

# Towards 'coherent and consistent' nuclear fuel resources reporting standards

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# The "Atoms for Peace" Agency

- *World centre of cooperation in the nuclear field*
- *Promotes safe, secure and peaceful nuclear technologies*
- *Three pillars (3S) of IAEA*
  - **Safety and Security**
  - **Science and Technology**
  - **Safeguards and Verification**



# Assurance of fuel supply

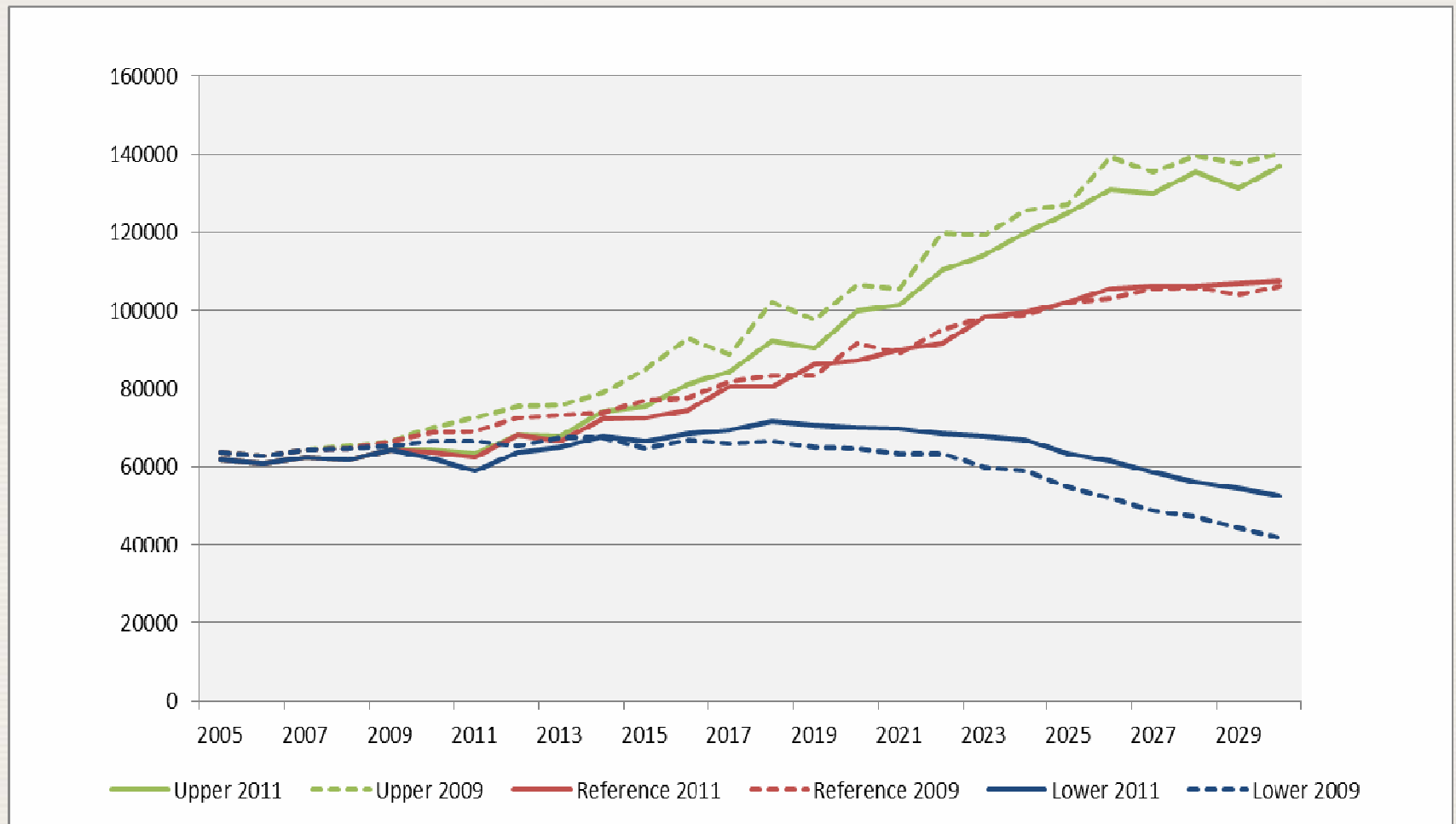
- Post – Fukushima, nuclear energy estimated to **grow** 2 – 3 % per annum into 2050
- Uranium fuel supply has to be assured for **~100 years** for reactor life
- Thorium is the **future** of nuclear energy
- **Alternate sources of uranium** such as phosphoric acid and waste streams can augment the resources and clean up the environment.
- IAEA supports Member States in **sustainable uranium production**.

# IAEA Scenario September 2011

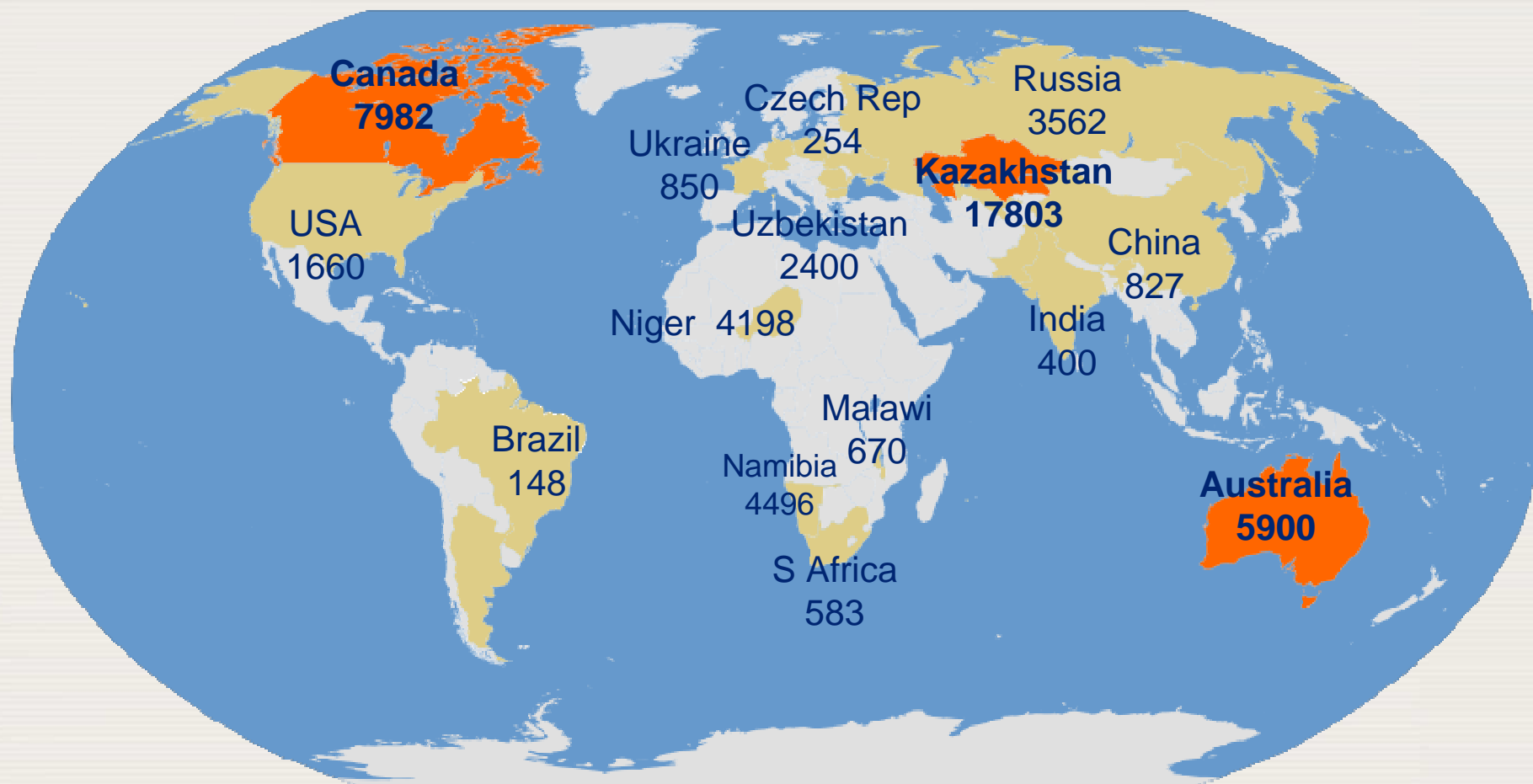
Country Group	2010			2020 (a)			2030 (a)			2050 (a)(b)		
	Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear	
		GW(e)	%		GW(e)	%		GW(e)	%		GW(e)	%
North America	1165	113.8	9.8	1273 1310	119 126	9.4 9.6	1346 1526	111 149	8.3 9.7	1475	120 200	8.1 13.6
Latin America	313	4.1	1.3	457 587	6.4 6.4	1.4 1.1	982 1403	9 18	0.9 1.3	1990	15 60	0.8 3.0
Western Europe	843	122.9	14.6	1007 1058	93 126	9.2 11.9	1132 1389	83 141	7.4 10.1	1586	60 170	3.8 10.7
Eastern Europe	465	47.4	10.2	661 661	66 80	10.0 12.1	723 914	82 108	11.3 11.8	1031	80 140	7.8 13.6
Africa	130	1.8	1.4	383 422	1.8 1.8	0.5 0.4	781 1093	5 16	0.6 1.5	2630	10 48	0.4 1.8
Middle East and South Asia	418	4.6	1.1	538 954	13 22	2.4 2.3	1414 1885	30 53	2.1 2.8	5223	50 140	1.0 2.7
South East Asia and the Pacific	173			293 312			473 526	0 6	0.0 1.1	1242	5 20	0.4 1.6
Far East	1564	80.6	5.2	2222 2407	130 164	5.8 6.8	2818 3381	180 255	6.4 7.5	5215	220 450	4.2 8.6
World Total	Low Estimate High Estimate	5071 375.3	7.4	6835 7711	429 525	6.3 6.8	9669 12118	501 746	5.2 6.2	20391	560 1228	2.7 6.0

**~ 215 000 tU/year by 2050 – high case**  
**~98 000 tU/year by 2050 – low case**

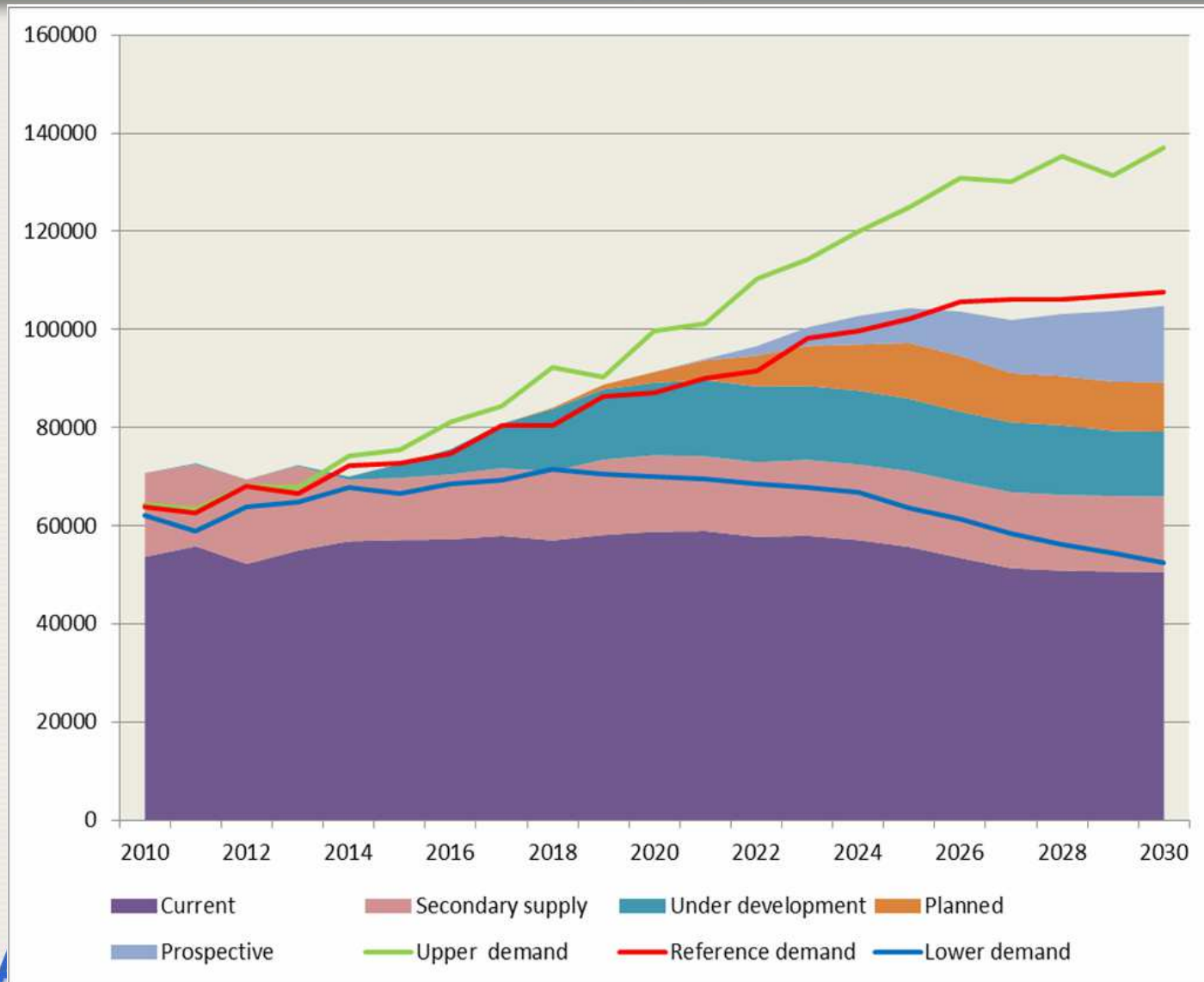
# WNA Scenario September 2011



# Uranium production 2010



# Supply reference case



# World distribution of uranium resources

Red Book 2009

	tU	
Australia	1 679 000	26.6%
Kazakhstan	832 000	13.2%
Russia	565 000	9.0%
Canada	544 000	8.6%
United States	472 100	7.5%
South Africa	295 600	4.6%
Namibia	284 200	4.5%
Brazil	278 700	4.4%
Niger	275 500	4.3%
Others	1 079 000	17%
<b>Total</b>	<b>6 306 000</b>	

INFCIS - UDEPO

The screenshot shows the 'World Distribution of Uranium Deposits' interface. It includes a search bar, filters for Deposit Type, Deposit Status, and Country, and a table of results. The table has columns for Country, Deposit Name, Deposit Type, and Deposit Status. A cloud-shaped callout points to the table with the text 'Data of 1 415 uranium deposits from 75 countries'.

Country	Deposit Name	Deposit Type	Deposit Status
Gabon	Mounana	Sandstone - Tectonic/Uthologic	Depleted
France	Vendée District	Vein	Depleted
Niger	Abakorum	Sandstone - Tabular	Dormant
Algeria	Abankor	Vein	Dormant
United States of America	Abbe	Sandstone - Tabular	Depleted
Canada	Abeta	Quartz-pebble Conglomerate	Dormant
Egypt	Abu Tartur	Phosphrite	Dormant
United States of America	Acadia Claim Group	Sandstone - Roll Front	Exploration
Canada	Ac-Fav-Verna	Vein	Depleted
Spain	Acebucho-Cedavin	Vein	Dormant
Ukraine	Adamovskova	Other	Dormant
Tajikistan	Adrasman	Vein	Depleted
Kazakhstan	Asashsice		Dormant
Russian Federation			Dormant
Canada			Depleted
Uzbekistan			erating
Kyrgyzstan			ormant
Iraq			mant
Kazakhta			rine
Niger			

Data of 1 415 uranium deposits from 75 countries

Total 26 802 989 tU

Undiscovered Resources: 10 400 000 tU

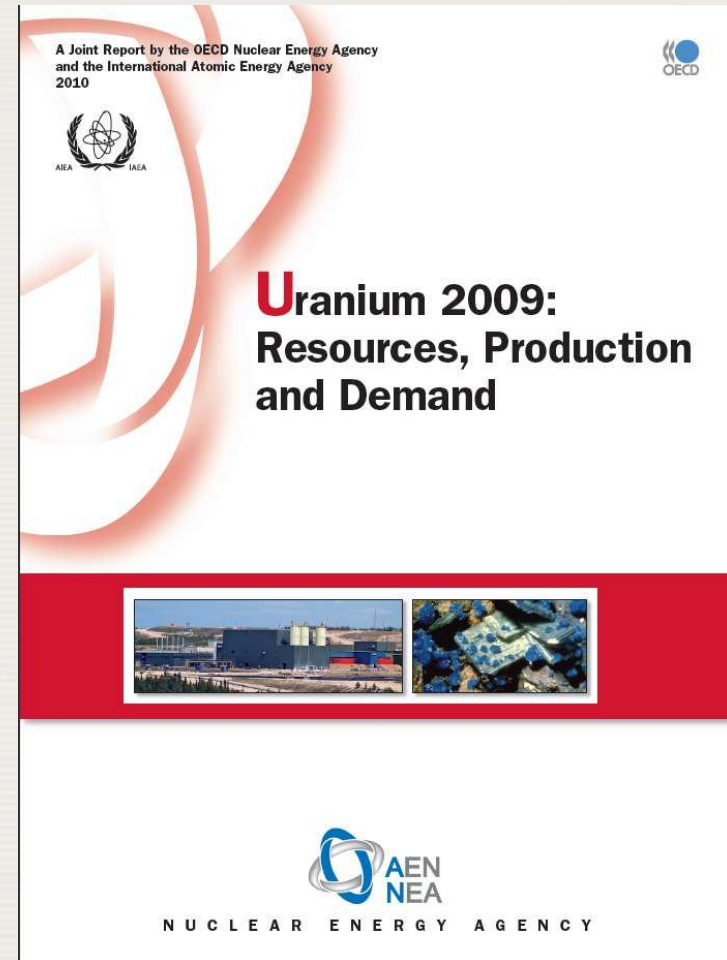
IAEA /OECD NEA Uranium 2009: Resources, Production and Demand

<http://www-nfcis.iaea.org>



# The 'Red Book'

- Publisher jointly by **OECD-NEA and IAEA**
- Standard for making official country resource submissions .
- All countries are encouraged to openly report their uranium resources using a classification that is compatible with the national systems.



# Aspects considered

- Consideration for **recoverability**
- Adjustment of estimate for **past production**
- Meaningful economic analysis of **production cost**
- Take into account **all costs** in economic analysis - such as infrastructure and rehabilitation following operation
- Avoid **obsolete** economic evaluation

# 'Coherent and consistent' reporting

- **Rationale**
  - Quality reporting of uranium and thorium resources
  - More reliability for long-term resources availability studies
- **What has been achieved?**
  - Review of the existing scheme
  - Preliminary mapping of existing IAEA-OECD/NEA scheme to UNFC 2009
  - Suggestions for generic guidelines
  - Many training sessions in 2011-12
- **Looking ahead ...**
  - Detailed mapping and testing
  - U/Th **bridging document**
  - Report on UNFC application
  - Workshops, meetings, training courses



Uranium exploration, Namibia

# Consultancy meeting 30 April – 1 May

Experts from Australia, Brazil, China, Portugal, UK, USA and UNFC Task force experts participated.

## Recommendations:

1. Continue the process of mapping and alignment between the IAEA / OECD-NEA “Red Book” classification and UNFC
2. Communicate on a regular basis to exchange information and feedback between EGRC, IAEA and the OECD-NEA on the development and use of UNFC documentation
3. Develop a bridging document for mapping, correlation and conversion of values to UNFC 2009 from the IAEA-NEA scheme, and report findings and recommendations at the latest by the EGRC meeting 2013

# Consultancy meeting 30 April – 1 May

4. Propose to the Uranium Group **an optional / alternative reporting based on UNFC 2009**. As a test case/ worked example the Australian resources as expressed in the UNFC 2009 scheme will be provided
5. In collaboration with the responsible IAEA Expert Working Group, develop **Guidelines for the accommodation of Comprehensive Extraction projects** within the Framework and develop Guidelines for the classification of uranium and thorium for both operational use and stakeholder communications
6. Develop documentation and associated training materials **to build capacity in IAEA Member States (MS)** to adopt UNFC within their national mineral exploration, mining and mineral extraction plans including the role of UNFC in support of stakeholder engagement and social licensing
7. Consider longer-term opportunities for enhancing the alignment of UNFC with, and its adoption into, policies and good practices for **sustainable development, resource conservation and life-cycle management of essential minerals**
8. Consider opportunities for the further normalisation and enhanced taxonomic robustness of the Framework notably in respect of **strategic or non-commercial projects**.



# IAEA's UNFC message has gone to ...

**2-6 May, Amman, Jordan:** National Workshop on uranium production from phosphates – *Presentation and discussions – 25 participants from Jordan*

**1-3 June, Buenos Aires, Argentina:** IAEA-CYTED-CNEA International Workshop on Nuclear Fuel Resources of Latin America – *Presentation and discussions – 125 participants from Latin America and other countries*

**26-29 September, Vienna:** Technical Meeting on Uranium production from phosphate rocks, 26-29 September, Vienna - *Presentation and discussions on UNFC application for by-product uranium applications – 45 participants from about 30 countries*

**17-21 October, Thiruvananthapuram, India:** Technical Meeting on World thorium resources, - *Presentation and discussions on UNFC application for thorium and REE mineral application – 50 participants from about 22 countries.*

**31 October – 4 November, Marrakech, Morocco:** International workshop and Africa Regional Training Course on Uranium extraction from phosphoric acid,. – *Presentation and discussions on UNFC application for by-product uranium applications – 65 participants from about 30 countries.*

**26 – 31 March, Madagascar:** Regional Training Course - Uranium geology and exploration – *UNFC session – 50 participants from 20 countries.*



# Resources management tool

- **Geological knowledge**
  - **Exploration** and geologic and mineralogical studies.
  - **Resource evaluation** and estimation
  - Evaluation of **various metal content** associated with deposits.
- **Project feasibility**
  - Better **recovery** of U
  - **Co-recovery** of by-products (REE, Th etc)
  - **Recycle and re-use** of process water
  - Refilling of **mine wastes**
  - Establish the best practices in **tailing management**.
- **Socio-economic viability**
  - Economics, markets
  - Health – Safety – Environment
  - **Public acceptability**

# You can reach me at ...

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*Thank you*

