respective product or service of which The Ux Consulting Company, LLC (UxC) is aware, taking into consideration information on bid prices for these products and services and the timing of bids and offers as well. The Ux U<sub>3</sub>O<sub>8</sub> Price (Spot) includes conditions for delivery timeframe (≤ 3 months), quantity (≥ 100,000 pounds), and origin considerations, and is published weekly. The Ux LT U<sub>3</sub>O<sub>8</sub> Price (Long-Term) includes conditions for escalation (from current quarter), delivery timeframe (≥ 24 months), and quantity flexibility (up to ±10%) considerations. The Ux Conversion Prices consider offers for delivery up to twelve months forward (Spot) and base-escalated long-term offers (LT) for multi-annual deliveries with delivery in North America (NA) or Europe (EU). The Ux NA UF<sub>6</sub> Price includes conditions for delivery timeframe (6 months), quantity (50-150,000 kgU), and delivery considerations. \*The Ux NA and EU UF<sub>6</sub> Values represent the sum of the component conversion and U<sub>3</sub>O<sub>8</sub> (multiplied by 2.61285) spot prices as discussed above and, therefore, do not necessarily represent the most competitive UF<sub>6</sub> spot offers available. The Ux SWU Price (Spot) considers spot offers for deliveries up to twelve months forward for other than Russian-origin SWU. The Ux LT SWU Price (Long-Term) reflects base-escalated long-term offers for multi-annual deliveries. \*\*The Ux Spot and Term EUP Values represent calculated prices per kgU of enriched uranium product based on a product assay of 4.50% and a tails assay of 0.30%, using spot and term Ux NA and appropriate spot and term price indicators and are provided for comparison purposes only. All prices, except for the weekly Ux U<sub>3</sub>O<sub>8</sub> Price, are published the last Monday of each month. (Units: U<sub>3</sub>O<sub>8</sub> = US\$ per pound, Conversion/UF<sub>6</sub>: US\$ per kgU, SWU: US\$ per SWU, EUP: US\$ per kgU) The Ux Prices represent neither an offer to sell nor a bid to buy the products or services listed. \*\*The Euro price equivalents are based on exchange rate estimates at the time of publication and are for comparison purposes only.

The Platts Forward Uranium Indicator price range belongs to Platts, a McGraw Hill Company, and is published with permission. Definitions of these prices are available from their original source.

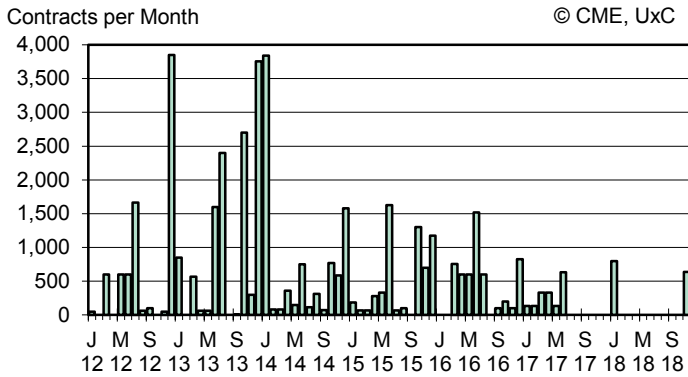
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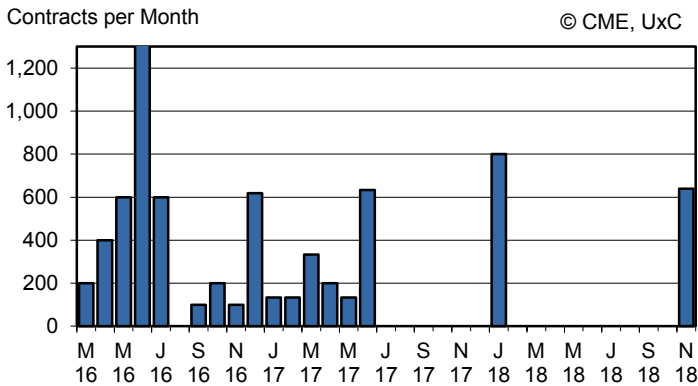
**CME/NYMEX UX Futures Activity**  
**Total Contracts by Transaction Month, by Transaction Year**



**Total Contracts by Settlement Month**



**Open Interest by Settlement Month**

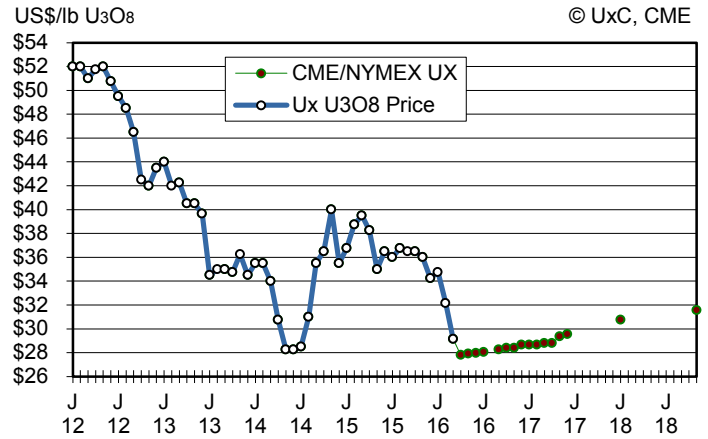


**CME Uranium U<sub>3</sub>O<sub>8</sub> (UX) Futures**

**Activity as of April 1, 2016**

Settlement	Price	Volume	Open
Feb 2015	\$38.75	66	N/A
Mar 2015	\$39.50	69	N/A
Apr 2015	\$38.25	282	N/A
May 2015	\$35.00	332	N/A
Jun 2015	\$36.50	1,628	N/A
Jul 2015	\$36.00	66	N/A
Aug 2015	\$36.75	100	N/A
Oct 2015	\$36.50	1,300	N/A
Nov 2015	\$36.00	700	N/A
Dec 2015	\$34.25	1,176	N/A
Mar 2016	\$29.15	758	200
Apr 2016	\$27.80	600	400
May 2016	\$27.90	600	600
Jun 2016	\$27.95	1,520	1,359
Jul 2016	\$28.05	600	600
Sep 2016	\$28.25	100	100
Oct 2016	\$28.40	200	200
Nov 2016	\$28.40	100	100
Dec 2016	\$28.65	824	619
Jan 2017	\$28.65	133	133
Feb 2017	\$28.65	133	133
Mar 2017	\$28.80	333	333
Apr 2017	\$28.80	333	200
May 2017	\$29.35	133	133
Jun 2017	\$29.55	633	633
Jan 2018	\$30.75	800	800
Nov 2018	\$31.55	640	640
*From May 2007	<b>Totals:</b>	<b>95,777*</b>	<b>7,183</b>

**Ux U<sub>3</sub>O<sub>8</sub> Price vs. CME/NYMEX Forward UX Price Curve**



**UxC Broker Average Price (BAP) Definition**

The **UxC BAP** (Broker Average Price), subject to the terms listed, is a calculated average mid-point of bid and offer prices as supplied to UxC by participating brokers. The participating brokers are Evolution Markets and Numerco Limited (the "Brokers"). Data posted by the Brokers are kept confidential and will not be published or made available independently. The Broker data are subject to verification by The Ux Consulting Company, LLC (UxC), which compiles and reports the UxC BAP. In order to have a sufficient number of data points and to represent submissions by all of the Brokers, the UxC BAP includes the best bids and offers reported over a three-month forward period. This period is consistent with the three-month delivery period for offers considered in the determination of the **Ux U<sub>3</sub>O<sub>8</sub> Price**. On a daily basis, the Brokers submit their best bids and offers over a forward three-month period through a secure system. From these postings, UxC separately calculates the UxC Broker Average (BA) Bid and the UxC Broker Average (BA) Offer prices. The UxC BAP is a simple mid-point average of the **UxC BA Bid** and **UxC BA Offer** prices. Other Broker data collected include lot volume on a per offer basis. The UxC BAP is published on a daily basis and is made available to subscribers through email updates and UxC's Subscriber Services website.

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**UxC Broker Average Price (BAP) Definition**

