

**ALTA 2017**  
20 - 27 May  
Perth, Australia  
22<sup>nd</sup> Annual Event

**Proceedings**

# **Uranium-REE Conference**

*Including*

**Lithium Processing Forum**

**13<sup>th</sup> Annual Uranium Event**

ALTA Metallurgical Services, Melbourne, Australia

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# PROCEEDINGS OF ALTA 2017 URANIUM-REE SESSIONS

*Including*  
**Lithium Processing Forum**

25-26 May 2017  
Perth, Australia

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**ALTA Metallurgical Services** was established by metallurgical consultant **Alan Taylor** in 1985, to serve the worldwide mining, minerals and metallurgical industries.

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**Short Courses:** Technical Short Courses are presented by Alan Taylor, Managing Director.

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## Uranium-REE Opening

### RED BOOK 2016: INSIGHTS INTO URANIUM SUPPLY AND DEMAND

By

Adrienne Hanly and Peter Woods

Presenter and Corresponding Author

**Dr Peter Woods**

Team Leader, Uranium Resources and Production Subprogramme  
International Atomic Energy Agency (IAEA), Austria

p.woods@iaea.org

### ABSTRACT

The 26th edition of “Uranium 2016: Resources, Production and Demand”, the “Red Book”, was released in November 2016. This well-recognised world reference on uranium was jointly prepared by the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD-NEA) and the International Atomic Energy Agency (IAEA). The report provides analyses and information from 49 countries. The new edition provides a thorough review of world uranium market fundamentals and presents data on global uranium exploration, resources, production and reactor-related requirements. It offers information on established uranium production centres and mine development plans, as well as projections of nuclear generating capacity and reactor related requirements through 2035.

Among the key findings in the latest report is that the total identified uranium resources as of 1 January 2015 increased by only 0.1 percent since 2013, with the resource base changing very little due to lower levels of investment and associated exploration efforts reflecting the currently depressed conditions of the global uranium market.

More than 20 countries around the globe produce uranium, with the largest producers Kazakhstan, Canada and Australia accounting for approximately two-thirds of world output. Global uranium mine production, meanwhile, had decreased by 4 percent between 2013 and 2015, though it remains above 2011 levels. The drop is due mainly to decreased production in Australia and lower output in Brazil, the Czech Republic, Malawi, Namibia and Niger. Kazakhstan, the world's largest producer, continued to increase output, although at a slower pace.

Regarding future demand for nuclear power, the Red Book's projections vary from region to region. While the Fukushima Daiichi accident led to a change of policies in some countries, nuclear power looks set to keep expanding globally both in low and high case scenarios, particularly in Asia.

While current uranium resources are more than adequate to meet the high growth scenario, doing so would “depend upon timely investments to turn resources into refined uranium ready for nuclear fuel production,” according to the report, adding that “significant investment and technical expertise” would be needed “to bring those resources to market”.

*Keywords: Uranium Resources, Uranium Demand, OECD-NEA, IAEA, Red Book*

## “Red Book”

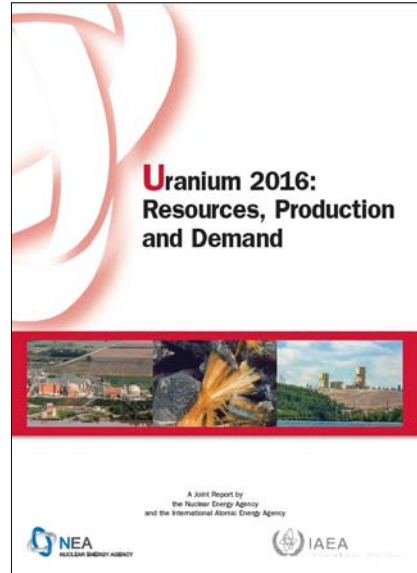
Recognized source for **Global Resource** information

Longstanding **OECD/NEA** and **IAEA** cooperation - published every 2 years

Relies principally on input from country representatives nominated by governments to the **Uranium Group**

Summary chapters on **Supply** and **Demand**

**2016 Edition:** 49 Country reports (12 are Secretariat estimates)



## Uranium Resources Production and Demand-Red Book

*Key messages in recent editions:*

Resources more than adequate to meet high case demand scenarios

Investment and expertise required to bring resources into production\*

Production costs increasing\*

Long lead times owing to regulatory requirements and public resistance\*

\*Contributing to potential supply challenges over next 5-10 years

## Red Book 2016

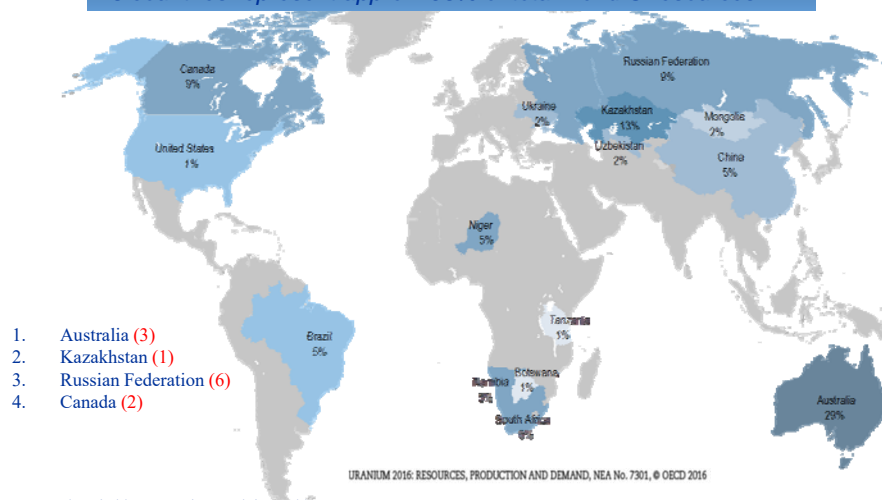
Time slice of a dynamic system – reference date  
**1 Jan 2015** – Red Book outlines situation based on  
available information on that date

Red Book released by OECD publications as **PDF  
free of charge**

<http://www.oecd-nea.org/ndd/pubs/2016/7301-uranium-2016.pdf>

## Red Book 2016 – Distribution of Resources\*

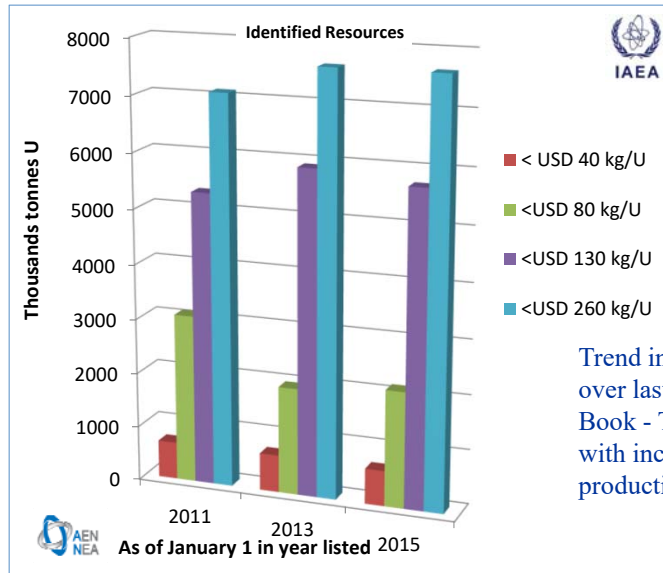
15 countries represent approx. 95% of total world U resources



Note: numbers in blue are nations rank in world resources,  
those in red are the nations rank in world production.

\*Identified Resources at <USD130 kg/U as of January 1, 2015

## Red Book 2016– Resource Trends

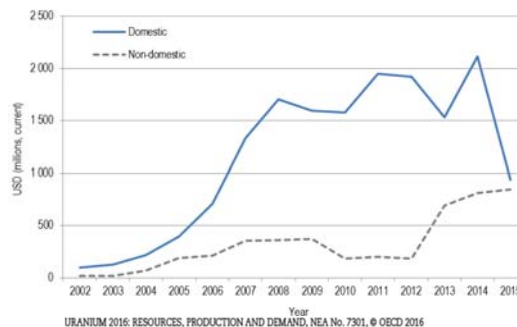


Trend in resource inventory over last three editions of Red Book - Total increasing along with increasing costs of production.



## Red Book 2016 – Expenditures

- Exploration and mine development expenditures continued to increase, driven mainly by Husab (Namibia) mine development and Cigar Lake (Canada)
- Total exploration expenditures alone decreased



Notes:

\*2015 values are estimates

\* Domestic exploration and development expenditures represent the total expenditure from domestic and foreign sources within each country.

## Red Book 2016 – Summary of Exploration and Resources

- Total exploration and mine development expenditures have increased since the last reporting period. However, no significant resources have been added and the expenditure increase reflects investments in the Cigar Lake mine in Canada and the Husab mine in Namibia.
- Total identified resources (RAR + Inferred) have increased by only 0.1% since 2013 (reflecting lack of investment in exploration)
- Overall reductions in <USD40 kg/U and <USD130kg/U categories.
- Decreases in RAR were offset by increases in the Inferred Resources category.
- Notably 208 400 tU from China and Kazakhstan was added to Inferred Resources category.

## World Uranium Production

Uranium production has decreased by 4% since 2013

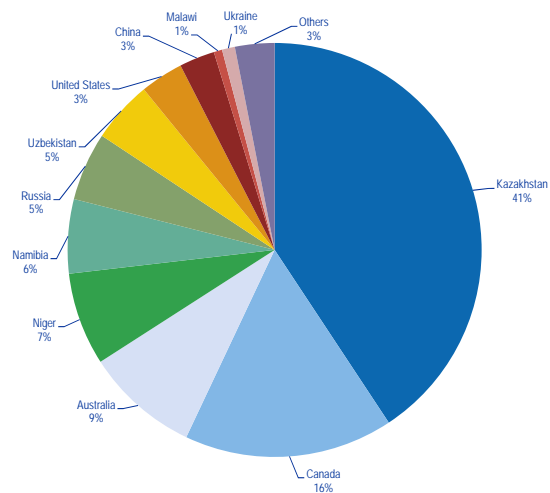
2014 production ~56 000 tU

Kazakhstan responsible for 41% of production in 2014 (production rate continued to increase but not as rapidly as in previous years)

Canada (16%) and Australia (9%) remain significant producers and production expected to increase in coming years

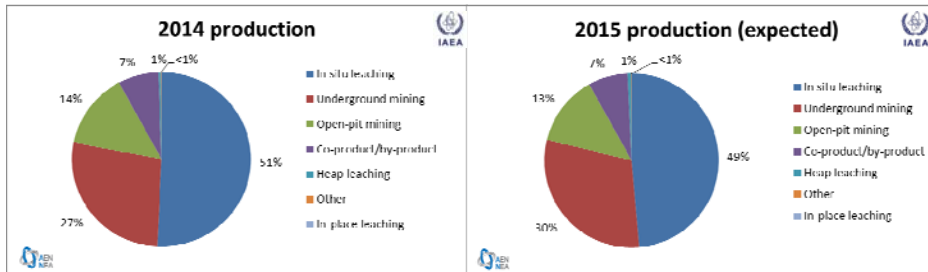
Largest production decrease was from Australia-dropped to 9% from 12% of world total in 2012

Also lower output from Brazil, the Czech Republic, Malawi, Namibia and Niger



URANIUM 2016: RESOURCES, PRODUCTION AND DEMAND, NEA No. 7301, © OECD 2016

## Total Uranium Production for 2014 and 2015 (expected) by Method

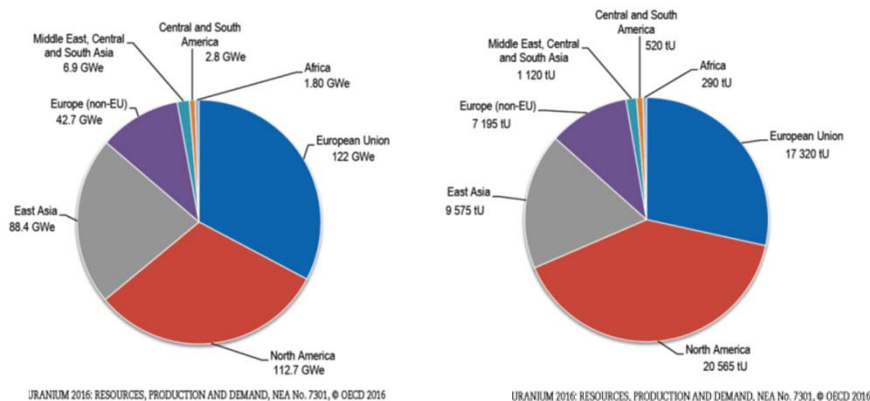


Since 2009, In situ leach (also known as in situ recovery) method is the dominant uranium production method in the world making up over 50% of 2014 production with similar forecasts for 2015.

A large part of this is due to production in **Kazakhstan**, the world's largest uranium producer.

Underground mining is second, with a large portion coming from the world's second largest producer, **Canada**.

## World Nuclear Capacity and U Requirements (as of January 1, 2015)



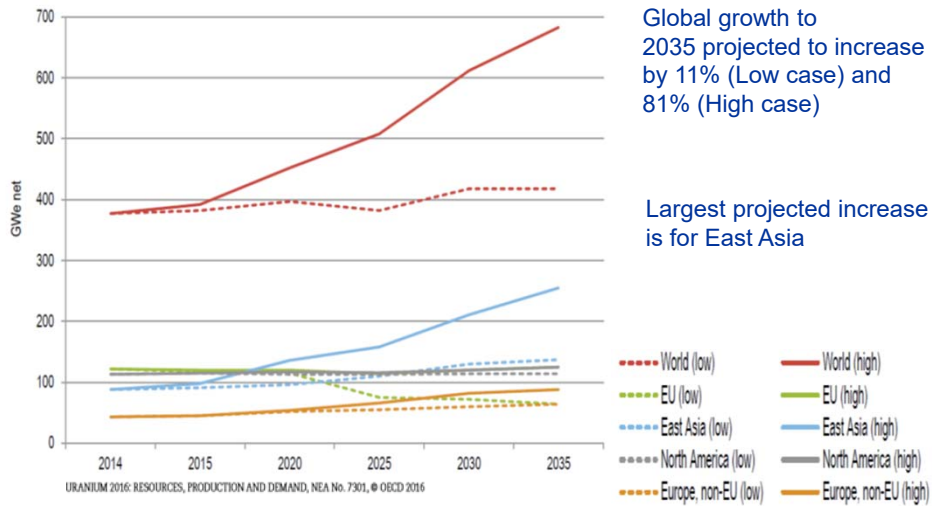
World installed nuclear capacity: 377.4 Gwe net

World uranium requirements: 56 585 tU (excluding MOX)

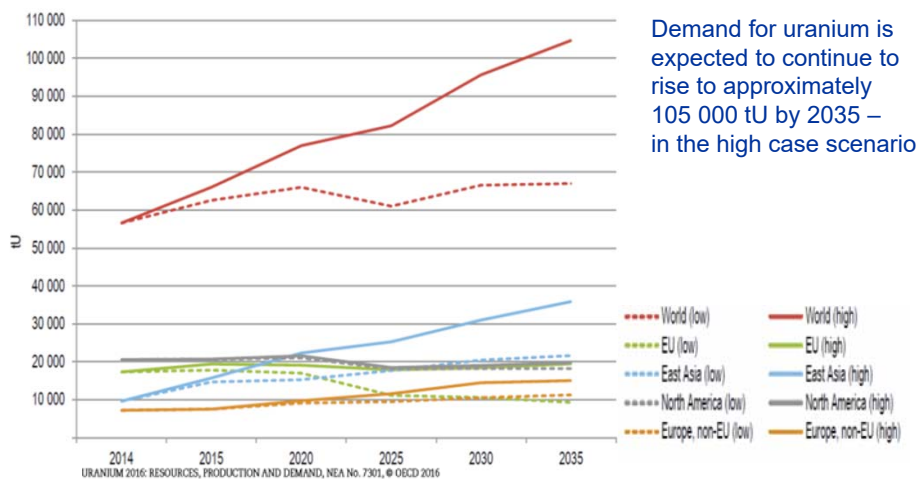
Uranium was produced in 21 countries in 2014, with total global production amounting to 55 975 tU which was about 99% of world reactor requirements for that year



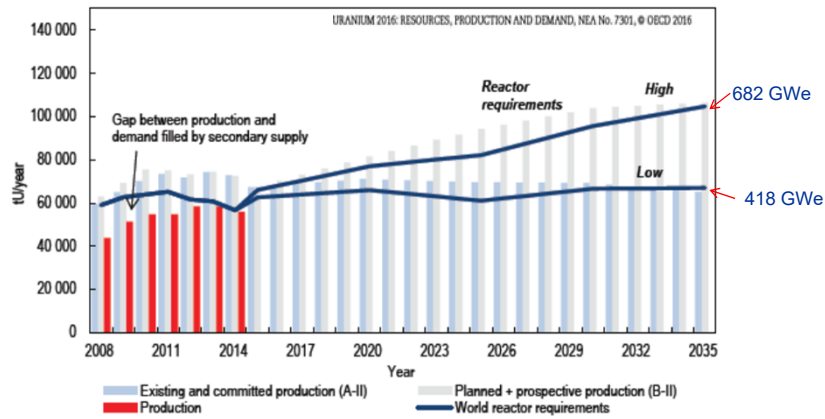
## Projected Nuclear Capacity to 2035 (as of January 1, 2015)



## Uranium Requirements to 2035



## Uranium Production Capability vs Demand



\* Includes all existing, committed, planned and prospective production centres supported by reasonably assured resources and inferred resources recoverable at a cost of <USD 130/kgU. Does not include the secondary supply forecast.

## Summary and Conclusions

- Growth continues in the nuclear industry-commitment remains in many countries; pace has slowed down in some
- Demand for uranium will continue to rise for the foreseeable future
- Identified Resources are more than adequate to meet high case demand projections to 2035

## Summary and Conclusions

- Mine developments delayed; strong market conditions required to bring resources to market
- Increased production capability (i.e. expansions and new mines) will be required for projected growth in nuclear demand (high case scenario)
- To meet demand in the long term uranium production is projected to expand and with this a strong safety and environmental record must be maintained, communicated and continuously re-evaluated

## Acknowledgements

- The compilers of this joint publication are Drs Adrienne Hanly of the IAEA and Luminita Grancea of the OECD-NEA, to whom inquiries should be made
  - [A.Hanly \(at\) iaea.org](mailto:A.Hanly@iaea.org)
  - [Luminita.GRANCEA \(at\) oecd.org](mailto:Luminita.GRANCEA@oecd.org)
- Permission to reproduce tables or figures from the Red Book should be requested of the OECD-NEA
- If you downloaded the Red Book 2016 prior to April 2016, please revisit the site and download again for the revised official version
- <http://www.oecd-nea.org/ndd/pubs/2016/7301-uranium-2016.pdf>