Comparing recent uranium supply scenarios

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Introduction

For more than one decade – even after the Fukushima accidents – an increase in global nuclear energy generation capacity is widely expected. At this point it is clear, that uranium will remain the fuel used by the majority of the NPPs for the next few decades. For this poster a variety of uranium supply scenarios, published by industry, academics or international organizations, were identified and compared.

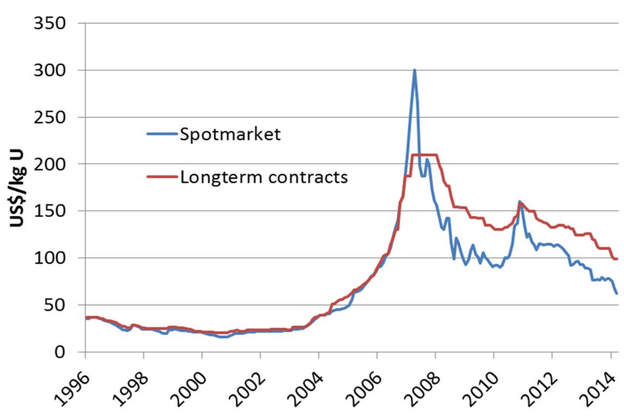

Fig. 1: Development of longterm contract prices and spotmarket prices (Data: cameco.com)

They were created with the background of a uranium market facing several challenges. First an excursion in the uranium price from 2004 to 2007, then reduced demand after 2011 due to the Japanese and German shut-downs, implying considerable changes to the supply side, just at the time uranium prices were recovering (Fig. 1).

Scenarios and frame conditions

To address uncertainties for the estimations on future uranium supply, it is common practice to provide several scenarios or a bandwidth of expected future production. In the evaluated scenarios (see literature), some similarities in the results can be found. Still, as they originate from different interest groups, they have different foci and show some differences in the results.
Most relevant for the outcome of the scenarios are the different frame conditions, such as

- resource estimations, expected new finds and the availability of secondary or unconventional resources
- expected future uranium demand
- current and future production, including supply demand relations and the market situation
- the time frame and development times
- socioeconomic and other impact factors

As for the resource and demand figures, data and scenarios published by the IAEA are often used, so at this point some common basis can be found (thus the IAEA Redbook demand scenarios were also used in Fig. 2).

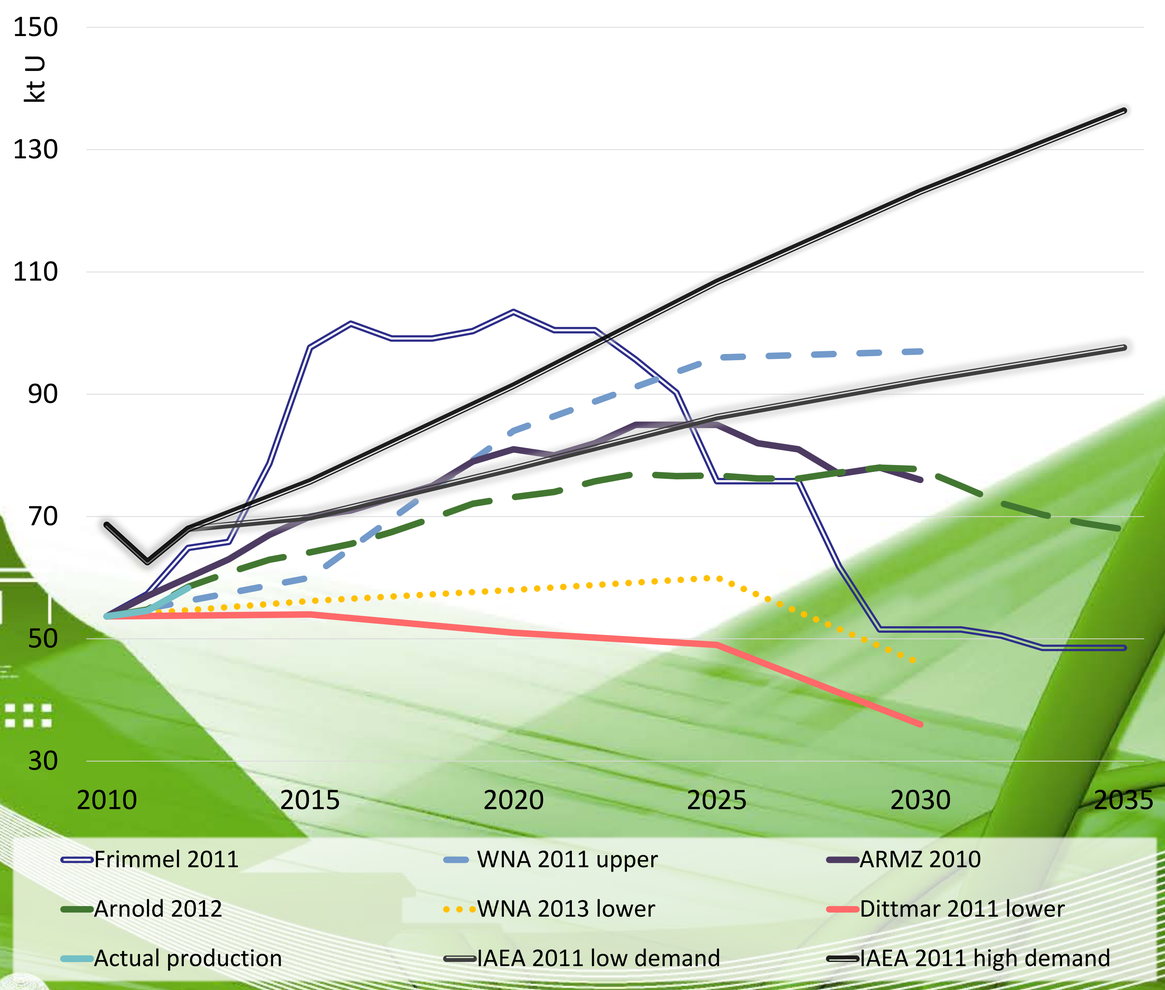

Fig 2: Selection of uranium production scenarios (excluding secondary resources to enable scenario comparison). A selection of scenarios was made to keep the figure readable. See the publications for the frame conditions made in the respective scenarios.

Findings

Most notably is an expected decline in production – somewhere between the beginning and the middle of the next decade – in almost all the scenarios. As these scenarios include all cost categories, a decline in production from low cost resources can be expected earlier, particularly as overall a shift towards higher cost categories can be observed. The decline in production has to be considered as critical aspect for future uranium supply (to some extent the decline in production can be explained by the limited planning horizon of companies). Thus the necessity of the timely development of mining projects is pointed out - especially when taking into account long lead times for mine openings.

Opinions on a possible contribution of secondary resources to fill the supply-demand gap diverge. Expected amounts range from 3 ktU_{eq} to 18 ktU_{eq} per year in the next 15 years. There is consensus, that their contribution is limited and that there will be a significant reduction in their share in U-supply with the expiry of the HEU Agreements, at least in the short term.

In the past years the increased production in Kazakhstan (Fig. 3) reduced the dependence on secondary resources. Today Kazakhstan is the main player on the uranium market, which was already projected in reports published several years ago. Nonetheless the boom in Kazakhstan is slowing down, and in upcoming years new mines have to compensate for the expected decline in Kazakh production, which is also reflected in the global scenarios.

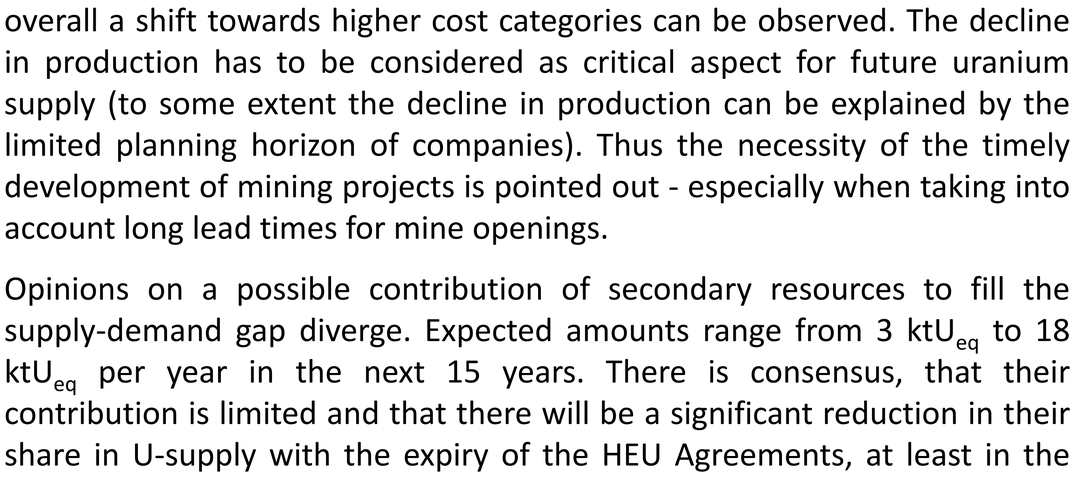

Fig 3: Yearly uranium production and production changes in Kazakhstan.

Another aspect discussed in some of the reports is the dependence on few large deposits/mining operations. The success of those mining projects (e.g. Olympic Dam, Cigar Lake or Husab and Elkon) is crucial for future supply scenarios and the security of supply.

Particularly against the background of rising production costs for conventional resources, possible contributions from unconventional resources are newly discussed. But, although mentioned in several publications significant contributions are not expected, thus not reflected in the scenarios of most reports.

Finally it has to be noted that estimations on future production capacity developments tend to be overestimated. Delays of projects and capacity expansions can have a critical impact on security of supply (depending on the size of the projects), especially with respect to the expected decline in production the next ten years. Overall, it can be stated, that the availability of uranium will have a significant impact on growth prospects of nuclear energy, probably much more than publically discussed.

Literature

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