

Exploring Exploration Futures – Insights into possible drivers

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Queensland
Government

Strategic foresight

Importance of seeing what is going on around us!

Cannot abandon current products – they are still the basis of our future

However new commodities are also needed to fuel the future technology boom – new opportunities.



Strategic foresight...

Of the top 20 ASX listed projects at development stage 40% are for graphite, Li, Ta, Nb and REE (Argonaut).

Critical technologies for the next ten years are here now



Strategic foresight... take home message

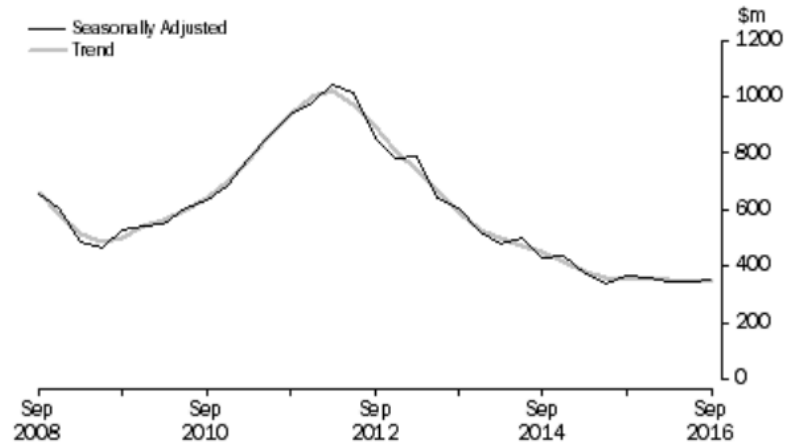
Benefits to be had by looking at future trends and shifts

Community attitudes will drive some of these opportunities

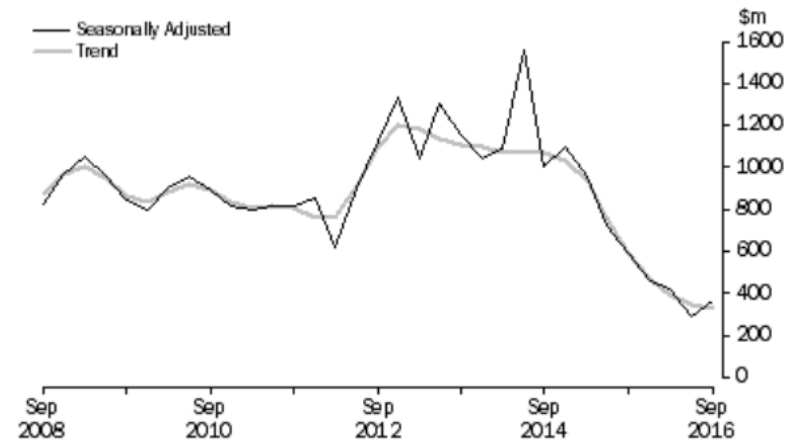


Mineral/petroleum exploration in Australia has had a rocky couple of years (pardon the pun?)

MINERAL EXPLORATION, Seasonally adjusted and trend

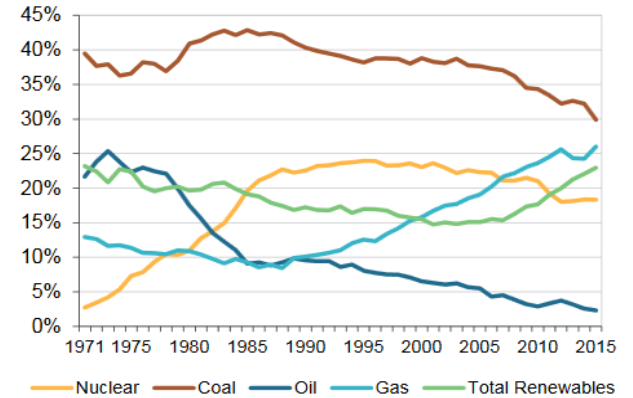


PETROLEUM EXPLORATION, Seasonally adjusted and trend

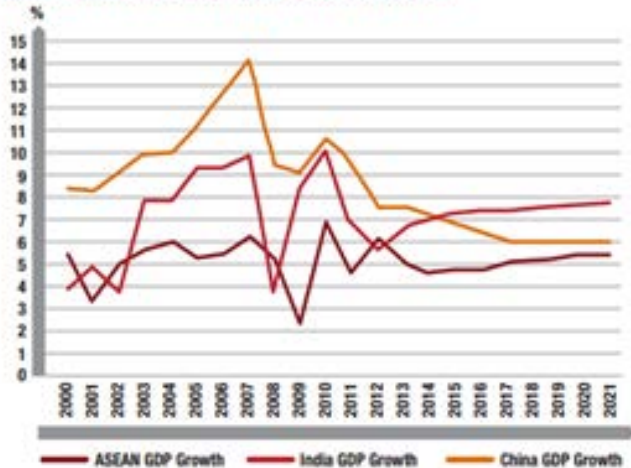


Do we keep doing what we have been doing?
 Or review our future drivers e.g. Transition to
 low carbon energy futures (gas and
 renewables)... and the differing levels of
 demand?

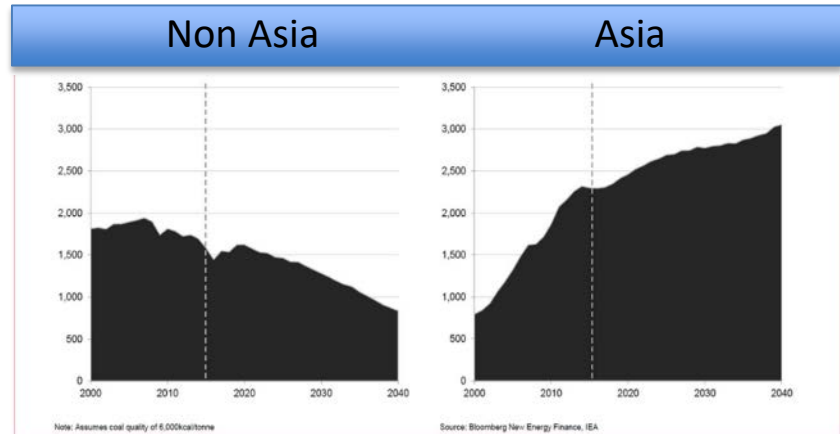
Figure 19. OECD electricity generation mix
 1971-2015



China, India and ASEAN-5* GDP Growth



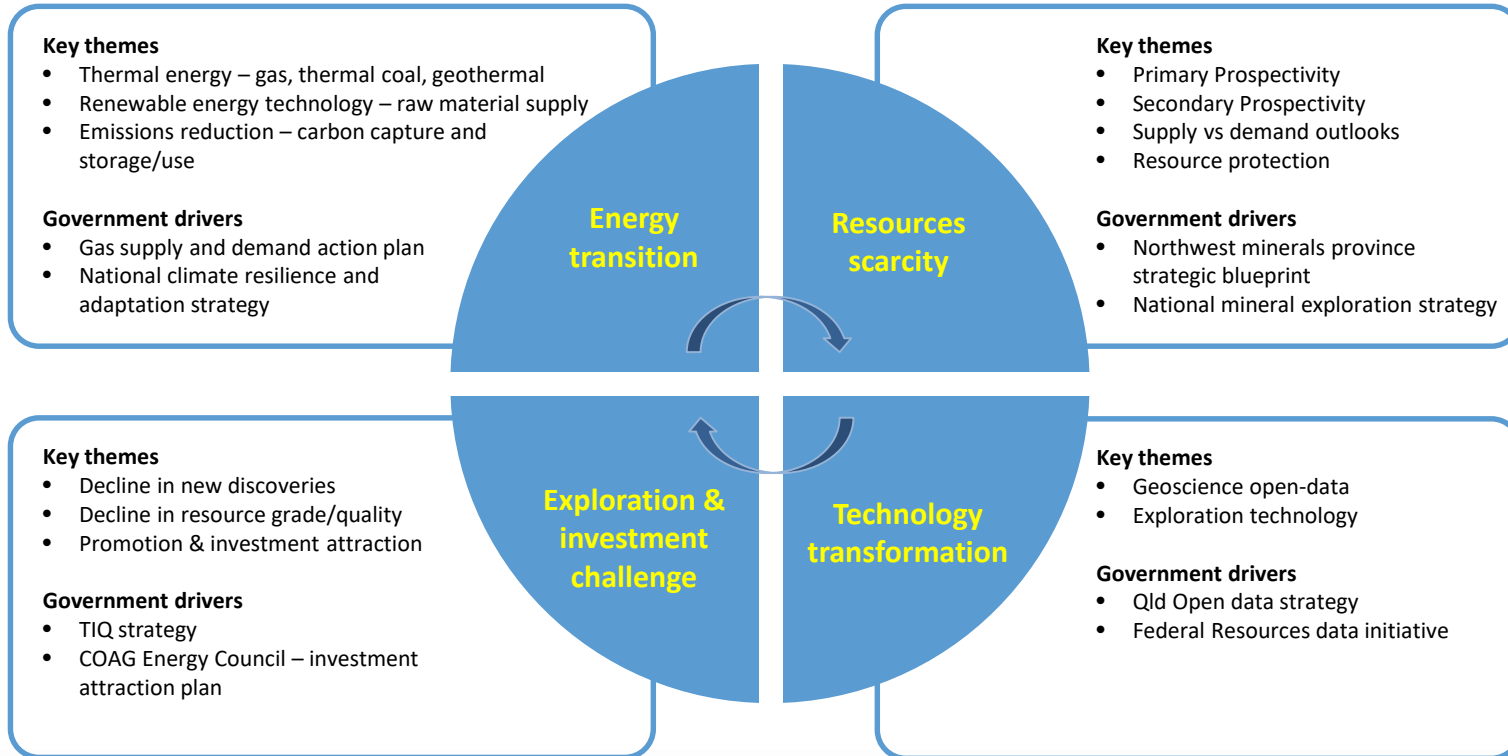
* The ASEAN-5 comprises Indonesia, Malaysia, the Philippines, Thailand and Vietnam.
 Source: IMF



Note: Assumes coal quality of 6,000kcal/tonne

Source: Bloomberg NEF Energy Finance, IEA

DNRM is focussing on 4 key strategic themes



Energy Transition is increasing demand for more and increasingly sophisticated batteries

- Renewable energy production relies on batteries to transition to the main stream
- Batteries required at several levels
- Decentralisation
- Cost of transition?



China to invest \$361 billion into renewable power by 2020

 **The Independent** January 4 at 6:25pm Like Page

Incredible



Germany has so much renewable energy that people are being paid to consume electricity

INDEPENDENT.CO.UK

9.5K 242 Comments 3.6K Shares

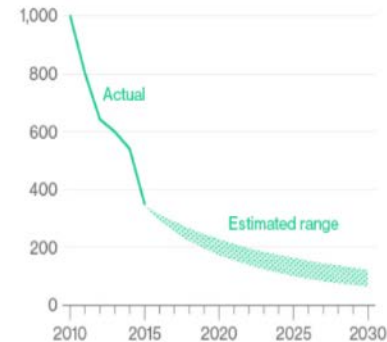
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It's All About the Batteries

Batteries make up a third of the cost of an electric vehicle. As battery costs continue to fall, demand for EVs will rise.

Cost for lithium-ion battery packs

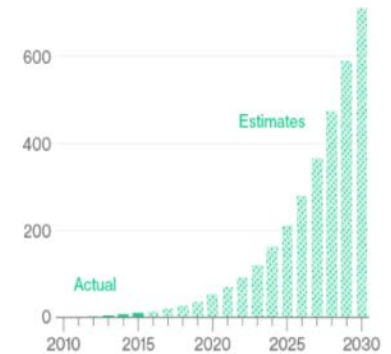
\$1,200 per kilowatt hour



Source: Data compiled by Bloomberg New Energy Finance

Yearly demand for EV battery power

800 gigawatt hours



Bloomberg 

Question: Can we influence the future?

- Our industry need to supply the materials needed
 - Lithium, cobalt, graphite
- Failure to supply the demand?
- We can influence the future

GRID POWER

**Batteries can be larger
Vanadium flow batteries?**

DECENTRALISED POWER

- **Batteries can be larger**
- **Sodium ion batteries?**

What to do if things go wrong?

Managing supply is the challenge...

How can we discover new base metals deposits needed to replace dwindling supplies?

- Industrial Minerals
- Should we be recycling tailings?
- Critical Elements – basis for new technologies, alloys etc.

Resource Sustainability (Critical elements):

- Critical elements are those which underpin new technologies and which have limited supply issues.
- Include Rare Earth elements, Li, Ta, Nb, Co and carbon
- Critical elements are typically 'spice elements' where only small amounts are used and do not represent attractive exploration targets
- High value end is in the technologies these elements support

Encouraging and supporting Exploration success

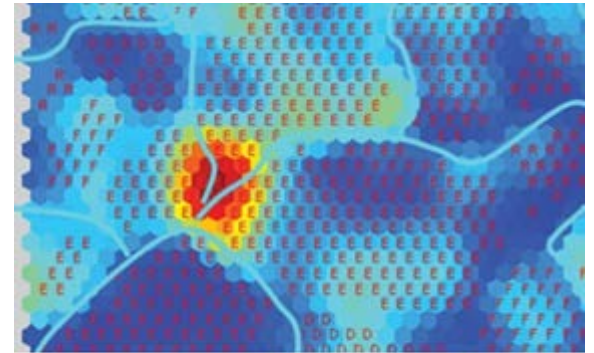
- What do we need to do to promote exploration success? Uncover, CRC's,
- CSIRO's Deep Earth Imaging, Exploration through cover, Rapid resource characterisation, Big data for earth sciences



FastGrade: on-site elemental drillhole analysis >



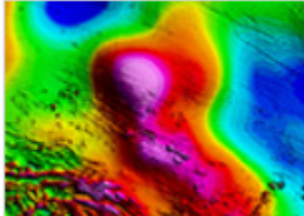
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Making the most of Technological advancements

- What technologies do we focus on to promote exploration investment and success? Supply of data
- R&D
- Keeping track of technology advances to predict which commodities will be needed (graphene)



How to extract more information from geophysical data

OCTOBER 6, 2016 [EXPERTISE](#)



Give them data and they will come

AUGUST 4, 2016 [EXPERTISE](#)

