

# **AN OVERVIEW OF URANIUM MINING DEVELOPMENT IN MALAWI**

**PRESENTED AT**

**Implementation of Global Best  
Practice in Uranium & Processing  
IAEA HQs - VIENNA**

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# PRESENTATION OUTLINE

- Brief history of Uranium & radioactive mineral exploration
- Current development trends
  - Keyerekera Uranium Project
  - Current exploration programmes
  - Policy and Legislation
- Challenges
- Conclusion



# BRIEF HISTORY OF URANIUM & RADIO ACTIVE MINERAL EXPLORATION IN MALAWI

- A number of early reports on Karroo exploration programmes highlighted existence of radio-active anomalies in the late 1950s
- Not much uranium exploration interest was undertaken since coal was the only targeted mineral.
- Airborne Radiometric and Geophysical exploration – 1985 to 88 revealed a number of potential radio-active mineral areas (with Kayerekera as one of the most promising)
- First EPL granted to CEGB 1988 to 1991
  - Mapping, drilling and yielded positive feasibility studies
- Tumbling of world uranium price due to fall of iron curtain led to project stalling leading to eventual EPL surrender by CEGB.
- Area Re-licenced to Paradin 1997 leading to re-evaluation, confirmation drilling, Bankable feasibility studies and go ahead given in 2005, with Mw Govt-Paradin agreement signed in 2007.
- Kanyika Prospect – EPL in granites granted to Globe Uranium of (Australian) in 2005 and progressing very well.
- A number of other licences also granted to other players mostly Australian, RSA and UK based between 2004 and 2006.

## CURRENT DEVELOPMENTS

### ○ Kayerekeru Uranium Mining Project

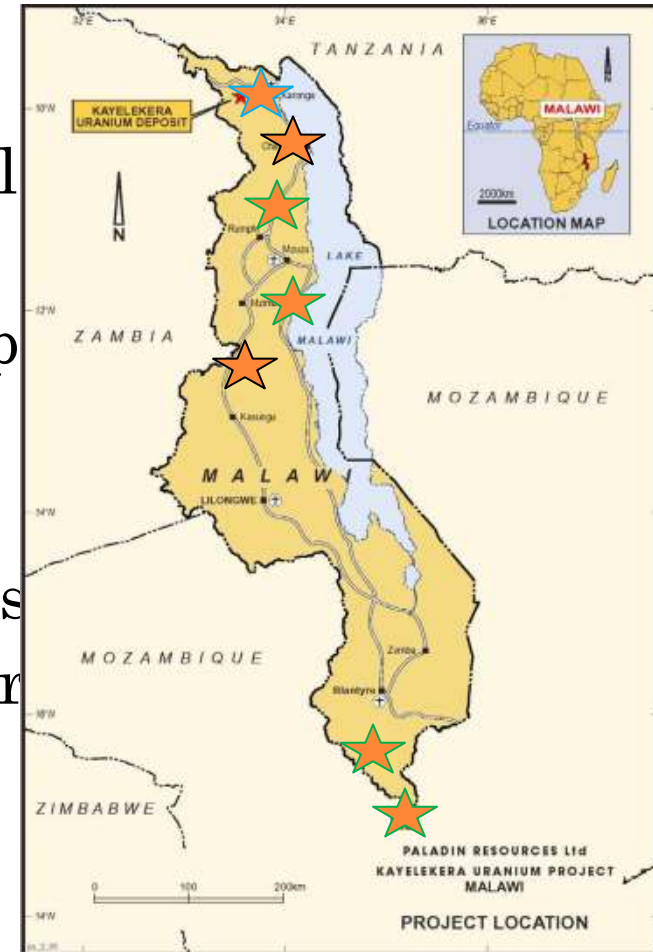
#### ○ Geology

- Deposit is a sandstone-hosted uranium within the Permian Karoo Sandstones.
- Uranium occurs as Coffinite  $U(SiO_4)(OH)_4$  and minor Uraninite ( $UO_2$ ). Six principal mineralised lenses form bulk of mineralisation. Hosted within distinct arkose units and occur to a depth of 100 m from surface.
- Mudstone layers sandwiched, between arkose layers some of which are mineralised.
- Resource contains approximately **13 600 tonnes** of recoverable  $U_3O_8$  with a grade of approximately 800 ppm  $U_3O_8$ .

# KAYEREKERA URANIUM MINING PROJECT

## ○ Mining Method

- All mining will be by conventional open pit methods using hydraulic excavators with articulated dump trucks.
- Mine life pegged at 7 years with possibility of extension for 3 years
- Targeted production 3.3 mlbs/year
- The final open pit dimensions are expected to be in the order of 300 m wide (east west), 600 m long (north-south) and 130 m deep. The ultimate in-pit elevation expected to be 830 mamsl at end of mine life.



# KAYEREKERA URANIUM MINING PROJECT CONTINUED.....


## ○ **Process Plant**

- The flow sheet selected for the Kayelekera process plant is conventional acid leaching technology in use in several uranium operations worldwide. Process divided into six areas:

- Ore Handling and Preparation – includes Crushing, Milling and Thickening.
- Extraction – includes acid Leaching and Liquid-Solid Separation
- Concentration and Purification – includes solution Clarification and Solvent Extraction.
- Precipitation and Product Preparation – includes ammonium diuranate Precipitation.
- Thickening and product Drying and Packaging



# KAYEREKERA URANIUM MINING PROJECT PROCESS PLANT CONTINUED.....

- Tailings Handling – includes Disposal and Storage services and Utilities – includes Reagents and Water systems
  - Concentration and Purification – includes solution Clarification and Solvent Extraction.
  - Precipitation and Product Preparation – Ammonium diuranate Precipitation.
  - Thickening and product Drying and Packaging.
  - Tailings Handling – Disposal and Storage
  - Services and Utilities – Reagents and Water systems
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# KAYEREKERA URANIUM MINING PROJECT CONTINUED.....

- **Sulphuric Acid and Sulphur Dioxide Gas**
- Sulphuric acid and sulphur dioxide gas are required for the leaching of uranium from the host ore.
- A stand alone, sulphur-burning plant will be installed to produce sulphuric acid and gaseous sulphur dioxide. Sufficient storage for both reagents is required to allow continuous operation of the Process Plant.
- Storage tanks will be required for sulphuric acid. A facility is being constructed to liquefy sulphur dioxide gas, store liquid sulphur dioxide and vaporise it for use in the leaching circuit.



# KAYEREKERA URANIUM MINING PROJECT CONTINUED.....

## ○ **Services**

### ○ **Water**

- Water requirement for subsequent years of operation 2,4 Mm<sup>3</sup>/a
- 1,7 Mm<sup>3</sup>/a of process water.
- 0,023 Mm<sup>3</sup>/a for consumable water (wash water and potable water).
- 0,36 Mm<sup>3</sup>/a for filtered water for the plant
- 0,29 Mm<sup>3</sup>/a for dust suppression.

### ○ **Power Generation**

- The plant will have dedicated diesel generator sets rated between 6 and 8 MVA capable of supplying all the plant's electricals

### ○ **Social Responsibility**

- School, Medicine (Dis. Hos.), Clinic, Water Supply (Dis. Hqs.)

# KAYEREKERA URANIUM MINING PROJECT CONTINUED.....

## ○ **Product Transportation**

- The yellow cake transported by road to shipment port in 210-litre steel drums packed in standard 20-foot freight containers.
- Shipment, approximately 1 transport truck/week. Drums adequately secured for transport, in accordance with international transport and International Atomic Energy Agency (IAEA) guidelines.

## ○ **Waste**

- Waste Rock
- Tailings
- General Waste (non-hazardous or domestic)
- Hazardous Waste (non-radiological)
- Medical Waste
- Radiological Waste



# KAYEREKERA URANIUM MINING PROJECT CONTINUED.....

## ○ **Workforce**

- **Construction stage:** nominal construction staff of **500** persons, with a peak construction complement of **800** persons.
- **Operations stage:** the open pit mine contingent will consist of **118** local employees and **12** expatriates. The process plant will require **150** persons, with **30** being expatriates to decrease to **15** after training of locals.

## ○ **Current development position.**

- Under development (64% as of June 2008 ) with following infrastructure under construction
  - Civil Works, concrete & sag mill foundation, crusher equip installation, PowerStation, acid storage tanks ancillary roads etc.

- **Expected commissioning date – January 2009**  
(delayed from targeted Nov. 2008)



# GLOBE NIOBIUM/URANIUM PROJECT

## URANIUM'S

## KANYIKA

- Exploration (6000 m drilled) revealed 56 mt reserve with 321 mlbs @ 0.26%  $\text{Nb}_2\text{O}_5$  & 9mlbs  $\text{U}_3\text{O}_5$  with further drilling indicating high-grade intercepts.

- **Proposed conceptual process**

**Development phase (1)** Mining → crushing  
gravity concentrate → flotation concentrate →  
→ smelting → finished product (FeNb) → market


Potential phase (2) Acid leach (of flotation concentrate) →  $\text{Nb}_2\text{O}_5$ ,  
 $\text{To}_2\text{O}_5$ ,  $\text{U}_3\text{O}_5$  → Market

- **Current Project Position**

- From Sep 08 conducting Pre-feasibility study which has already yielded very good positive results

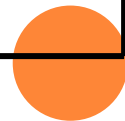


TABLE 1 OUTLINES OTHER RADIO-ACTIVE MINERAL EXPLORATION PROJECTS UNDER INVESTIGATION IN MALAWI.

<b>MINERAL</b>	<b>AREA</b> (Potential ore type)	<b>TONNAGE</b> (million tonnes)	<b>STATUS</b>	<b>COMPANY</b>
Uranium	<b>Mhaju</b> (Karoo - Sandstone)	N/A	EPL (Early Exploration)	Globe Uranium (Australia)
Uranium	<b>Livingstonia</b> (Karoo - Sandstone)	Still drilling stage	EPL (Mid Exploration)	Globe Uranium (Australia)
Uranium	<b>Chilumba</b> and Extension of Kayerekera & <b>Mwankenja</b> areas	N/A  (Karoo – Sandstone)	EPL	Paradin Africa
Uranium	<b>Nsanje</b>  (Granitoid)	N/A  (Baseline study)	EPL	Oropa  (UK-RSA-Zw) 

**TABLE 1 CONTINUED.....**

<b>Mineral</b>	<b>Area</b>	<b>Tonnage</b>	<b>Status</b>	<b>Company</b>
Uranium	Mwabvi  (Karoo - Sandstone)	N/A (Baseline study)	EPL	Africa Energy (Australia-RSA)
Uranium	Thambani Granitoid	(Baseline study)	EPL	Lisungwe Ltd
	Chintheche  Granitoid	(Baseline study)	EPL	JV - Saurus Resources Tanaka Mining Red Rock Resources



# POLICY AND LEGISLATION

- Government is committed to facilitate the sustainable development of the sector (which only accounts for 1.4% of GDP) and is fully aware that to attain this sustainable development, is a challenge which cannot be achieved by it alone.
- Government is continually establishing an integrated enabling environment which is attractive to potential investors. In this respect,
  - New Mines and Minerals Policy formulated that seeks to increase mining sector's contribution to GDP between 3-5% in the next 5 years.
  - Government is in the process of reviewing the mining legislative framework to attract private sector participation in exploration and exploitation, processing and utilization of Malawi's mineral resources.
- Government is also implementing policies that would to ensure macro-economic stability and put in place a balanced fiscal regime that provides an overall competitive investment climate, which will provide confidence to the private sector.
- In view of the prospective investment in the Radio-active mineral sector, government is developing Nuclear Law, Radio Active Minerals Act and other related legislation with assistance of bilateral partners and donors.

# CHALLENGES

- Up to date **legislation conforming to international standards** to match with up-coming radio-active minerals exploitation and development.
- **Understaffing levels** to adequately monitor exploitation of these resource developments.
- **Uranium mining is new area** for Malawi and therefore requires new equipment and skills to adequately monitor & enforce.
- Late institutional strengthening requirements to match, control and facilitate developments on ground (e.g. Nuclear Licencing Authority).
- **Loss of government staff** to developing uranium operations.
- How to **fast track development and revision** of requisite legislation



## CONCLUSION

- Radio-active mineral exploration and development progressing very steadily
- Malawi Government is committed to develop the mineral sector and recognises it as one of the priority key sectors for growth diversification.
- Government is committed to support the private sector in the development of this radio-active mineral sector.
- A fast track approach to requisite institutional creation, strengthening and development of sector is a must to match with trends on the ground.

THANK YOU FOR YOUR ATTENTION!

