Queensland’s Challenge to Match Northern Queensland’s New Economy Minerals with Renewable Energy Technologies

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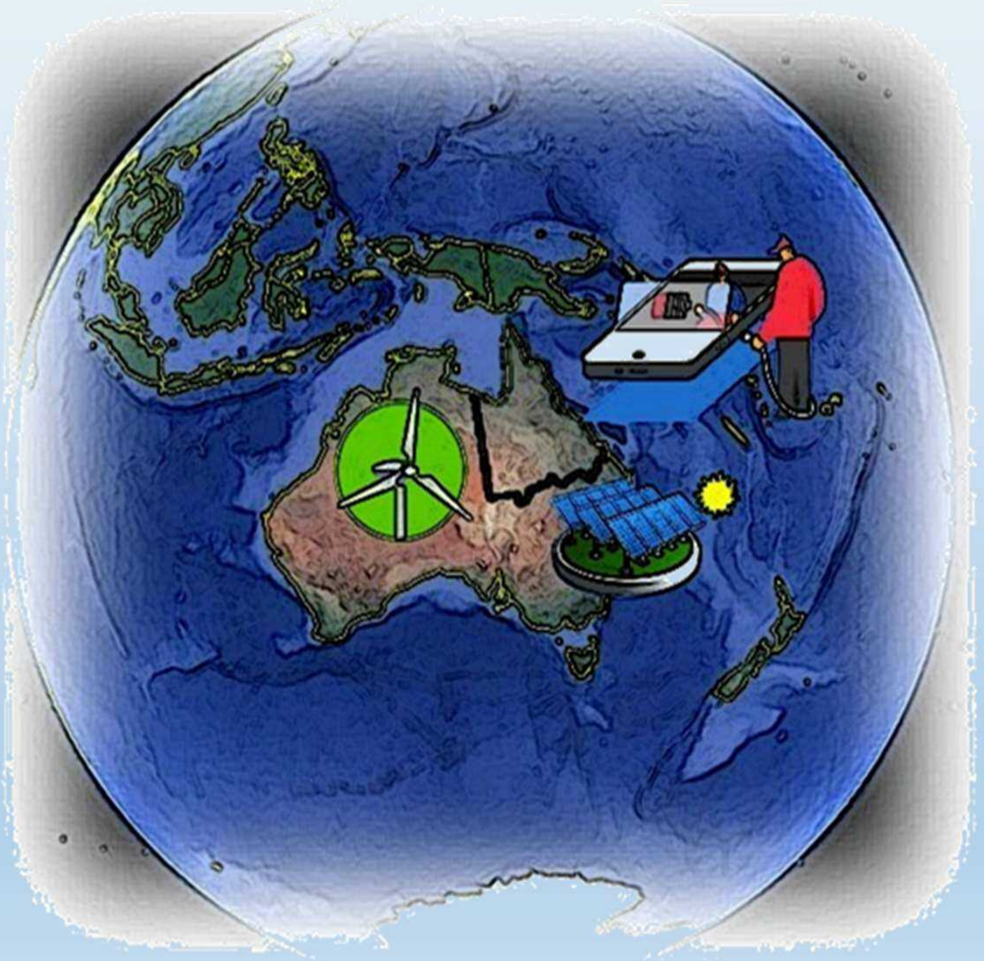
June 2021

Renewable Energy in context of this presentation



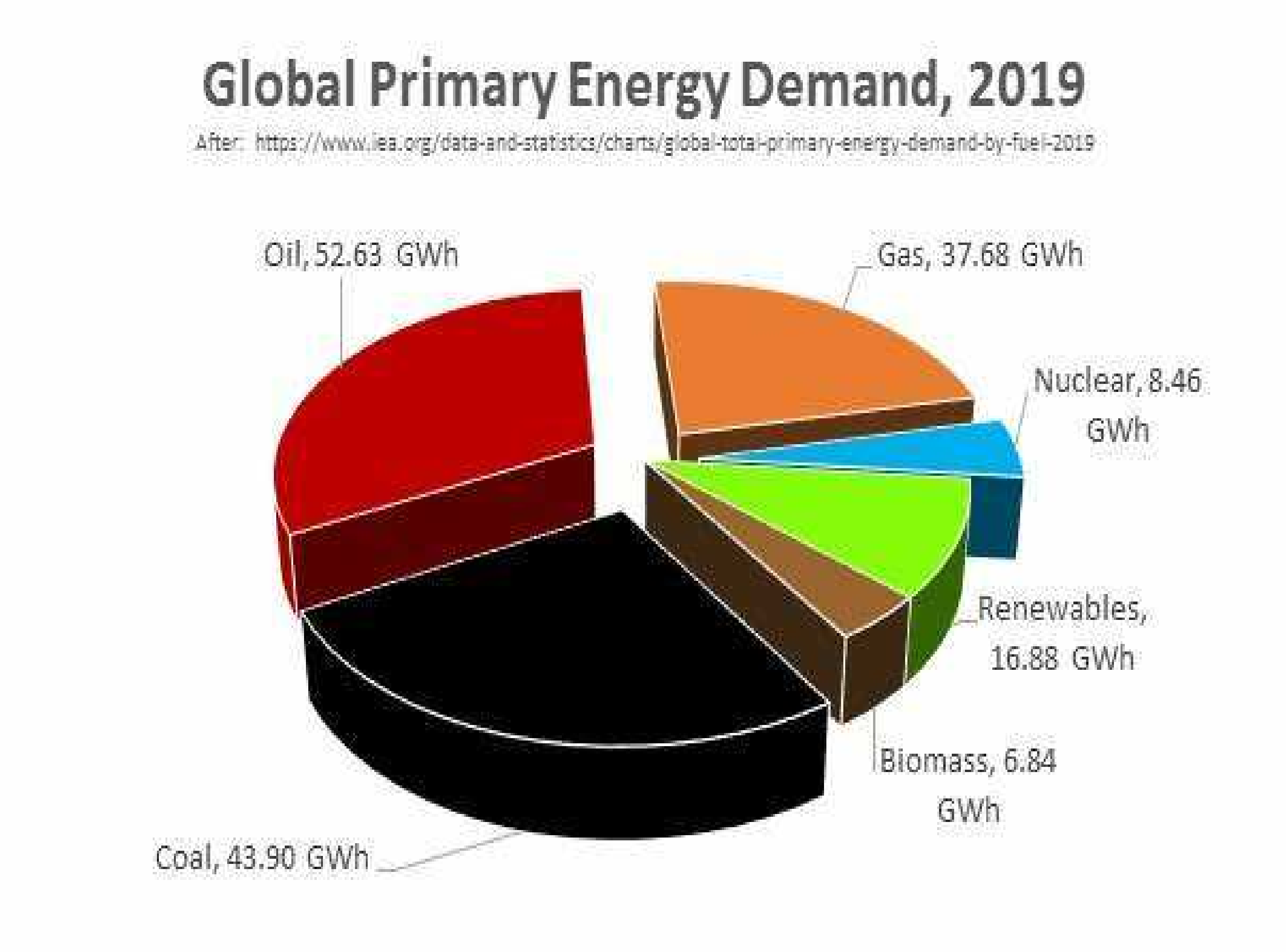
- ✓ **Wind**
- ✓ **Solar**
- ✓ **Batteries**

Where?

- **Northern Qld**

- **Shown as area in red**
- **South boundary defined by electoral boundaries**
- **Has well developed industrial centres**
- **Existing infrastructure**
- **National and global access**

Renewable energy demand is already significant



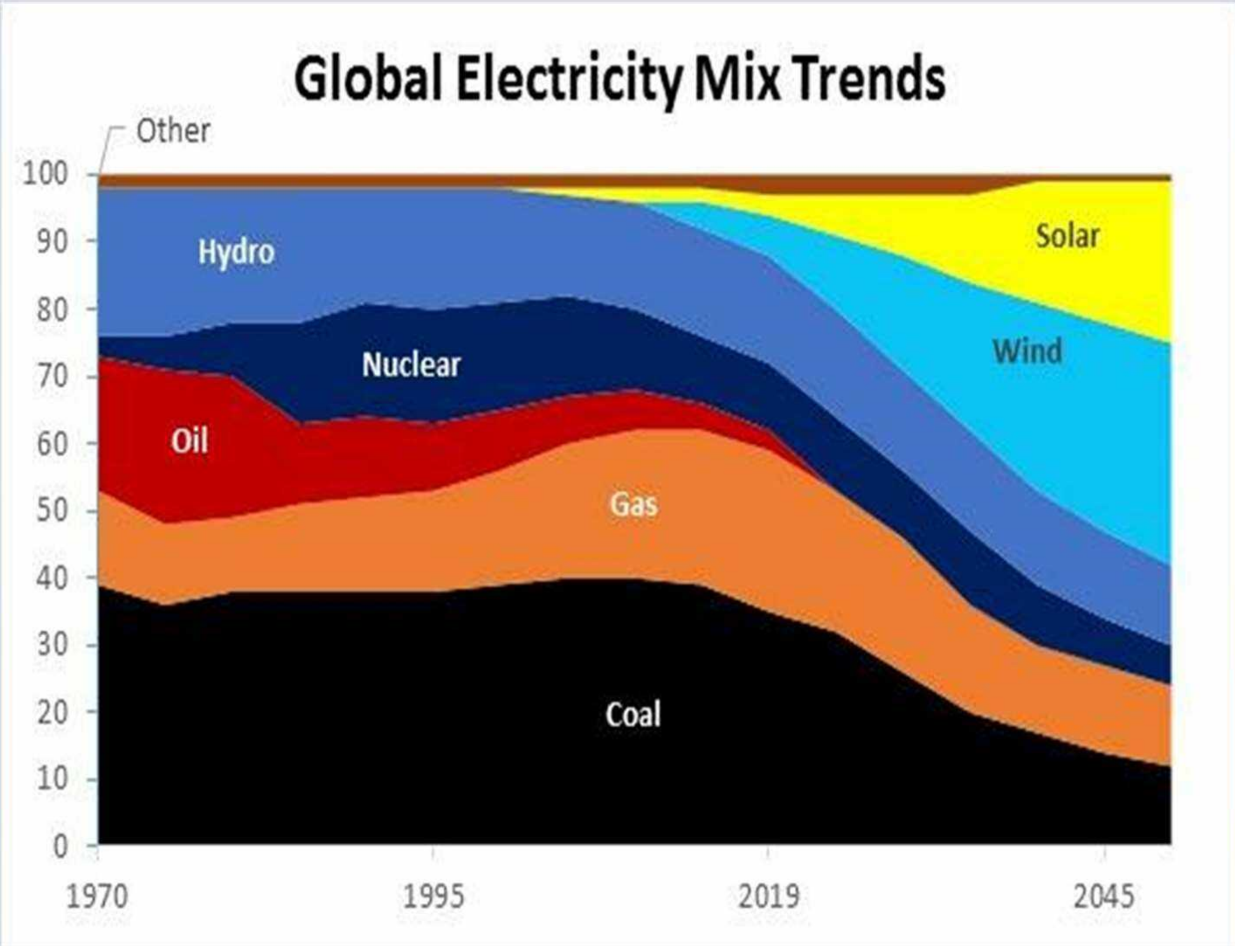
In 2019:

- Fossil fuel industry (dominated by coal, oil and gas) produced over 80% of world's energy
- Renewables including biomass produced just over 14% of global energy

But

- Change is in the air driven by global perceptions

Looking into the future



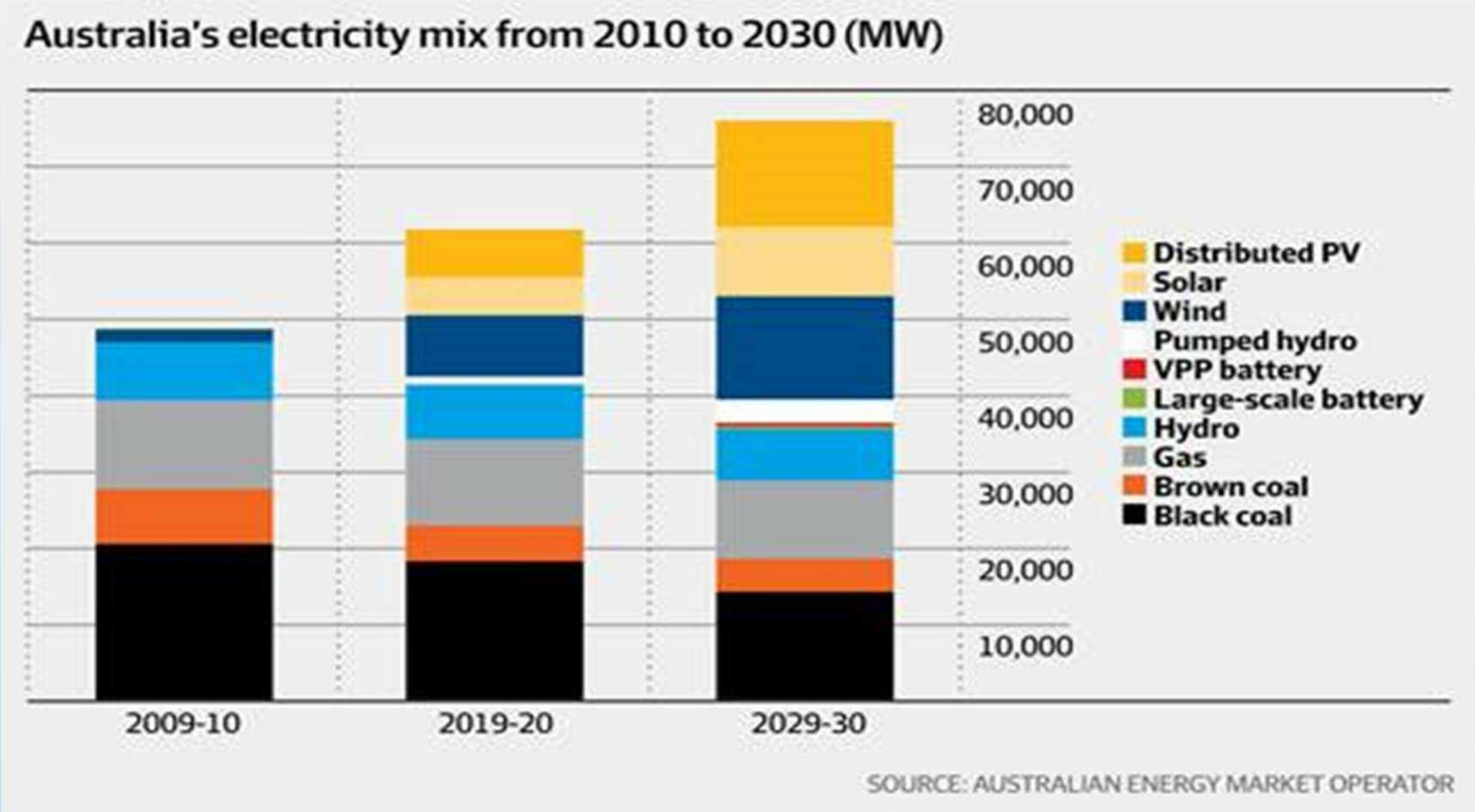
- ❑ Coal will continue to be an important source of revenue

But

- ❑ Renewable Energy will dominate

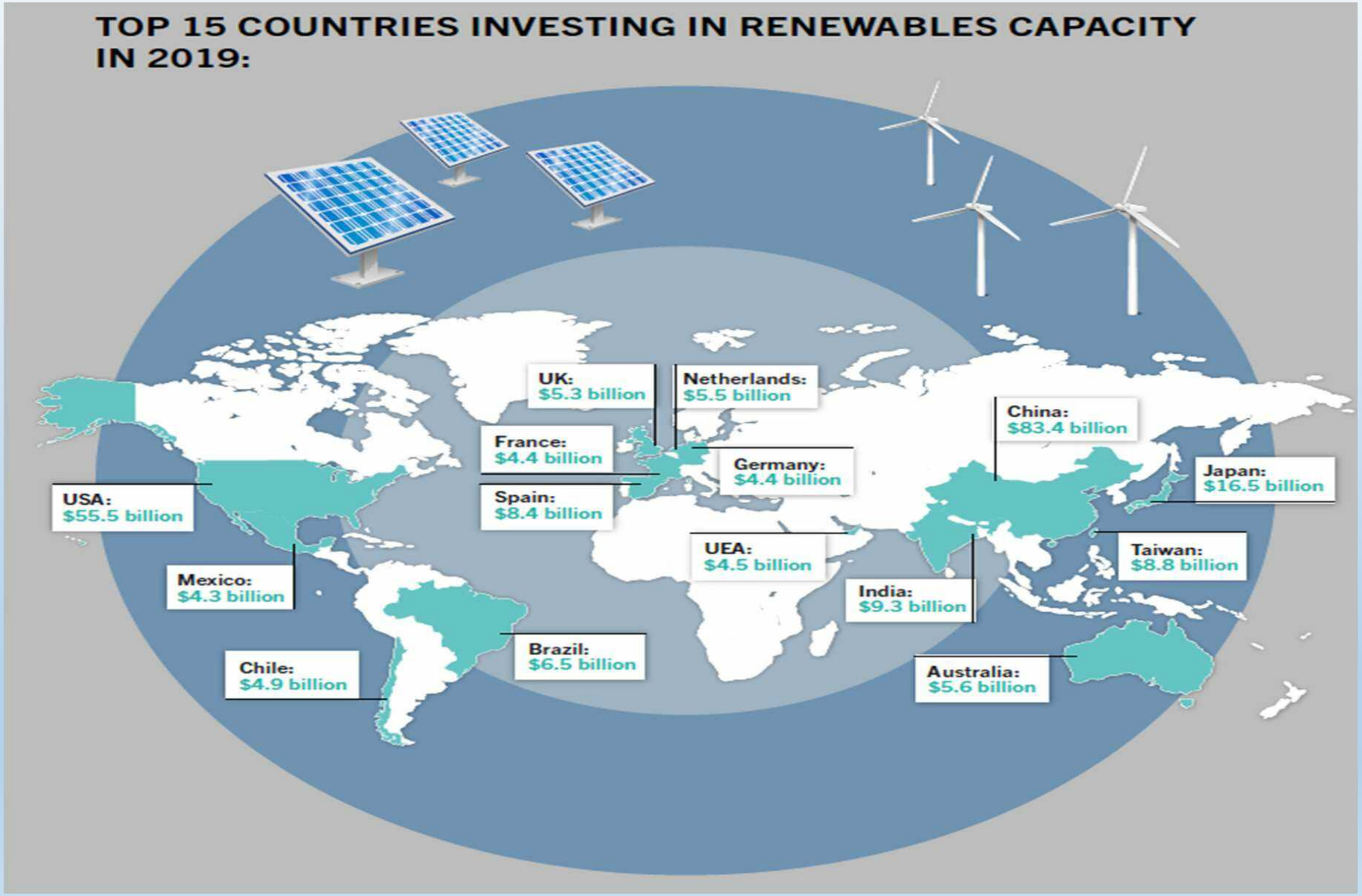
Northern Qld could be the winner

Future Australian renewable energy demand



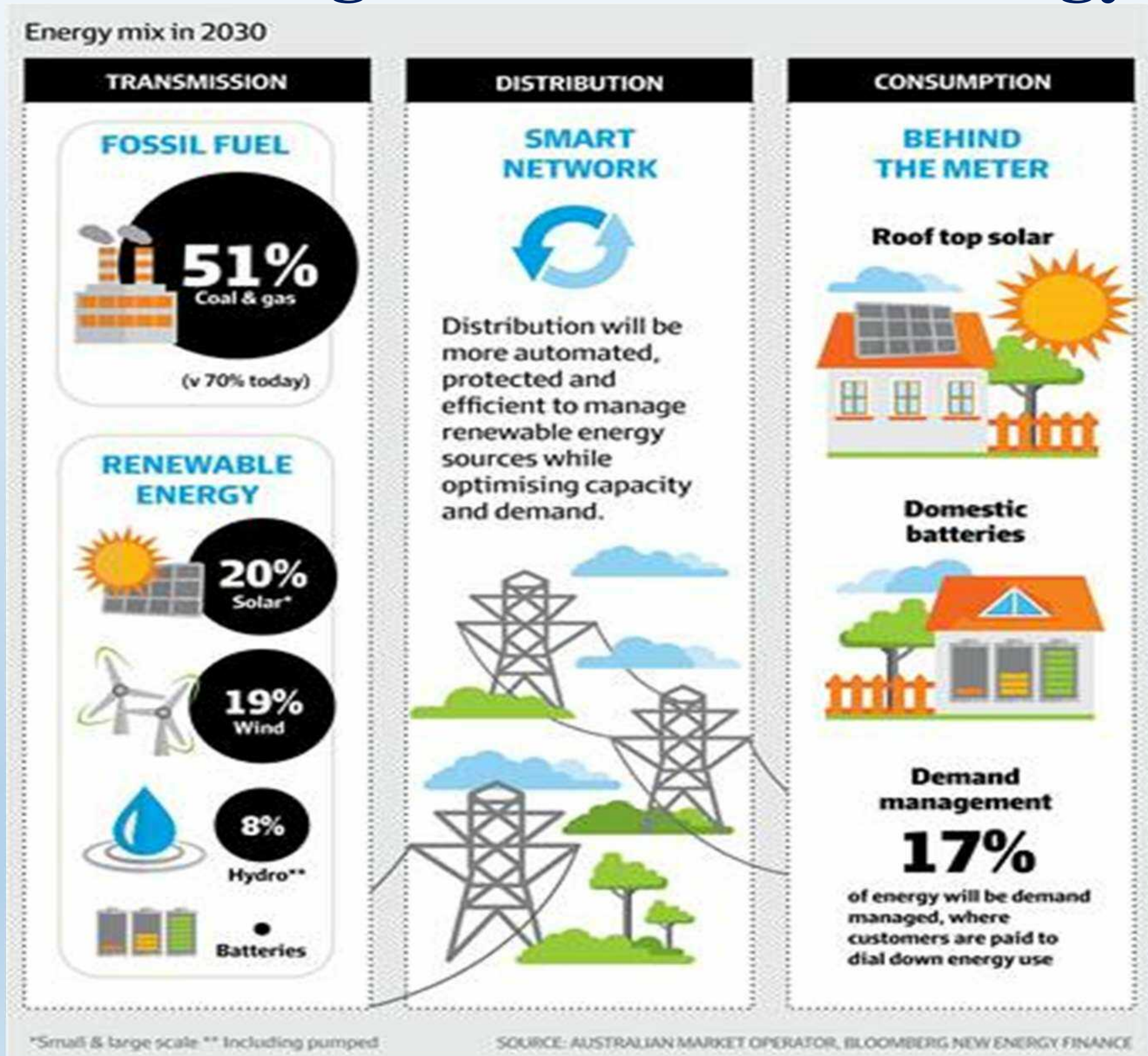
- Northern Qld is well placed to process and supply New Economy Minerals to int'l renewable energy technology manufacturers and therefore drive local employment

Investment in renewable energy is significant



- Top 15 countries invested USD227.3 billion into renewables in 2019
- Only 6% was raised through cap. markets
- Australian Mines, Magnis Energy Technologies, QEM Ltd, VECCO Group
- Iluka now undertaking dev. Work -RRE processing in WA, Neo Metals JV for Li-ion recycling plant in Germany

Bloomberg think the 2030 energy mix will be



- ❑ Northern Queensland is well placed to capitalize on internationals $ trends
- ❑ We have new economy minerals
- ❑ People & infrastructure

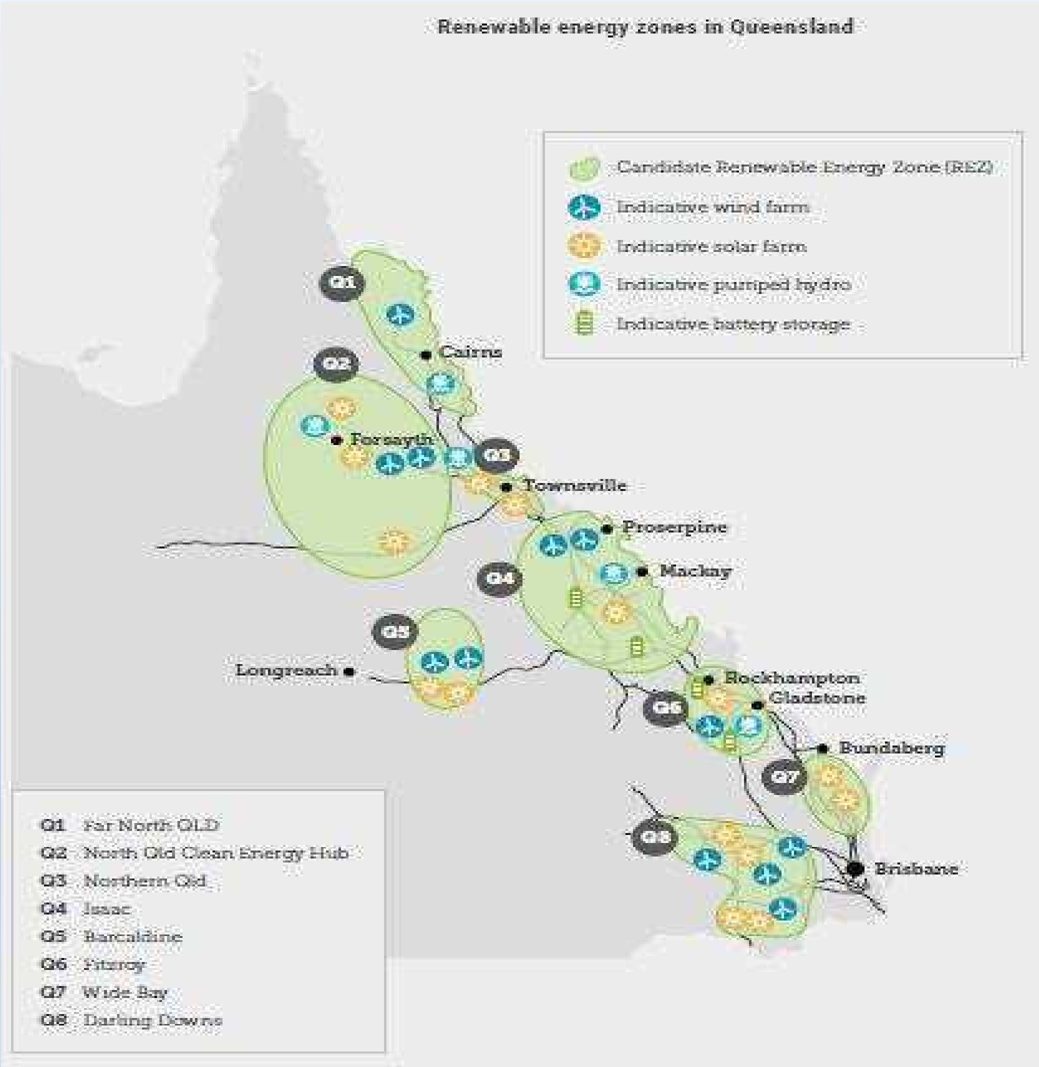
MUST

- ❑ Understand the market. Eg. Since 2,000- int’l businesses have lodged +65,000 battery patents with EPO

AND

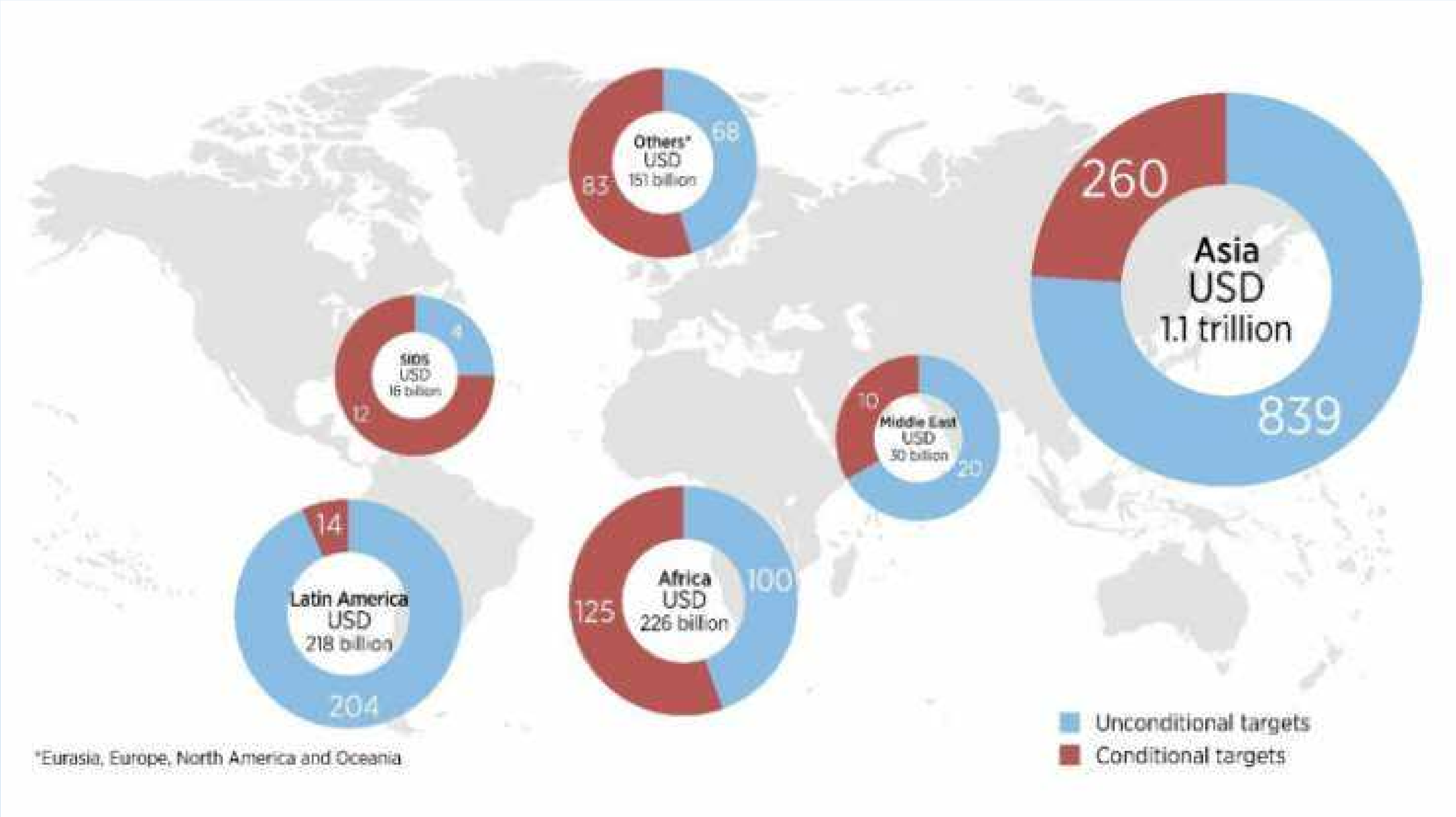
- ❑ Act NOW to secure our future

QLD has given some thought to “Energy” Zones



- These Zones could be the template for developing the New Economy Mineral supply and processing chain

Projected investment in renewable energy
(required to achieve Paris Accord Targets)



- Northern Qld is well placed to deliver the necessary New Economy Minerals

Natural Resources Used in Demand for Renewable Energy Technologies

- ✓ Cerium
- ✓ Dysprosium
- ✓ Lanthanum
- ✓ Neodymium
- ✓ Praseodymium

- ➢ Aluminium (2kg/kW)
- ➢ Copper (1 kg/kW)
- ➢ Fibreglass (14kg/kW)
- ➢ Steel/Iron (100kg/kW)

- ❖ Total Turbine Weight is 120kg/kW)

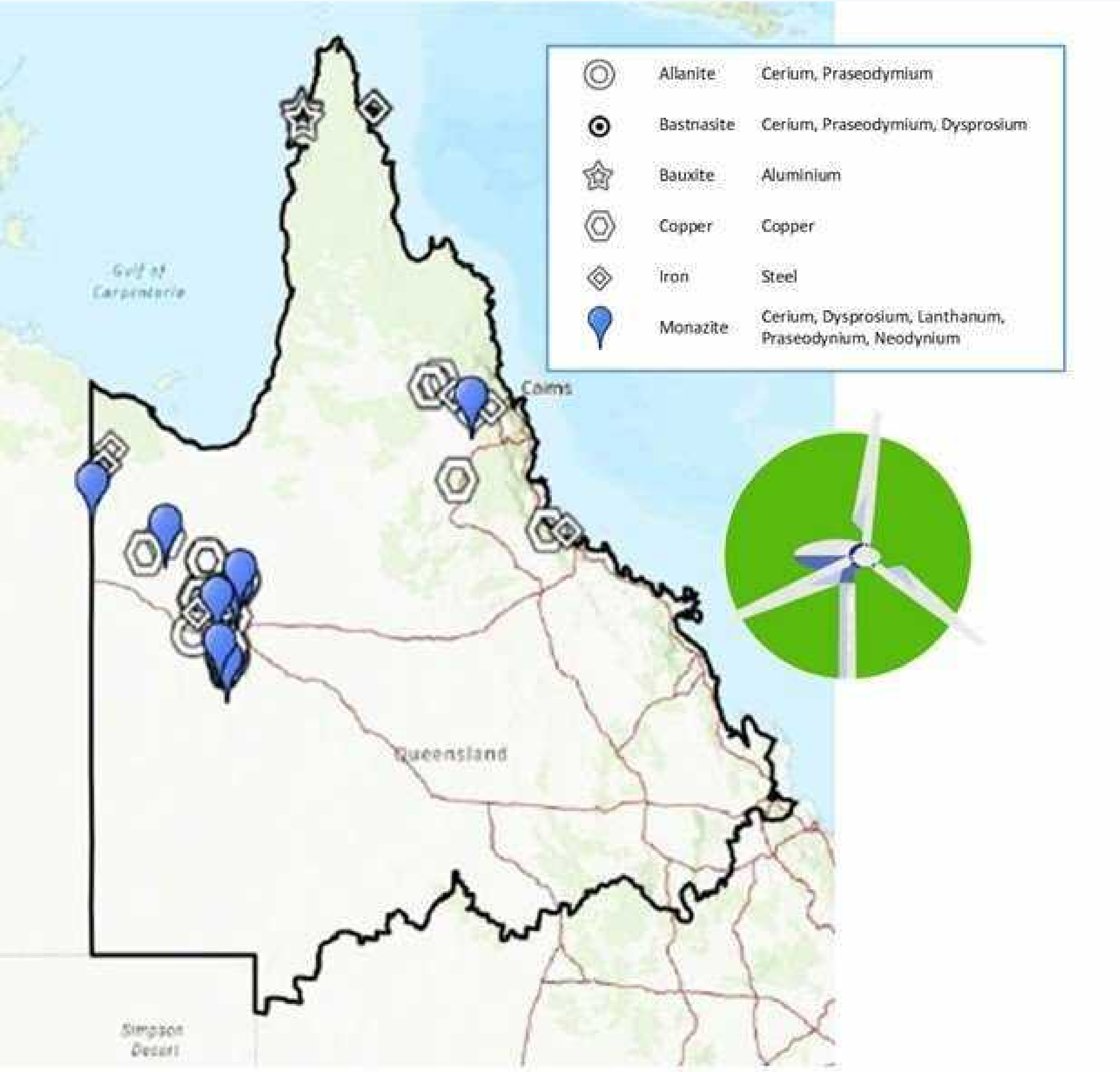
- ✓ Cadmium
- ✓ Gallium
- ✓ Germanium
- ✓ Indium
- ✓ Selenium
- ✓ Tellurium

- ➢ Aluminium
- ➢ Boron
- ➢ Copper
- ➢ Gold
- ➢ Molybdenum
- ➢ Phosphorous
- ➢ Pure silicon
- ➢ Silver
- ➢ Steel
- ➢ Titanium Dioxide

- ✓ Cadmium
- ✓ Cerium
- ✓ Cobalt
- ✓ Dysprosium
- ✓ Graphite
- ✓ Lanthanum
- ✓ Lithium
- ✓ Manganese
- ✓ Neodymium
- ✓ Praseodymium
- ✓ Tantalum
- ✓ Vanadium

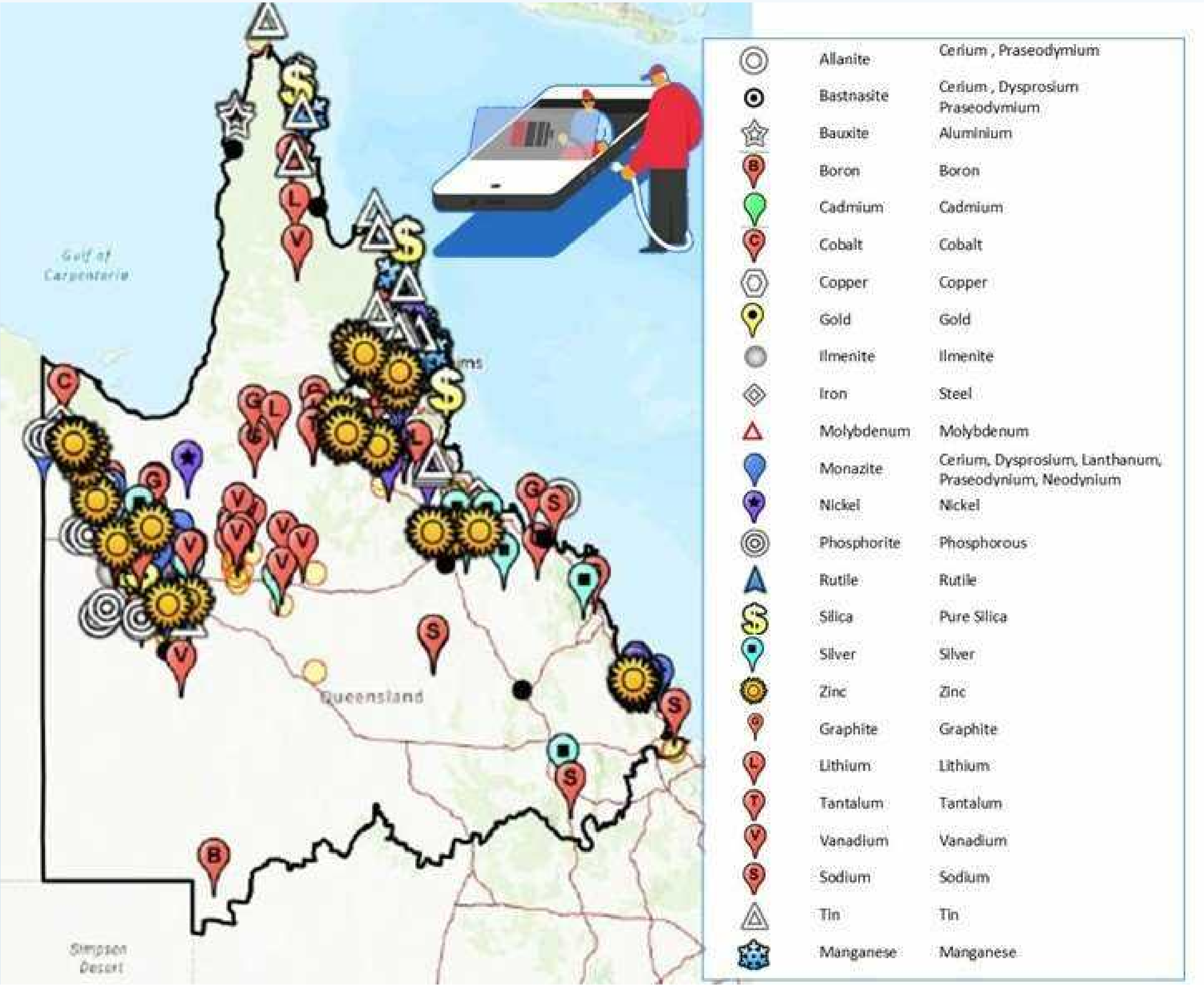
- ➢ Aluminium
- ➢ Nickel
- ➢ Silica
- ➢ Silver
- ➢ Sodium
- ➢ Tin
- ➢ Zinc

- ❑ Northern Qld has known occurrences of ALL listed New Economy Minerals

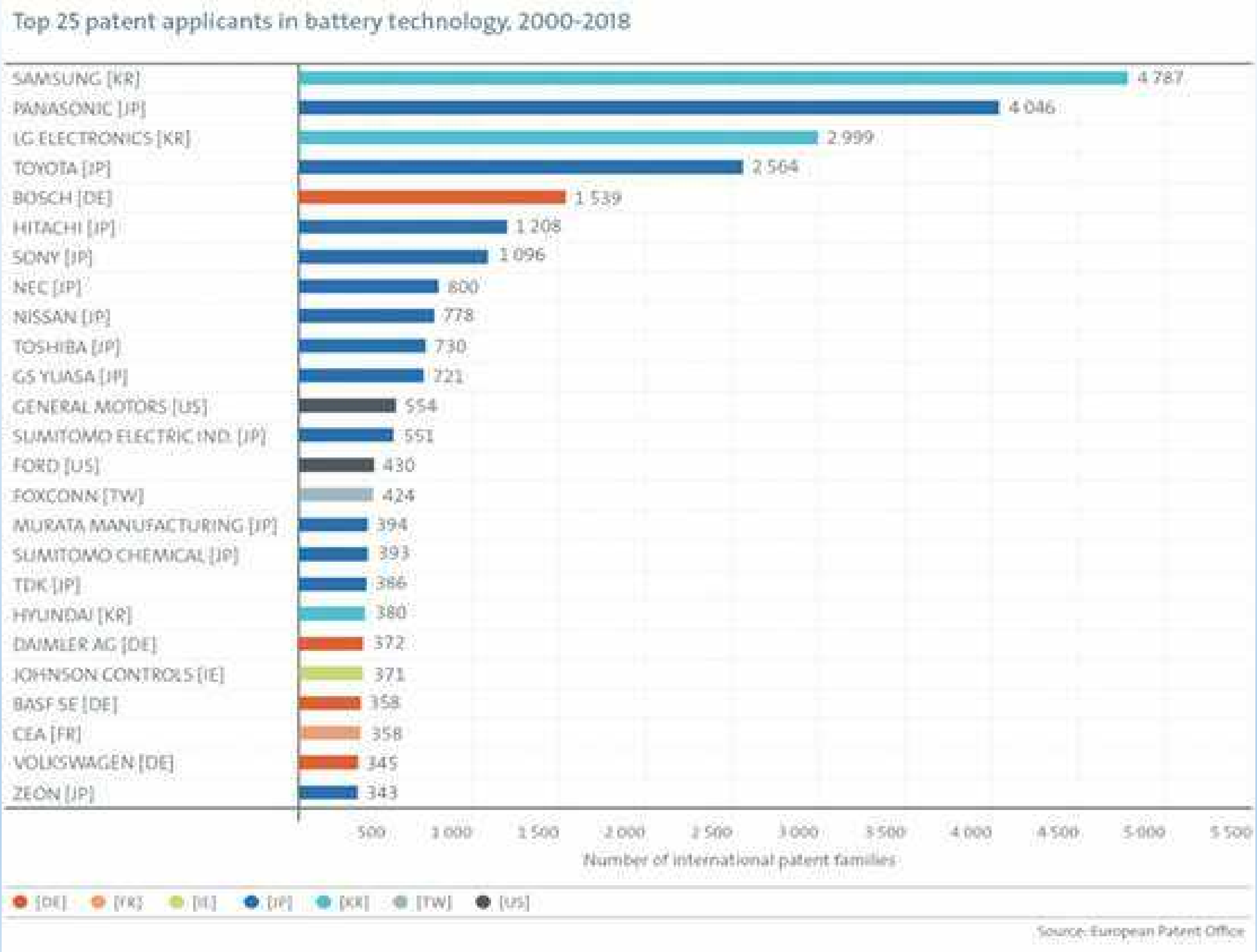


Known occurrences of minerals used in Wind Turbines

Known occurrences of minerals used in Solar Panels



Known occurrences of minerals used in Batteries


Top 25 patent applicants in battery technology, 2000-2018
SAMSUNG [KR]
4 787
PANASONIC [JP]
4 046
LG ELECTRONICS [KR]
2 999
TOYOTA [JP]
2 564
BOSCH [DE]
1 539
HITACHI [JP]
1 208
SONY [JP]
1 096
NEC [JP]
800
NISSAN [JP]
778
TOSHIBA [JP]
730
GS YUASA [JP]
721
GENERAL MOTORS [US]
554
SUMITOMO ELECTRIC IND. [JP]
551
FORD [US]
430
FOXCONN [TW]
424
MURATA MANUFACTURING [JP]
394
SUMITOMO CHEMICAL [JP]
393
TDK [JP]
386
HYUNDAI [KR]
380
DAIMLER AG [DE]
372
JOHNSON CONTROLS [IE]
371
BASF SE [DE]
358
CEA [FR]
358
VOLKSWAGEN [DE]
345
ZEON [JP]
343
500
1 000
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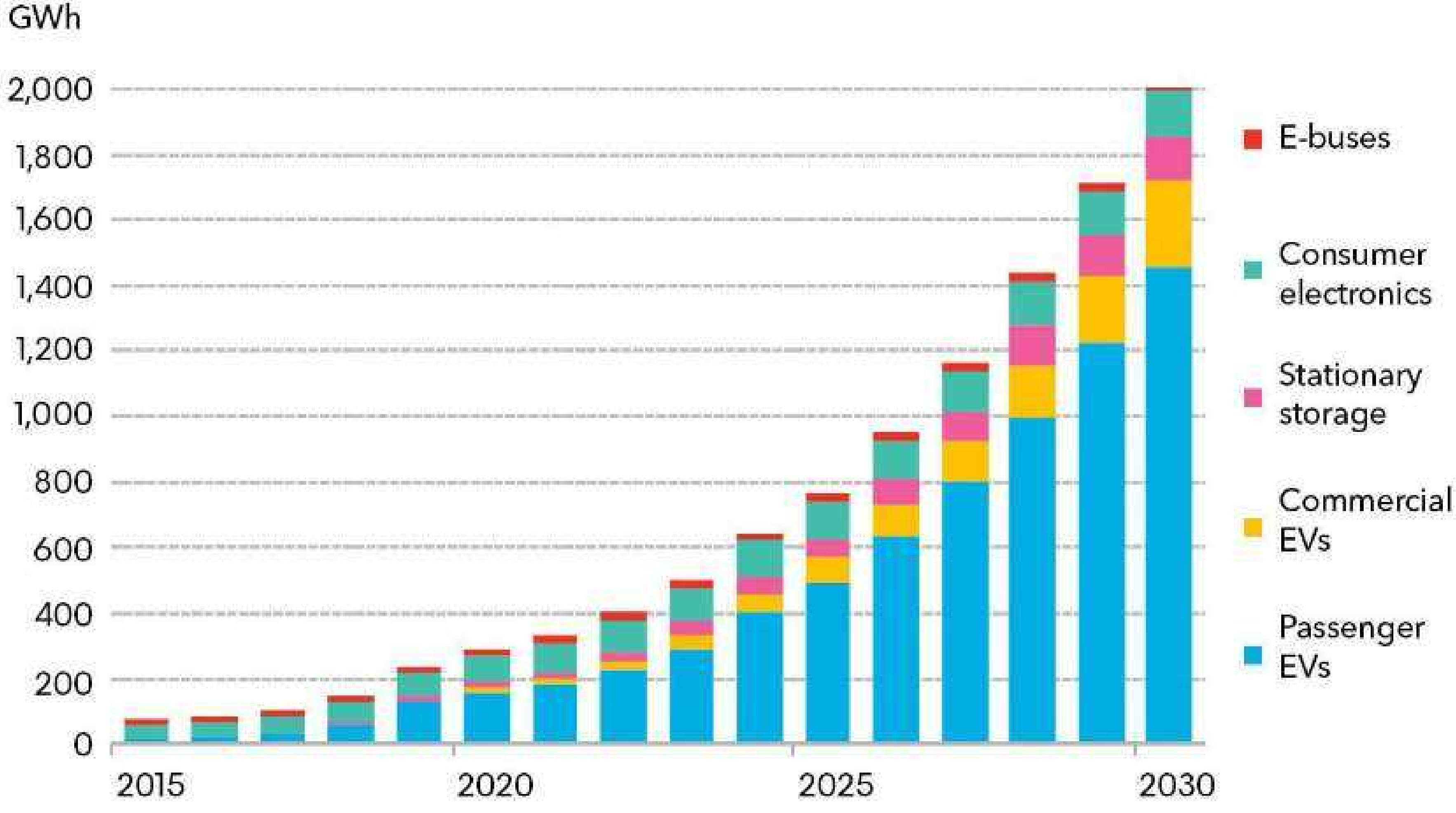
Number of international patent families
[DE] [FR] [IE] [JP] [KR] [TW] [US]
Source: European Patent Office

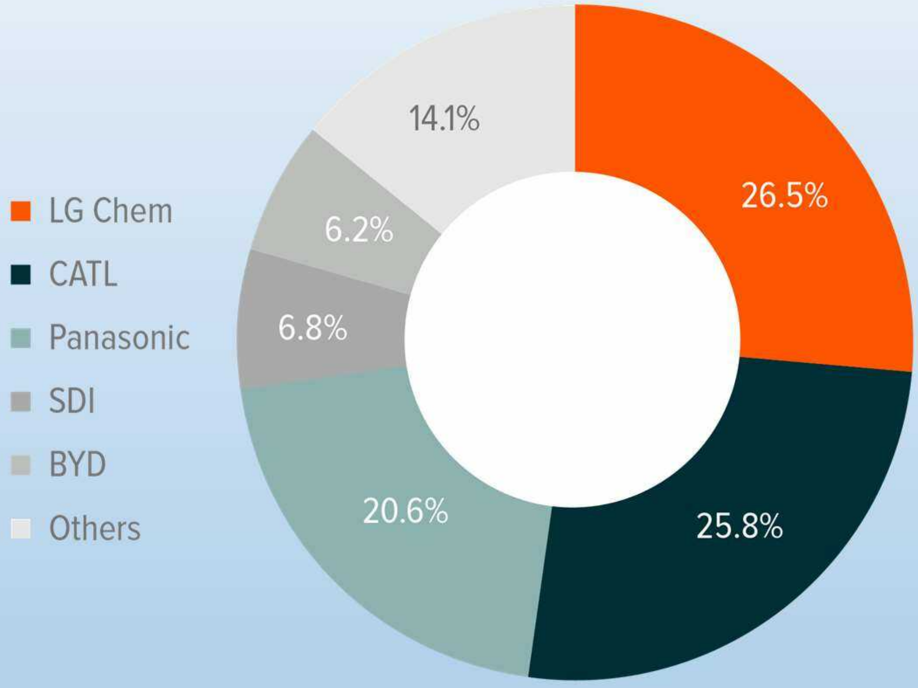
Annual lithium-ion battery demand

Source: Energy Central, 2019

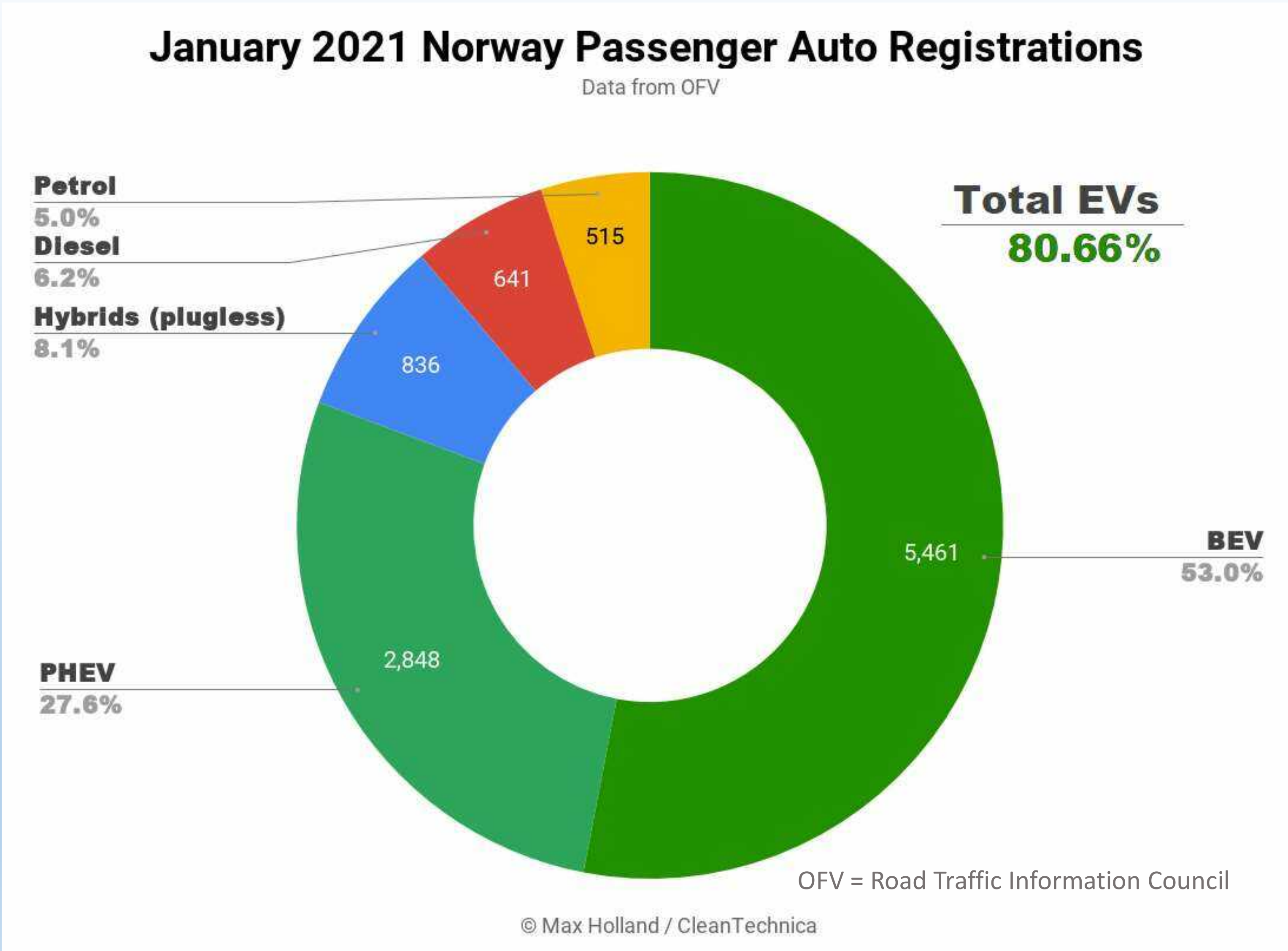


EV BATTERY MARKET SHARE (CUMULATIVE JAN-AUG 2020)

Source: Global X ETFs, The Korea Herald. Note: Cumulative battery capacity from January to August 2020.



COMPANY	GIGAWATT-HOURS (GWH)
LG Chem	15.9
CATL	15.5
Panasonic	12.4
SDI	4.1
BYD	3.7
SKI	2.7
AESC	2.2
Guoxuan	1.2
PEVE	1.2
CALB	1.2


January 2021 Norway Passenger Auto Registrations
Data from OFV
Total EVs
80.66%
Petrol
5.0%
Diesel
6.2%
Hybrids (plugless)
8.1%
515
641
836
5,461
BEV
53.0%
2,848
PHEV
27.6%
OFV = Road Traffic Information Council
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To take advantage of changing technologies, Queensland needs to:

- ✓ Define competitive advantages, including understanding international patent trends;
- ✓ Better understand established and lost manufacturing industries. For example, coal ship load and coal handling plant sectors.
- ✓ Coordinate federal and state incentives.
- ✓ Match specific New Economy Minerals used in the Renewable Energy Sector to specific mines and advanced prospects to established industries.
- ✓ Match specific miners to specific industries, and facilitate development of synergies.

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Thankyou

Any Questions?