



## New Horizon, New Challenges

This quarter, we have extended our price forecasts in our Uranium Market Outlook report to the year 2025. Extending the time horizon brings a new set of challenges to the forecaster, as obviously more can happen over a more protracted period of time. One of the greatest challenges faced by the forecaster is analyzing how producers respond to the challenges faced in bringing new production online or in extending existing production. This will be examined in more detail below.

As the timeline for making forecasts is extended, questions arise, such as whether uranium resources are sufficient to meet demand. At the other end of the spectrum, we have all seen comparisons of future production and requirements that show a great excess of production in the future based on currently known but not yet exploited resources.

We have some observations on this. The first is that running out of uranium resources is not the problem and has never been the problem. The problem is getting uranium out of the ground in a timely manner. Second, while it is very easy to draw supply and demand lines on paper, history has shown that it is much more difficult to make these lines a reality. Of course, this applies to the demand side as well as the supply side, as it is difficult to build reactors just as it is difficult to add production capacity. In fact, we do our own comparisons that show, in our high production case, there is more than enough production to meet any realistic demand scenario between now and 2025. However, the problem is that, with the exception of Kazakhstan, the high case has not proved to be a very good indicator of future production levels.

Of course, a critical consideration in any supply/demand comparison is the future level of demand, which can vary considerably depending on what growth scenario is being forecast. In a uranium market analysis, demand is treated exogenously, at least in the first pass (that is, a basic demand level is assumed independent of the uranium price), after which adjustments are made due to changes in tails assay that incorporate price impacts.

Production reacts to demand levels and associated prices. In a lower demand scenario, it is much easier for production from fast-growing production centers like Kazakhstan and Namibia to meet demand, and for prices to be relatively lower. In higher demand scenarios, other geographic areas, whose expansion rates have been much more sluggish, must be called upon. Under a very high demand scenario, production must expand considerably, placing pressure on all regions to perform, and this pressure is reflected by higher prices. On top of this, there are other uncertainties such as exchange rates, inflation rates, technology changes, and future enrichment developments. A lot can happen over the next 15 years from both a microeconomic and macroeconomic perspective.

What you end up with is a wide range of price scenarios for 2025. This result may make it seem like a forecaster is shirking his responsibility, but it is an indication of the uncertainty of the future market. (In the end, probabilities are assigned to the various scenarios and a composite forecast is developed, which serves to limit the expected price variability.) Further, a wide range of prices should not be any surprise to anyone in this industry, given what has happened in the recent past. The price spike in 2006/2007 has been rightly attributed to speculative behavior. However, it also must be recognized that something was being speculated about, and that was the future supply/demand situation in the market. In hindsight, hedge funds were correct in their assessment of China's nuclear power growth. However, the prospect of a shortage of timely production (on which a very high price scenario was based) was dashed, at least temporarily, when Kazakhstan expanded production so rapidly.

It is important to note that, looking out to 2025, we are dealing with a production level that may be approximately double the current one, as uranium requirements and inventory demand increase, while inventory supplies decrease. Kazakhstan will not be able to keep up its rate of expansion – in fact, it is already slowing down – so a relatively larger share of production will have to come from other countries.

Looking into the future, some things are going to become relatively more or less important than today. In the category of being less important is military material, like HEU. While HEU supply was a game changer when demand was low and not growing, it is not nearly as significant when demand is high and growing. For instance, by 2025 our mid and high demand projections range from 300-350 million pounds. The 400 million pound HEU deal would represent a little over a year of supply by this time.

In contrast, regulation and technology are going to become much more important factors as a far greater portion of future supply must come from in-ground resources. Regulation has the potential to slow or even eliminate production (consider Coles Hill in Virginia). As more and more uranium is needed, perhaps at a faster and faster clip, the nature and extent of regulation becomes a

more important consideration. While regulation is certainly necessary, it can also frustrate the operation of markets.

Technology has the potential to greatly expand the supply of uranium and lower the costs of producing/extracting it. This too becomes vitally important as larger and larger amounts of uranium are needed. With a shorter-term outlook, there is less opportunity for technological improvements. However, when the time horizon is expanded, there is more time for technology to play a larger role, in addition to a greater need for it to do so. In this regard, technology becomes even more important, if not critical, when the time horizon is pushed out well beyond 2025.

Of course, technology improvements are not just limited to uranium production, but include enrichment and reactor design as well, as these can affect the demand for uranium. In this regard, vertically integrated companies such as AREVA and Rosatom are uniquely positioned to shape both the future supply and demand for uranium. While technology may not be as big a consideration when it comes to conversion, conversion is still a vital part of the fuel supply, which requires continued investment.

As supply needs to expand considerably in the future, a greater emphasis is placed on investment, and here the risks associated with regulation and technology need to be overcome. Investing in new technology is inherently risky because one does not know if the investment will pay off. By the same token, regulation represents another risk to investment, as it can delay the time in which a return on investment can be realized. These are not the only risks; developing resources in new countries or geological environments represent new risks, as do evolving trade, transportation, and nonproliferation issues.

Although this is not universally true, U.S. utilities are much less likely than non-U.S. utilities to think direct utility investment in new uranium production is necessary. (This is a preliminary result of our survey, which is currently ongoing – so we would appreciate your participation). Perhaps this difference has to do with the greater market orientation of U.S. utilities. Their belief is that markets will work and suppliers will make the requisite investments, and in the process sufficient uranium supplies will develop.

Of course, it is non-U.S. utilities (especially those in Asia) that are the ones primarily building the reactors and securing supplies for those reactors. While we would not say that they have given up on markets, there is clearly the intention of helping markets along. Getting back to our point on regulation, China is focusing on those regions where supply is expected to grow the quickest, and thus where markets are more unencumbered than in other regions.

Perhaps one's view of the market all comes down to a question of metaphysics. Einstein is quoted as saying:

"There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle."

In the present application, the question is will it take a miracle to reach the higher production levels needed in the future, or is this an inevitable outcome of market dynamics? Such attitudes will also influence the future progression of the market.

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