Renewable Energy
Superpower: Beyond the Rhetoric

ALP Conference
17 August 2023
The challenge facing Australian industry policy in light of the US IRA

1. The Global Energy Transition
2. Energy Transition: China leads the world; and this is a global technology and investment race
3. The US IRA Changes Everything – A race to the top
   • South Korea re batteries
4. The Australia-US Compact: Climate change, critical minerals and clean energy is the third pillar of the Australia-US alliance; Australia’s Critical Minerals Strategy
5. Australian Exports – Embodied Decarbonisation

*Australia needs another $100bn of public strategic capital to crowd-in $200-300bn of private capital*

Tim Buckley, Climate Energy Finance, Sydney – Please note this is public interest research, CEF does not provide general or specific financial advice.
1. The Global Energy Transition

The move to zero emissions renewable energy is deflationary, in absolute terms, and recently relative to hyperinflation of fossil fuel commodities.

The Cost of Renewable Energy Has Plummeted

Cost of building and running new power plants, in dollars per megawatt hour

Emissions must fall to zero by mid-century to meet global target.

Source: Bloomberg NEF July 2023
1. The Global Energy Transition

There is nothing slow, orderly or ambiguous about global momentum in the energy transition

Source: IEA Critical Minerals Market Review July 2023
1. The Global Energy Transition

Global Investment Needed to reach Net Zero by 2050
## 2. China Leads the World in Renewable Energy

China installed 108GW of Wind and Solar in 1HCY2023, and is on track to deliver their 1,200GW by 2030 RE target 6 years early.

### New Capacity Installed in China in Jan-June 2023

<table>
<thead>
<tr>
<th>Capacity Type</th>
<th>Jan-June 2023</th>
<th>Share of new adds (%)</th>
<th>Change (yoy %)</th>
<th>Jun-23</th>
<th>Share of new adds (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Power</td>
<td>GW</td>
<td>26</td>
<td>18%</td>
<td>97%</td>
<td>4.0</td>
</tr>
<tr>
<td>Hydropower</td>
<td>GW</td>
<td>5</td>
<td>4%</td>
<td>-43%</td>
<td>1.0</td>
</tr>
<tr>
<td>Nuclear Power</td>
<td>GW</td>
<td>1</td>
<td>1%</td>
<td>-48%</td>
<td>0.0</td>
</tr>
<tr>
<td>Wind Power</td>
<td>GW</td>
<td>23</td>
<td>16%</td>
<td>78%</td>
<td>6.6</td>
</tr>
<tr>
<td>Solar Power</td>
<td>GW</td>
<td>78</td>
<td>56%</td>
<td>154%</td>
<td>17.2</td>
</tr>
<tr>
<td>Other (Biomass, W2E)</td>
<td>GW</td>
<td>7</td>
<td>5%</td>
<td></td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Total capacity added</strong></td>
<td><strong>GW</strong></td>
<td><strong>141</strong></td>
<td><strong>100%</strong></td>
<td><strong>104%</strong></td>
<td><strong>30.4</strong></td>
</tr>
<tr>
<td>Variable Renewable adds</td>
<td>GW</td>
<td><strong>108</strong></td>
<td>77%</td>
<td>112%</td>
<td>25.4</td>
</tr>
<tr>
<td>Zero Emissions Capacity Adds</td>
<td>GW</td>
<td>115</td>
<td>82%</td>
<td>106%</td>
<td>26.4</td>
</tr>
</tbody>
</table>

*Source: NBS, CEF Estimates*
2. China Leads the World in EVs

China EV share in June 2023 was 34% of total passenger sales. And Year to date China EV sales +44% yoy.

<table>
<thead>
<tr>
<th>China Automobile Sales</th>
<th>Jun-23</th>
<th>YoY</th>
<th>Market Share</th>
<th>YTD 2023</th>
<th>YoY</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Vehicles</td>
<td>2,268,000</td>
<td>5%</td>
<td></td>
<td>11,268,000</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>EVs</td>
<td>767,000</td>
<td>35%</td>
<td>34%</td>
<td>3,577,000</td>
<td>44%</td>
<td>32%</td>
</tr>
<tr>
<td>of which BEVs</td>
<td>535,000</td>
<td>19%</td>
<td>24%</td>
<td>2,555,000</td>
<td>31%</td>
<td>23%</td>
</tr>
<tr>
<td>of which PHEVs</td>
<td>232,000</td>
<td>93%</td>
<td>10%</td>
<td>1,022,000</td>
<td>91%</td>
<td>9%</td>
</tr>
<tr>
<td>Export</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Vehicles</td>
<td>312,000</td>
<td>58%</td>
<td></td>
<td>1,780,000</td>
<td>88%</td>
<td></td>
</tr>
<tr>
<td>of which EVs</td>
<td>75,000</td>
<td>176%</td>
<td>24%</td>
<td>516,000</td>
<td>164%</td>
<td>29%</td>
</tr>
</tbody>
</table>

*Source: China Association of Automobile Manufacturers, Climate Energy Finance calculations*
2. China Leads the World on Mineral Processing

Supply chain security, cheap RE and resource ownership means Australia should be leveraging our new competitive advantages to lead the global energy transition.

Source: IEA Securing Clean Energy Technology Supply Chains July 2022

Think ‘China +1’
## 2. China Leads the World in Renewable Energy

Solar manufacturing scaling up at unbelievable speed

### Installed and announced manufacturing capacity, relative to 2030 levels needed in IEA net zero scenario

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
<th>Announced as of late 2022</th>
<th>Announced as of end-1Q 2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PV</td>
<td>29%</td>
<td>40%</td>
<td>103%</td>
<td>165%</td>
</tr>
<tr>
<td>Batteries</td>
<td>6</td>
<td>11</td>
<td>78</td>
<td>97</td>
</tr>
<tr>
<td>Electrolyzers</td>
<td>4</td>
<td>5</td>
<td>46</td>
<td>57</td>
</tr>
<tr>
<td>Heat pumps</td>
<td>25</td>
<td>30</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>Wind</td>
<td>24</td>
<td>25</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Think of ~1,000GW pa of solar installs globally by 2030

The IEA APS assumes 290GW pa 2022-2030 (~400GW by 2030);
NZE scenario assumes 462GW pa 2022-2030 (~600GW by 2030)

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### Massive PV Manufacturing Complex In China

**JinkoSolar Plans RMB 56Bn Vertically Integrated Solar PV Production Compound In Shanxi**

25 May 25 2023 Taiyang News

- JinkoSolar has entered an investment framework agreement for a large scale manufacturing complex in Shanxi
- It will host monocrystalline silicon pull rod, silicon wafer, high efficiency solar cells and modules with 56 GW annual capacity each
- Phase I and II with 14 GW capacity for each of the products are planned to enter commercial operations in Q1 and Q2 of 2024

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Source: Bloomberg, Multiplying Solar and Battery Factories Put Net Zero in Closer Reach, 25 May 2023


3. US Inflation Reduction Act 2022

~US$800bn funding => a resurgence in US manufacturing post the IRA

FACT SHEET: Bidenomics Has Driven $500 Billion in Private Sector Investments Across the Country, Is Growing South Carolina’s Economy From the Middle Out and Bottom Up

President Biden’s economic agenda—Bidenomics—is growing the American economy from the middle out and the bottom up, not the top down. Tomorrow, President Biden will announce that companies have committed over $500 billion in manufacturing and clean energy investments in the United States since the beginning of his Administration. The President will visit South Carolina, where companies have announced $11 billion in manufacturing and clean energy investments, and the Biden-Harris Administration has already awarded $2.6 billion in funding for infrastructure projects. The President will highlight that Enphase Energy is joining a growing list of companies beginning clean energy manufacturing operations in the United States—mobilized directly by President Biden’s Inflation Reduction Act—creating 1,800 new jobs nationwide, including up

3. Korea’s Refocus on the US IRA

Battery Makers Plow $31 Billion Into Remaking Korean Steel Hub

*The city of Pohang built up a world class steel industry over decades. Now it’s turning to EV batteries.*

President Yoon Suk Yeol said ‘the government and companies including Samsung Electronics Co. will pour US$422 billion into areas such as chips and EV in the nation’s most aggressive effort yet to win a heated global race for tech supremacy’

A South Korean city home to one of the world’s biggest steelmakers is betting its manufacturing expertise, billions of dollars in investments and government incentives can help it dominate a 21st century industry: electric vehicle batteries.

Companies in the south-eastern hub of Pohang — famous for *Posco Holdings Inc.* steel mills and one of the country’s elite universities — are aggressively building out EV battery campuses as automakers hurry to find reliable suppliers outside China. Three South Korean giants in the global battery market — LG Energy Solution Ltd., Samsung SDI Co. and SK On Co. — have promised 40 trillion won ($31 billion) in domestic investments with their local suppliers.
4. Australia’s Critical Minerals Strategy

South Korea-Australia Integrated Mining-Batteries-EV Cooperation

A VALUE-ADDED CRITICAL MINERALS BILATERAL AGREEMENT FOR AUSTRALIA AND SOUTH KOREA

Australia’s imperative to create a mutually-beneficial bilateral agreement with South Korea, leveraging the US Inflation Reduction Act to complement Korea’s battery industry and value-add onshore

Matt Pollard, Global EV Supply Chain Analyst, CEF
Tim Buckley, Director, CEF
Dr Annemarie Jonson, Director Communications

29 June 2023

Source: Climate Energy Finance
www.climateenergyfinance.org
4. Australia-US Compact

Climate change, critical minerals and clean energy is third pillar of the Australia-US alliance

The US will back Oz for COP31 in partnership with our Pacific neighbours.

Supply chains: Oz treated as a US domestic source; but unlikely direct US subsidies to Oz projects;

The Quad investor network, EFA-US EXIM collaboration

Australia and the United States commit to enhance bilateral cooperation under a Climate, Critical Minerals and Clean Energy Transformation Compact (the Compact), establishing climate and clean energy as a central pillar of the Australia-United States Alliance. Australia and the United States recognise the importance of addressing the climate crisis as a critical component of the bilateral relationship. The Compact is a framework which is designed to advance ambitious climate and clean energy action this decade, at home and abroad. The framework intends to coordinate policies and investments to support the expansion and diversification of responsible clean energy and critical minerals supply chains, accelerate the development of markets for established and emerging technologies, meet the growing energy and adaptation needs of the Indo-Pacific, and enhance the region’s role as a driver of resilient and sustainable global prosperity.

Source: Whitehouse, 20 May 2023
4. Australia’s Critical Minerals Strategy

This could add $134bn to Oz GDP and create 262,600 new jobs by 2040 =>
“Proportionate” response:

- $500m funding for NAIF (new)
- $225m to Geoscience Australia
- $100m critical minerals development program.
- $2bn EFA critical minerals facility
- NRF: $3bn Low emissions tech
- NRF: $1bn Resources value-add
- $50m Australian Critical Minerals R&D Hub
- $57m Critical Minerals International Partnerships
- Powering the Regions Fund: $1.9bn
- $3.1bn Australian Apprentices Incentive System
- $500m Jobs & Skills Councils
- $105m New Energy Apprenticeships

Another critical minerals review 2026

Another $100bn of public capital to crowd-in $200-300bn of private capital

Source: Resource Minister King, 20 June 2023
5. Exporting Embodied Decarbonisation

Australia needs to move on from the ‘dig-and-ship’ view

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**ASX / MEDIA ANNOUNCEMENT**

**Wednesday, 2 August 2023**

**FINAL INVESTMENT DECISION FOR MID-STREAM DEMONSTRATION PLANT**

BOARD APPROVAL GRANTED FOR CONSTRUCTION OF DEMONSTRATION PLANT TO PRODUCE VALUE ADDED LITHIUM PRODUCT AT PILGANGOODA.

PROJECT SEeks to DEMONSTRATE POTENTIAL TO IMPROVE THE BATTERY MATERIALS SUPPLY CHAIN THROUGH DECARBONISATION OF SPODUMENE PROCESSING, REDUCTION IN TRANSPORT VOLUMES AND INCREASED VALUE-ADD PROCESSING AT THE MINE SITE.

- Independent Life Cycle Assessment studies estimate that converting spodumene using electric calcination when using 100% renewable energy has the potential to reduce calcination carbon emissions intensity by >80%, which would materially reduce carbon emissions in one of the most energy intensive steps of the lithium battery materials production process.

- Delivering a more lithium-enriched mid-stream product has the potential for industry wide benefits including reduced transport of waste, greater value creation and utilisation of the mineral resource and unlocking future assets with limited transport infrastructure.

- Estimated construction costs of $104.9M will be partially funded with a $20M Australian Government grant² with Pilbara Minerals now funding $67.4M of the remaining budgeted construction expenditure.