Australian Government

Geoscience Australia

Geoscience Australia: Supplementary Information on Uranium and Thorium for Senate Select Committee Inquiry into Fuel and Energy

GEOSCIENCE AUSTRALIA

Australia's recoverable uranium resources
(December 2008)

Reasonably Assured Resources (RAR)* recoverable at costs up to US$80 / kg U**

= 1,163,000 tonnes U

= 38% of world resources in this category

= major increase (18%) over previous year

➔ Olympic Dam, Ranger 3, Four Mile

Total Identified Resources (RAR + Inferred Resources) < US$80 / kg U

= 1,612,000 tonnes U

= 33% of world total

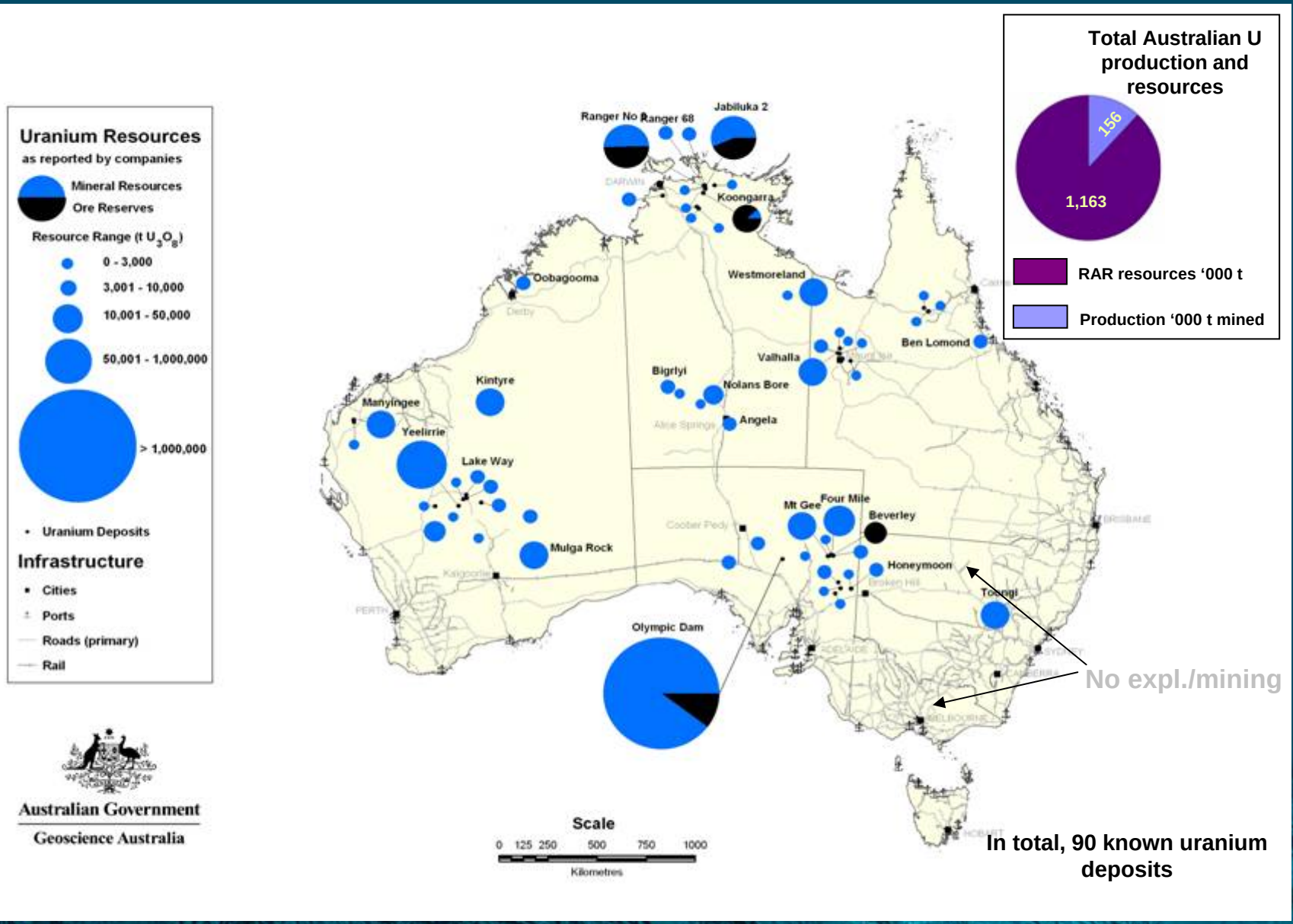
*** RAR is international terminology of the Uranium Group: equivalent to "Economic Demonstrated Resources" used by GA**

**** US$80 / kg U = US$30 / lb U3O8 [current spot prices = US$50 / lb U3O8]**

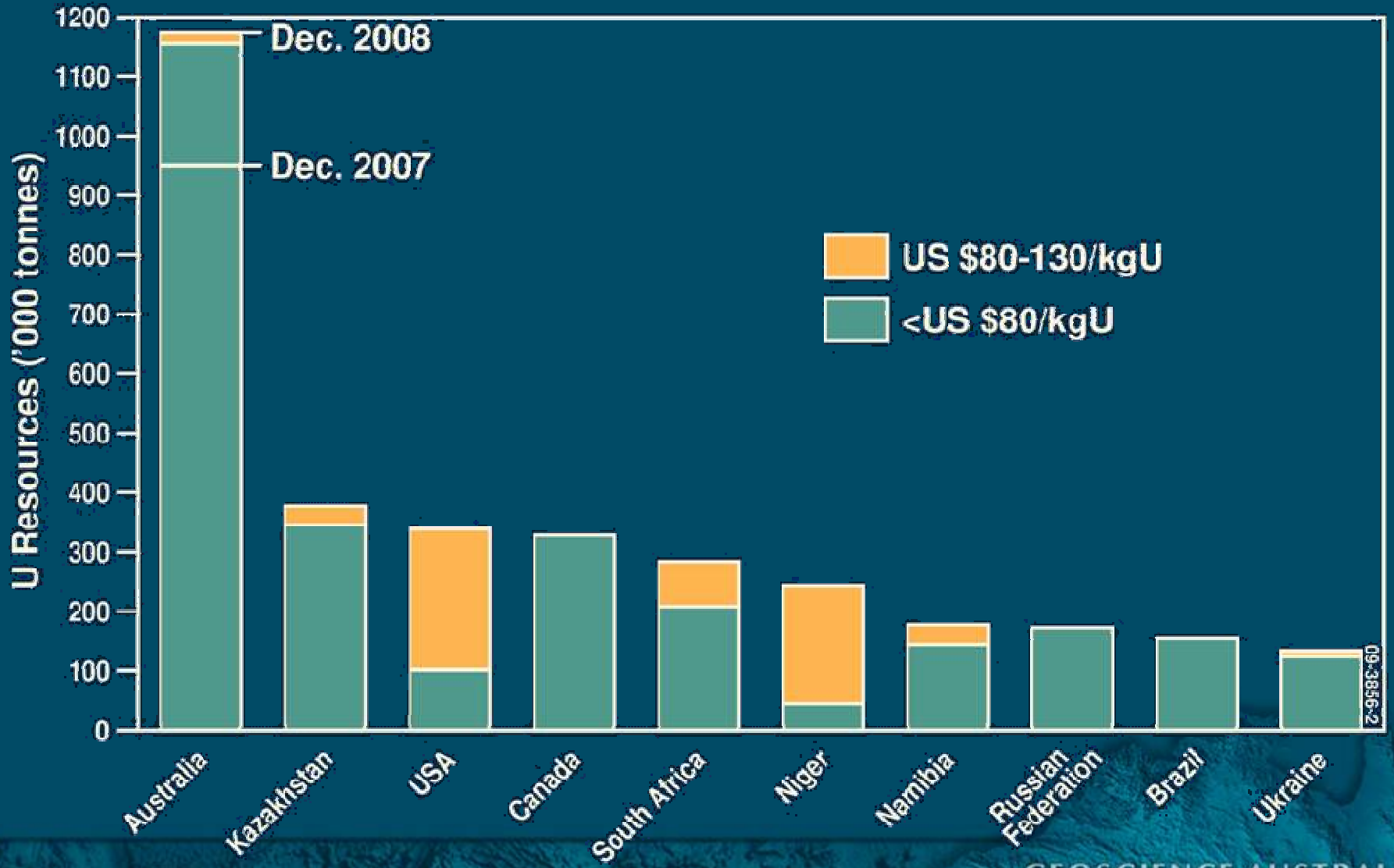
Australia's uranium resources and total production
(December 2008)

	<US$80/kg U Tonnes U	US$80-130/kg U Tonnes U	<US$130/kg U Tonnes U
RAR	1,163,000	13,000	1,176,000
Inferred Resources	449,000	48,000	497,000
Total Production	156,400		

Current Uranium Mines and Deposits
Resources and total production to December 2008



Reasonably Assured Resources for Top 10 Uranium Resource Countries (Dec. 2008)



Australia's U production 2008

Australia produced 9944t U_3O_8 (8432t U)
(2% less than for 2007)

- **Ranger 5342t U_3O_8**
- **Olympic Dam 3943t U_3O_8**
- **Beverley 659t U_3O_8**

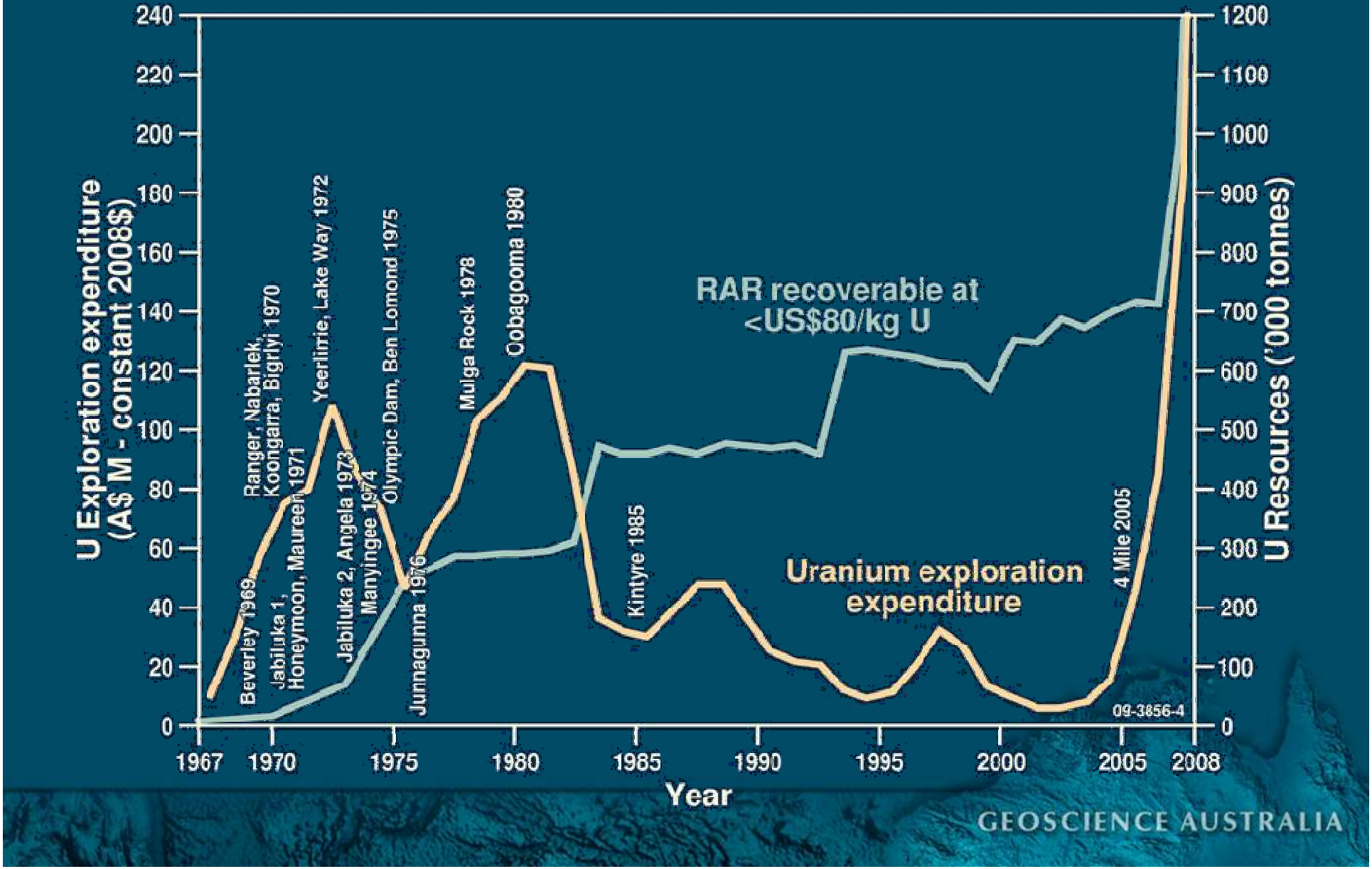
World U Mine Production by Country in 2008

World mine production 44,019t U in 2008 (51,910t U_3O_8)
7% higher than 2007

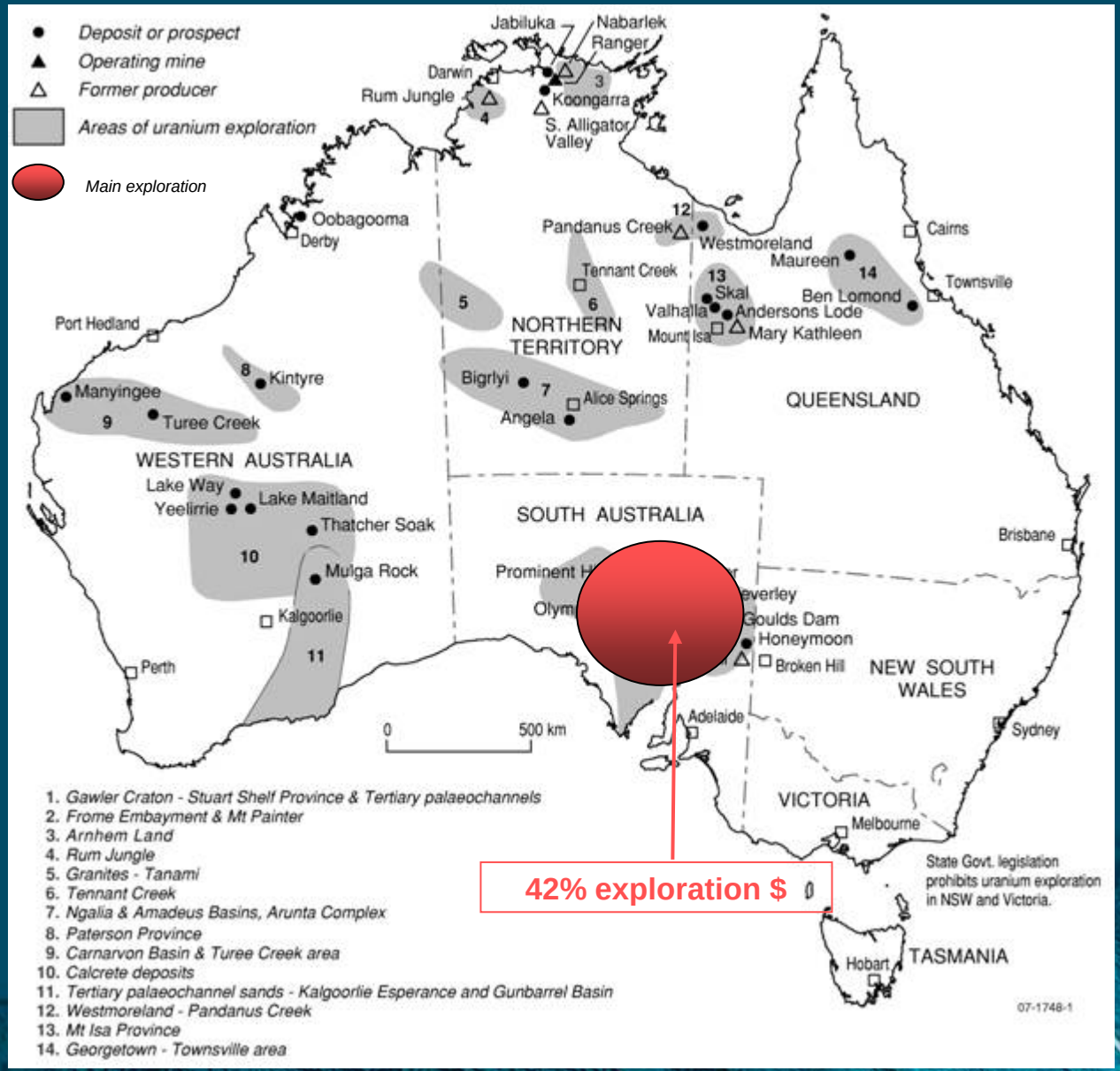
	Tonnes U	Share of Total (%)
Canada	9000	20
Kazakhstan	8521	19.4
Australia	8432	19.2
Namibia	4385	10
Russia	3521	8
Niger	3000	7
Uzbekistan	2338	5
USA	1430	3
Ukraine	808	2
Others	2584	6
TOTAL	44,019	100

Sources: RET for Australia, World Nuclear Assoc., Ux Weekly

Australia's Uranium Exploration Expenditure, Discoveries and Resources



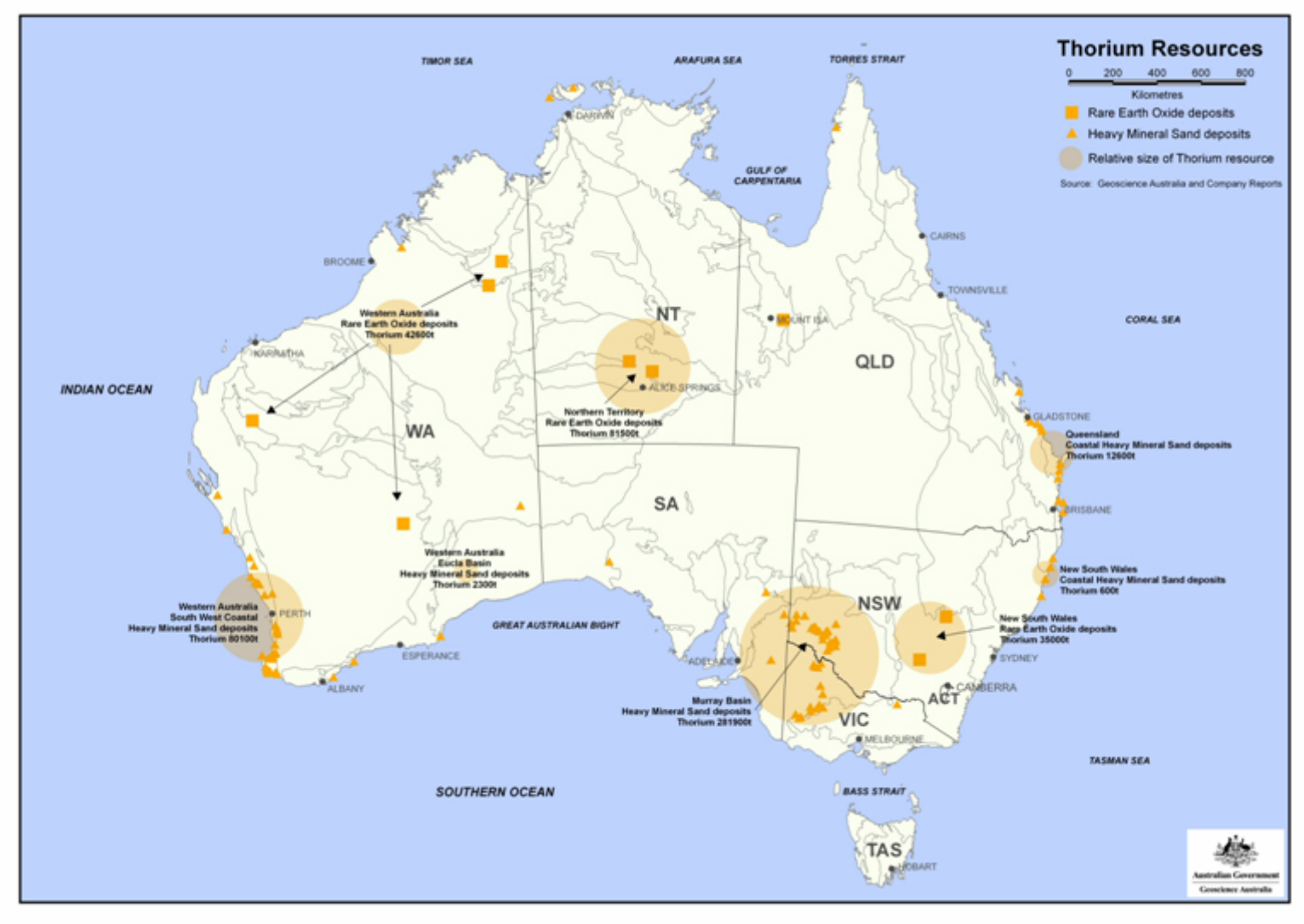
Uranium Exploration 2008



Australia's Thorium Resources

- **There are no comprehensive detailed records on Australia's thorium resources**
  - **Because of the lack of large-scale commercial demand for thorium and a paucity of the required data**
  - **Australia clearly has a lot of thorium in mineral sand and other deposits**
    - **Associated with Rare Earth Elements and other commodities**
  - **Thorium is currently being disposed of as mining waste**

Map showing locations and indicative magnitudes of Australia's thorium resources



Status of thorium fuel cycle

- **Thorium can be used as a nuclear fuel through breeding to ^{233}U**
  - **Large-scale commercial demand for thorium depends on development of thorium fuelled nuclear reactors for power generation**
- **Currently there are no full-scale thorium fuelled reactors**
  - **Reasons include the high cost of thorium fuel fabrication and abundance of cheap uranium fuel for the established uranium based nuclear power generators**

Status of thorium fuel cycle

- Research in thorium fuel cycle is ongoing because it is considered to
  - Be more proliferation resistant
  - Produce less waste
- However, these will be offset significantly by the burning of plutonium and other nuclear “wastes” in the next generations of uranium fuel cycle power reactors
- India is developing thorium fuel cycle because it represents energy security given that country’s abundant thorium resources (in heavy mineral sands) but limited uranium resources

Status of thorium fuel cycle

- It appears thorium fuel could be used in some existing uranium fuelled reactors
  - Such as the latest (Canadian) CANDU and the (Russian) VVER-1000
  - By 2015 to 2020
- A technical demonstration version of the purpose built 300 MWe Indian AHWR thorium fuelled reactor is planned to be completed some time after 2017
- However, full scale commercial electricity-generating thorium fuelled nuclear reactors are not likely to come on stream for 20 years or so