



Sydney Mining Club

Vanessa Guthrie
1 October 2015

***Uranium:
critical to a
clean energy
future***

Why talk about uranium?



**NUCLEAR
FUEL CYCLE**
ROYAL
COMMISSION

How safe is uranium and nuclear?

Can Fukushima happen again?

Can Australian uranium be diverted to weapons?

What is the answer to waste disposal?

How is nuclear part of the world energy mix?

Uranium and Radiation

- Heaviest naturally occurring metal
- Mildly radioactive in natural form
- 3 isotopic forms – ^{238}U ^{235}U ^{234}U
- Uranium ore =
 - $^{238}\text{U} = 99.3\%$
 - $^{235}\text{U} = 0.7\%$ (fissile)
- To convert U ore to nuclear fuel requires multiple processing steps
- 1 kg $\text{U}_3\text{O}_8 = 20,000$ t black coal
- Sufficient energy to power an average household for 25 years

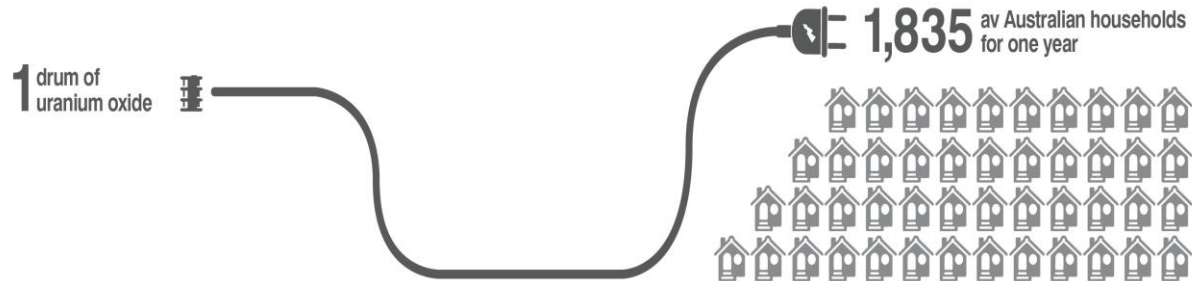


Uranium as a source of energy

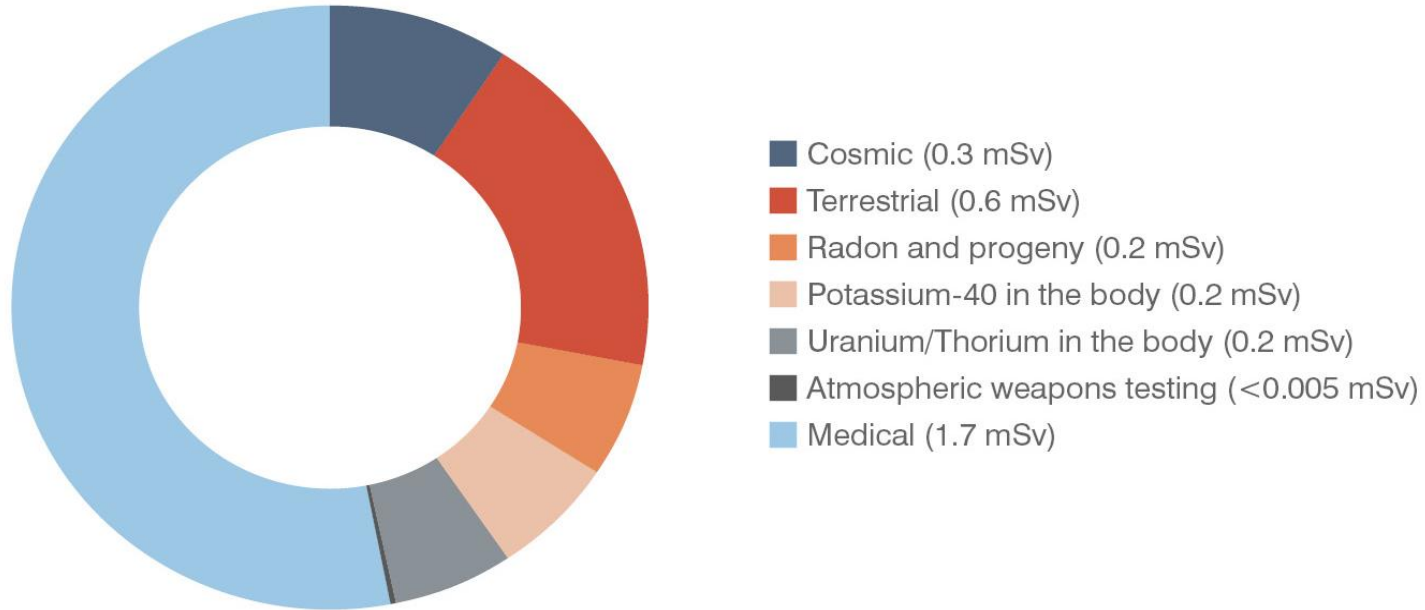


= 1 kg uranium
Household for 25 years

The energy content of uranium oxide⁶



Where does radiation come from?

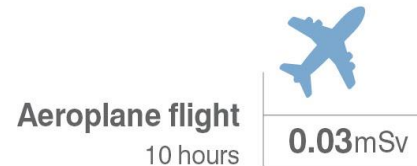
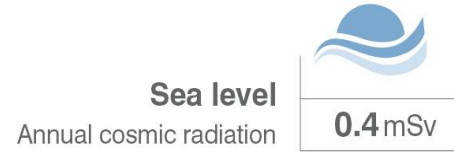


Total annual per capita dose = 3.2 mSv

Source: Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)

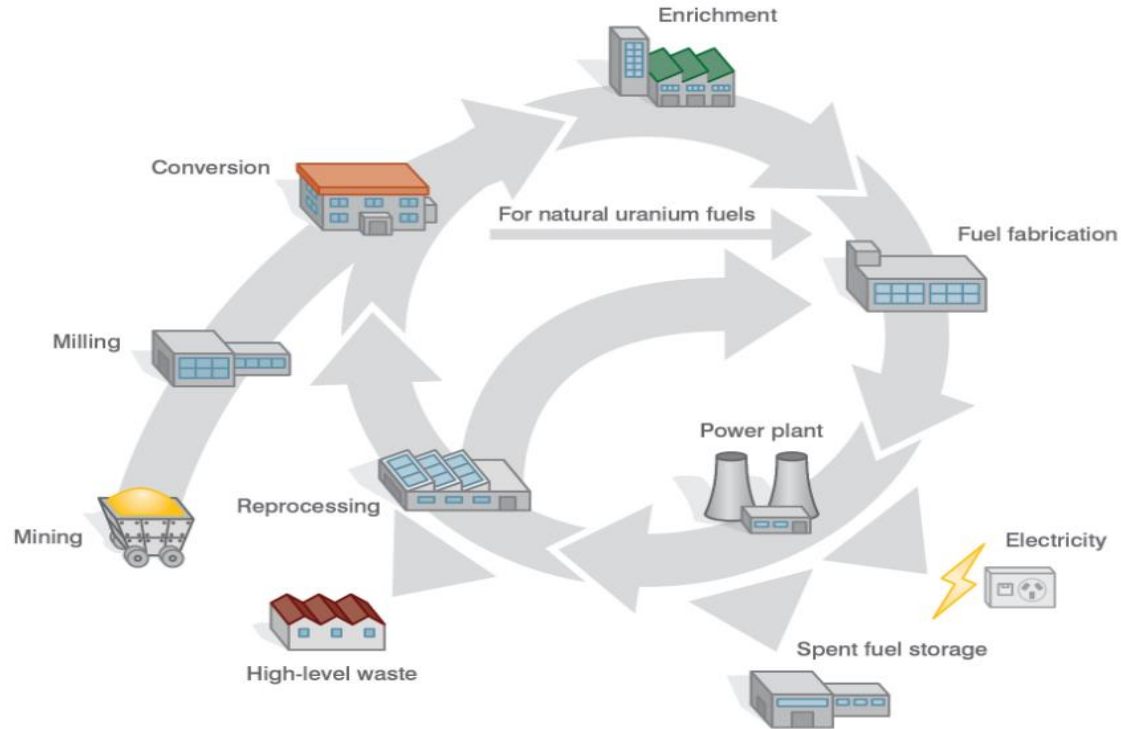
Sources of Radiation Exposure

What most people don't know about radiation....



Source: United Nations Scientific Committee on
the Effects of Atomic Radiation (UNSCEAR)

Nuclear Fuel Cycle



Source: Australian Government, Department of the Prime Minister and Cabinet

Lessons from Incidents

Three Mile Island

- Operator training
- “Human” factors



Chernobyl

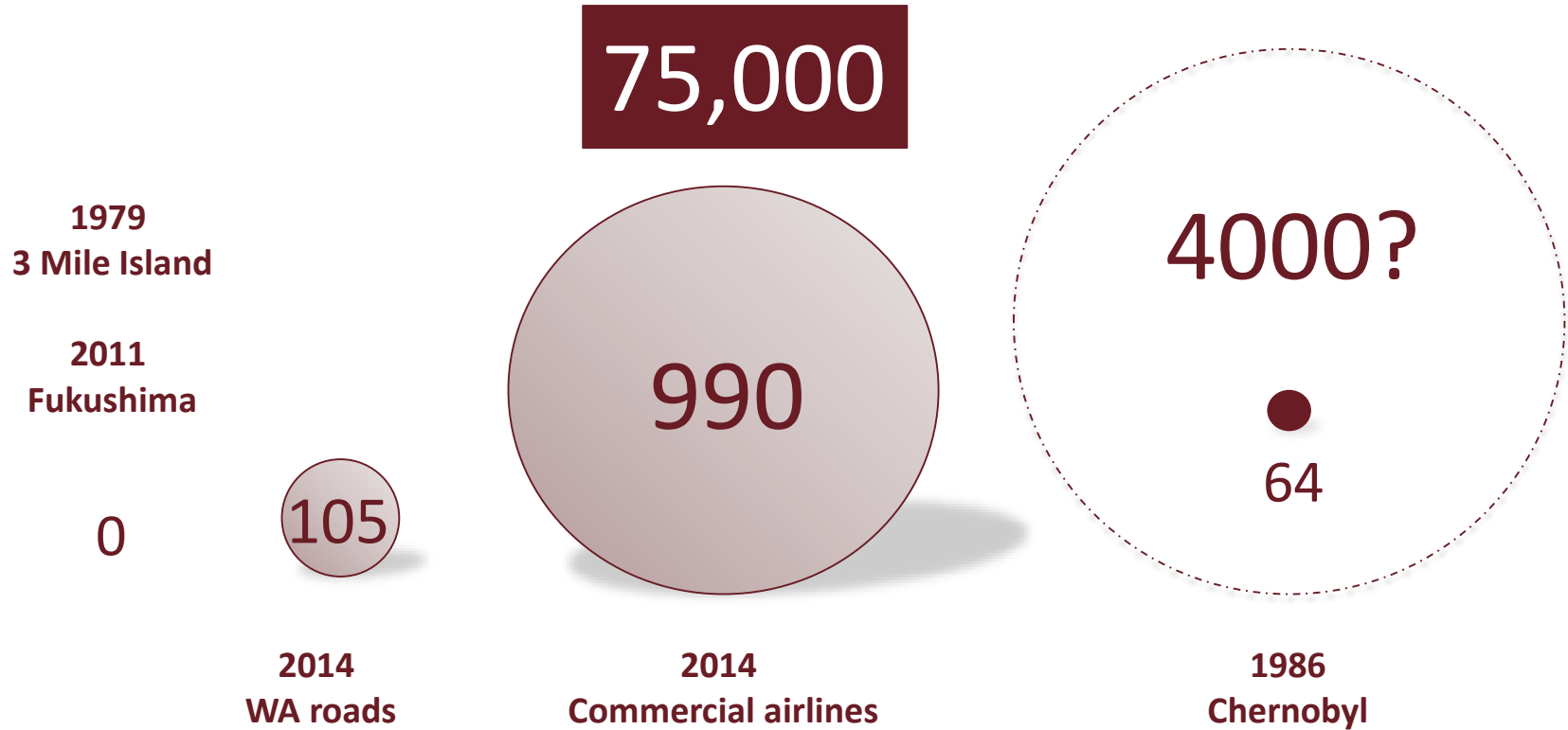
- Plant design
- Planned maintenance
- “Human” factors



Fukushima

- Plant design
- Risk Protection
- Early warning systems
- Useful life

Deaths from Nuclear related events



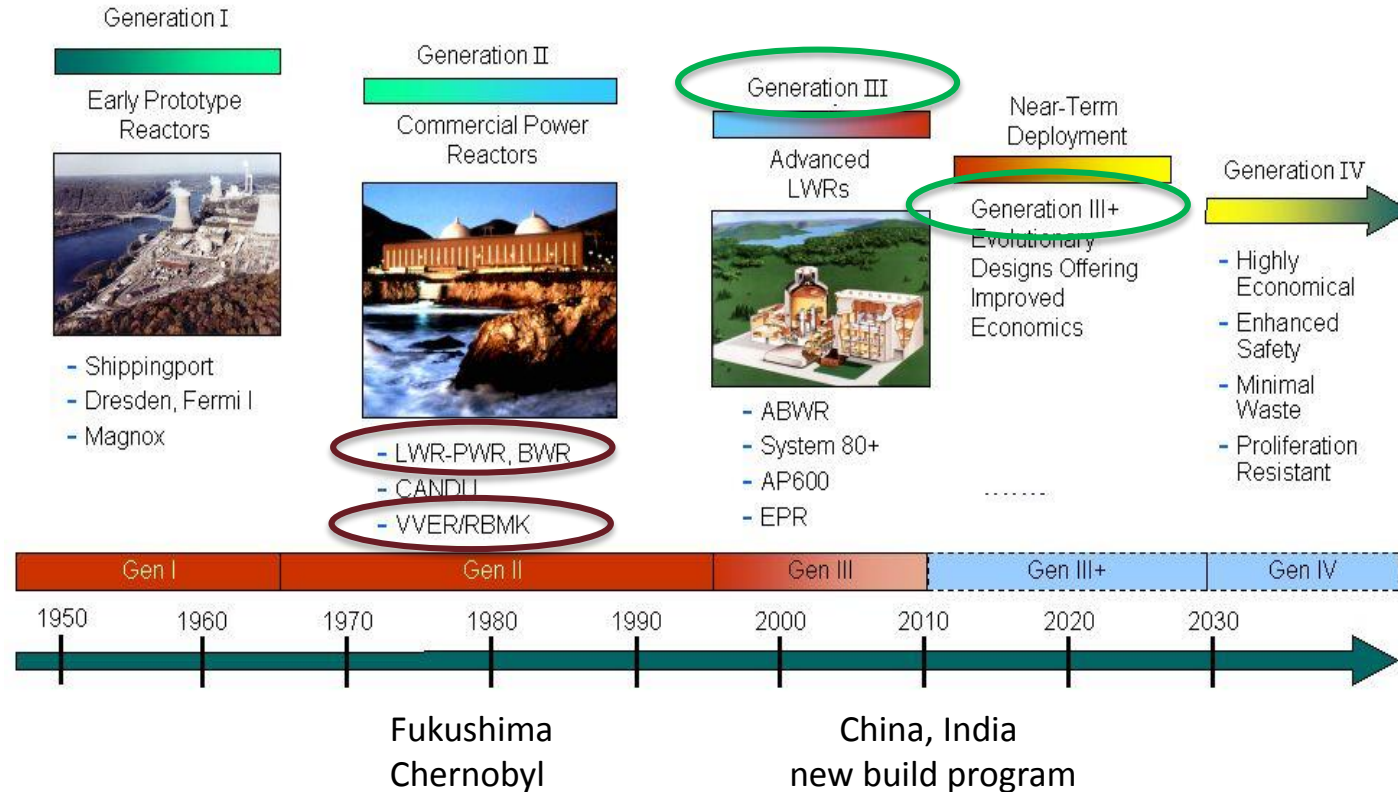
Source: WA Police, UNSCEAR, IAEA, CNN

Events since Fukushima



- Japan systematically closed reactor fleet over 2 year period
- Loss of 30% power generating capacity – replaced by oil, coal and gas
- Japan committed to 22% nuclear energy as part of future energy mix
- 2 reactors allowed to re-start – Ohi 1 and Ohi 2 then closed after one year operation
- 25 reactors re-start applications in place
- Sendai 1 reactor re-started 10 August, Sendai 2 reactor now ready
- Japanese nuclear operators investing ¥3 trillion in safety measures
- China suspended approvals for reactor new builds, now recommenced Gen IV design

New Reactor Design



Nuclear Non-Proliferation Treaty



- NPT commenced in 1968, now 191 countries have signed
- 5 recognised nuclear states: US, Russia, UK, France and China
- 5 non-signatories: India, Pakistan, South Sudan, Israel and North Korea
- Nuclear weapons declared in Pakistan, India, known in Israel, North Korea
- ^{235}U is required at 3-5% for nuclear power; >95% for weapons
- “Megatons to Megawatts” US-Russia program
 - 20 years, US\$1.3 billion
 - 500 tonnes weapons grade HEU removed
 - 7 trillion KWH or 10% US electricity generation
- Australia-India Nuclear Civil Cooperation Agreement 2014
 - Yet to be ratified by Australian Parliament
 - Will need to meet Australian Safeguards Act
 - Reflects IAEA requirements

Nuclear Fuel and Waste

		Percent by radioactive content	Percent by volume
Low level waste	Hospitals/medical; Industrial, tailings	1	90
Intermediate level waste	Resins, cladding, industrial, construction	4	7
High level waste	Spent fuel, reprocessed waste	95	3

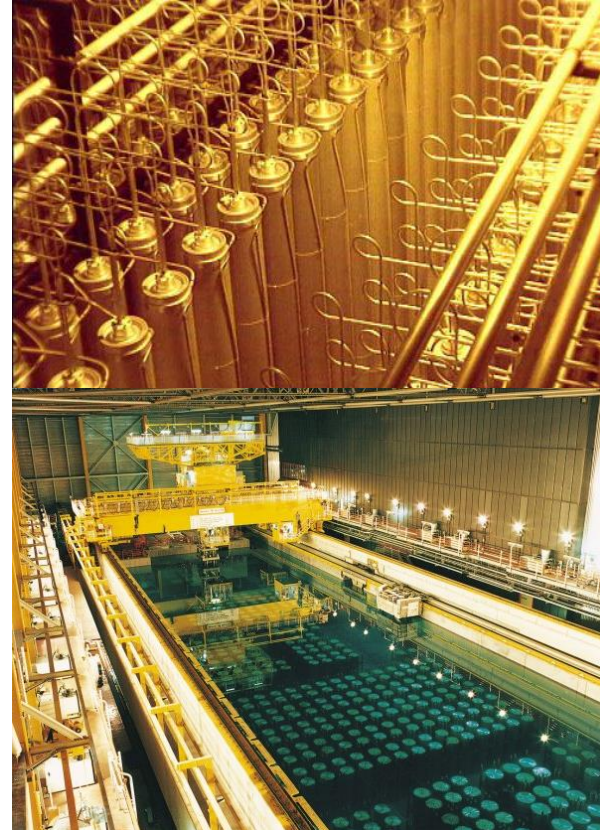


The hockey puck test:

**High level spent fuel from one person's
lifetime**

The waste dilemma

- Technology solutions available today
 - Multiple barrier systems
 - Geological repositories
- Total waste over 60 years = 30,000m³
- Equivalent to 10 Olympic swimming pools
- By 2040 = 60,000 m³
- 1GWe reactor = 3m³ (27t) per year of waste
- 1000 years to decay to original radioactivity levels
- 5% total cost of electricity production



Uranium – critical to a clean energy future

7.3 billion people....

47%

of world's population

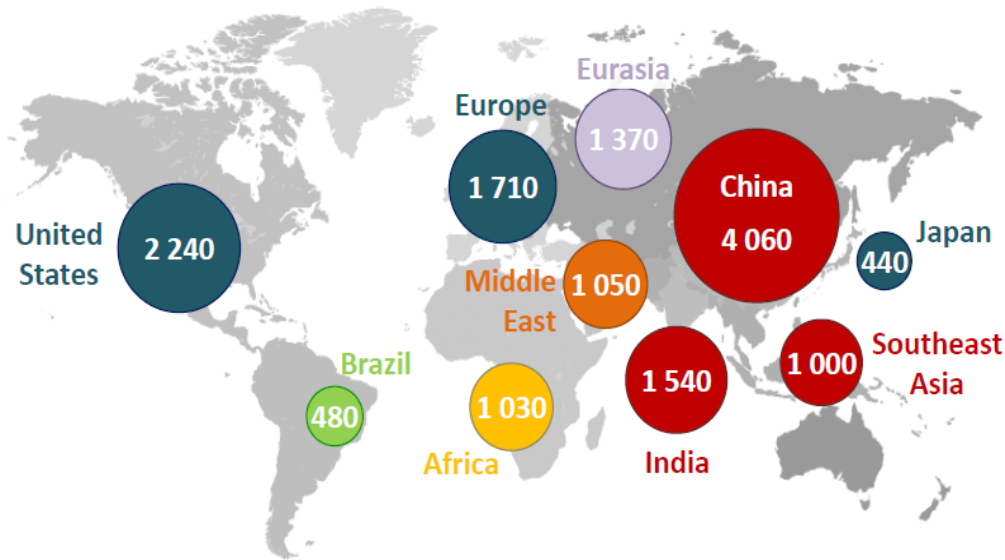
6 out of 10

Have nuclear power

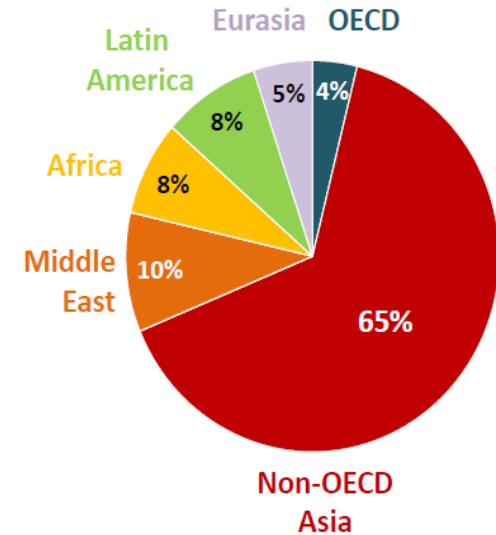


World Energy Outlook 2014

Primary energy demand, 2035 (Mtoe)⁽¹⁾



Share of global growth
2012-2035



Source: IEA 2014

(1) Million tonnes oil equivalent (Mtoe)

Where will the energy come from?

		Increase by 2040	Percent % increase
Oil supplies	Non-OPEC supplies to 2025 Requires investments in Middle East	14 mbd	15
Coal	70% output from India, Indonesia, China, Australia by 2040	6,350 Mtce	0.5%pa
Gas	Includes unconventional gas 31% increase Requires \$11 trillion infrastructure investment	5,400 bcm	50
Nuclear	Includes 380 GW added, 148 GW retired	624 GW	60
Renewables	Includes hydro, solar, wind, biofuels 33% global power generation by 2040 Requires subsidies of \$205 billion in 2040	16,500 TWh	300
CO₂ emissions	40% of global emissions over the period	15.4 Gt	16

Source: IEA 2014

Nuclear Power today

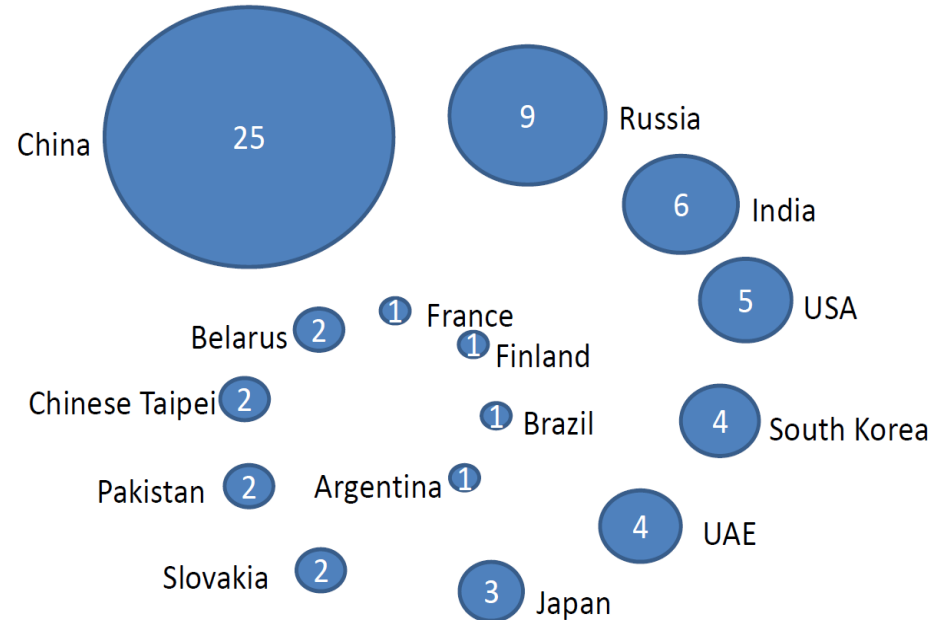
344

Operating reactors



69

Under construction



Nuclear Power in 2040

60% ↑

624GW

380 GW added
148 GW retired

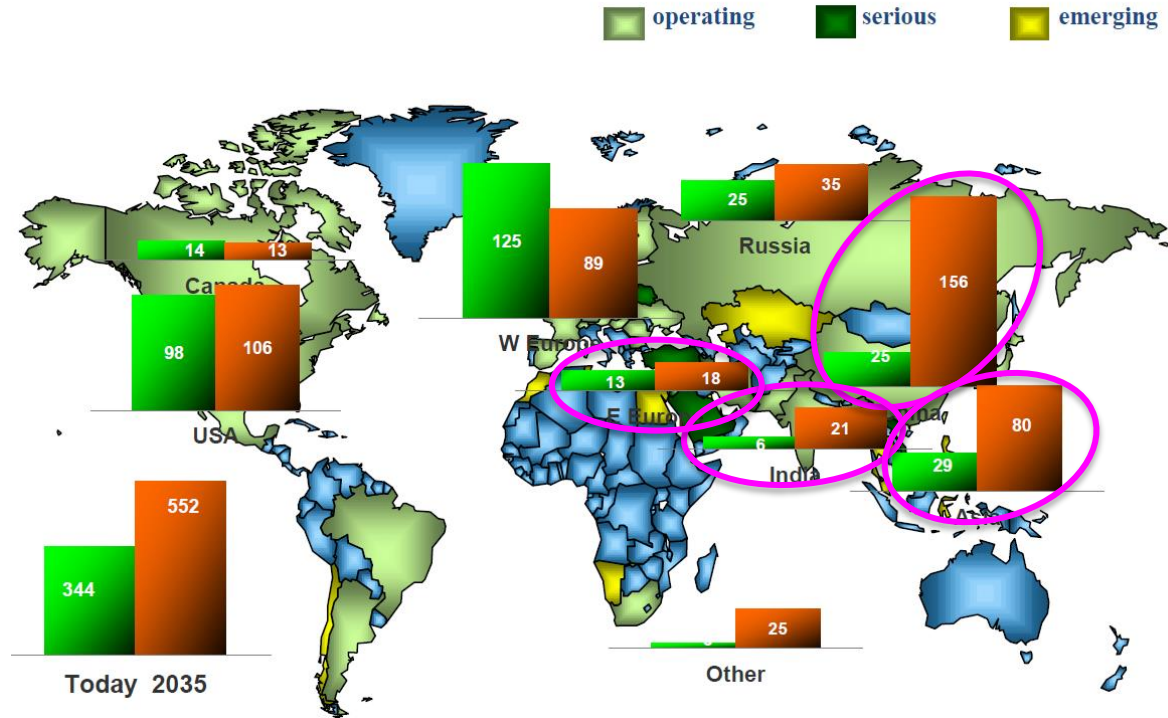
112,000Mt

CO₂ emissions avoided



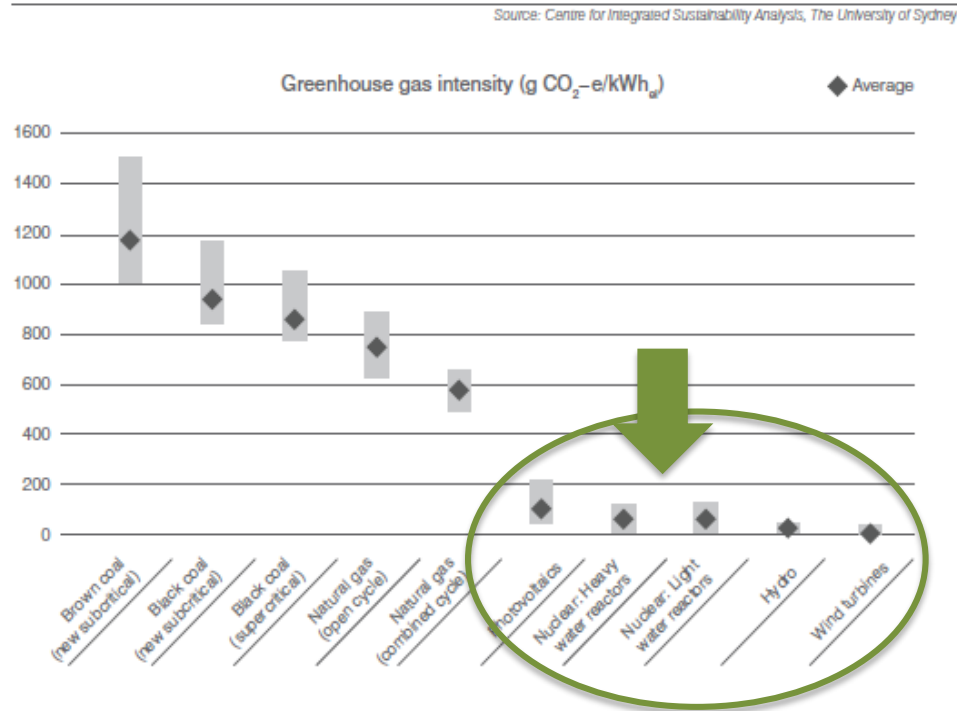
Global Nuclear Power Growth

- 60% increase in nuclear power by 2040
- 624 GWe
- China:
 - 58 GWe by 2020
 - Largest nuclear fleet by 2025
 - X% energy mix by 2050
- India:
 - 17GWe by 2024
 - 25% energy mix by 2050
- Middle East:
 - UAE, Saudi Arabia, Egypt, Jordan
 - Displacing domestic gas power gen



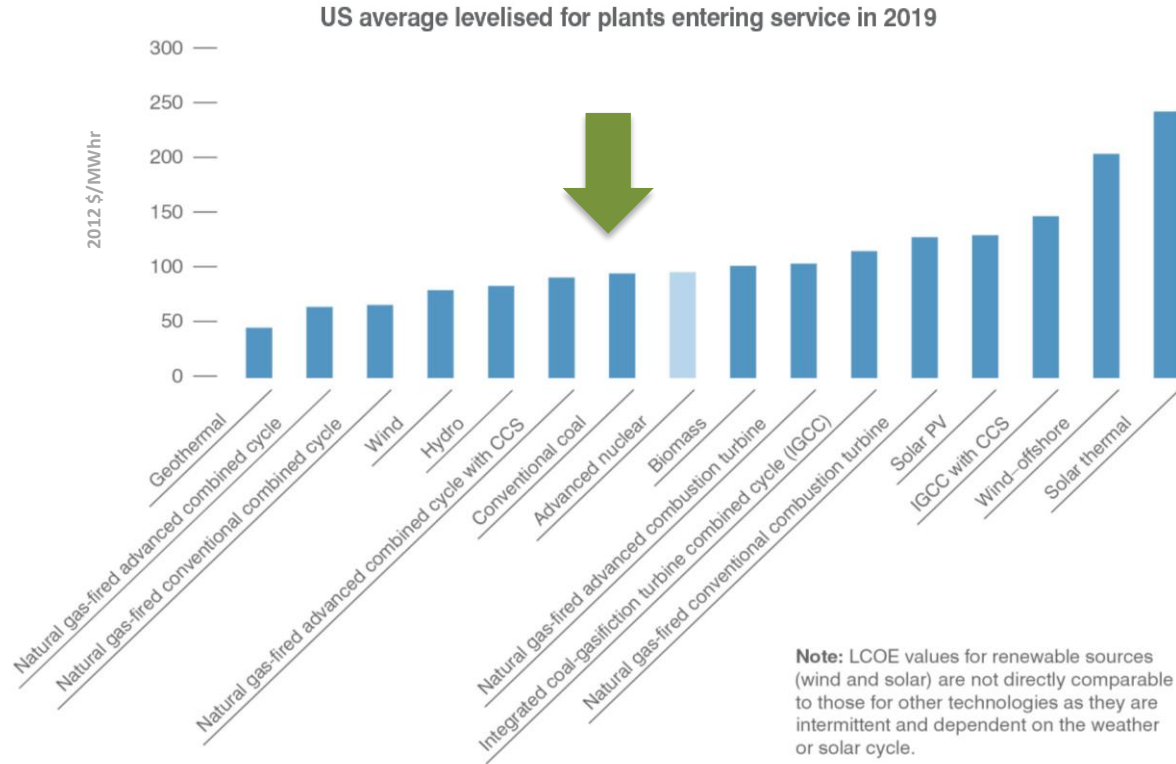
Nuclear Power and Climate Change

- Source of low emissions energy
- Life cycle emissions in the same range as renewables
- Competitive average levelised costs per unit power output (\$/MWh)
- Recognition by US-China Joint Announcement on Climate Change
- Nuclear power generation projected to grow by 60% by 2040
- 1GWe nuclear reactor could meet Australia's emissions reductions commitments by displacement of fossil fuels



Life cycle emissions from power generation

Comparable Cost of Nuclear Power



Source: US Energy Information Administration

Australian Uranium Facts



1st in resources

- 32 per cent of global uranium resources

2nd largest primary energy source

- 22 per cent total primary energy production in 2012/13

3rd in global production

- 11 per cent of global supply in 2013

4,200 jobs

- Uranium industry employment, much in remote areas

5,710 tonnes

- production of uranium in 2013-14
- Equal to >90% of domestic energy consumption

\$622 million

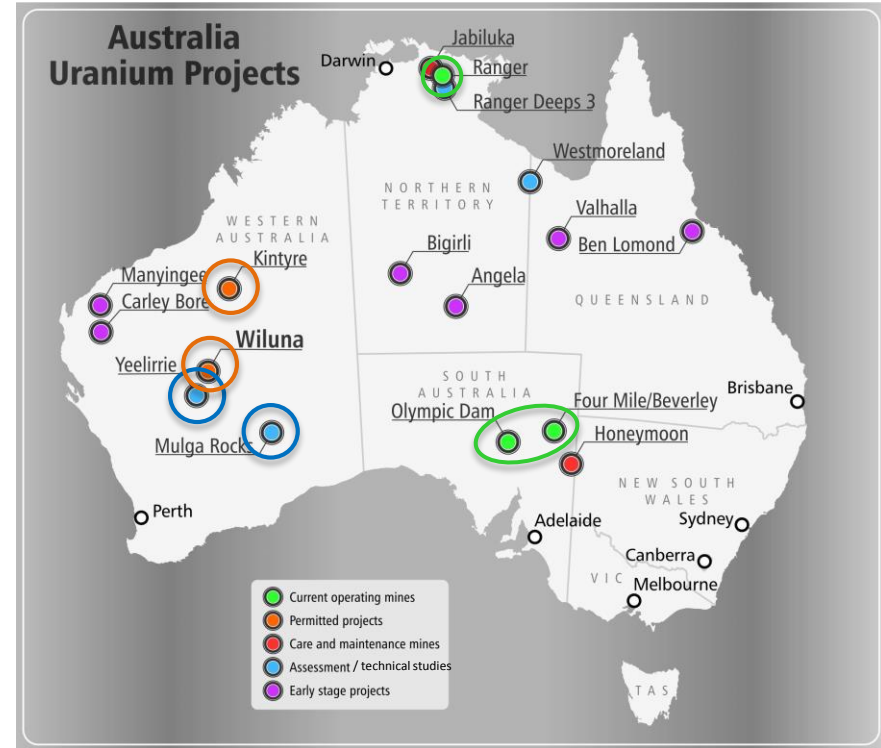
- Australian uranium export earnings in 2013/14
- \$1.1 billion forecast value of Australia's uranium exports in 2018/19



Australian uranium... many opportunities, few choices



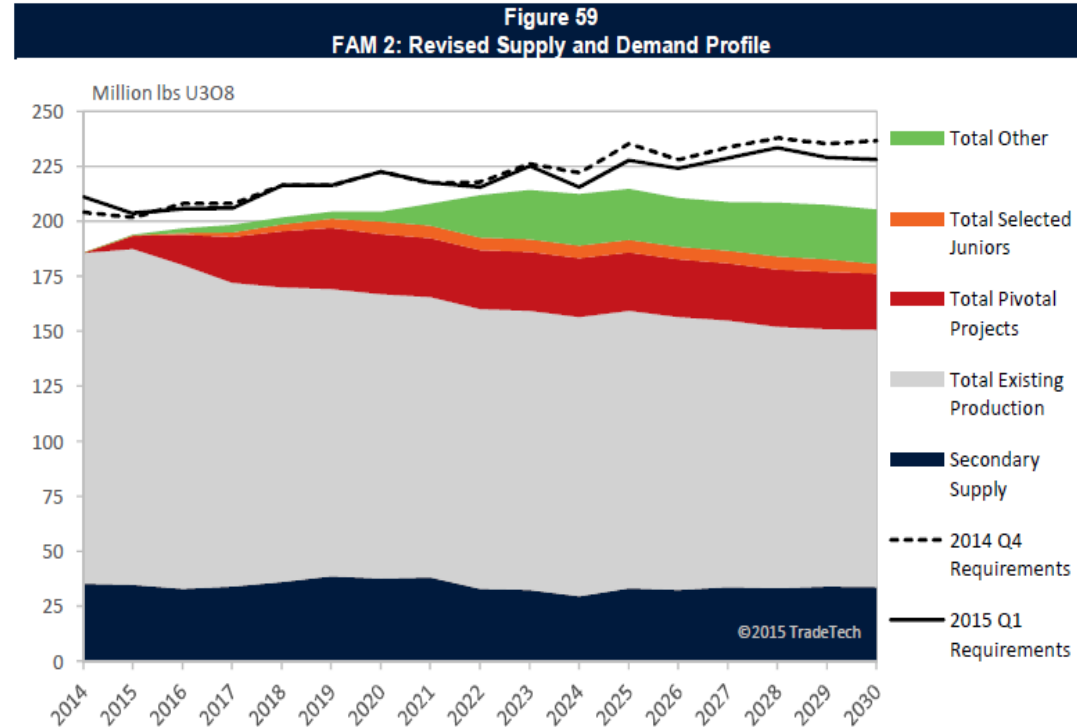
- Free trade deals – China, South Korea and Japan
- India – Australia Nuclear Civil Cooperation Agreement signed, Free Trade Agreement expected 2015
- Australia – strong production history but now only three mines in operation
- Queensland assets now under uranium ban again; approvals required by 2017 for WA assets
- 2018 forecast production limited to Olympic Dam, Four Mile
- Near term production assets with approvals ready to go are limited – Wiluna is at the front of the queue



Global uranium market



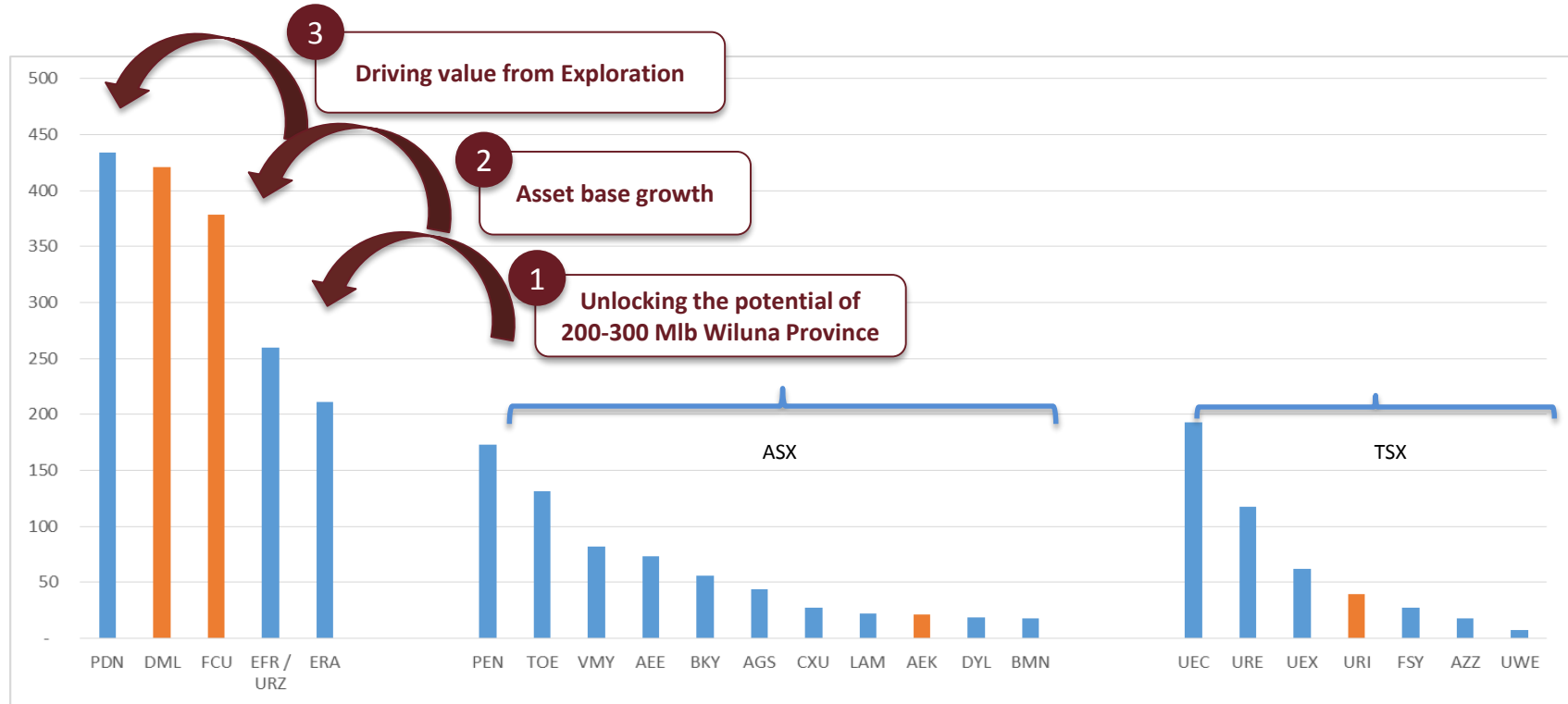
- Global uranium stocks are high, filling demand gap and holding back investment
- Uranium prices taking longer to recover, but long term fundamentals remain strong
- Forecast demand/supply shows a gap emerging in mid term
- Australia is well positioned to deliver into growing Asian market
- Toro continues to focus on developing Wiluna allowing value to be realized permitting and traditional owner agreements, resource improvement, project financing



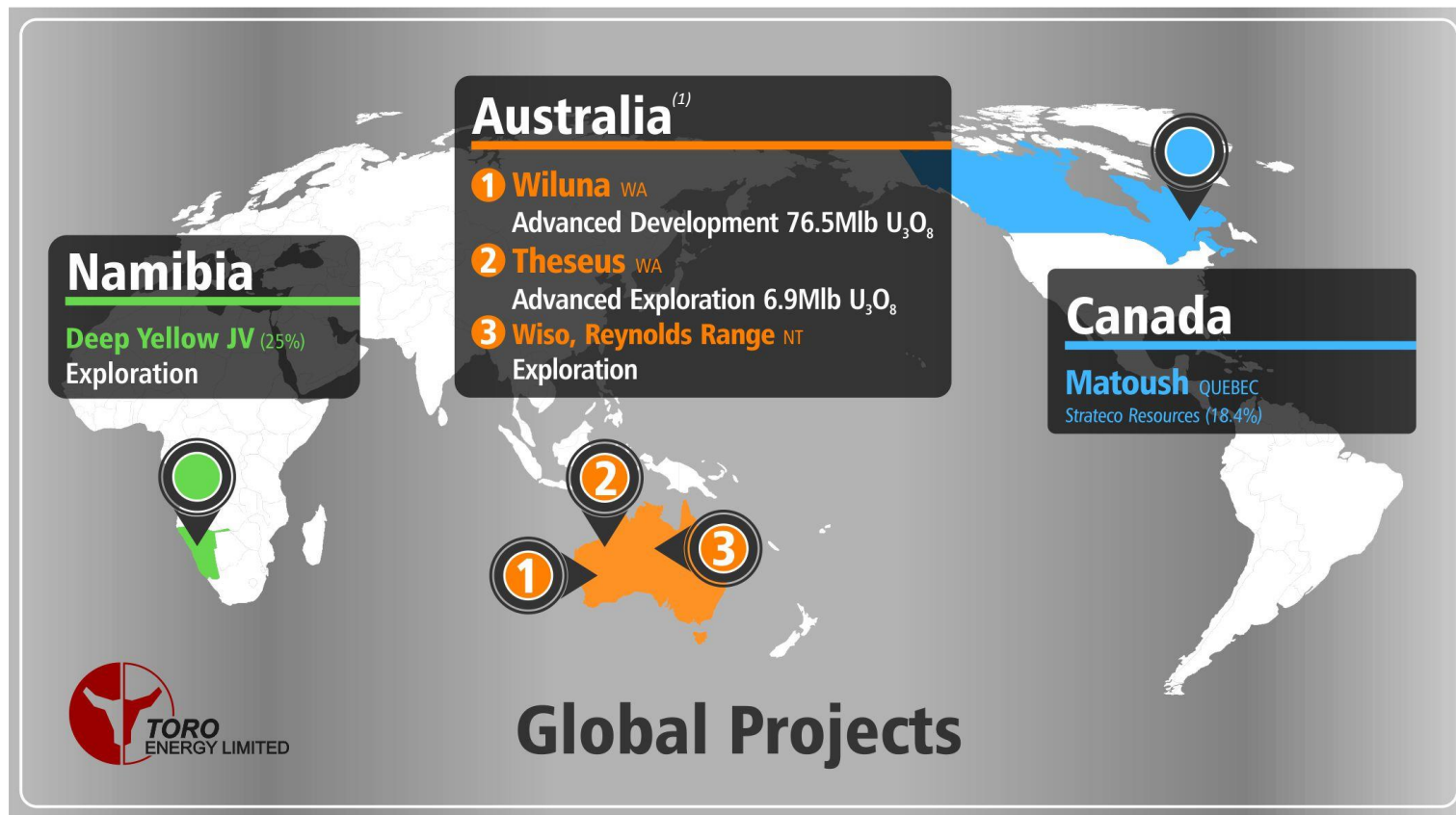
Toro's vision



Create a significant mid-tier uranium company



Toro's asset portfolio



(1) Refer Resources table at slide 40 and Competent Person's statement following this presentation

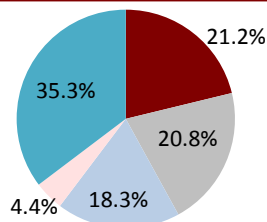
Capital structure



Capital Structure

ASX Code		TOE
Ordinary Shares on Issue	m	2,000.8
Share Price	cps	5.8
Undiluted Market Capitalisation	A\$m	116.0
Cash (31 August 2015)	A\$m	15.8
Loan	A\$m	6.0

Shareholders



■ OZ Minerals
 ■ Mega Uranium
■ The Sentient Group
 ■ RealFin Cap

Directors

John Cahill ⁽¹⁾	Acting Chairman
Vanessa Guthrie	Managing Director
Richard Patricio – Mega	NED
Richard Homsany – Mega	NED
Michel Marier – Sentient	NED
Board and management shareholding – OTM options and performance rights	2% of diluted issued capital

Research Coverage

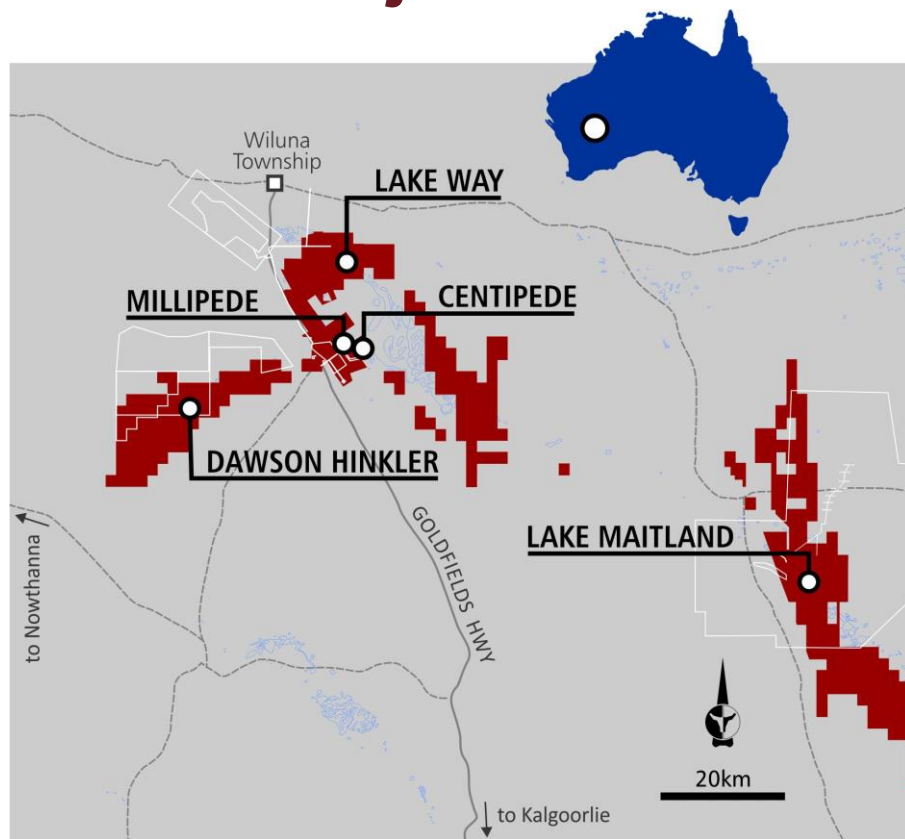
Realfin Capital Partners

Dundee

Proactive Investors

(1) Fiona Harris was granted a leave of absence effective 1 July 2015. John Cahill is acting Chair during this period.

Wiluna Project



Wiluna Project - highlights



Location	<ul style="list-style-type: none">• 520 km north of Kalgoorlie and 30 km south of Wiluna
Highlights ⁽¹⁾	<ul style="list-style-type: none">• 6 shallow calcrete-hosted carnotite deposits• Centipede, Lake Way, Millipede, Lake Maitland• 1.3Mtpa plant, 2mlbpa production• Life of mine 16+ years• First class mining jurisdiction; 100+ years of mining history• Infrastructure and services available – power, gas, transport, people• 350 workers in construction, 170 production• Major environmental approvals to commence mining now in place
Status	<ul style="list-style-type: none">• State & Federal Environmental approvals granted for processing, Centipede and Lake Way deposits• Current application for Millipede/Lake Maitland submitted• Optimisation studies underway• Low technical risk – simple open cut mining and proven process flow sheet• Project financing ahead



(1) Refer ASX release 20 November 2013 for additional and qualifying information on the resource that underpins the production target and ASX release 30 January 2014 that provides the material assumptions on which the production target is based.

Wiluna – a low impact project

- No discharge to surface waters
- No listed species of significance
- Re-use of all mine dewatering
- In-pit tailings storage
- CoGen power – heat and off gas recovery into processing facility
- No standing landforms post-mining
- Culturally sensitive areas excluded from mining



- Strong regional support for Toro's efforts including the Wiluna shire and Traditional Owners
- The region needs new mining proposals – Magellan recently placed on care and maintenance, no exploration discoveries
- Mine would employ over 300 people in construction and an operating workforce of 180
- Annual mine expenditure of approximately \$80M
- Well advanced with a mining agreement with the Traditional Owners
 - Consultation has been consistent for many years
 - Commitments to training and education to build capacity
 - Liaison Committee to be formed, representatives to be employed
 - The mine will require land management services, environmental and heritage management and monitoring
 - Production and milestone payments

Project funding considerations



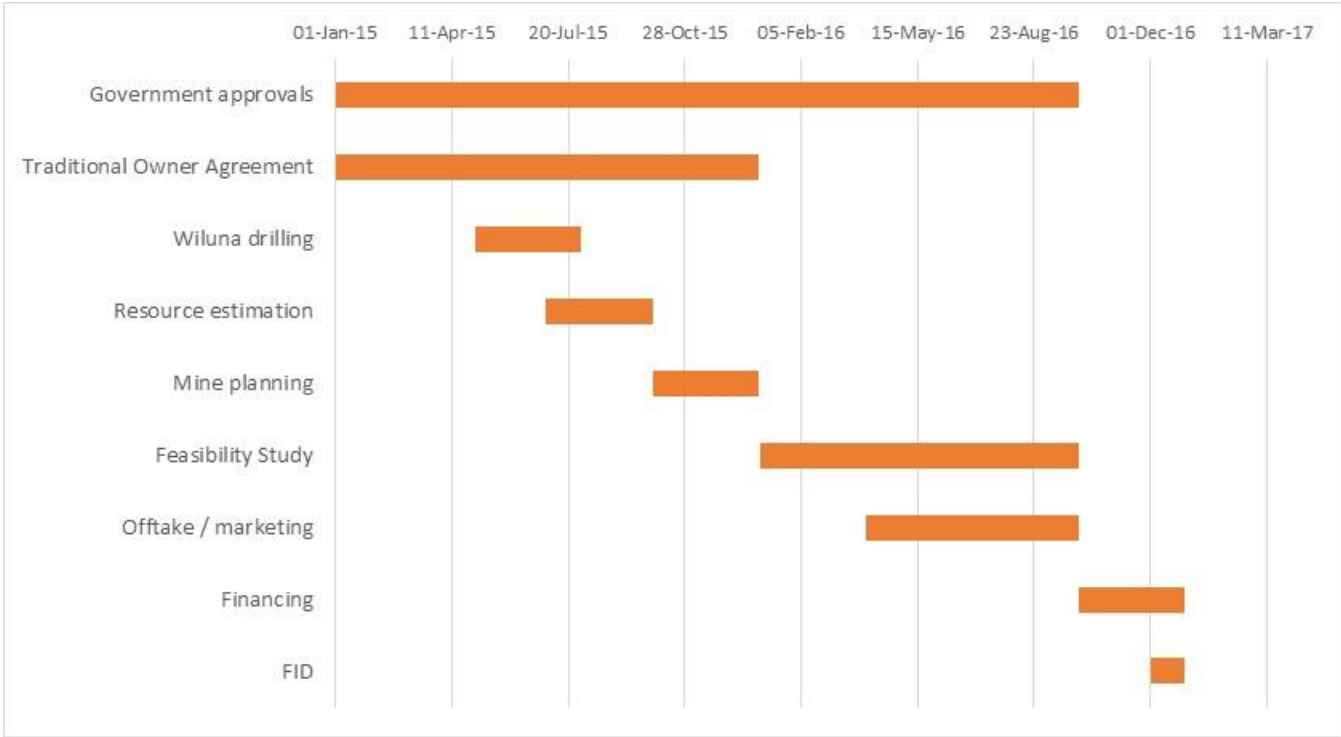
Partner

Capital \$315m



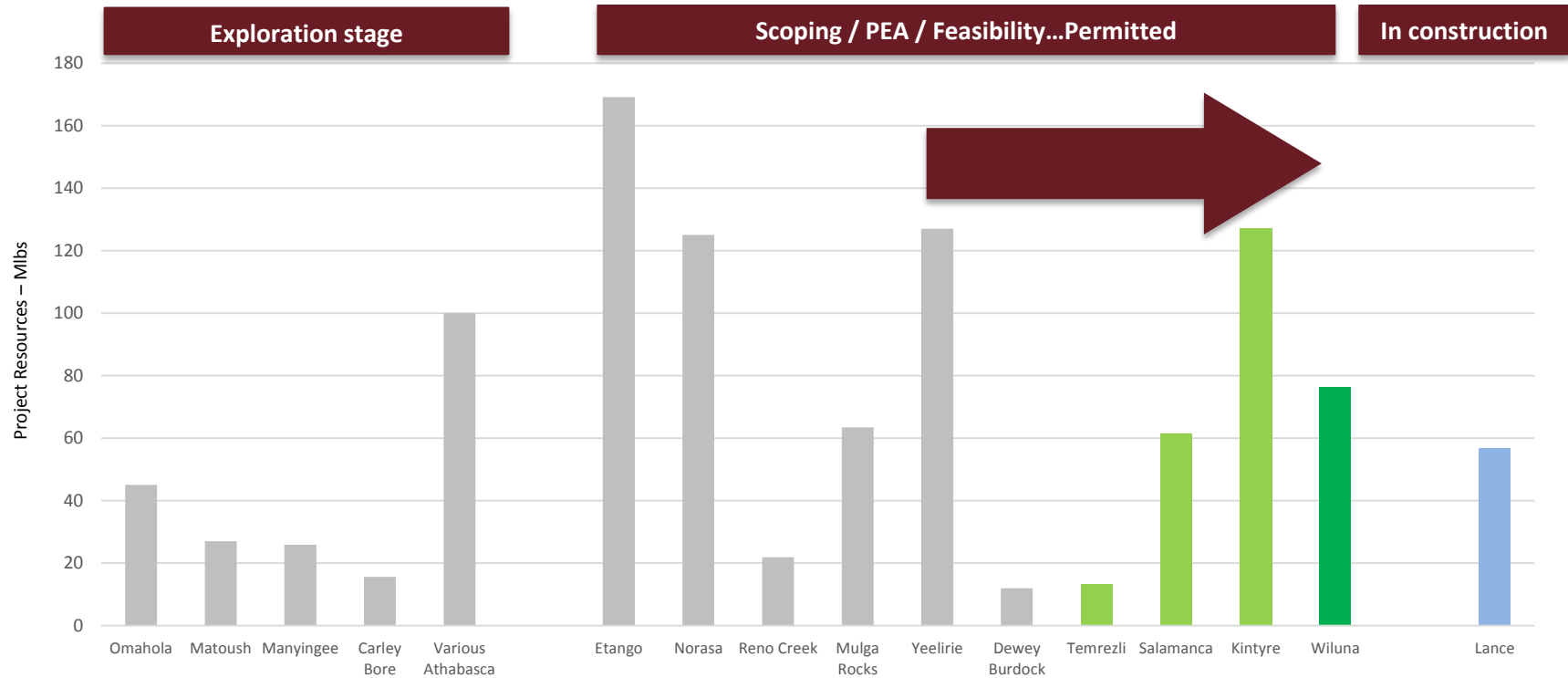
- Debt financing with suitable offtake in place could support up to \$160M project finance
- JAURD / Itochu own an option to invest US\$39M in Lake Maitland for a 35% interest
- Opportunity for significant strategic partner to assist the project financing
- Asia and the merging economies are the target

Development timetable



Wiluna – ready for the uranium price rise

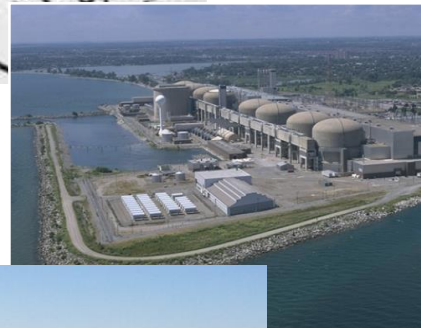
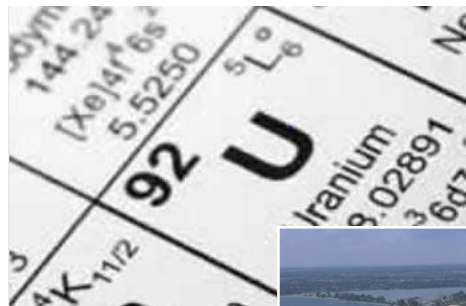
Why Wiluna? ...pathway to production



Uranium and Toro – part of a clean energy future



- Uranium and nuclear industry has strong track record
- Nuclear power is important in meeting global energy demand in a carbon constrained world
- Australia has significant U resources and real opportunity for growth
- Toro has a clear vision to create value in the uranium industry
- Our belief in the uranium market and in the need to continue to advance the **approved** Wiluna Uranium Project despite slow market pressure
- On the doorstep of the fastest growing world economies in China and India
- The Wiluna Uranium Project is at the front of the Australian project development queue



Thank You



Dr Vanessa Guthrie

Managing Director

Toro Energy Limited

L3 33 Richardson street

WEST PERTH WA 6005

Telephone: +61 8 9214 2100

Email: info@toroenergy.com.au

Website: www.toroenergy.com.au



Appendix - Resources



The Wiluna Uranium Project - JORC 2012											
Deposit	Measure	Measured		Indicated		Total Measured or Indicated		Inferred		Total	
		200 ppm	500 ppm	200 ppm	500 ppm	200 ppm	500 ppm	200 ppm	500 ppm	200 ppm	500 ppm
Centipede	Mt's	2.9	1.2	7.5	3.1	10.4	4.3	-	-	10.4	4.3
	Grade ppm	551	872	572	943	566	923	-	-	566	923
	Mlb's U ₃ O ₈	3.5	2.3	9.5	6.5	13.0	8.8	-	-	13.0	8.8
Lake Way	Mt's	-	-	10.3	4.2	10.3	4.2	-	-	10.3	4.2
	Grade ppm	-	-	545	883	545	883	-	-	545	883
	Mlb's U ₃ O ₈	-	-	12.3	8.2	12.3	8.2	-	-	12.3	8.2
Millipede	Mt's	-	-	4.5	1.6	4.5	1.6	1.9	0.4	6.4	1.9
	Grade ppm	-	-	530	956	530	956	382	887	486	943
	Mlb's U ₃ O ₈	-	-	5.3	3.3	5.3	3.3	1.6	0.7	6.9	4.0
Lake Maitland	Mt's	-	-	19.9	7.5	19.9	7.5	-	-	19.9	7.5
	Grade ppm	-	-	555	956	555	956	-	-	555	956
	Mlb's U ₃ O ₈	-	-	24.3	15.7	24.3	15.7	-	-	24.3	15.7
Sub-total	Mt's	2.9	1.2	42.2	16.3	45.1	17.6	1.9	0.4	47.0	17.9
	Grade ppm	551	872	553	935	553	930	382	887	546	930
	Mlb's U₃O₈	3.5	2.3	51.4	33.7	55.0	36.0	1.6	0.7	56.6	36.7
Dawson Hinkler	Mt's	-	-	8.4	0.9	8.4	0.9	5.2	0.3	13.6	1.1
	Grade ppm	-	-	336	596	336	596	282	628	315	603
	Mlb's U ₃ O ₈	-	-	6.2	1.1	6.2	1.1	3.2	0.4	9.4	1.5
Nowthanna	Mt's	-	-	-	-	-	-	11.9	2.3	11.9	2.3
	Grade ppm	-	-	-	-	-	-	399	794	399	794
	Mlb's U ₃ O ₈	-	-	-	-	-	-	10.5	4.0	10.5	4.0
Total Regional Resource	Mt's	2.9	1.2	50.6	17.2	53.5	18.4	19.0	2.9	72.5	21.3
	Grade ppm	551	872	517	918	519	915	365	791	479	898
	Mlb's U₃O₈	3.5	2.3	57.7	34.8	61.2	37.1	15.3	5.1	76.5	42.2

- (1) Tonnes and pounds are quoted to one decimal place which may cause rounding errors when tabulating
 (2) All Resources reported in accordance with the 2012 edition of the JORC code.
 (3) Refer ASX release 20 November 2013 for additional and qualifying information on the resource.

Appendix - Competent Persons Statement



Wiluna Uranium Project 2012 JORC code compliant resource estimates

The information presented here that relates to Mineral Resources of the Centipede, Millipede, Lake Way, Lake Maitland, Dawson Hinkler and Nowthanna deposits is based on information compiled by Dr Greg Shirliff of Toro Energy Limited (with the aid of Mega Uranium Limited geologists Mr Stewart Parker and Mr Robin Cox in the case of Lake Maitland) and Mr Robin Simpson and Mr Daniel Guibal of SRK Consulting (Australasia) Pty Ltd. Mr Guibal takes overall responsibility for the Resource Estimate, and Dr Shirliff takes responsibility for the integrity of the data supplied for the estimation. Dr Shirliff is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM), Mr Guibal is a Fellow of the AusIMM and Mr Simpson is a Member of the Australian Institute of Geoscientists (AIG) and they have sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity they are undertaking to qualify as Competent Persons as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code 2012)'. The Competent Persons consent to the inclusion in this release of the matters based on the information in the form and context in which it appears.