

LITHIUM VALLEY

Establishing the Case for Energy Metals and Battery Manufacturing in Western Australia

SUMMARY DOCUMENT MAY 2018



About the authors

Future Smart Strategies offer strategic advice on business-to-business relations, business innovation, advocacy, and sustainability. They bring evidence-based advice on a wide range of market, policy and regulatory issues for commercial entities and not-for-profit organisations interested in minimising risk and maximising reputation. Their analysis team for this Regional Development Australia report included Prof. Ray Wills; Howard Buckley; David Roper; Kelvin Say and Simon Hicks.

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Curtin University Sustainability Policy Institute Professor Peter Newman has been a major instigator of this report and has been an editor of the final product.

Regional Development Australia (WA) has co-ordinated and helped to fund this report through Colleen Yates who has also been a major part of shaping the ideas.

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Forward

This report provides evidence and recommendations for why Lithium Valley could be established in WA just as Silicon Valley happened in California. The rationale is based on the science and engineering realities which show that WA has all the basic raw materials and expertise to make it happen. However, WA does not have a history of adding value to its raw materials before export. There are differences with Lithium (and the other battery metals) of the New Energy economy and that is: reliable quality, high value products, security of supply and access to other energy metals in a stable political environment. If WA can create global best practice environments that meet or exceed emerging users demands, this will attract international companies to local specialised industrial regions around the State. That is the context for our report.

The report sets out evidence in support of increasing the value added to energy metals prior to export, as the basis of the next stage of industrial development and economic expansion for Western Australia (WA). The transition to a New Energy economy is outlined as a global and local process where WA can help provide leadership and enjoy great benefits from the process. This will require policy support and infrastructure investment coordination from the Commonwealth, WA and local governments. The key enablers are all in place and the time is now otherwise the opportunity will be missed.

WA is home to the world's most accessible abundance of energy metals –lithium, rare earths, cobalt, vanadium, tin, tantalum, nickel, manganese and magnesium – essential components in energy storage devices, such as lithium ion batteries. The chemistry of energy storage devices continues to evolve, however the market for these elements is expanding rapidly and will continue to do so for the foreseeable future, due to a range of economic and environmental drivers. That market is for quality battery materials associated with Lithium Ion batteries.

WA has a transparent, western democratic and free market system of governance, offering low

sovereign risks to investors. The confidence this inspires has underpinned the development of world-leading mining, petroleum and agricultural sectors, efficient and reliable logistics infrastructure, a high-quality education system and a workforce with diverse and advanced technical competencies and associated professional services. This is a solid foundation for industrial development and growth.

WA has an unmatched array and depth of energy and mineral resources, shares direct ocean access to 2.5 billion people and has a sound long-term growth rate. WA also has abundant renewable energy resources – which are increasingly being harnessed for households and integration into industrial processes to resolve water constraints and reduce energy costs.

WA's location, small population and lack of capital have long stood in the way of greater industrial development. Historically, it was more cost effective to value add closer to large markets or in countries with large, low cost workforces. This is no longer the case. Information technologies, artificial intelligence, automation and new energy systems now favour manufacturing at the earliest point in the value chain where all the input materials can be brought together in a low, cost effective way. WA has this advantage with energy metals like no other place in the world and can offer reliable security of supply to local processing facilities. This is a unique opportunity for the State.

WA also has a special ability at making quality minerals for export as it has developed the smart technologies, software and research capability that allows very precise determination of the mineral quality along the development chain, from discovery through exploiting the resource and transporting it to individualised markets – mostly overseas. However, for Lithium there are ways now to create high quality mineral products that can be combined into electrochemical processes that are then made into batteries. There is no reason why this should not be done here.

WA is coming of age as an Indian Ocean regional trading power and an important centre for future global trade and security operations. WA's trading partners appreciate the developing strategic role the State has although Commonwealth and State policies do not yet reflect this shift, nor does the political debate suggest a proper appreciation of the scale of the opportunity for the State, Commonwealth and our alliance and trading partners.

The first signs of Lithium Valley are becoming evident with the first 'second stage processing' of Lithium being built at two sites in Kwinana and another under approval at Kemerton. It

should be recognised that these current Lithium refining announcements were based upon business decisions made months or years ago. To capture additional downstream processing a proactive approach is now required to influence further business decisions currently being made internationally.

This is an opportunity that should now be grasped. We welcome feedback on the ideas in this report on how to make this happen.

**Peter Newman, Ray Wills, Cameron Edwards
and Colleen Yates**

“ WA needs a plan and the strategy otherwise the long term benefits of the current energy metals boom will be lost. ”



Executive Summary

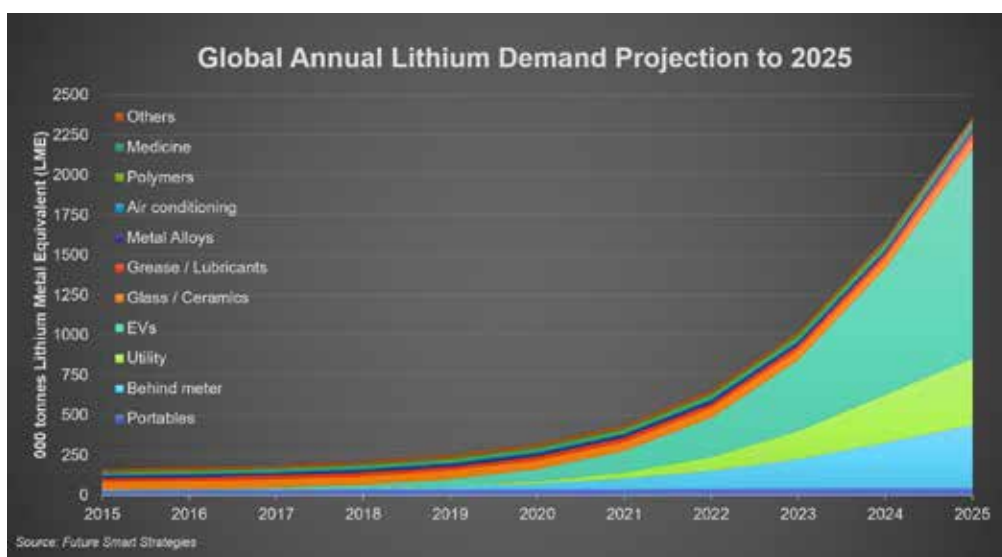
Lithium Valley is a set of collaborating and competing industries that are based around the New Energy economy of Lithium Ion-based batteries. This report sets out why Lithium Valley should be in WA due to the presence of the required minerals that are now being called energy metals. There will be various geographical locations for the industries but this report makes a case for Kwinana, Geraldton and Kemerton with other components in the Pilbara and Goldfields.

Energy metals are those that help in the supply of batteries now so critical to electricity and transport futures: lithium, nickel, manganese, cobalt, vanadium, tin, tantalum, magnesium, rare earths and others. Western Australia (WA) will continue to enjoy competitive advantages as an efficient and reliable supplier of most energy metals for the foreseeable future. By contrast developing and advanced industrial economies, have long held competitive advantages across much of the rest of the value chain. This has been a missed opportunity for WA because the economic value of goods increases sharply as they proceed up the value chain. For WA to continue its remarkable growth story it must capture more economic value per unit mined as the basis of future jobs, prosperity and strategic advantages as a trading partner.



What is the New Energy market?

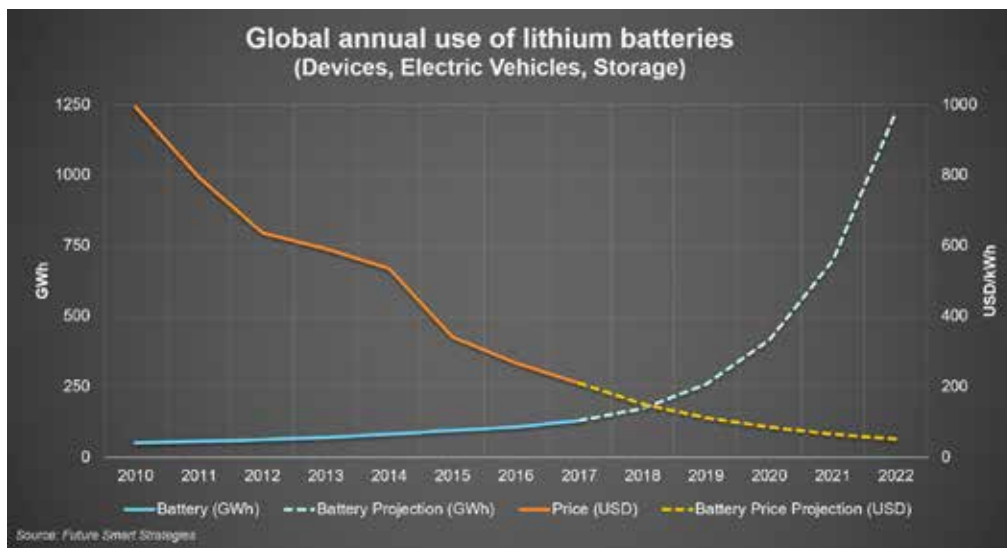
The foundation element of the new energy market is lithium. This metal is now being used in many products but increasingly in batteries for transport and electricity (Figure 1).



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Figure 1:
Global Annual
Lithium Demand
Projection to 2025

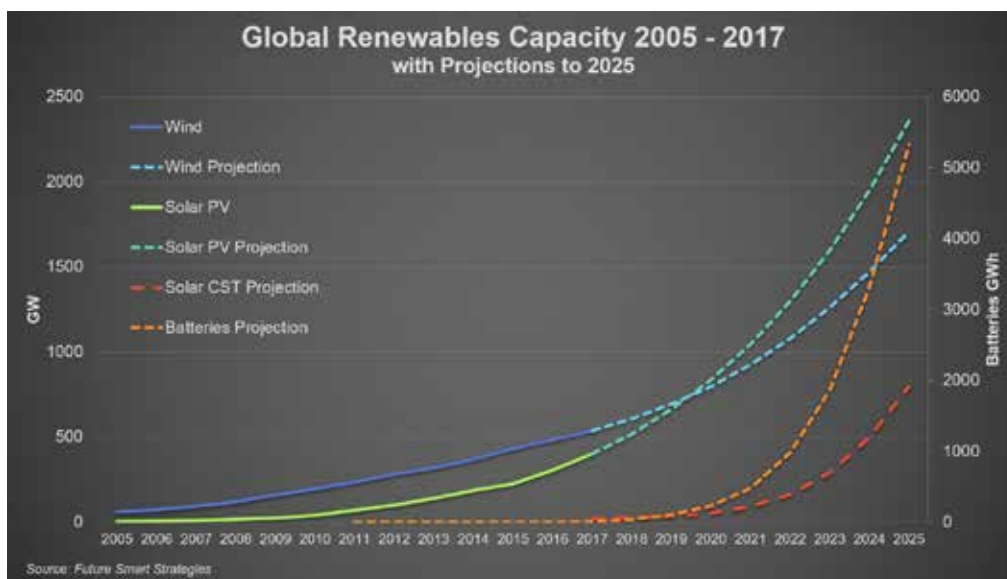
The price of lithium ion batteries has been dramatically reducing as manufacturers gear up for electricity storage and especially electric vehicles (Figure 2).



2

Figure 2:
Global Annual Use
of Lithium Batteries

Renewable energy from wind and solar requires battery storage and future projected growth in renewable energy will be met with growth in battery storage (Figure 3).



3

Figure 3:
Global Renewables
Capacity Projections

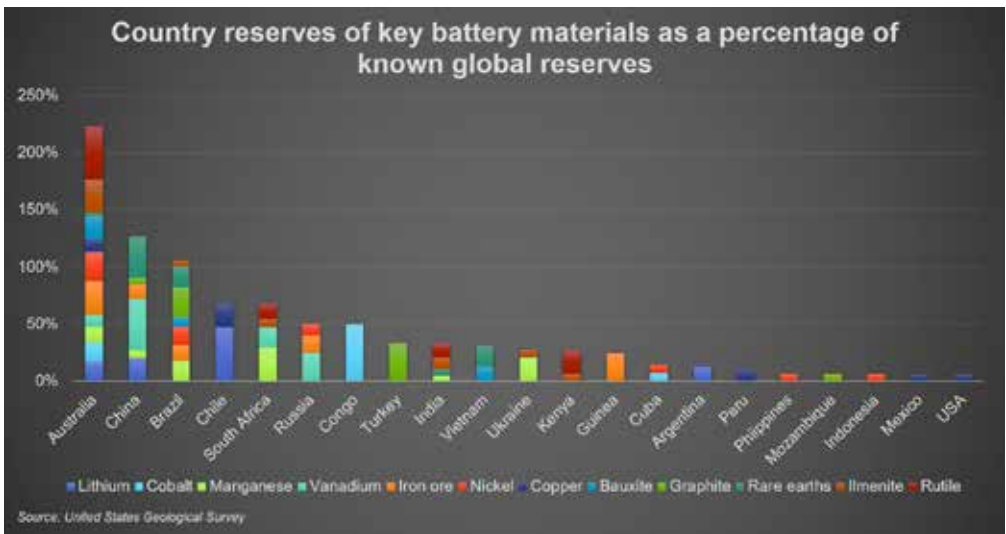
Why is WA the best place for Lithium Valley?

According to Klaus Schwab, the Founder and Executive Chairman of the World Economic Forum,¹ the world is in the middle of the fourth industrial revolution (the fourth stage). Information technologies, artificial intelligence, automation and new energy systems are the fourth stage technologies that will underpin an energy metals processing industry in WA, but the term also refers to social media, online communities, gaming, 3-D printing, genetics, breakthroughs in the materials sciences and virtual and augmented reality. Collectively, these technologies are fundamentally altering the way we live, work, and relate to one another. They are also transforming the global economy and WA's position in it.

¹ Schwab, K (2015) "The Fourth Industrial Revolution", *World Economic Forum*, Geneva, <https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab>.

Fourth stage technologies offer WA the opportunity to develop a much larger industrial base that is complementary to its world-leading resource extraction sector. These technologies shift the competitive advantage of early stage value adding away from low cost labour countries to the earliest point in the value chain where all the input materials can be brought together for highly automated manufacturing processes. Components are then shipped to the major global manufacturing centres for later stage manufacturing where proximity to markets or low -cost labour still afford an advantage. WA is in the unique position of having abundant quantities of almost all the energy metals, giving it a large advantage in electro-chemical processing.

Australia’s abundance of New Energy metals, mostly in WA, leads the world (Figure 4).

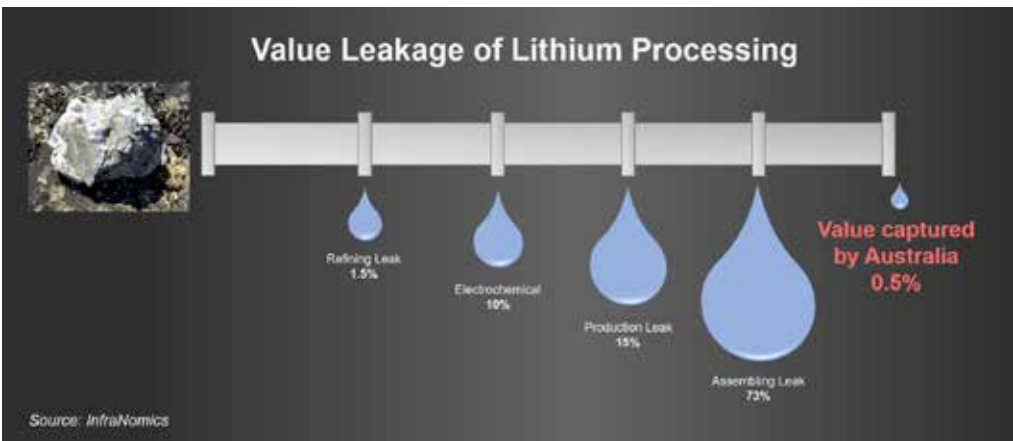


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Figure 4: Country Reserves of Key Battery Materials

A good example is lithium, as the main component (after nickel) of energy storage devices. WA has the largest hard rock reserves of lithium globally and its consistency is most suitable to manufacturing.

Almost the entire value of this important strategic resource is captured in other countries and by other processes (Figure 5). Currently Australia captures approximately 0.5% (A\$1.1bil) of lithium’s ultimate value mainly as simply processed exported ores. 99.5% (A\$213bil) of the value of lithium products is paid to Australia’s trading partners for value added through electrochemical processing, battery cell production and product assembly by WA’s trading partners. Secondary processing in WA alone would capture an additional 12-27% of the value available.



5

Figure 5: Value Leakage of Lithium Processing

WA's Western Trade Coast in Kwinana offers another important advantage. It is one of the most integrated, efficient and productive industrial estates globally. It services world scale oil and gas, resources and agricultural sectors through a concentration of refining, fabrication, chemical, research and innovation, service and supporting companies. The chemical precursors and other requirements for electro-chemical processing are already in place. It has one of the best global examples of industrial ecology with over 158 waste exchanges between industries. This is based on a strong collaborative approach represented by the Kwinana Industries Council that can be a major building block for creating Lithium Valley as outlined in the governance recommendations below.

Global competition for the emerging energy metals market is vigorous. Other countries recognise the importance of energy metals and storage devices for future growth and are concentrating significant resources to control these supply chains. WA still has the advantage of being upstream of all of them, but this will erode rapidly if competitors are able to establish long term trading arrangements and attract processing facilities to their shores. Ensuring this does not happen requires an integrated policy and infrastructure response at all levels of government to ensure the logistics and industrial infrastructure, the research and development base, as well as the policy levers are all in place to attract proponents to the State.

Table 1: Estimated Potential Employment Generation and Capital

Energy metals - lithium, cobalt, nickel, rare earths and vanadium		
Employment		
Current employment in the energy metals sector - 2017	Actual	7,291
Expected growth in direct employees until 2025	Estimate	21,480
Forecast employment in the energy metals sector - 2025		
Direct - Full Time Employment 2025	Estimate	28,771
Indirect employment 2025- multiplier 2.5	Estimate	71,927
Total energy metals sector employment 2025 *	Estimate	100,698
		A\$
Employee wages in 2025	Estimate billions per annum	\$3.33
Payroll taxes 2025	Estimate millions per annum	\$183
Economic contribution from the energy metals sector		A\$
Economic contribution of energy metals 2016/17	Estimate billions per annum	\$2.97
Potential Economic contribution mine, refining and 10% of electro chemical production per annum 2024/2025	Estimate billions per annum	\$56.52
Capital investment for the energy metals sector		A\$
Capital investment forecast for new mines, refining facilities	Estimate billions until 2025	\$13.8
Capital investment forecast for new mines, refining facilities, battery processing and recycling	Estimated billions until 2025	\$34.1

Source: InfraNomics

What are the benefits for WA?

The cost of missing the energy metals industry development opportunity, the New Energy transition, would be high for WA. The direct losses per unit of energy metals exported are substantial. The indirect losses through an opportunity forgone to expand WA's industrial and logistics infrastructure for further development by future industries would be much larger. Research conducted as part of this report estimated the following potential employment generation and capital investment from a fully developed energy metals industry in WA.

In addition, approximately 12,275 construction jobs are expected to be created by 2025.

WA is no longer remote nor positioned at the far end of global supply chains. It is at the beginning of many of them and convenient to global markets. This strategic and economic advantage will likely continue to improve as the economic rise of many nearby nations continues and Indian Ocean Regional economies drive the next global growth super-cycle. The energy metals or New Energy industries opportunity is not just about the domestic Australian market, it is almost solely focused on exports to fuel WA's trading partners in a win-win trade deal.

Commonwealth and State policies are yet to reflect WA and Australia's coming of age and its changing strategic role and associated opportunities. There is good reason to redress this oversight urgently. Trade routes are constrained, even as next generation freight vessels are poised to outgrow them. Trade flows are changing as new technologies change where it is best to refine and manufacture. Rising strategic tensions risk disruptions along the most heavily trafficked trade routes. Energy metals are at the centre of this realignment as nations race to secure access to these resources and leverage control of supply chains for economic and strategic advantage.

WA, in addition to its arrival at the centre of current and future trade and development, can service the development of a complementary and comparatively secure southern trade route. It can also guarantee freer trade in energy metals. This would be transformative for WA and Australia and represents an opportunity for WA's trading partners to participate in and benefit from investments in supporting infrastructure and resulting regional growth if the Federal and State Governments can participate with the necessary urgency.

As well as the economic driver in this New Energy metals and industry opportunity there is an element of strategic importance for Australia in the management of these vital resources that are becoming critical for the global economy. These issues are pursued in the report.

“ In addition approximately 12,275 construction jobs are expected to be created by 2025. ”

Top priorities

The top priorities identified in this report are:

1. **Quality** priority in all steps in the value chain – the fundamental driver in bringing value added New Energy-based industries to the state will be the commitment to high quality products. This will require technical and research capability, financial awareness of the opportunities to invest in quality, and governance processes that ensure this outcome.
2. Designation of **strategic resources** – strategic resources are fundamental to the long-term sustainability of WA. Strategic resources must be clearly identified and have additional focus and protection by government.
3. Establishment of a **Specialised Industrial Park (SIP)** in Kwinana – the establishment of a SIP in Kwinana will stimulate broad industry economic activity and generate jobs through the development of energy metals manufacturing and processing capabilities, development of secondary supporting industries, trading of goods at lower prices, and improving international competitiveness. It can also be the structure for a series of other governance arrangements including Strategic Environmental Assessment, that can enable the rapid development of New Energy industries on the site. It will become the base for Lithium Valley.
4. **Branding** – WA has the raw resources of minerals and skilled people to make Lithium Valley a reality. It will require much support from industry, the community and government but can become a great source of pride and value for the state. It is recommended that the state adopt a branding exercise that can help enable the state to be positioned around this idea as a global sign of how WA views its future economy.
5. **Smart royalties** – It is estimated that Australia loses up to \$90B per year in resource royalties². The royalties system must be reformed to capture this value for strategic resources at both the State and Federal levels. Dynamic, rather than flat rate royalties, may also help to incentivise secondary processing and disincentivise (but still permit) the direct export of raw materials. International examples abound of how this can be done.
6. **Domestic reservation** – to ensure a long-term supply of raw materials, a minimum analytically-determined percentage of strategic resources designated for potential local value adding should be reserved. This guarantees local supply security for processing. The minerals should be valued at market price to ensure mining companies are not disadvantaged.
7. **State strategic vision and strategy** – a roadmap with milestones and timelines for up to 20 years to underpin commercial investment decisions. Infrastructure WA could integrate this into its 20 -year infrastructure strategy, to help prioritise public and private sector investment – linking industrial, logistics and service infrastructure for maximum effect.
8. **Parliamentary Inquiry into New Energy** – all aspects of the development of the Lithium Valley concept as well as how the local energy system can transition into being a model for electricity and transport using the new energy metals for the transition in electricity generation, transmission and retail as well as the integration of electric vehicles. This can build on the existing Economics and Industry Standing Committee Inquiry into Microgrids and Associated Technologies that is showing the importance of distributed generation.³
9. **Regional Lithium Valley** – develop a globally significant E-waste recycling facility at Geraldton with its port linked to the European, Asian and Indian Ocean markets and its Narrogin Industrial Estate linked by rail to the South West and eastern states. Industrial processing is likely to be viable in Kemerton, the Pilbara and Goldfields if quality New Energy mineral products are created. All such places need to see their energy as facilitating the solar and battery transition in their own services.

² Bagshaw, Eryk (2018), "Staggering: \$90 billion lost in resources tax", *The Sydney Morning Herald*, March 12, 2018, <https://www.smh.com.au/politics/federal/staggering-90-billion-lost-in-resources-tax-20180305-p4z2uv.html>. (Accessed: 01 May 2018)

³ Economics and Industry Standing Committee (2018), Inquiry into Microgrids and Associated Technologies in WA, 21 February 2018, Legislative Assembly of WA, [http://www.parliament.wa.gov.au/Parliament/commit.nsf/\(EvidenceOnly\)/8C9FB0B8AA10E88D4825823B0019BAA3?opendocument](http://www.parliament.wa.gov.au/Parliament/commit.nsf/(EvidenceOnly)/8C9FB0B8AA10E88D4825823B0019BAA3?opendocument). (Accessed: 01 May 2018)

Recommendations - Federal Government Specialised Industrial Park (SIP)

Work with the State Government to establish a SIP over the entire Western Trade Coast.

The SIP is a globally developed approach to attract economic development; it is a port or an area of a port in which imported goods can be held or processed free of customs duties before re-export. SIPs have become common in recent years and exist around the world (EU, Middle East, Asia) to increase activity and production within the zone. In Kwinana the main advantages will be to simplify and speed up the approvals processes while also reducing operating costs through greater economies of scale. There is significant evidence that SIPs create increased employment, particularly for higher-skilled personnel, as there is a strong emphasis on value-adding. All quarantine and customs services are provided within the secured zone. The Federal Government can work with the WA State Government to develop an SIP within the Western Trade Coast area.

Encourage the transition from a combustion-driven to an electric economy

Enable Australia to be a leader in the global transition from a fossil fuels-driven economy to a renewable economy through a wide variety of policies, mandates, legislation and regulation.

The global transition to new energy metals and New Energy industries is driven by a business-based market and by governments through the Paris Agreement which Australia is committed to. Federal leadership in seeing the Lithium Valley opportunity in Kwinana as part of this agenda as well as an economic opportunity, can help place Australia as a world leader.

This would mean integrating agendas for innovation, economic development, strategic and defence planning, as well as climate change. Apart from reducing dependency on imported fuels (mitigating fuel security issues) it would stimulate local renewable industries, generate more local jobs, reduce pollution and move Australia towards a more sustainable economy while increasing national security.

Support the Establishment of a New Energy Industry CRC

Create a New Energy Industry CRC in Perth.

As economies around the world decarbonise the globally burgeoning demand to new energy products produced with Australia's abundant new energy material has been identified as a major and unrealised opportunity for Australian industry as well as research and innovation providers. There is a need to establish a CRC in New Energy Industry in Western Australia to provide the R&D that can link industry to new and emerging markets using Western Australian minerals. WA has some rapidly emerging innovative companies in the use of new energy batteries within cities and regions but does not have sufficient happening in the industry stages between mineral processing and battery use.

CSIRO has several centres of excellence in the energy storage area, in particular the Stored Energy Integration Facility (SEIF) at the CSIRO Energy Centre in Newcastle, NSW, or the Centre for Hybrid Energy Systems (CHES) in Clayton, Victoria. University researchers in WA are also doing work in this area but need a focussed and resourced CRC that can link to industry and to such resources in the east. Facilities associated with the CRC could be established at the Western Trade Coast (WTC) to maximise research

and development, commercialisation and integration in and across key industries. To maximise these facilities, specialist expertise from around the world needs to be encouraged to locate to Kwinana and to set up partnerships for mutual benefit. The core requirement that will attract people and investment to create Lithium Valley in WA is if there is a clear commitment to making the highest quality energy materials along the value chain. Battery manufacturers are already raising their quality requirements beyond what any producer can currently do. This will require world's best technical capability in the industries and universities associated with this venture. It will need smart systems for monitoring in the field and inside industrial processes and constant upgrading to be ahead of the game.

This will give the innovation edge that no other global producer of energy metals can provide.

It would provide the basis for local research and development programs to work in parallel with the producers of current-generation production of storage, power and drive components, in order to develop next generation components right through the industry stages to the utilisation of new energy in households and business across the city and regions.

Australia has considerable capability in and utilisation of advanced technology in the processing of metal ores. This capability should be incentivised to extend our technology into the processing of all of the new energy materials, especially those that lead to the production of rare earth magnets, battery precursors (cathodes and anodes) and even the extraction of key materials from complex e-waste mixes. The development of micro-grids and Peer-to-Peer trading of renewable energy is happening in Perth as a global first and can help establish the kind of research centre that will be world-leading.

A Federal Government funded CRC on New Energy Industry, supported by State Government funds already committed and announced, would be a major step towards establishing Lithium Valley industries in WA.

Commercialization of innovation

Facilitate innovation in New Energy to be commercialised.

In order to ensure the highest value return from energy metals there is a need to establish innovation support, risk management and procurement processes that can enable these new energy industries to be commercially successful.

A critical factor in the commercialisation of products from innovative or "start-up" customers is having easy access to customers. In 2017, the Queensland University of Technology (QUT) completed a three-year long project to design and produce a lithium-ion battery. The project was funded by a \$4M investment from Australian and Malaysian Governments and included construction of a pilot manufacturing plant. This is an admirable accomplishment as at current pilot plant capacity there is no direct commercial return. Research and development activity is very important however we also need to consider existing technology that is already commercially viable.

Government organisations and government trading entities have social and longer-term drivers, in particular new generation power storage and are better able to justify risks against benefits to their stakeholders. The Federal Government's new Infrastructure and Projects Finance Authority is set up to enhance risk management strategies. With this type of government support, a fully functional battery operation, perhaps based on the results of the QUT project but also potentially based around other innovation, could be up and running within one year and producing cells to meet existing commercial demands and developing next generation power storage. This is given as an example of how quickly innovation can be turned into value adding economic activity in the Kwinana SIP of Lithium Valley.

The Federal Government can thus prioritise support of local, emerging and innovative suppliers in purchasing or tendering processes as a risk-manageable means of supporting new products and

championing Australian technological innovation. Procurement guidelines in government purchases can be used to help establish markets for new energy innovations and products in Australia and especially WA.

Standards

Set high standards for refined products of New Energy minerals to promote quality.

As outlined in this report the core attraction for bringing New Energy industries to WA will be whether we have the highest quality product for their battery supply chain in the world. It is therefore recommended that the Federal Government develops new standards for refined products of New Energy minerals such as purity and grades which meet the kind of evolving world best requirements from battery producers.

Similar to import locations that require pricing resources on quality, export locations like WA could also codify standards, quality and benchmarks for a global market, such as is the process for pricing Brent crude, TOCOM gold or Iron ore 62% CFR Tianjin. This increases the international importance of products from WA as well as standardising product and increasing jobs in the testing and certification sectors. Currently the market grades for lithium are: as Lithium carbonate, min 99-99.5% Li_2CO_3 ; large biannual contracts, del continental USA, \$/kg or Lithium hydroxide, 56.5-57.5% LiOH ; large contracts, packed in drums or bags, del Europe or USA, \$/kg or Lithium hydroxide monohydrate min 56.5% $\text{LiOH}\cdot\text{H}_2\text{O}$; and technical and industrial grades, contract prices DDP Europe and US, \$/kg.⁴

The opportunity exists to standardise quality and pricing based upon an Australian standard that will centralise trading around Australian product and lead to greater value-adding local industry as part of the focus on WA as being the Lithium Valley of the world.

Prioritise selection of GST and royalties to take advantage of New Energy industry

Reform the GST model to enable New Energy industry.

The current GST system penalises states from developing resources projects as there is an imbalance between the generation of resource royalties and the subsequent redistribution as a result of the Commonwealth's horizontal fiscal equalisation model. The long-term consequences of this policy as it currently stands are unlikely to be beneficial to Australia's long-term development, especially in the resources sectors. In addition, this does not encourage value-adding industries to work with such mineral extraction. Reforms can now happen and the new energy industries opportunity provides the political momentum to adjust the model.

The Federal Government could bring to COAG the reform of royalty systems and the treatment of royalties in the Commonwealth's horizontal fiscal equalisation model as part of the on-going process of adding value in the economy through New Energy industry.

⁴Industrial Minerals (2018), Lithium, <http://www.indmin.com/Lithium.html>. (Accessed: 01 May 2018)

Foreign Investment Review Board – Strategic Resources

Include strategic resources as a new section for Foreign Investment Review Board approval.

Strategic resources should be defined although at a minimum should include lithium, cobalt, rare earths, high purity alumina, graphite, manganese and vanadium. Transactions such as the proposed Altura / Shaanxi investment highlight the opportunity to include a new class of conditions required before approval of foreign investment in this sector. For example, a condition may be that a minimum amount of investment is made in domestic downstream value-add potentially through to finished battery product. This can only be done as part of a major strategy agreed to by the Federal and State Governments to make the most out of New Energy metals and to ensure that strategic and defence issues are not compromised.

European Union Critical Raw Materials (CRM)

Ensure the EU define Australia as a Critical Raw Materials supplier.

The EU Commission publishes a list of CRM that are important for the EU economy and may have supply risk concerns. In the latest EU Commission report⁵ Australia isn't seen as a major supplier even though Western Australia has all the CRMs.⁶ It is therefore recommended that the Federal Government immediately write to the EU, to note the lack of CRM supplier status. Further, the Government could request that to assist in facilitating diversified supply of these critical materials there should be a commitment for EU companies to seek a better return for investment, technology and secondary processing facilities in Australia. Due to the environmental regulations and restrictions in Europe it may be advantageous to process in WA (where environmental laws are also strong) than export to Europe. As part of a geostrategic agreement with the EU, e-waste from the EU could be reprocessed in WA as part of a long-term concession to justify WA investment.

National recycling policy

Implement a harmonised nationwide recycling approach, potentially using the EU regulations as a guide and using E-waste as the exemplar.

The recent blocking of waste exports to China has exposed a lack of maturity in Australian waste treatment and recycling. E-waste in particular can be considered a resource for manufacturing into raw materials either for domestic usage or export. There are also likely to be synergies with new technology manufacturing and energy metals processing. In order to enable E-waste recycling as part of the new SIP area in Kwinana or associated with it somewhere else in WA, there needs to be a national strategy developed.

The choice of sites and management of such a facility would be a state responsibility, hence the focus shifts to WA.

⁵ European Commission (2017), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the 2017 list of Critical Raw Materials for the EU, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0490>. (Accessed: 01 May 2018)

⁶ Although natural rubber is not grown commercially in WA, the CSIRO has previously identified the potential viability of a local industry. http://www.pir.sa.gov.au/aghstory/industries/minor_crops/guayule. (Accessed: 01 May 2018)

Recommendations - State Government

Lithium Valley as a WA brand

Establish a branding and information program for Lithium Valley.

WA needs to grasp the opportunity provided by the New Energy economy and the extraordinary mineral resources it has to supply this, to establish the brand of Lithium Valley as a clear part of Western Australia's identity and future. By establishing this brand and following through on the more detailed recommendations below the State can be seen to have established a base for companies wanting to be part of the value chain in the New Energy economy. This can be taken around the world and help to show how WA has moved from its major dependence on the boom and bust mineral export economy.

To assist companies wanting to relocate or open operations or an office in WA as part of Lithium Valley, it is recommended to produce a database of all local companies already participating in Lithium Valley, across the necessary disciplines required (business case development, approvals submissions) and to make this database publicly available, such as on the main government department websites.

State and Federal Bilateral Approval Process

Establish Federal and State bilateral agreements on the Kwinana, Kemerton and Geraldton sites for the New Energy industries especially Strategic Environmental Assessment.

A common theme from interviews with industry was that companies arriving in WA the first time are unprepared for differences in local regulations, environmental protection approaches, heritages reviews and the approvals process. Often companies from over east or overseas are engaged and valuable time is lost through this misunderstanding. Creation of a local partnership database and capabilities register would save companies time and money in getting the right advice from local companies that understand the local environment but in reality there is a need for a streamlined approvals process.

A Strategic Environmental Assessment (SEA) is the legal process that can enable this in WA. The environmental approvals process covers all areas of potential impact and an SEA is something that is done over a wider area covering a series of potential projects rather than just one project at a time which is not efficient and is highly costly.

It is therefore recommended that bilateral approvals between State and Federal Governments be implemented through an SEA for these strategic Lithium Valley projects. It is important to do more Strategic Environmental Strategies as has been happening on the Perth and Peel 'Green Growth Plan' and a number of others across Australia. These approval processes once completed enable much quicker planning approvals for industries that can show they comply.

Unnecessarily doubling up of approvals processes, especially environmental and planning approvals, at both State and Federal levels has now been demonstrated to have been replaced by these strategic integrated processes. They should be immediately done on the SIP and NIE approvals processes.

As part of the Strategic Environmental Assessment process it is recommended that the State Government completes a checklist or map of all approvals for all industrial parks so that a 'plug and play' environment exists. This good management practice will speed up companies locating to all industrial parks but in particular the ones associated with Lithium Valley. During the interviews, several companies expressed understandable surprise that government approvals processes relating to industrial parks hadn't been completed. The impact has been unnecessary delays, costs, loss of revenues and to the State and Federal Governments, a loss of taxes.

Parliamentary Inquiry into Lithium Valley

A Parliamentary Inquiry to provide a whole of government and community response to Lithium Valley.

All government agencies and the broader community need to be brought along with this concept of Lithium Valley. There are various ways to do that but one that enables both mechanisms is a Parliamentary Inquiry. The Parliamentary Inquiry into Lithium Valley should examine all aspects of the development of the Lithium Valley concept as well as how the local energy system can adapt into being a model for electricity and transport using the new energy metals for the transition in electricity generation, transmission and retail as well as the integration of electric vehicles.

The transition that all global economies are entering can be reviewed to see how WA is managing to compete if not lead. This would then enable the Lithium Valley concept to become a focus for all agencies and in particular to enable strong and growing public support for this new future. The WA Government Inquiry into Micro Grids is already starting such a process. A Parliamentary Review can assist to gain perspective on this transition and especially to see how the value-added industries are developing. The review would be updated every five years as the transition unfolds.

Another key aspect of a Parliamentary Inquiry could be about how Lithium Valley relates to energy costs. Australia's access to energy resources of both fossil fuels and renewables is world-leading. WA is now showing leadership in the adoption of solar energy and batteries. One of the reasons for this happening is how solar energy companies in Perth have been able to commercialise roof top PV through permitting and financing that is considerably cheaper than in the US. Taking advantage of the New Energy minerals and the solar resources, energy pricing provides opportunities for reliable long-term supply that becomes a major point of difference to competitor nations and provides Australia with significant competitive advantages. The ability to offer long term, reasonably priced energy is essential for manufacturing as it allows companies to continually incrementally improve production. Australia needs to be at the forefront of how New Energy usage, pricing and delivery can stimulate energy-intensive industry growth and value-added energy services. This can be supported and sustained by the ongoing development of locally sourced and cost competitive new generation electricity generation. These matters need to be constantly reviewed.

“ Despite innovations in automation in recent years, over the last decade Australia has fallen from 23rd to 95th in the World Bank's rankings for trade across borders. On these rankings, Australia is now trading behind Albania, Nicaragua, and Swaziland. ”

Domestic reservation across energy metals

Following gas policy, set aside key strategic minerals for domestic use.

It is recommended that a domestic reservation scheme be established, based on market valuations, to ensure security of supply for local production and businesses. Security over supply is a major driver of this industry and a domestic reservation policy would encourage local value-added industry.

WA introduced a domestic gas reservation policy in 2006, which requires new gas developments to supply the equivalent of 15% of their gas exports to the Western Australian domestic gas market. The aim of the policy is to maintain domestic gas prices below export parity. Lithium, rare earths and other resources could be subject to similar domestic reservation policies in order to develop and support local business. Although a portion of the income from the resource is foregone the additional value adding from local processing increases the gross return on the original resource. Allowing the export of finite strategic resources, such as rare earths, with minimal domestic processing and without applying suitable taxes or royalties robs WA of the economic and social benefits that should come from the mining of resources that are rare and result in high value/margin products.

Off take agreements and domestic usage

Establish strategic minerals status for all New Energy materials.

Long-term product off-take agreements are usually sought by mine developers in order to underwrite the capital cost of building resource production on-stream. However, the downside of unconstrained agreements is that such agreements effectively exclude any opportunity for domestic value-add to these resources, which in turn results in lost opportunities for domestic industrial growth.

One way of enabling local value-add to be achieved is through recognising 'strategic resources' that are not just like iron ore distributed in many places across the globe but are focussed in WA. Awareness of WA's new energy metals is rapidly growing. It is therefore recommended that all "new energy" materials should be considered strategic resources. This would need to happen in partnership with the Federal Government. In order to do this it would need:

- All "new energy" materials should be considered strategic resources,
- All such strategic resources to be tracked for their economic reserves and their trade commitments,
- All off-take commitments to be subject to approval to ensure that the ability to satisfy a diversity of domestic and international customers is assured, and
- All off-take agreements to include a domestic value-add requirement.

Smart royalties

Review the royalties scheme in the light of new energy metals.

This review is needed in order to ensure an equitable return for the State from its new energy metals, to encourage the supply of strategic resources to Australia and secondary processing in WA, to discourage the exporting of unprocessed resources (especially strategic resources) and to ensure that local job creation is maximized. Resources are finite global commodities and it is further recommended that a review be conducted of comparable jurisdictions to ensure consistency of approach in this rapidly evolving industry as well as to maximize the benefits to the owners of the resources, its citizens.

Incentives

Investigate the provision of direct and/or indirect support to strategic industries using energy metals.

Support for mining and resource development is not without precedence in WA as the state geological survey continues to provide information to resource companies and the oil/gas industry was established through the WA Government's West Australian Petroleum Pty Ltd and was supported by the take-or-pay contract that brought natural gas south from the Pilbara. Other incentives can be applied to assist companies that are now wanting to establish value-added processing, for example, South Australia offers interest-free loans, payroll tax holidays, direct bulk buying orders and cheap land as incentives for targeted companies. Other Governments offer many more incentives, such as tax holidays, subsidised utilities and light regulations. WA could be more proactive to be more competitive. This approach is widely used around the world including throughout Asia, Europe and the US for attracting high value industry. It could be argued WA is in the minority by not offering such incentives for priority industries.

Beyond the provision of subsidies, it is recommended that the State Government establish well-capitalised investment funds to focus on investment in priority companies and industries. These investment funds should be commercially run and sit outside of political interference and political processes. This would be a replacement for grant schemes that are often conservative in fund allocation and are inefficient due to government processing costs. There would also need to be an assessment of State and Federal programs to deliver a more coordinated and seamless approach.

Facilitate governance of the Western Trade Coast and SIP

Establish a dedicated management authority to facilitate development for the WTC and Lithium Valley.

Currently, businesses in the WTC deal with a multiple of government departments each with different approvals, monitoring and reporting regimes. Ideally there should be only one body responsible for the Government interface, especially when an SIP is established with a focus on New Energy Industries. This would speed up approvals while also reducing costs and at the same time it would also be expected to improve compliance with regulations. It is recommended and considered critical that a statutory authority or similar be established for the development, management and marketing of new industries in the Western Trade Coast / Specialised Industrial Park. It could set the future management of other significant industrial areas such as Oakajee but should begin with a sole focus on the WTC. This would require either:

- A statutory authority be established for the whole of the Western Trade Coast, inclusive of management of the SIP; or
- The Industrial Lands Authority mandate a special purpose vehicle under their restructuring specifically to manage the WTC.

This authority would be responsible for activating, managing and promoting facilitated industrial parks within the WTC such as a Lithium Valley Park inclusive of a plug and play approach covering specifics such as utilities, visas, industrial relation services, and other opportunities to facilitate ease of entry for set up of new companies in both the energy metals and ship sustainment space. Professional management with a proactive commercial Business Development focus is critical for a successful industrial park. Activities to be carried out are further described in this document.

Regional Lithium Valley: E-cycling facilities in Geraldton and Minerals processing in Kemerton, the Pilbara and Goldfields

Develop energy metal recycling facilities at Geraldton as part of NIE as well as mineral processing in Kemerton, the Pilbara and Goldfields.

E-recycling is a critical new industry required in WA. This will involve significant investment and co-ordination between industry and government, however there are competitive advantages that can be captured if a suitable location can be found. As an international point of differentiation the development should be sustainable and use the maximum amount of renewable energy possible (wind and solar) as can be found in the Geraldton region at Narngulu Industrial Estate (NIE). Developing the technologies and skill bases to encourage recycling should be prioritised. The facility is linked by rail to the Perth region. This development should be part of NIE. Importing E-waste through Geraldton Port is feasible as it is easily accessible to NIE.

Currently more than 95% of lithium ion batteries are deposited in landfill. This has a direct impact on the exploitation of scarce resources and unsustainable extraction practices of components such as cobalt, and raises the significant incidence of fires, uncontrolled toxic waste and toxic gas release.

International sanctions on the dumping of e-waste are increasing in response to environmental and social impacts from poorly managed operations combined with under-resourced governance and protection frameworks. In comparison, Western Australia can effectively avoid social or environmental risks.

According to industry participants the demand growth for recycling of energy materials will follow the growth of their virgin components by some 5-10 years. Accordingly, there is a window of opportunity for Geraldton to combine the extractive technology capability of WA's mining industry with its recycling commitments to develop next-generation recycling excellence. The following opportunities could be considered as part of developing the NIE recycling capability:

- Waste stream across the supply chain - both mine site waste dumps, capturing waste stream from domestic and commercial outputs prior to disposal, and recovery from landfill sites.
- Encourage the discovery and commercialisation of comprehensive energy material recycling.
- Material safety standards be reviewed, enhanced as required and enforced for the handling and transport of all e-waste.
- Attract to NIE downstream industries that will reuse recycled materials, combined with virgin materials to produce additional high value-added products.
- Mandating the recycling of all e-waste.
- Phasing out of e-waste exports.

There are new mines for lithium and other New Energy metals in the Pilbara and the Goldfields. Processing of these minerals to meet the different stages of quality standards may mean it is easier to do such work near to the mines. Being able to participate in all aspects of the Lithium Valley initiative will be an advantage to these industries.



Build the infrastructure needed for the SIP and New Energy initiative

Ensure a timely framework for the transitional development of the new port in Kwinana.

The development of the new port at Kwinana is crucial to the long term strategic success of the State of Western Australia. There are four pillars of future economic opportunity that will struggle to meet demand without a port that can accommodate the volumes required for the strategic development of the state above and beyond the existing containerised shipping. These four pillars include:

- Energy Metals and Power Storage Manufacturing;
- Ship Sustainment both for Defence and Commerce;
- Establishing Western Australia as Asia's Main Source of Proteins; and
- World Class Tourism Development at Fremantle

The new port in Kwinana or WestPort as it is now known requires the road and rail links to be upgraded as well as related supporting infrastructure. This should be a priority but would be best done as a PPP project as outlined below.

Western Power access

Renewable power with battery support should be a high priority for the Kwinana region and other parts of the SWIS associated with this New Energy initiative.

With such an obvious recognition of the global transition to using renewables and batteries, the New Energy initiative should also be promoting renewables and batteries as part of any access to the SWIS grid managed by Western Power. The prioritisation of renewable energy access and the uptake of new technologies assists in establishing the system as a dynamic network model that can in itself be part of the New Energy initiative. This means that Western Power should prioritise the access to the grid of renewable projects preferably within a six-month time limit from application to connection, especially anything associated with the major sites in Kwinana and Geraldton.

New technologies such as blockchain systems enabling microgrids and smart grid support through batteries allow greater and more accurate measurement of network usage. These new technologies have the ability to improve financing, network effectiveness, asset utilisation, planning and delivery.

Developing a robust local market for the energy metals and batteries can provide a cornerstone for the industry especially when it builds on innovations already underway in WA. The prioritisation of renewable energies fits within this strategy and therefore should be encouraged by fast-tracking access associated with Kwinana and Geraldton. If the Government is committed to attracting secondary processing and electrochemical companies for battery production then a robust local market provides a strong commercial incentive.

Public-private partnerships

Lithium Valley partnerships need to invite private investment.

It is recommended that the State Government embraces Public-Private Partnership (PPP) projects to better manage risk, reduce costs and maximise economic benefits in establishing the Western Trade Coast with the New Energy initiative.

In order to assist Lithium Valley the Government needs to develop a framework for the use of PPPs to develop vital WA infrastructure and create the necessary investment opportunities. It is also recommended that the Government implement the unsolicited proposal framework completed by the Department of Premier and Cabinet.

PPPs are an important channel for attracting private investment into a wide range of projects initiated by government in areas like infrastructure and public services and there is much private investment that is needed in the New Energy era. There have only been a few PPPs in WA in recent years though the Perth Stadium project shows they can be very successful. Due to the very limited utilisation of PPPs in WA, private industry will necessarily retain doubts over funding, legal, regulatory and the political environment as long as the possibility remains that arbitrary government intervention might affect the contractual agreement entered into between public and private entities. Hence, development of a PPP framework would benefit industry by providing greater clarity and increased transparency for all parties. The use of such a framework could be trialled on the Kwinana SIP and associated industries as part of the Lithium Valley initiative.

Direct mining investment

Review the involvement of the State Government in New Energy minerals and industries.

The Government should review whether it is in the State's interest to again become directly involved with mining operations either as a majority or minority shareholder in companies that are prepared to enter into local value-added activity in the New Energy arena.

As outlined above the WA Government has a history of direct involvement in mining and resource development. The state should consider partnering in developing resource deposits if the partner companies are committed to developing quality products that would then be processed into Lithium Valley industries and associated value adding activity. The state government could be involved on a short term basis to help capture more of the benefits of these finite resources. This would particularly be to catalyse industrial activity in the SIP. Although this would be a major change from recent government policy, the current budget deficit and the dramatic changes in industry and society resulting from technological advances would justify at a minimum reviewing the risks and rewards to the state. As in the past this involvement would only need to be in the early stages of the transition to a New Energy economy.

Become a model for the circular economy

Develop a program to capture and recycle 100% treated wastewater to the southern groundwater aquifers.

The New Energy economy is also associated with what is known as the Circular Economy where wastes are minimised. Kwinana is globally known for its industrial ecology and waste exchanges that dramatically reduced wastes going into the air and water in the region. The next stage of industrial development in the region needs to take this further and use global best practice waste treatment, especially on wastewater.

It is recommended that discharges of wastewater into the sea be scaled down and eventually prohibited as soon as practically possible to enable the local development of alternative wastewater uses for agriculture and industry and maximise the economic and social benefits for the region, especially the value of Cockburn Sound. Treated wastewater with reduced dissolved salt content is a valuable but expensive commodity. The treated wastewater presently being recycled by industry from the sewage pipe passing through Kwinana is a good example of how the area can treat its waste. WaterCorp has its Managed Aquifer Recharge project that is now taking 100% treated sewage and recycling it back to the northern groundwater aquifers. The New Energy initiative in Kwinana can be used to ensure any water needed for the site is treated wastewater and any wastewater created is returned to the system as 100% treated groundwater recharge for the southern aquifers or used by agriculture or industry as part of a Circular Economy program with considerable value to the state.

State strategic plan and objectives

Provide industry with a clearer view of how Lithium Valley industries fit into its strategic objectives.

There are many reasons why the State Government needs to clarify the WA Vision of industry, employment, the environment and the economy over a 5 and 10-year period. The Lithium Valley initiative is a very good example of how a clear and committed strategy and vision of industry, employment, the environment and the economy for at least the next five to ten years, can help provide the certainty industries need for investment and the community needs to provide the political capital for government programs. Such a Strategy would then help bring all agencies and government bodies to assist with the Lithium Valley agenda.

It is considered essential that the State has a clear and committed strategy and vision of industry, employment, the environment and the economy for at least the next five to ten years. This is to provide guidance to society and industry about the desired direction for the State. For instance, the Government should:

- Clarify the short, medium and long-term strategy for energy. For instance, the EU's strategy is structured around five closely interrelated and mutually reinforcing dimensions addressing (i) energy supply security, (ii) a fully-integrated energy market, (iii) energy efficiency, (iv) decarbonising the economy and (v) research, innovation and competitiveness. Perhaps WA could have a similar strategy and execution plan.
- Create a term-limited project directorate with the authority and support to drive cooperation, collaboration and completion of the roadmap towards the WA Vision.
- Prioritise and enhance overseas efforts by WA Government resources such as WA's Agent General to the UK, and where possible orient all diplomatic missions by Western Australian Ministers in 2019 to ensure these are well informed, well integrated, well resourced, and well managed to provide the highest level of Export policy framework

The lithium sector is critical for the new energy economy. Other jurisdictions, such as Chile, around the world have imposed significant conditions on lithium extractors including term licenses, downstream investment demands, export limits and commitments to in-country value add. Australia has a significant amount of new energy resources, although it has a restricted range of customers for value added industries, yet. These can be opened up by a concerted State Government plan starting with a Strategic State Plan.

It is recommended that for all "new energy" materials, an export policy framework should be established that:

- Supports reservation of materials for local value-add;
- Supports commitments for local investment in local value industries; and
- Supports global diversification of customers.

“ The lithium sector is critical for the new energy economy. ”

Finite resources and intergenerational allocation

Review intergenerational revenue allocations.

It is recommended that the Government reviews the process of the intergeneration allocation of the benefits from finite royalty revenues, with a particular focus on implementing a scheme that is modelled on the Norwegian approach. Although Western Australia is currently blessed with abundant natural resources, there is a debt owed to previous generations who were custodians of the land and also to future generations who inherit the land. At the time of writing, all royalties are included in current yearly revenue totals and it could be argued that little is saved or invested. In addition, there has been an increase in unsustainable debt, an increase in government deficits and a growing government reliance on royalties from unsustainable finite resources (18% in 2017; 15% in 2016). The Norwegian Government's approach to the equitable allocation of finite resource royalties across the generations is widely seen as world's best practice.

State Government policy on electric vehicles

State Government review phasing out petrol and diesel vehicles by 2030, especially in metro areas.

Global Governments in nations and cities are regulating and incentivising to phase out petrol and especially diesel in favour of electric vehicles. This can be seen as a help to the environment but it also helps facilitate the New Energy transition.

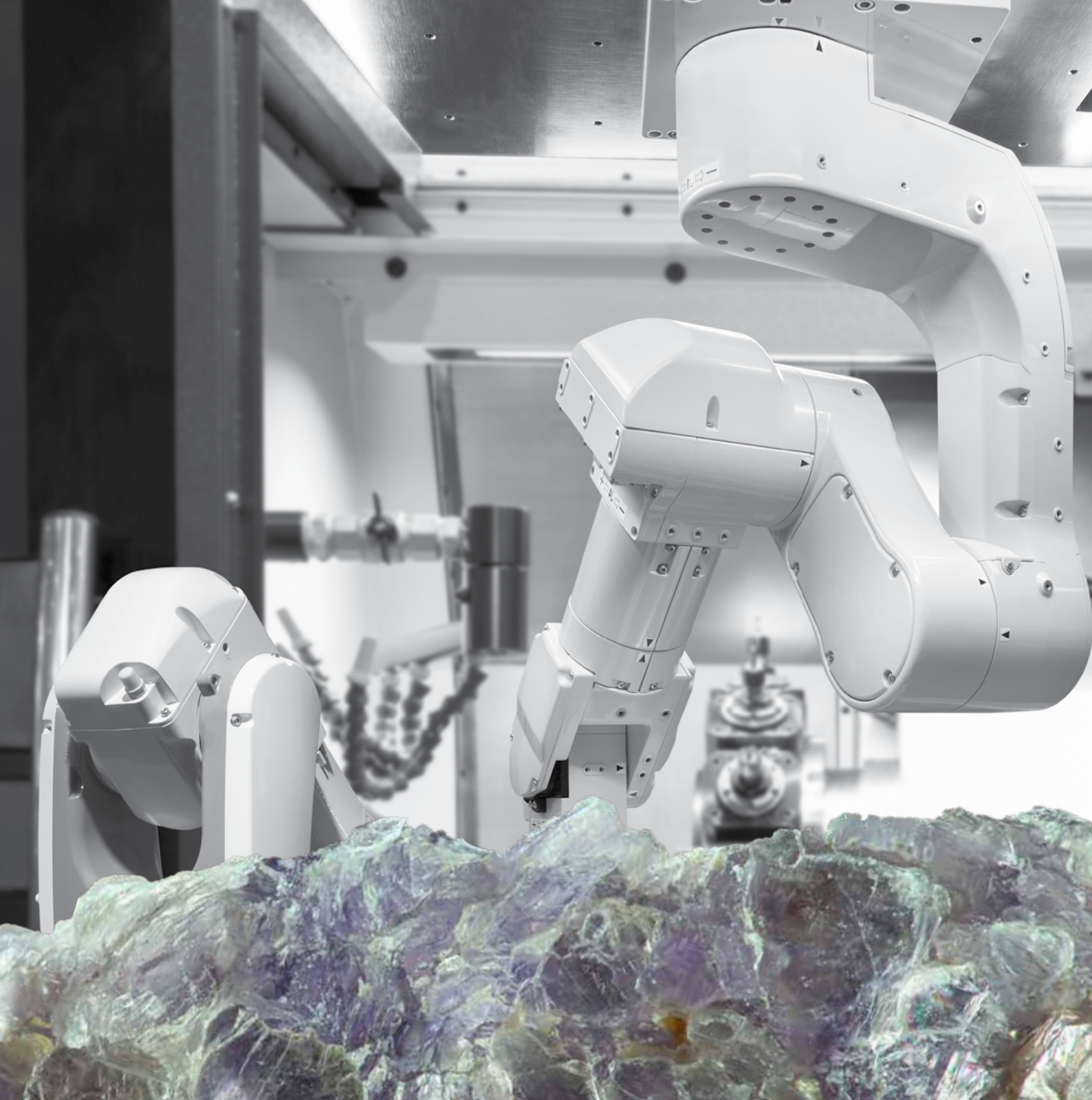
The WA power network is preparing for a significant increase in electric vehicle (EV) usage. The Government of Norway has incentivized EVs and seen 40% of new cars sold in Norway being EVs. Several European Governments are discussing banning petrol and diesel engines over the next fifteen years: The Netherlands by 2025, Paris by 2030 and even Germany is investigating phasing out petrol and diesel engines in favour of EV and gas around 2030. Eighty per cent of WA's light vehicles could be accommodated on the network without significant investment and this would increase electricity usage (approximately 8-11%) and increase revenues to the State Government. Greater numbers of EVs for the local market would increase the demand for batteries and assist to underpin local battery production. Other benefits would be reduced pollution, improved fuel security, new industries and jobs, cheaper vehicle purchase and maintenance costs, health and safety benefits and reduced imports of foreign petroleum products.

Most importantly the policy would provide a strong signal to the world that WA is taking seriously the New Energy economy and wants to play a big part in its development locally.

European Union Critical Raw Materials (CRM)

WA initiate EU support over Lithium Valley through CRM status.

As outlined above the EU Commission publishes a list of CRM that are important for the EU economy and may have supply risk concerns. In order to assist WA's minerals being placed on this list it is recommended that the State Government assist in facilitating diversified supply of these critical materials with WA companies in return for investment, technology and secondary processing facilities. As part of a geostrategic agreement with the EU, e-waste from the EU could be reprocessed in WA as part of a long-term concession to justify WA investment. Thus this approach can be part of the branding and promotion of Lithium Valley to the EU and its companies that may be interested in investing here. Due to the emphasis on quality that is expressed through standards, environmental regulations and strong technical and transparent monitoring of products, the Lithium Valley brand can be something for WA to use as a major means of creating our future.



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