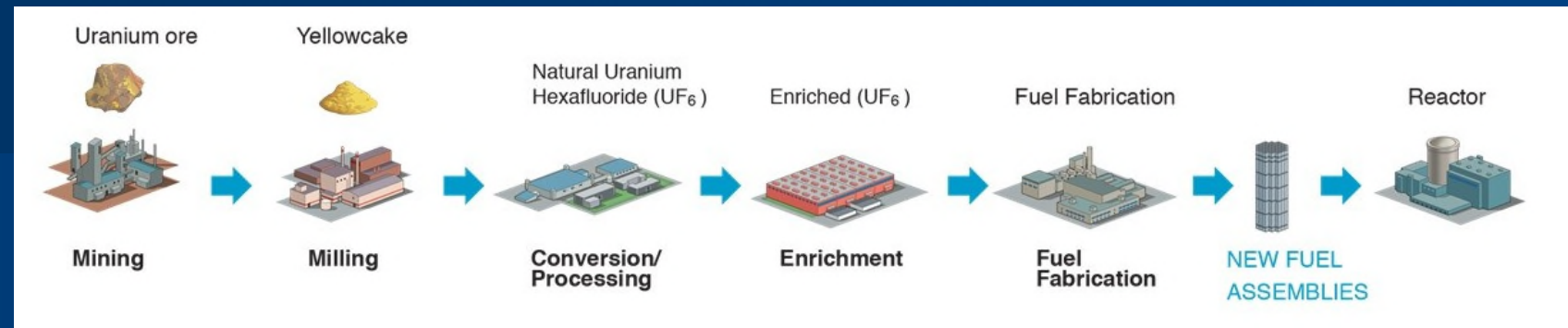


ISR Uranium Mining Frome Basin South Australia



Dr Andrea Marsland-Smith
Operations Manager

Agenda



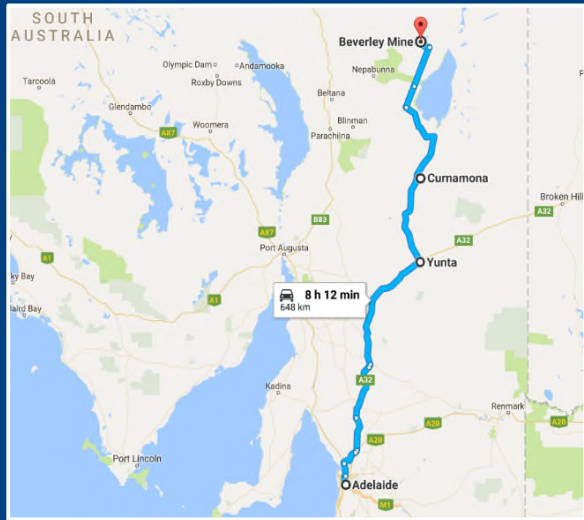
- Introductions
- Heathgate Resources - Overview of market, company & U mining operations (Dr Andrea Marsland-Smith, HGR)
- Nuclear Fuel Cycle and Nuclear Power (Dr Ben Heard, Frazer Nash Consultancy)
- Field Visit – Wellfield and Processing Plant
- Q&A

Heathgate Resources Pty Ltd – GA Subsidiary

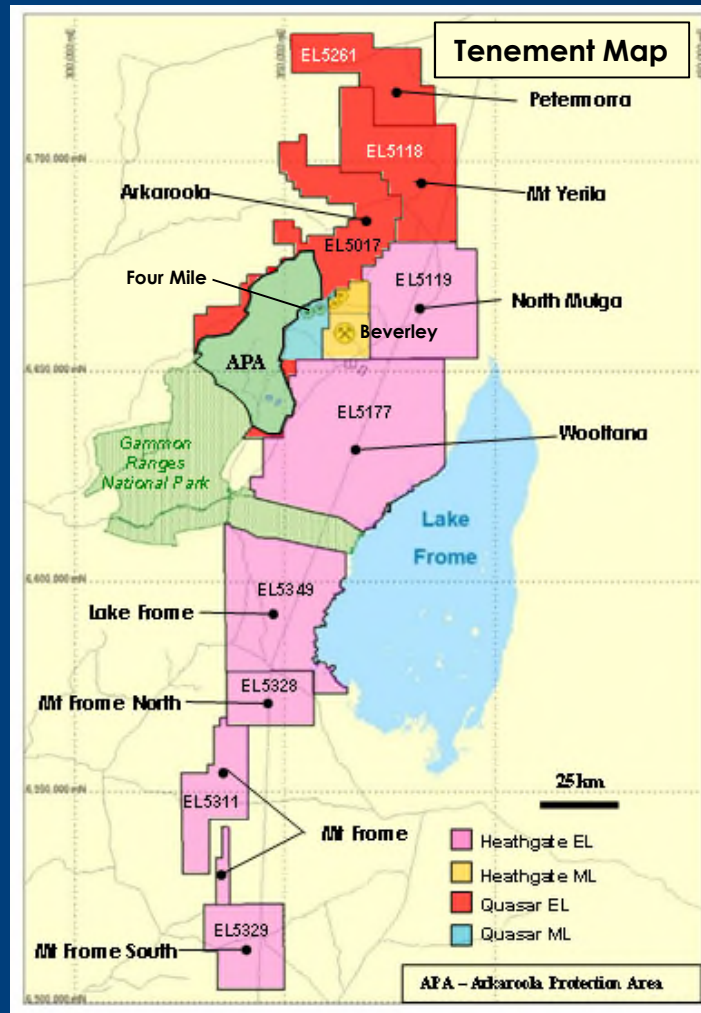


GA and Affiliated Companies > 12,000 employees worldwide

HGR Operations

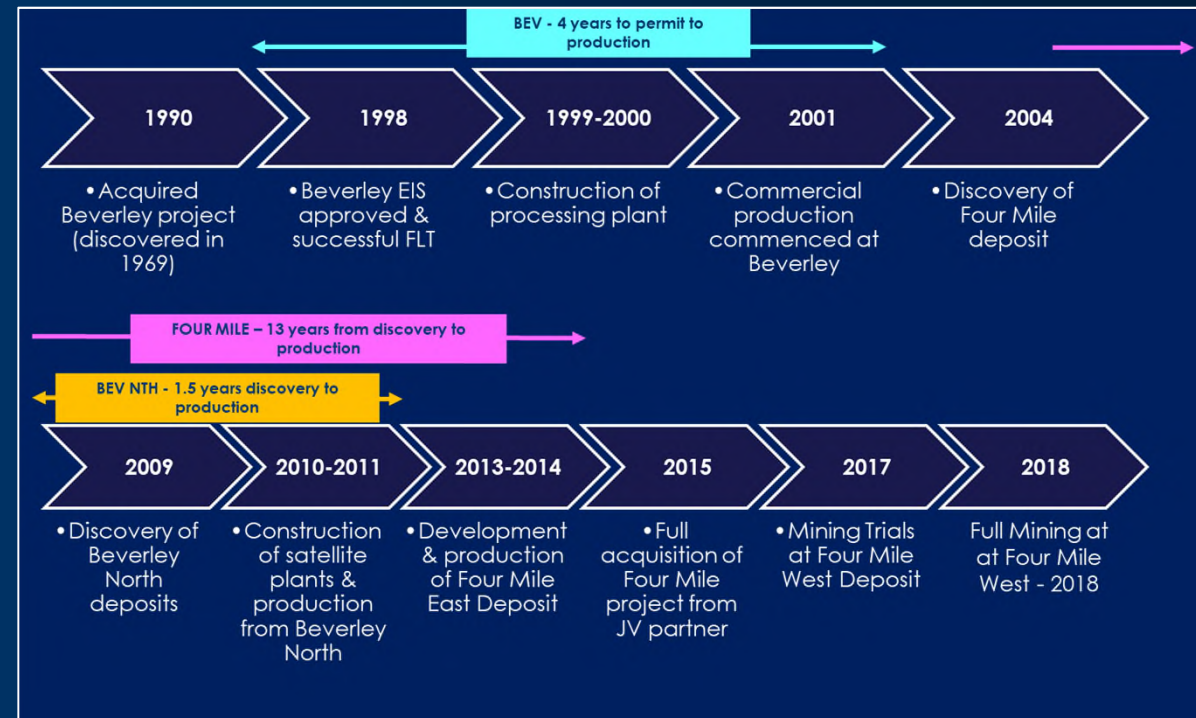


- 10 exploration licences
- 3 mining leases
- Central processing facility and 2 remote satellites



ISR U producer in the Frome Basin for over 17 years

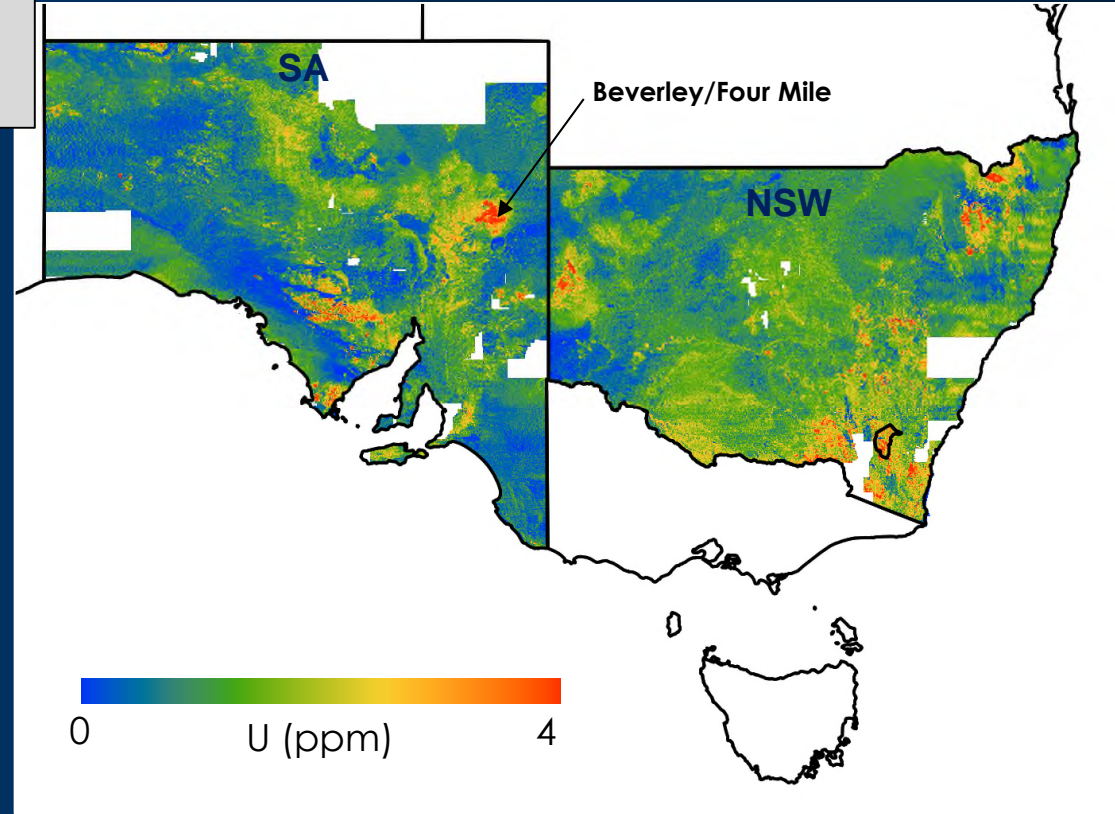
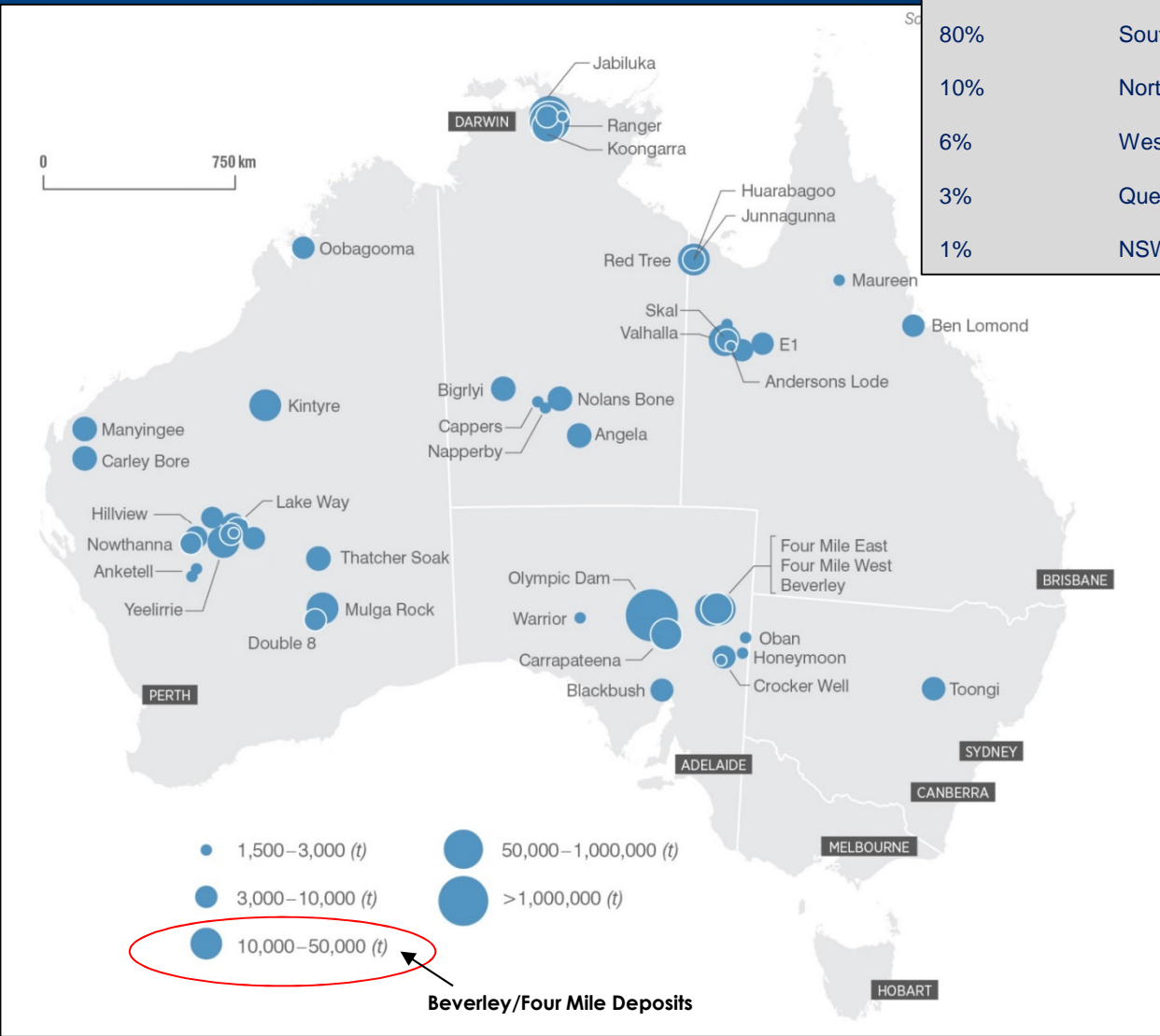
- Heathgate (HGR) owns Beverley & Beverley North mines
- Quasar (affiliated company) owns the Four Mile Mine (HGR operator)
- Fly-in/out operation, 24/7
- ~285 employees & contractors
- 20% of on-site non-professional employees are Adnyamathanha



Australia's uranium resources

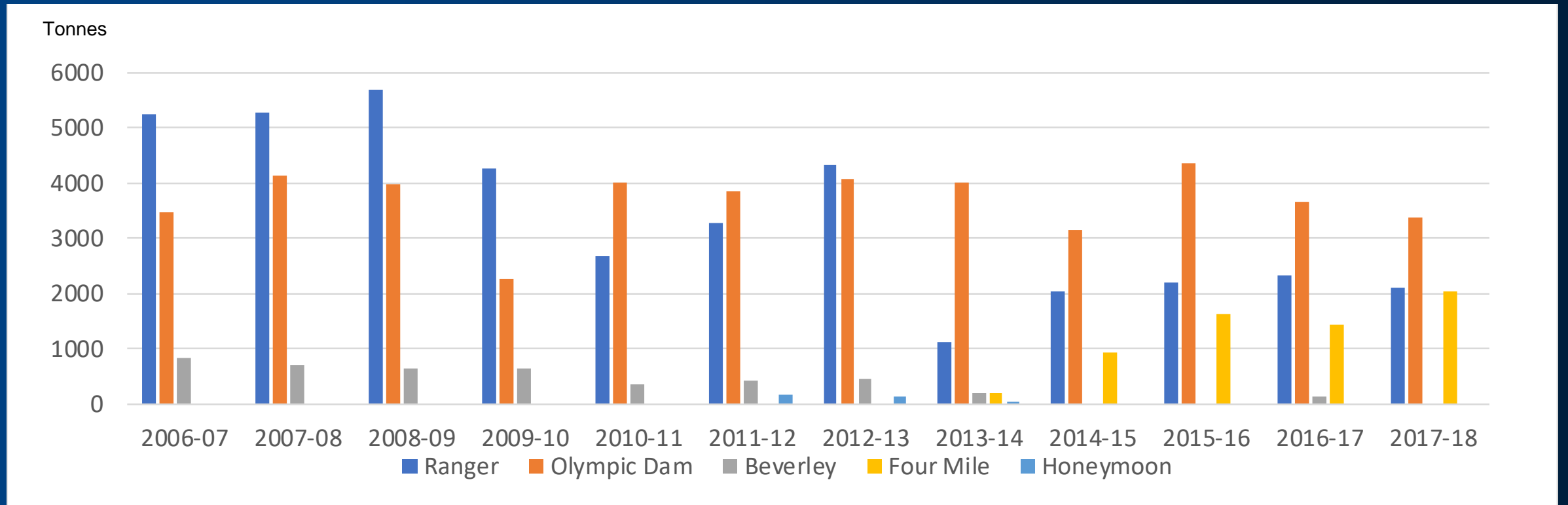
Uranium resources by state

80%	South Australia
10%	Northern Territory
6%	Western Australia
3%	Queensland
1%	NSW



Source: World Nuclear Association

Australian Uranium Production 2006-2018



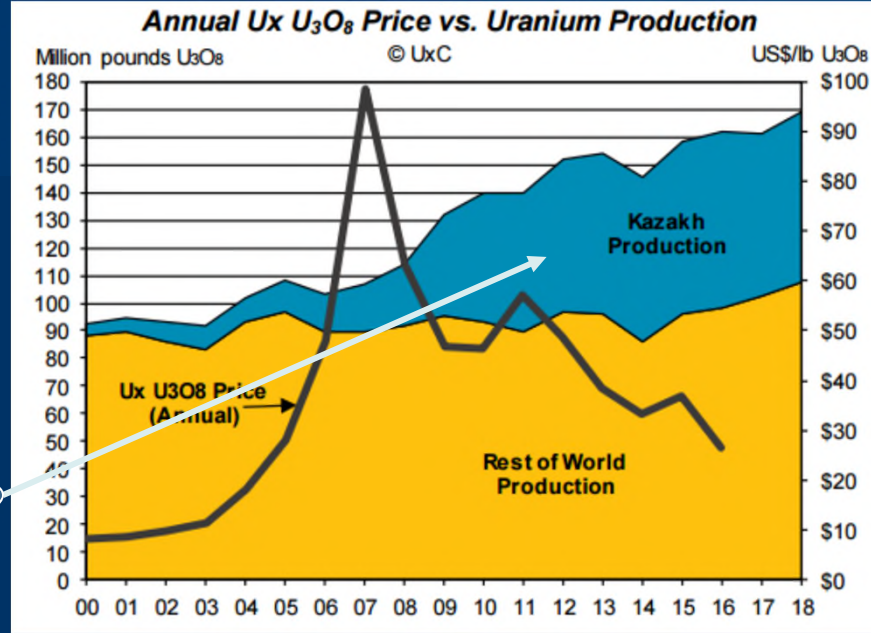
Source: World Nuclear Association

Market vs Mining Method

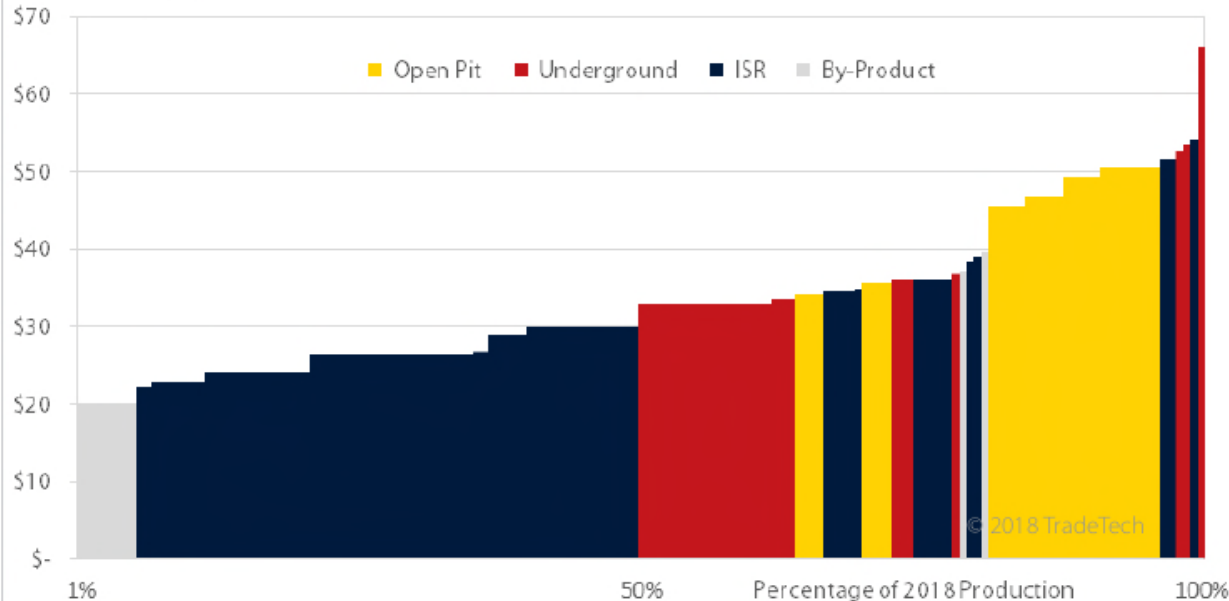
World Uranium Production By Mining Method, 2000-2016
(Percentage)

Source: Ux Consulting Company, LLC

Mine Method	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Open Pit	32	26	27	28	26	29	24	25	28	25	23	18	21	20	13	13	14
Underground	38	46	45	40	43	41	43	37	33	31	29	29	27	27	27	32	31
In-Situ Recovery	16	16	19	22	20	20	24	28	29	37	42	45	45	47	52	49	49
By-product/Co-product	14	12	9	10	11	10	9	10	10	7	6	8	7	7	7	6	6
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100



Full-Cost Production Curve by Mine Type 2018



Upside Factors

- Major Western Capacity Idled; Producer Buying
- Japan Demand Returns
- China, India Growth
- US/EU NPP Life Extensions

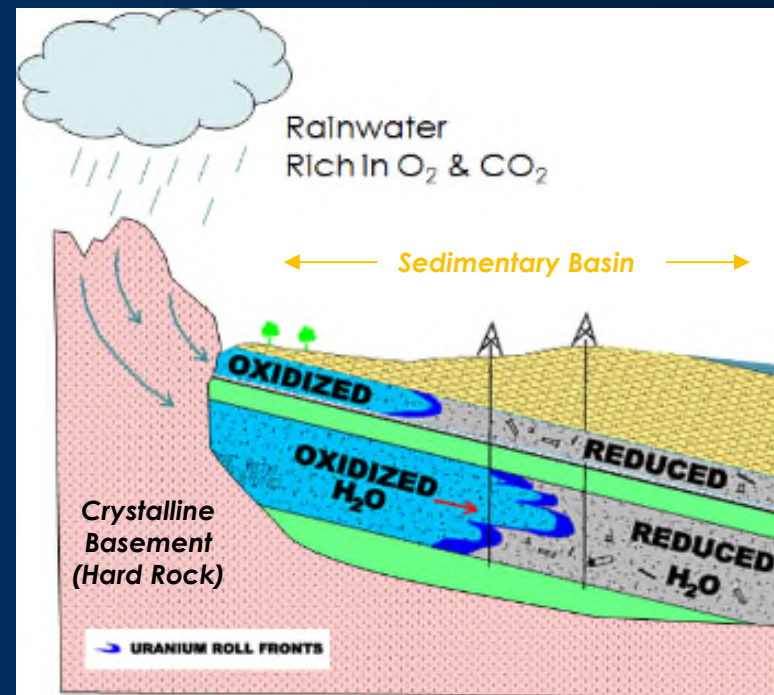
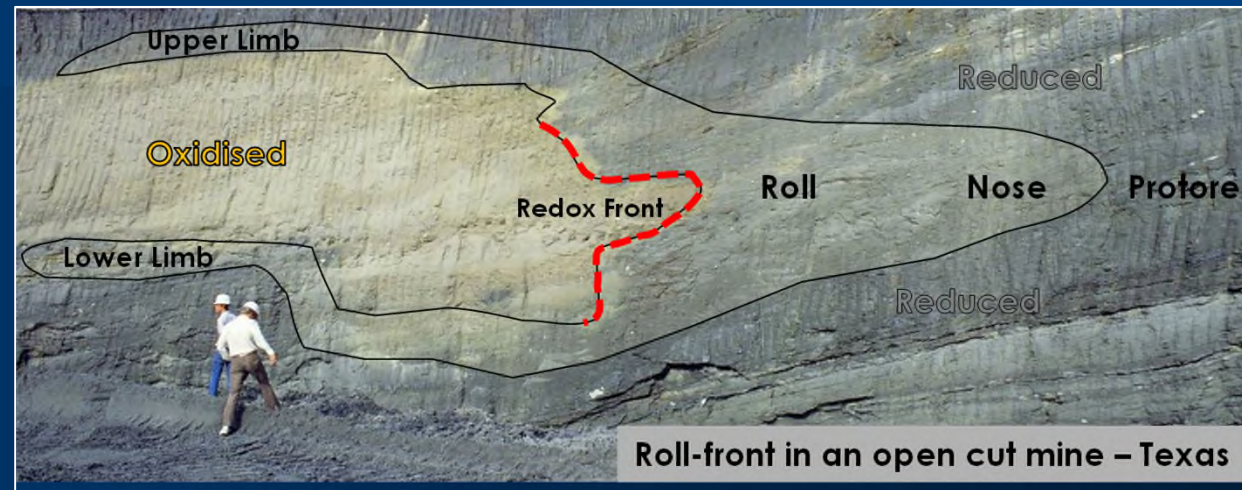
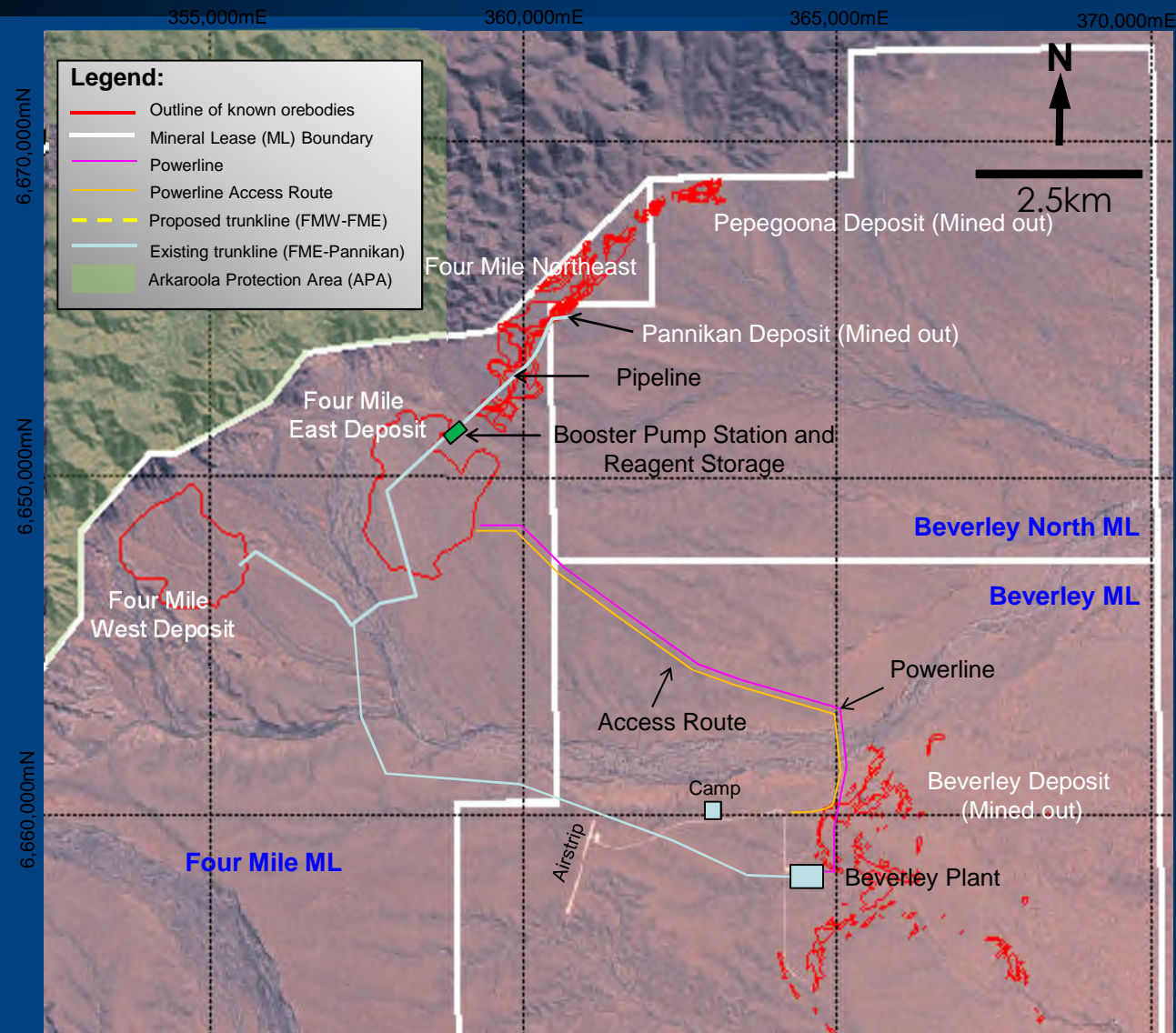
Downside Factors

- Kazakh Production Growth
- US/EU NPP Closures
- Government Inventories

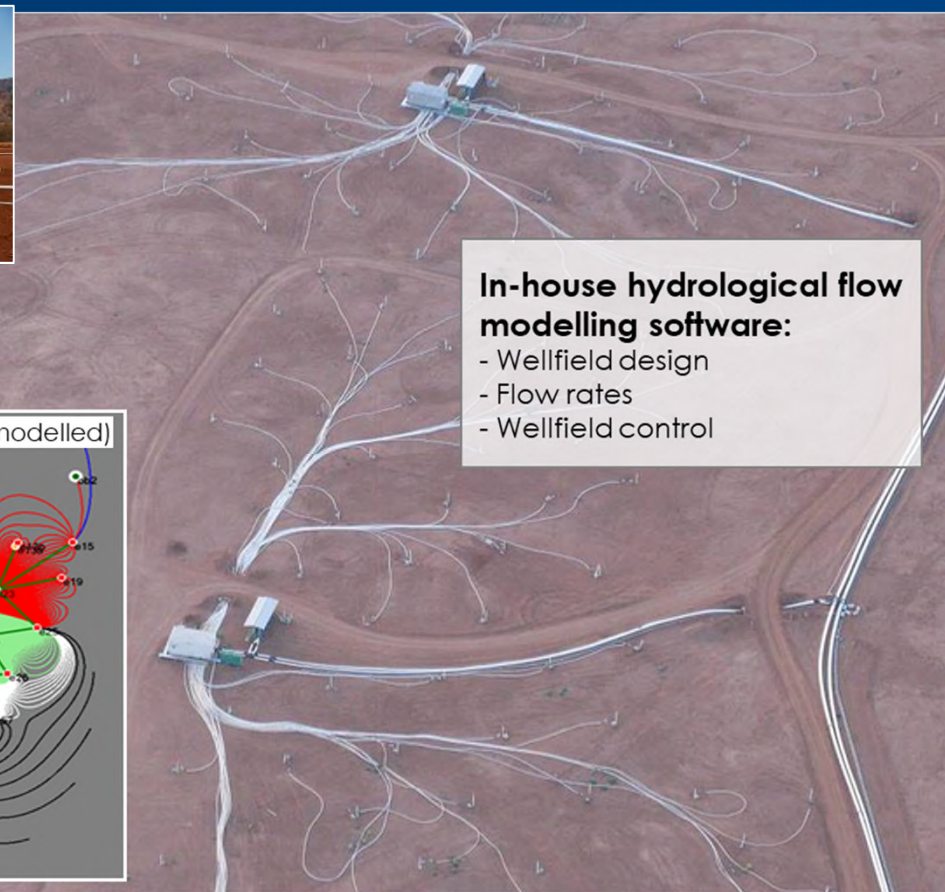
Wild Cards

- Longevity of Low-Cost Kazakh Production
- US Trade Review / Politics
- 3rd Party Entrants / Funds

Operations

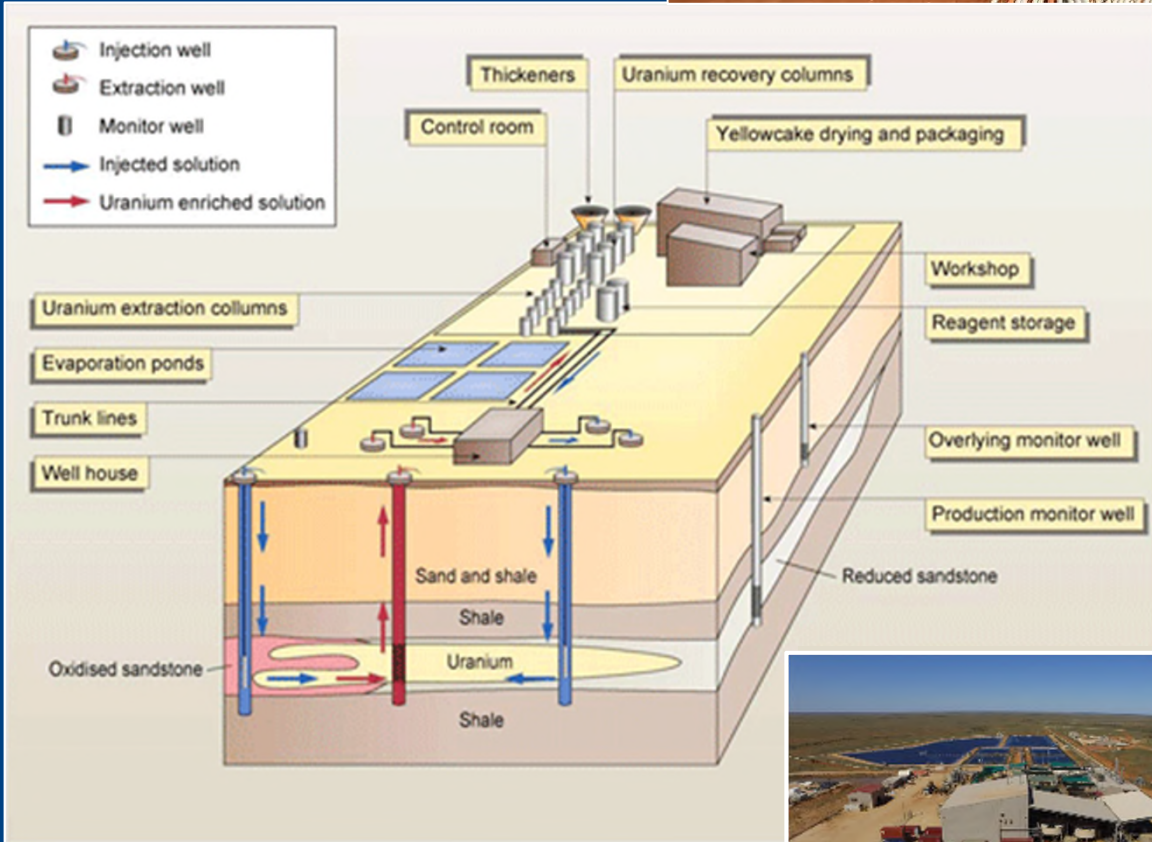
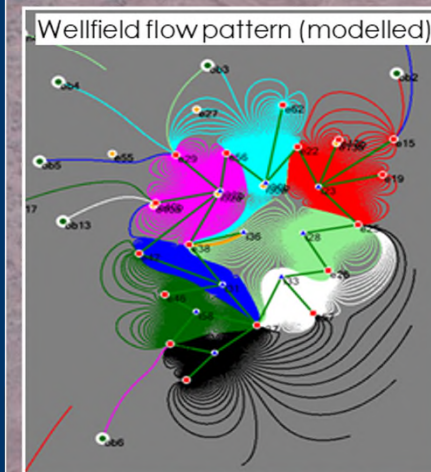


ISR – The Process



In-house hydrological flow modelling software:

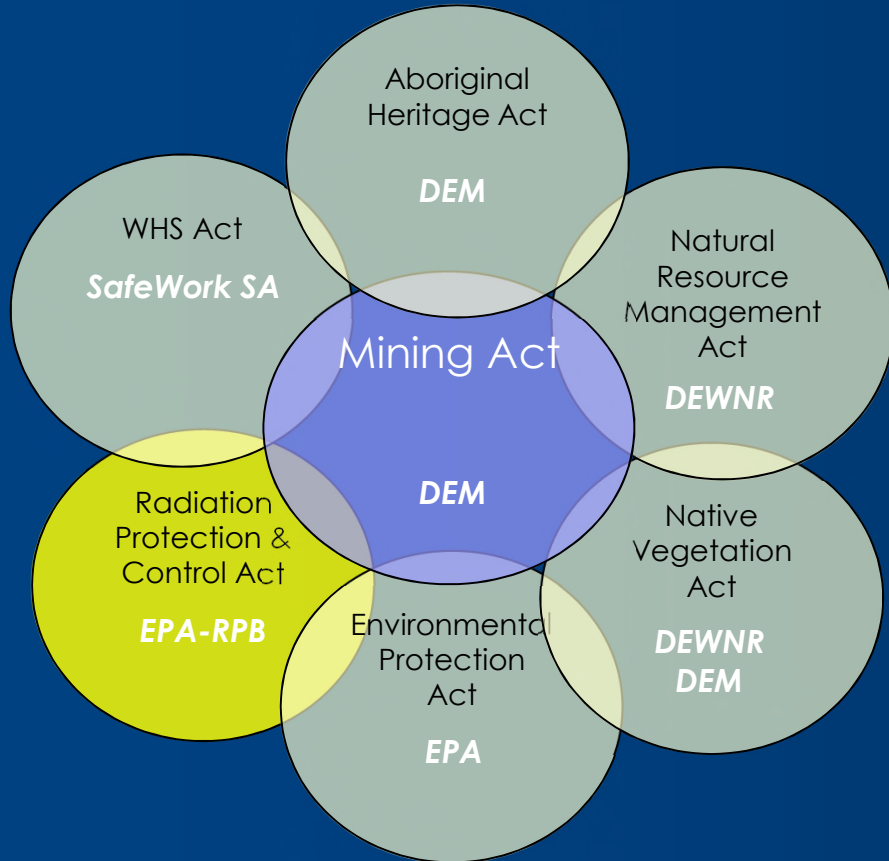
- Wellfield design
- Flow rates
- Wellfield control



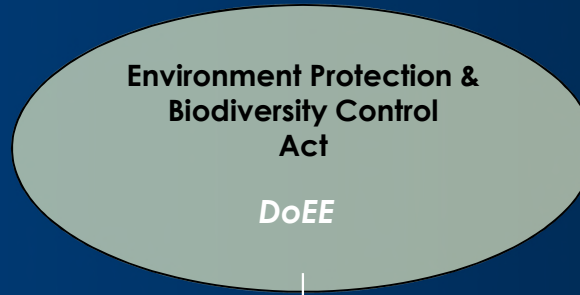
- The reservoir (wellfield) determines production
- ISR is a chemical process
- Infrastructure is tailored to what each wellfield requires
 - Flow rates = Pumps
 - Clays/fines = Filtration
 - Geochemistry = Injection Reagents

Legislative Framework – South Australia

SA STATE



COMMONWEALTH



- Triggered if project will impact a “Matter of National Environmental Significance (MNES) – i.e. requires Commonwealth Approval.
- U projects automatically trigger this requirement



Prescriptive ML Conditions/Regulatory Oversight

2000

2019

Outcomes Focused ML Conditions/Regulatory Oversight

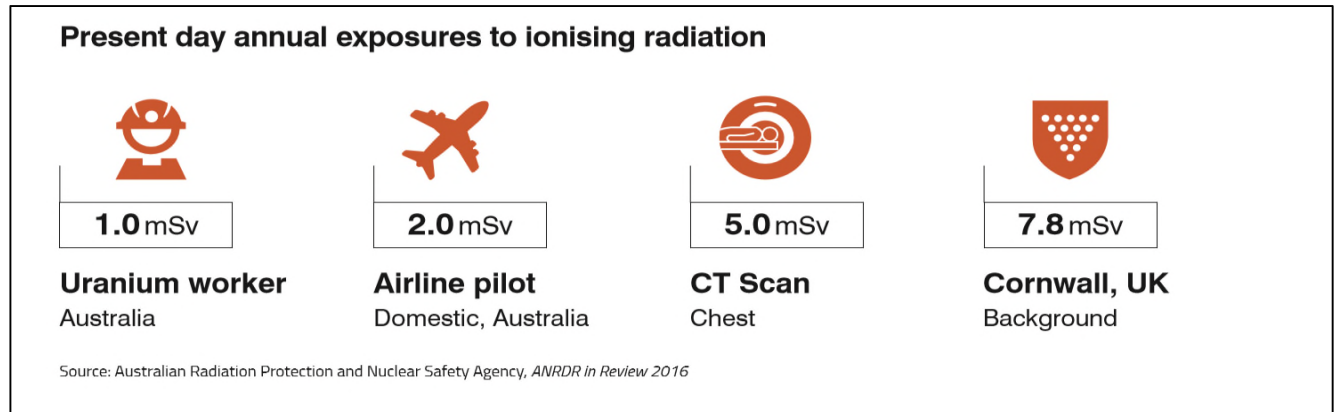
Radiation Matters

- The unit of radiation is Sievert (Sv)

1 Sv = 1000 mSv

1 mSv = 1000 μ Sv

- The annual radiation dose limit to an employee working in a radiation facility is 20 mSv
- Average radiation dose received by a Beverley Mine worker is < 1 mSv
- In comparison, the radiation dose that may lead to health effects in humans are:
 - 1000 mSv to cause cancer in future
 - 10,000 mSv to cause death in a few days





Thankyou

TECHNICAL EXCELLENCE DRIVING CHANGE

