Legacy Uranium Production sites in Northern Territory, Australia
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August 2018
NT and Uranium mining

• More or less continuous the end of WW2
  – Rum Jungle, South Alligator field, Moline, Westmoreland (1950-60s)
  – Nabarlek (1978-88), Jabiluka development work

• Currently only Ranger Mine is operating
  (Energy Resources of Australia)
Uranium and the Northern Territory

- A long history...
  - 1869: Goyder found a green coloured mineral "that was not copper" – torbernite perhaps?
  - 1912, Dr H L Jensen, the then Government Geologist, reported the existence of uranium in the Rum Jungle area
  - 1949: Jack White found Uranium at Rum Jungle
  - 1953: Bruce Walpole found U at Coronation Hill
    - Contemporary finds included Adelaide River, Sleisbeck and all the other South Alligator Valley deposits - Scinto 1-6, Rockhole. El Sherana, Saddle Ridge, etc
  - Queensland Border area
  - Alligator Rivers Region
The good old days........
Since 1954 Uranium mining activity has been more or less continuous in the NT

- Rum Jungle - now the focus of a remediation planning project
- Significant deposits were found in the Pine Creek geosyncline and up into the Alligator Rivers Region
- South Alligator Valley
  - 54 radiological anomalies; 19 mine sites
    - Commonwealth funded hazard reduction works
    - Adelaide River and Pine Creek areas
- Other minor sites at Westmoreland and Adelaide River
- 1960s exploration led to Nabarlek, Ranger, Koongarra and Jabiluka
- Ranger operating since 1980
- Other recent but small finds throughout the NT
South Alligator Valley – early activity
South Alligator Uranium Field

- Operated between 1959 and 1965
- The total production for this field was approximately 840 tonnes of U$_3$O$_8$.
- Area now stage 3 of Kakadu NP
- Need to clean up mining sites
- Program of survey and hazard reduction
- Studies and consultation began 1997
- Legacy sites remediated 2006-7

After remediation in 2007

Sleisbeck open cut c. 1995
Hazard Reduction

Rockhole Mine, Shaft #3

SAV Mill, near Rockhole mine
South Alligator Uranium Field Remediation

• Small field operated 1956-65
• 13 small mines produced about 850t $\text{U}_3\text{O}_8$
• Also a small mill
• Hazard Reduction works for public safety 1991-92
  – Physical safety
  – Radiological safety
• Remediation of sites 2007-8
• Extensive consultation from early 2000
  – Dry season working
  – Local people involved
• Containment completed 2008
  – Monitoring and management ongoing
  – Annual inspections and radiation checks
  – No radiological issues
• Traditional Owners to assess for completion

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SAV containment site

During construction

After completion

2016
Other Legacy Uranium sites

• Older mines in the Pine Creek area
e.g. Fleur de Lys
  – Now lies within a gold mine that has been restarted a couple of times

• Adelaide River Mines – 100 km from Pine Creek; very small sites; remediated, but mostly physical safety issues

• Westmoreland area – Queensland border; remote and small; focus of new exploration interest
Rum Jungle Uranium Field

• Rum Jungle operated between 1954 and 1971 mining and processing copper and uranium ores; 2 main mines and 2 satellite sites
• The site was previously remediated on two occasions; the most recent works were completed in 1986
• Remediation was considered a success at the time and met the objectives set for the project
• AMD was substantially reduced as a result of the remediation, however situation does not meet current standards and there are signs of deterioration of the covers
• In 2009, a National Partnership Agreement between the Australian and the Northern Territory government investigated what further remediation was required
• A preferred rehabilitation strategy has been developed in consultation with stakeholders and is currently undergoing optimisation and finalisation
• An Environmental Impact Statement is currently being prepared for the implementation of the preferred rehabilitation strategy
• A decision on financial commitment for rehabilitation of the site will be made on finalisation of the preferred rehabilitation strategy
• Some remedial action at RJ Creek South this year on old WRD covers

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Nabarlek Mine

- Operated 1979-1980
- Produced about 10,800t $\text{U}_3\text{O}_8$
- Decommissioned and remediated during the 1995-6 wet season
- Initial seeding quite successful
- Severe impacts on vegetation from Cyclone Monica in 2006
- Revegetation recovery ongoing and generally satisfactory
- Some issues related to infrastructure removal still to be completed
- Minor clean up works planned
- Weed management & erosion control programs in place
- Monitoring of water still ongoing
- Regular inspections by regulators and stakeholders
- Still an active exploration program here

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Jabiluka

- Deposits discovered in 1971 & 1973
- EIS approved 1979
- Development on hold after 1983 election
- ERA purchase site 1991
- New EIS submitted 1997
- Development decline excavated 1998-9
- Development stopped 1999
- Care and maintenance begun 2003
- Site majority remediated by end 2003
- Pond remediated 2013
- Revegetation underway; monitoring continues

1998 – Portal & decline construction

2018 – Portal area

Site in 2002
Ranger Uranium Mine – Major Activities

- Stockpile processing, continues; included laterite ore until Q 1 2018
- Production for 2017 was 2089 tonnes $U_3O_8$
- All $U_3O_8$ production to cease by January 2021
- Radiation Protection team still in place and actively monitoring all aspects of the operation; no significant issues
- Development of Mine Closure Plan including closure criteria is ongoing
- Updated Mine Closure Plan to be released shortly
- Continuing closure-related works in progress:
  - Direct disposal of tailings from mill to Pit 3
  - Dredging of tailings to transfer from TSF to Pit 3
  - Operation of Brine Concentrator for process water
  - Revegetation work ongoing at Trial Land Form
  - Some work to modify (notch) the east wall of the TSF
- Commenced first phase backfill of Pit 1, work well advanced
  - Expressed pore water from drainage system collected and returned to process water circuit for treatment
Ranger Uranium Mine 2018

Tailings disposal - Pit 3

- Mining ceased late 2012; underfill of ~30M t waste rock placed and under-drains installed by the end of 2013
- Schedule call for total of ~23M t of tailings to be moved from TSF to Pit 3 by 2020
- Dredge arrived on site in September 2015 with commissioning completed May 2016
- As of Q1 2018 the task was about 33% complete with work rate now meeting design specifications.
- Sub-aerial deposition initially now becoming sub-aqueous
- Mill tailings reporting directly to Pit 3 since late 2014

Ranger Mine
Pit 3 Tailings disposal
September 2017
Ranger Uranium Mine 2018

Pit 1 Back fill

- Pit 1 closure works saw 7700+ wicks installed in the tailings in 2012
- Followed by a geotextile layer and an initial preload of waste rock to commence consolidation of the tailings.
- The rock surface was capped with laterite to allow rainfall to be collected as non-process water
- Expressed pore water is collected in a dewatering sump and pumped to the process water circuit for treatment
- Placing backfill of waste rock commenced in April 2017
- ~12.2Mt waste rock to be placed project on schedule for completion Q2 2018.
- Final landform design under way; cover will be clean waste rock
Summary

• NT has a long history of uranium mining
• Ranger uranium mine is the only mine operating at present and remediation planning and activities are well advanced. Ranger has to cease processing in 2021 and clear site by 2026
• Many legacy sites from earlier times; majority remediated
  – One “modern” remediated site - Naborlek
  – One site revegetating - Jabiluka
  – One legacy site under remediation – Rum Jungle
  – South Alligator remediation and containment project is complete; Long Term Surveillance and Monitoring program in place
  – Other legacy sites are being managed by LMU
• Revegetation is progressing at Naborlek and Jabiluka
• LTSM programmes being developed for Ranger, Naborlek and Jabiluka
Thank you