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UxC Update

October 2022

A periodic newsletter to keep our clients up-to-date on developments within our company

We are through the first three quarters of 2022, and the year so far has already presented major new opportunities as well as challenges for the nuclear industry. The future of nuclear power is becoming brighter, but there are also several points of concern affecting the industry, especially due to ever-increasing geopolitical tensions. UxC has been navigating these unsettled times, and the following presents our latest accomplishments and future plans.

Message From UxC President Jonathan Hinze



We began 2022 filled with hope about the retreating COVID-19 pandemic, believing our industry and the world would return to a sense of normalcy - at least a new normal. However, less than two months into the year, the largest land war in Europe since World War II erupted when Russia invaded Ukraine. The fallout from the ongoing war continues to this day and has already created massive new uncertainties and complications for international business. All of us at UxC see this horrific war as completely indefensible, and our thoughts are foremost with the people of Ukraine, who are suffering needlessly. We hope that hostilities end as soon as possible, and that the world can move to a more peaceful state. However, we are not naïve and fully understand that the war has already left an indelible mark on the world, including the nuclear industry. Whatever the future holds, the aftermath of this war will resonate throughout the industry long after the bombs stop falling. There are many positives for nuclear power as countries reconsider the value of diversified supplies to enhance energy security. At the same time, the nuclear markets are becoming increasingly complex as the supply chain is fracturing along national and regional lines while governmental influences grow.

In light of this new state of the world, UxC intends to tackle the myriad changes impacting the nuclear industry throughout our various market reports, analyses, forecasts, and other services. In times of major upheaval, we see our true purpose as market analysts to help guide our clients and the industry at large with accurate data and information, hard-hitting and unbiased analysis, as well as innovative thinking to help explain not only the current issues but also the future trends that will shape the nuclear markets for years to come.

Nuclear Fuel Training Seminars

In June, UxC successfully held its latest in-person Nuclear Fuel Training Seminar in Atlanta, Georgia, USA. This was our first seminar in Atlanta since 2019 and also our biggest in terms of attendance. In total, 52 participants joined the seminar from 9 countries representing 35 companies, including utilities, producers, intermediaries, investors, and government agencies. For three full days, UxC experts guided our seminar participants through intensive sessions focused on the latest issues throughout the front-end nuclear fuel cycle markets while also hosting various lively networking opportunities.

We are also excited to announce that we will be holding our next Nuclear Fuel Training Seminar in **Vienna, Austria on June 11-14, 2023** at the Vienna Hilton Hotel. We look forward to welcoming participants from across the globe to what has become a premier nuclear industry event. Registration will open soon, so please save the



date!

For additional information regarding the June 2023 seminar in Vienna, please contact Eric Webb.

UxC Client Webinars

UxC has continued to provide additional content and insights to its global clientele via webinars. In early February, we conducted a well-attended online event focused on "Trends to Watch in 2022" provided at no additional charge to all *Ux Weekly* subscribers.



Given the popularity of our webinar series, UxC is planning a new webinar to be held on November 10, 2022, at 9:00 am EST, which will again be open to all *Ux Weekly* subscribers. Our upcoming webinar: "Navigating Nuclear Fuel Markets in Tumultuous Times," will examine the major issues and developments shaping the nuclear power and fuel markets in light of the dramatic changes resulting from Russia's war in Ukraine. We also anticipate a lively Q&A session after our formal presentation.

Registration for the November 10th webinar is now open for all active *Ux Weekly* subscribers at: <https://www.uxc.com/c/Webinars.aspx>

Speeches, Articles, and Achievements by UxC Personnel



UxC experts have also been quite busy in recent months contributing to various industry publications, events as well as media interviews.

Jeff Combs, Chairman and Owner, is authoring a paper on the topic of "Impact of Russia's Invasion of Ukraine on Nuclear Energy" to be published in a special edition of the *International Association for Energy Economics* (IAEE) Energy Forum journal focused on energy market impacts of the Russia-Ukraine war.

Jonathan Hinze, President, participated as a panelist discussing the "Geopolitical Impacts on the Nuclear Fuel Cycle Market and Supplier Responses" during the WNF 48th Annual Meeting in Montreal in June. Jonathan also moderated a lively session during the World Nuclear Symposium 2022 with government and industry leaders focused on "Sustaining Fuel Supplies." Also in September, Jonathan provided a "Nuclear Fuel Market Overview" presentation to a large audience from Indonesia during a webinar hosted by NEI and the National Research and Innovation Agency

(BRIN). Finally, as a sign of strong global interest in the nuclear fuel and power markets, Jonathan was interviewed by numerous media outlets over the past several months, including in stories published or aired by *The Wall Street Journal*, *MarketWatch*, *Barron's*, *Bloomberg*, *Financial Times*, *Fortune*, *NPR's Marketplace*, *CNBC*, and *S&P Global Intelligence*.



Anna Bryndza, Executive Vice President, International, who is currently serving as Chairperson of the WNA's Fuel Cycle Members Forum (FCMF), chaired two in-person sessions of the FCMF in April and September in London. During April's FCMF, Anna gave a presentation on the topic of "Multilateral Supply Assurance Mechanisms: Role of Fuel Banks." In September, Anna moderated a FCMF fuel cycle panel, which focused on the rapid changes in the underlying fundamentals of the nuclear fuel cycle. The panel included representatives of from the uranium, conversion, and enrichment sectors reflecting the interconnectedness of the nuclear fuel markets. The next FCMF will be held in January 2023 in London. Anna was also a keynote speaker during Red Cloud's Very Pre-PDAC 2022 Mining Showcase virtual event in March. Later this month, Anna will be presenting a paper on "Geopolitics Overtakes the Markets" during NEI's International Uranium Fuel Seminar in Las Vegas.

Nick Carter, Executive Vice President, Uranium, gave a presentation on "Uranium – Has It Become More Critical Than Other Metals?" for The Canadian Institute of Mining, Metallurgy and Petroleum's (CIM) Perspectives & Insights on Metals and Mines virtual event in March. Nick is also currently planning to speak at PDAC 2023 convention to be held in March 2023 in Toronto.

Philip Johnson, Vice President, Fuel Cycle, joined the Titans of Nuclear podcast in May during Reuters Events' SMR & Advanced Reactor 2022 Conference in Atlanta to discuss global new nuclear power developments, the impact of geopolitical issues on the nuclear markets, along with other important topics.

UxC Sponsorship of Atomic Runners

For the third year running, UxC again hosted a Virtual 5K Atomic Runners event. This year's event was special as UxC pledged to donate money to Ukrainian charities for every kilometer recorded by the group. The 2022 Atomic Runners for Ukraine event saw a new record 343 km covered across 8 countries and 3 continents. With your help, UxC donated a total of \$5,000 split between two charities:

- Razom (Together)
- ANS-ENS Ukrainian Nuclear Workers Humanitarian Fund

Participants sent pictures and comments to UxC, which were published in the August 29th edition of our *Ux Weekly* newsletter. Photos submitted by all our 2022 Virtual 5K participants can be found here:

<https://www.uxc.com/p/fun/UxCPictures.aspx?gallery=Atomic%20Runners%202022>

We were also glad to see the Atomic Runners return to live group runs with two held so far this year. The first in Montreal during the WNFAM Annual Meeting in June included new T-shirt giveaways sponsored by UxC. Another run was held in the heat of summer in July during NEI's Nuclear Fuel Supply Forum. Anyone looking for a





great way to start the day on October 17 in Las Vegas during NEI's IUFS is welcome to join the next Atomic Run.

Please contact Anna Bryndza if you want more information on the Atomic Runners running group.

UxC Partners with Bloomberg

In June, UxC launched a new partnership with Bloomberg to provide access to UxC's industry-leading uranium price indicators on the Bloomberg Terminal. UxC price data available on the Terminal includes:



- Daily, Weekly, and Month-End Ux U3O8 Prices
- Cameco, ConverDyn, and Orano Daily Ux U3O8 Prices
- 3 Year and 5 Year Forward U3O8 Prices
- Long-Term Ux U3O8 Price

To access the fee liable data on the Bloomberg Terminal, all users must maintain a full *Ux Weekly* subscription. Access is granted only to subscribers who have both a UxC and Bloomberg user account. More information on the *Ux Weekly* and UxC's nuclear fuel price indicators, including the daily Ux U₃O₈ Price, can be found here:

https://www.uxc.com/p/products/uxw_overview.aspx

UxC Nuclear Market Outlook Reports

So far in 2022, UxC has published numerous editions of its *Market Outlook* reports covering the various aspects of the nuclear fuel cycle.



Starting with the Q1 2022 edition, UxC extended its proprietary nuclear power forecasts presented in the *Nuclear Power Outlook* (NPO) quarterly report by ten more years through 2050. Each edition of the NPO also includes detailed reactor market data and country updates along with in-depth discussion of the major trends in nuclear power by country and region. The past three quarterly NPOs have also provided unique analysis of important nuclear power topics, including implications of the EU's inclusion of nuclear power in its sustainable finance taxonomy, changes to national energy policies in Europe as a result of Russia's war in Ukraine and implications for nuclear power, results of a new NEI survey showing potentially up to 90 GWe of new nuclear power demand by 2050 in the U.S., as well as recent OECD studies on nuclear power's role in meeting energy security and climate change goals. In addition, the *UxC Requirements Model* (URM) quarterly reports that accompany each NPO also now present UxC's proprietary modeling of future nuclear fuel component requirements through 2050.



The past three editions of UxC's *Uranium Market Outlook* (UMO) quarterly reports have included essays on key market topics, including extended demand forecasts through 2040, implications of Russia's war in Ukraine for the uranium market, and the potential future role of uranium mining in Africa. All our UMO reports present updated uranium supply and demand forecasts, contracting activity, uncovered requirements estimates, market trends, and spot and long-term price forecasts. Starting this year, all UMO forecasts have been extended through 2040.



The latest *Conversion Market Outlook* (CMO) report, issued in May 2022, included an initial analysis of how the war in Ukraine is likely to affect the UF₆ conversion market. The upcoming December 2022 full edition of the CMO will include a detailed essay focusing on implications of Russia's war for the conversion market. Each CMO report also analyzes all aspects of the constantly evolving UF₆ market, including supply and demand fundamentals, contracting activity, uncovered requirements estimates, market trends, as well as spot and long-term price forecasts. Starting this year, all forecasts in the CMO have been extended through 2040.



Thus far in 2022, the *Enrichment Market Outlook* (EMO) quarterly report has featured essays on: "Implications of Russia's War for the Enrichment Market," "Where Could New SWU Supply Come From?," and "The Future Open Market Tails Assay Regime." Each EMO report also presents updates on the latest SWU market developments, including supply and demand forecasts, contracting activity, uncovered requirements estimates, and long-term price forecasts. Starting this year, all forecasts in the EMO have been extended through 2040.



In September 2022, UxC issued its annual *Fabrication Market Outlook* (FMO), which presents detailed information and analysis on the global fabrication markets, including the latest contracting activity, market trends, supplier profiles, supply and demand dynamics as well as LWR fuel price forecasts. The 2022 essay, titled "Implications of Russia's War for the Fabrication Market," delves into the anticipated changes to VVER fuel supply and demand and market trends due to Russia's war on Ukraine as several VVER operators look to shift away from reliance on Russia. Other expected changes to TVEL's position in the fabrication market due to fallout from the war are also analyzed. Starting this year, all forecasts in the FMO have been extended through 2040.



UxC's *Policy Watch* reporting service has also been packed with new research and analysis on all the latest policy developments affecting the nuclear markets. Naturally, *Policy Watch* reports have focused heavily in recent quarters on major changes around the world in national energy policies, nuclear trade policies, and other big developments resulting from Russia's war in Ukraine. Additional coverage and analysis of other major policies have examined major legislation aimed at supporting nuclear power in the U.S., the EU's inclusion of nuclear power in its sustainable finance taxonomy, ongoing government moves in China to expand nuclear power, government efforts in Japan to hasten reactor restarts, a 180-degree policy reversal in South Korea following the presidential election, ongoing issues related to the amended Russian Suspension Agreement, the state of Iran-related sanctions, developments with the U.S. Uranium Reserve, spent fuel and nonproliferation policies, among many other topics.

As always, all UxC *Market Outlook* reports are available as part of our subscription packages.

Recent and Upcoming Special Reports

UxC's special reports are designed to complement our *Market Outlook* reports by examining key topics in greater depth. The following are some of our most recent and upcoming special reports.

Special report published in 2022:



Global Nuclear Fuel Inventories (GNFI)—UxC published the fourth edition of its special report on *Global Nuclear Fuel Inventories* in August 2022. The new GNFI report includes further enhancements over previous editions and provides the latest information and insights related to nuclear fuel inventories around the world, including updated data and analysis of all utility, supplier, trader/financial, and government inventory levels, plus new insights into the level of utility forward coverage rates and their evolution in the coming years. The GNFI also contains

forecasts for future inventory buying and disposition as well as a look at inventory policy impacts on the uranium, conversion, and enrichment sectors. Plus, the GNFI includes analysis of the market impacts of inventories and key considerations for all market entities.

Upcoming special reports:



Uranium Suppliers Annual (USA)—Later this year, UxC plans to issue its latest *Uranium Suppliers Annual*, which contains comprehensive data and information on all the world's uranium suppliers, including detailed sections on planned producers, junior/exploration companies, and intermediaries. Included in the USA are future production forecasts, operational considerations, supplier/project risk analyses, production cost estimates, mill capacities, project reserves, and supplier/facility summaries. The USA also examines supplier marketing strategies, allowing buyers to understand the capabilities and motivations of suppliers, as well as the political, social, and economic environments in which they operate.



Conversion & Enrichment Supplier Assessments (CESA)—Also later this year, UxC will be publishing its now annual CESA report, which provides profiles of each supplier in the conversion and enrichment markets as well as unbiased, quantitative evaluations of the major conversion and enrichment suppliers through a detailed risk matrix approach. CESA allows utilities to compare each of their suppliers and gauge the relevant risks within their current and potential future supply portfolios. For suppliers, investors, and others active or interested in following conversion and/or enrichment supply, CESA provides an independent and unique evaluation methodology to identify how each supplier ranks within the current fuel cycle market.



Small, Advanced, and Micro Reactor Assessments (SAMRA)—UxC has been at the leading edge of analyzing innovative small modular reactor (SMR) designs and their market potential, including through two major reports issued in 2010 and 2013 along with ongoing detailed coverage in many UxC reports since then. UxC's team of nuclear reactor market experts are now working on a new special report that specifically assesses the global landscape of small, advanced, and micro reactors. This new SAMRA report, which is targeted for publication by early 2023, will include profiles and evaluations of all leading advanced reactor designs, a detailed market analysis of how advanced reactors can fit into the future energy mix, global forecasts for these advanced technologies, along with critical discussions on the outlook for this emerging market through 2050 and implications for the nuclear fuel cycle.



Nuclear Zirconium Alloy Market—Nuclear-grade zirconium alloys and products are used in the fabrication of nuclear fuel assemblies for most current and future reactor designs. UxC will be publishing its next edition of this special report in Q2 2023, which will include updated analysis of the various sectors that make up the nuclear-grade zirconium sponge, alloy, component, and tubing markets. Using proprietary demand modeling and other unique research techniques, we identify the latest major trends in this industry by analyzing the global and regional supply and demand balances for nuclear-grade zirconium sponge, alloy, and tubing as well as the supply and demand situation based on reactor fuel types.



Uranium Production Cost Study (UPCS)—UxC plans to issue the next edition of its industry-leading biennial report on uranium production costs in the summer of 2023. The UPCS complements the *Uranium Suppliers Annual* and provides production cost curves for operational, planned, and potential uranium projects to identify where expanded and new uranium supply will come from among over 100 worldwide projects to meet future nuclear fuel demand. Production cost curves for individual projects are presented by geographic region and mining method. An extensive review of various factors impacting production costs is also detailed in the UPCS.

UxC Working with Tellus Museum to Expand Coverage of Nuclear Energy

This year, UxC has been continuing to work with the Tellus Science Museum to expand its coverage of nuclear energy, with special emphasis on small and advanced reactors. Tellus is a world-class science museum that is associated with the Smithsonian and based in Cartersville, Georgia.



So far this year, Tellus has sponsored two events that deal with nuclear energy. In March, it held a virtual event: Ask the Expert: Nuclear Power and Small Modular Reactors with Mark White. In June, UxC friend and colleague Dr. Claudio Filippone gave a lecture at Tellus on the Holos-Quad Micro-Reactor as part of Tellus' Friday night lecture series. A video recording of Dr. Filippone's presentation at Tellus can be viewed here: <https://www.youtube.com/watch?v=tZ1Nllumu3A>

For more information on UxC activities and reports, please visit our website at www.uxc.com.