

IAEA Support To Member States for Sustainability of Nuclear Fuel for Nuclear Power Plants

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Talking Points...



- International Atomic Energy Agency (IAEA)
- IAEA Nuclear Fuel Cycle & Materials Section (NFCMS), Uranium Production Cycle (UPC) Team
- NFCMS UPC Team support to Member States
- NFCMS UPC Team outputs
- Joint OECD-NEA / IAEA Uranium Group
- The "Red Book"... World uranium exploration, resources, and production

International Atomic Energy Agency (IAEA)

- 1953 Eisenhower's "Atoms for Peace" speech, UN General Assembly
- 1957 Established as autonomous agency
 - Although established independent of UN, reports to UN General Assembly and Security Council
- Promotes the peaceful use of nuclear technology and nuclear power worldwide
- Intergovernmental forum for scientific and technical cooperation



IAEA Member States... 176 As of 3 January 2023

• IAEA provides direct support to 52 Member States actively involved in the development of the uranium production cycle...





Member states
Membership approved
Withdrew membership
Non-members

IAEA Provides Support for the Nuclear Fuel Cycle

- Prospecting and exploration
- Mine and processing facility development
- Decommissioning and remediation
- Fuel enrichment and fabrication
- Nuclear power plants
- Spent fuel management



IAEA Nuclear Fuel Cycle & Materials Section (NFCMS), Uranium Production Cycle (UPC) Team...^A



IAEA NFCMS UPC Team... International Technical Cooperation Projects Support

- Technical training
- Workshops
- Expert missions
- IUPCR missions
- Fellowships
- Scientific visits
- Procurements

During 2016-2023, the UPC Team provided technical advice and support to 27 Inter-Regional, Regional, and National projects



Some 40-60 international experts provided training for 400-600 participants during 2018-2023...





Over 450 lectures on specific topics; Q & A sessions, discussions

IAEA NFCMS UPC Team... Development of National Infrastructure for the UPC

Development of national infrastructure to support and regulate the uranium production cycle is a significant and complex task



The IAEA has developed a Milestones approach to support Member States in developing national infrastructure in a systematic and manageable way

IAEA NFCMS UPC Team... Milestones Approach to



IAEA NFCMS UPC Team... Milestones Application (

Regional Africa IAEA Technical Cooperation Project...



2 **Preliminary** assessment of Milestone stage of **RAF-2014** project participating **Member** States...

IAEA NFCMS UPC Team Outputs (Resources-Related)

- Authoritative, objective, and reliable information to support member states with characterization and evaluation of uranium resources...
 - Statistical databases
 - Geology
 - Deposit types
 - Deposit distribution



- Undiscovered resource assessment and mineral potential
- Best practices guides





Meetings... Uranium Raw Material for the Nuclear

International Symposium on

Uranium Raw Material for the Nuclear Fuel Cycle

Innovation for Sustaining Future Resources and Production

8-12 May 2023, Vienna, Austria



Programme Symposium	LIAEA Committee Meeting on Uranium Raw Mae Nuclear Fuel Cycle Urana Moning 1 Juby 2021 to 30 April 2023 Ref. No. 888	on the 2023 terial for the	•
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- URAM Series…
 - -2000, 2005, 2009, 2014, 2018

– Sessions on...

- Nuclear power and modern energy markets
- Uranium markets
- Uranium geology and resources
- Advances in exploration
- Uranium deposit evaluation
- ISL and other U mining & processing
- Unconventional U resources, Th
- Health, safety and environment
- Tailings and waste management

Publications... Uranium Deposit Types and Models

Descriptive Uranium Deposit and Mineral System Models

1. INTRUSIVE 2. GRANITE RELATED 3. POLYMETALLIC BRECCIA COMPLEX VOLCANIC RELATED 5 METASOMATITE 6. METAMORPHITE PROTEROZOIC UNCONFORMITY 8. COLLAPSE BRECCIA PIPE 9. SANDSTONE 10. PALEO QUARTZ-PEBBLE CONGLOMERATE 11. SURFICIAL 12. LIGNITE COAL 13. CARBONATE 14. PHOSPHATE 15. BLACK SHALE IAEA



Publications... Resource Assessment & Mineral Potential



Databases & Data Explorers... Integrated Nuclear Fuel Cycle Information Systems, UDEPO & ThDEPO





Joint OECD-NEA / IAEA Uranium Group



- Collaborative effort between the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD) and the International Atomic Energy Agency (IAEA)...
 - Forum for the exchange of information, analysis, and guidance on the uranium market and its role and relationship with respect to the global nuclear fuel cycle
 - Platform for dialogue and cooperation among governments, industry, and other stakeholders on issues related to the uranium market and the nuclear fuel cycle
 - Activities are based on the principles of transparency, objectivity, and impartiality

https://www.oecd-nea.org/jcms/pl_28567/the-joint-nea/iaea-group-on-uranium-ug

Joint OECD-NEA / IAEA Uranium Group.... Red Book

- Responsible for preparation and publication of the "Red Book"
- Tracks world and country trends and developments in uranium resources, production & demand...
 - Derived from government information officially reported to the IAEA
 - Aims to obtain a uniform, worldwide acceptable classification of uranium resources



https://www.oecd-nea.org/jcms/pl_79960/uranium-2022-resources-production-and-demand

Red Book... Uranium Demand, Commercial NPPs...



Red Book... Uranium Production and Demand, Projection to 2040 (based on 2019 & 2020 data)



2020

2025

2030

2035

2040

 It is assumed that secondary supply will fill the gaps when requirements are greater than production

Red Book... Exploration & Mine Development Expenditures (2019 & 2020)

- Decreased to ~USD 250M in 2020 from ~USD 500M in 2018, and ~<u>USD 2B</u> in 2014
- Preliminary 2021 expenditures show small increase to ~USD 280M



 Total expenditures continue to decrease in response to a depressed uranium market that has lasted since mid-2011

Red Book... Identified Recoverable Resources Distribution at <USD 130/kgU (2019 & 2020)





Red Book... Changes in Global Uranium Reasonably Assured Recoverable Resources





Red Book... Identified Recoverable Resources, by Processing Method, at <USD 130/kgU (2019 & 2020)



Red Book... Identified Recoverable Resources by Deposit Type, at <USD 130/kgU (2019 & 2020)



Red Book... World Total Recent Uranium Production 2009-2021 (~0.72M tU)



Red Book... World Uranium Production (~47,300 tU) (2019 & 2020)



Red Book... World Uranium Production by Methods (2019 & 2020)



Red Book... World Uranium Production by Deposit Type (2019 & 2020)



Red Book & UDEPO Uranium... Who, What, Where



https://nucleus.iaea.org/sites/connect/UPCpublic/PublishingImages/Infographics/Red_Book_2020_Uranium_Depos-Res-Prod-Demd.png

