



CLIMATE ENERGY FINANCE

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**The global energy
transition**

GMR Energy

4 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 and EU NZIA (Net Zero Industry Act), India's solar PLI, Japan's GX Roadmap, Canada critical minerals strategy & 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. Exporting Embodied Decarbonisation

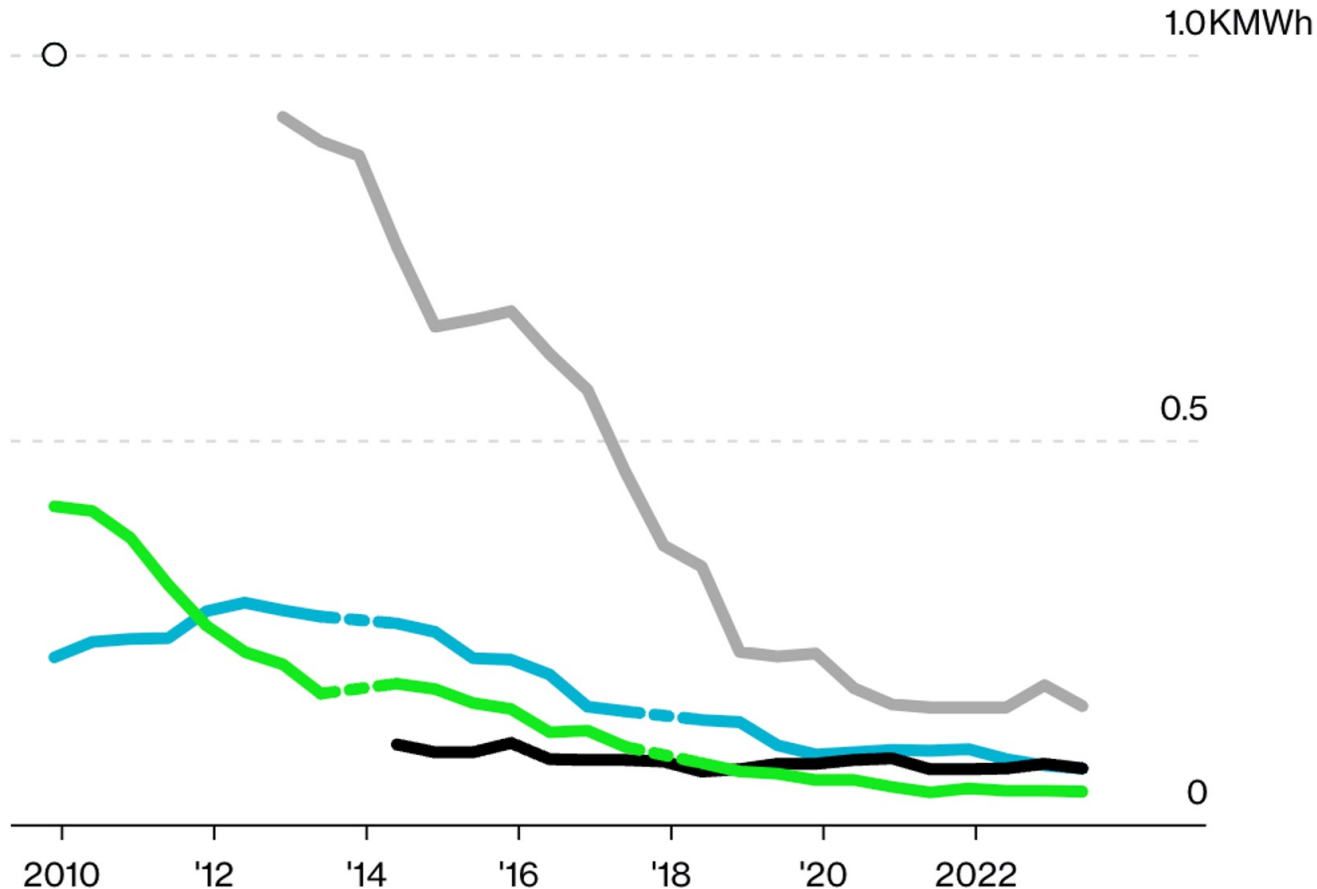
Financial markets are all about the rate of change

1. The Global Energy Transition

The move to zero emissions renewable energy is deflationary.

Key energy technologies are challenging or beating coal-fired power

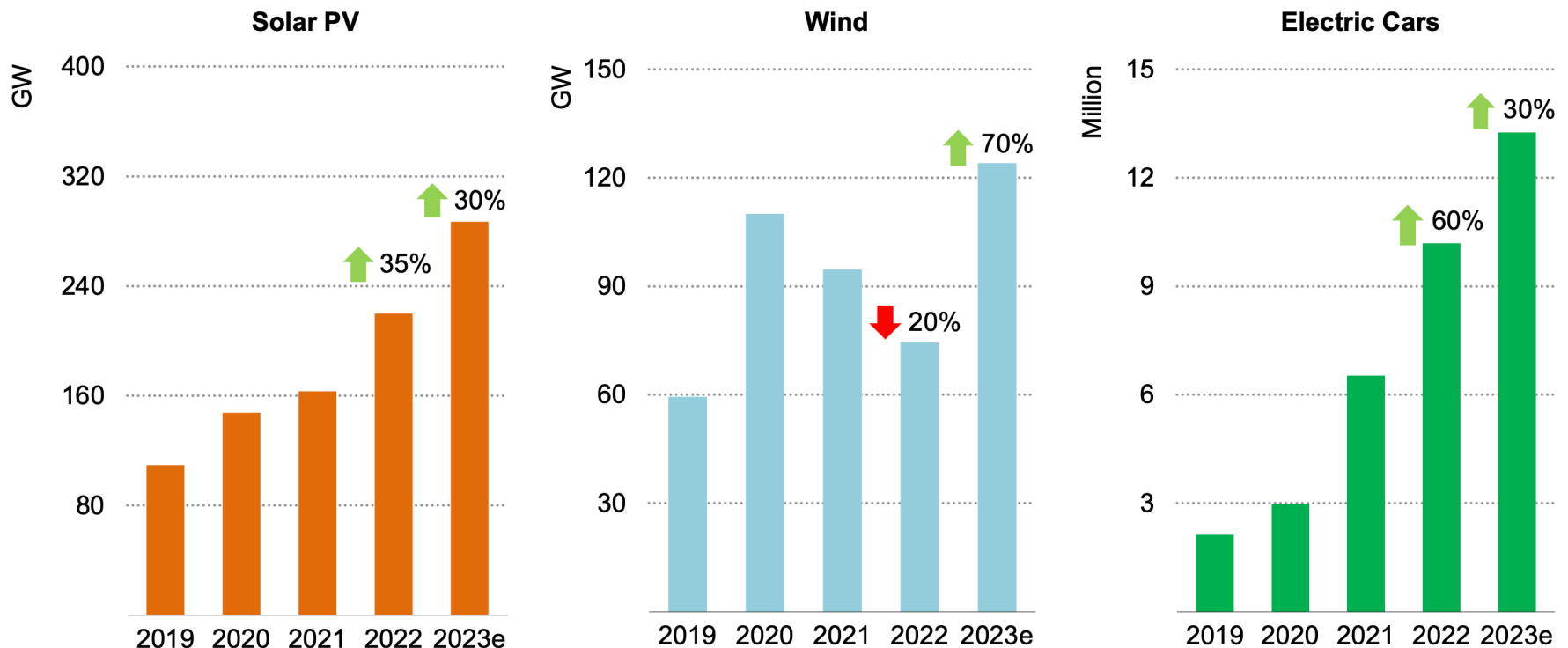
■ Solar ■ Coal ■ Utility-scale battery ■ Offshore Wind



1. The Global Energy Transition

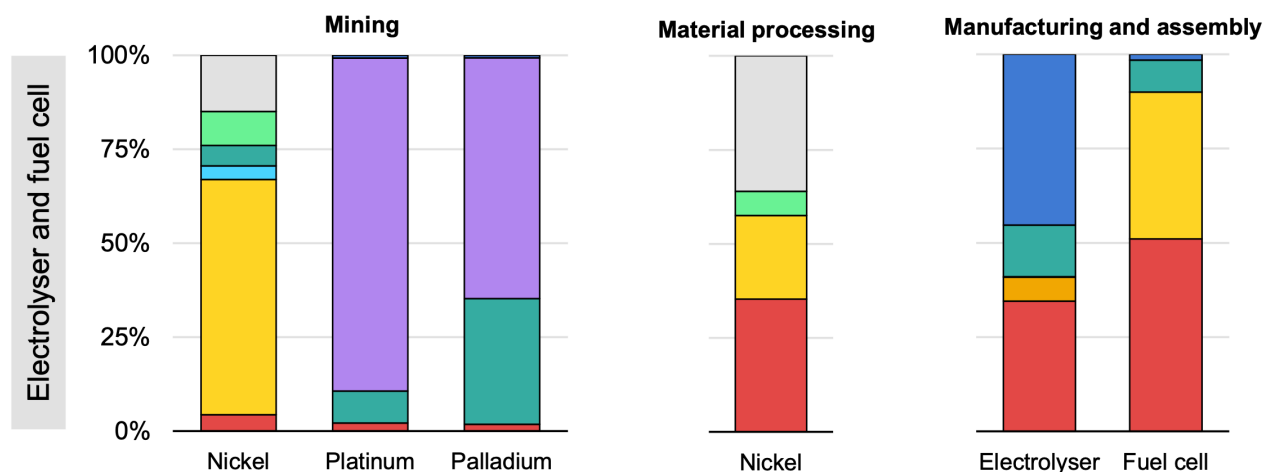
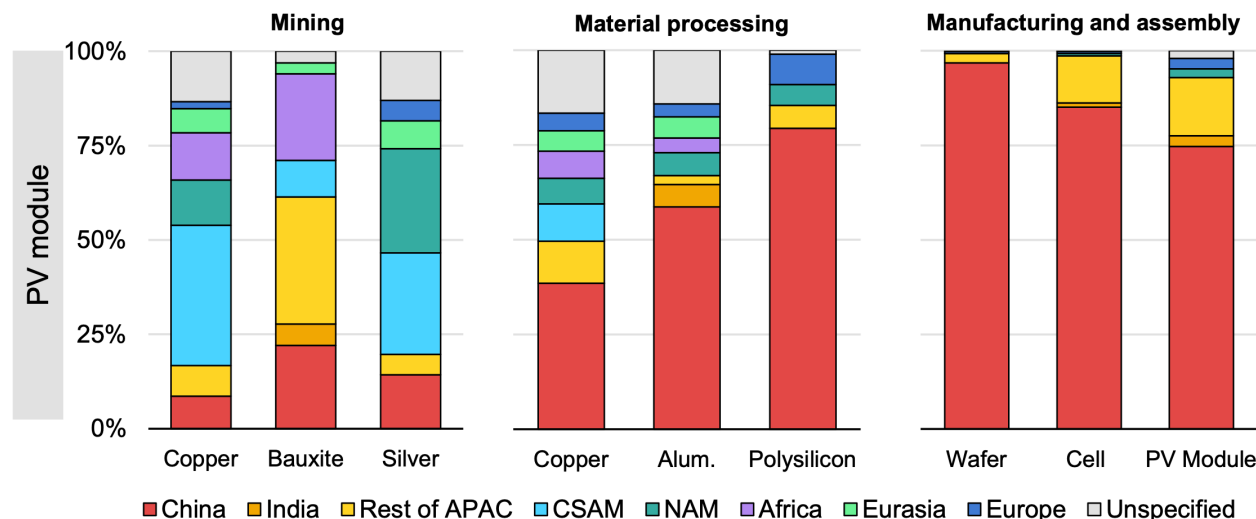
There is nothing slow, orderly or ambiguous about global momentum in the energy transition

Annual capacity additions for solar PV and wind and electric car sales



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



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

		Jan-June 2023	Share of new adds (%)	Change (yoy %)	Jun-23	Share of new adds (%)
Thermal Power	GW	26	18%	97%	4.0	13%
Hydropower	GW	5	4%	-43%	1.0	3%
Nuclear Power	GW	1	1%	-48%	0.0	0%
Wind Power	GW	23	16%	78%	6.6	22%
Solar Power	GW	78	56%	154%	17.2	57%
Other (Biomass, W2E)	GW	7	5%		1.6	5%
Total capacity added	GW	141	100%	104%	30.4	100%
Variable Renewable adds	GW	108	77%	112%	25.4	83%
Zero Emissions Capacity Adds	GW	115	82%	106%	26.4	87%

Source: NBS, CEF Estimates

2. China Leads the World in Renewable Energy

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

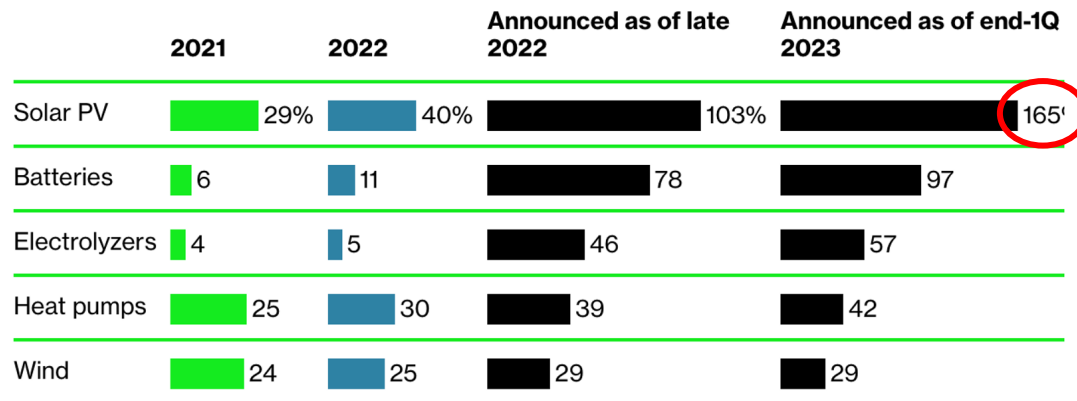
China Automobile Sales	Jun-23	YoY	Market Share	YTD 2023	YoY	Market Share
Domestic						
Passenger Vehicles	2,268,000	5%		11,268,000	10%	
EVs	767,000	35%	34%	3,577,000	44%	32%
<i>of which BEVs</i>	535,000	19%	24%	2,555,000	31%	23%
<i>of which PHEVs</i>	232,000	93%	10%	1,022,000	91%	9%
Export						
Passenger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

Source: China Association of Automobile Manufacturers, Climate Energy Finance calculations

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



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)



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

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

https://www.bloomberg.com/news/articles/2023-05-25/boom-in-solar-panel-ev-battery-factories-brings-net-zero-closer?utm_source=website&utm_medium=share&utm_campaign=twitter&leadSource=verify%20wall

China's Taiyangnews, 25 May 2023, <https://taiyangnews.info/business/massive-pv-manufacturing-complex-in-china/>

3. US Inflation Reduction Act 2022

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



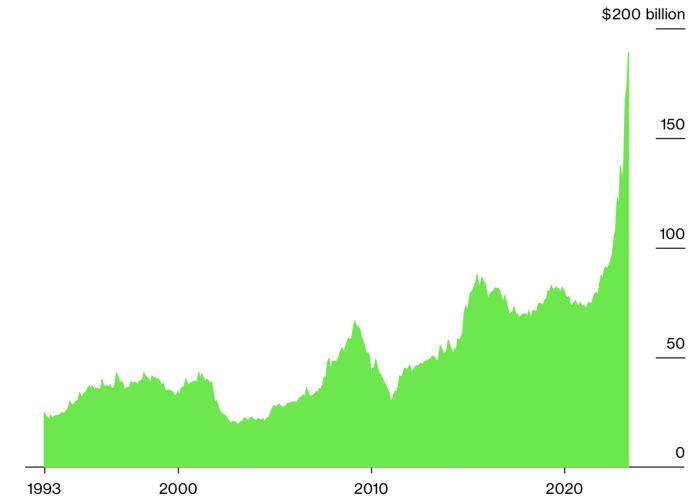
THE WHITE HOUSE

JULY 05, 2023

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**

Figure: US Private Construction by Manufacturers



Source: US Census Bureau, [Bloomberg](#)

3. EU Net Zero Industry Act 2023



Press release | 16 March 2023 | Brussels

Net-Zero Industry Act: Making the EU the home of clean technologies manufacturing and green jobs

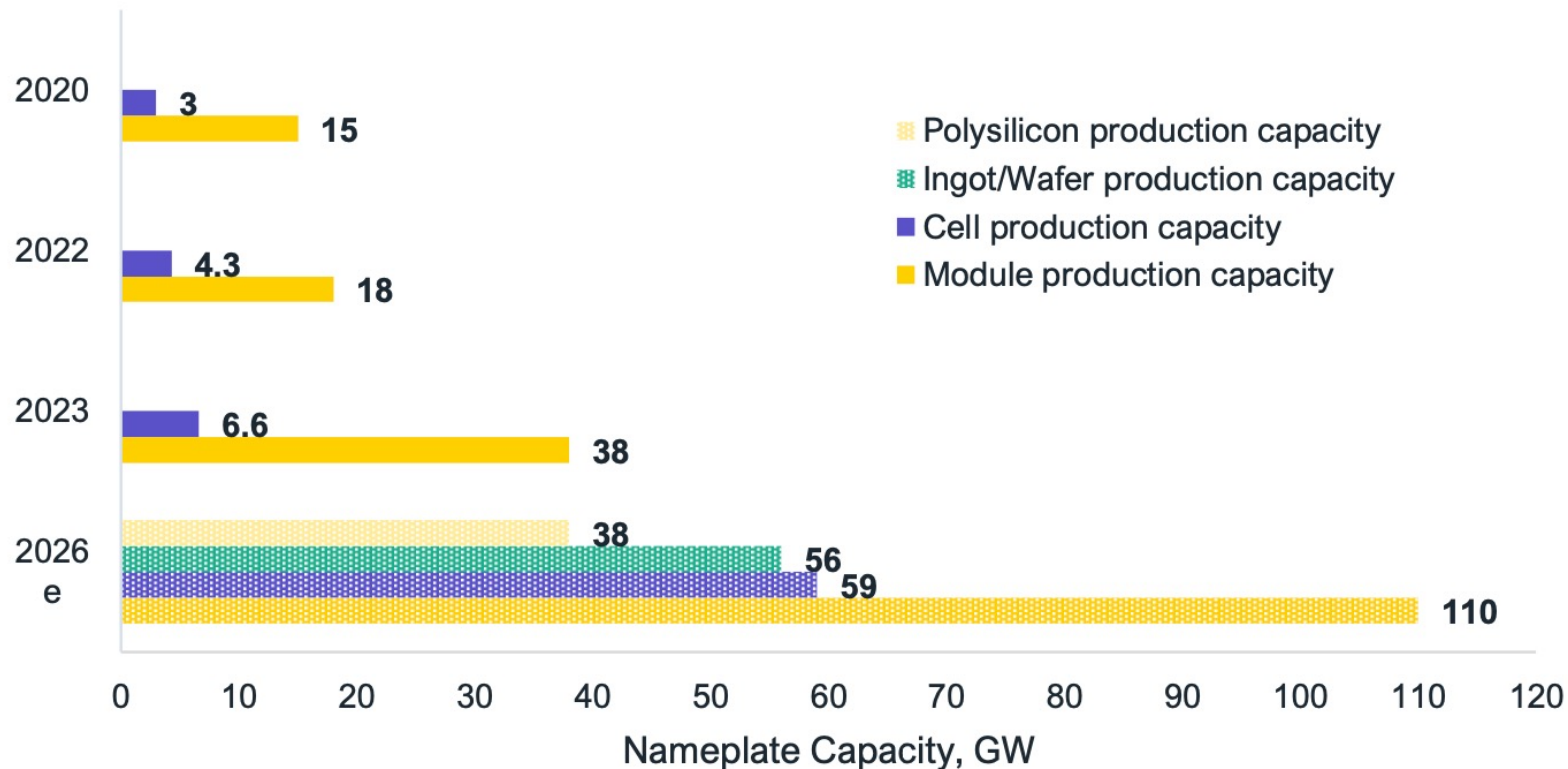
The aim that the EU's overall domestic share of strategic net-zero technologies manufacturing capacity is >40% of EU deployment needs by 2030.

Today, the Commission proposed the [Net-Zero Industry Act](#) to scale up manufacturing of clean technologies in the EU and make sure the Union is well-equipped for the clean-energy transition. This initiative was announced by President **von der Leyen** as a part of the [Green Deal Industrial Plan](#).

The Act will strengthen the resilience and competitiveness of net-zero technologies manufacturing in the EU, and make our energy system more secure and sustainable. It will create better conditions to set up net-zero projects in Europe and attract investments, with the aim that the Union's overall strategic net-zero technologies manufacturing capacity approaches or reaches at least 40% of the Union's deployment needs by 2030. This will accelerate the progress towards the EU's 2030 climate and energy targets and the transition to climate neutrality, while boosting the competitiveness of EU industry, creating quality jobs, and supporting the EU's efforts to become energy independent.

3. India's Solar Manufacturing PLI

MNRE secretary Indu Shekhar Chaturvedi said 21 Sept'2022 that the Solar PLI would add 74 GW of solar module manufacturing capacity, an investment of Rs 94,000 crore.



Source: PV Magazine's Uma Gupta 22 November 2022

<https://www.pv-magazine.com/2022/11/22/india-launches-second-phase-of-incentive-scheme-for-solar-manufacturing/>

JMK Research / IEEFA India, India's Photovoltaic Manufacturing Capacity Set to Surge, April 2023

3. Japan's GX Roadmap

Japan's Cabinet approves policy roadmap including plans for national ETS

METI's "Green Transformation" (GX) ten-year roadmap with ¥20 trillion in government support includes a 46% reduction in carbon emissions by 2030, a national ETS phased in from 2026, and "zero-emission thermal power" to decarbonise electricity by 2035.



On 10 February 2023, Japan's Cabinet approved the [Basic Plan](#) for the "GX: Green Transformation Policy", designed to help Japan reach its climate targets. Earlier in 2022, the Ministry of Environment, Trade, and Industry (METI) released the draft Basic Plan for public consultation, before compiling the final version towards the end of the year. The proposal comes at a time when Japan is facing an energy crisis, with energy in short supply and sharp increases in prices. To address these energy security challenges, Japan aims to continue moving towards "growth-oriented" carbon pricing.

The newly approved Basic Plan is a ten-year roadmap of Japan's decarbonization strategy. It outlines several carbon pricing instruments that will work in tandem to help Japan reach its NDC targets of a 46% reduction in greenhouse gases by 2030 and climate neutrality by 2050. These include the Green Transformation (GX) League (a voluntary baseline-and-credit system), a more traditional emissions trading system (ETS) later down the line, and a carbon levy.

Source: International Carbon Action
Partnership 22 Feb 2023

<https://icapcarbonaction.com/en/news/japan-s-cabinet-approves-policy-roadmap-including-plans-national-ets> & J-REI 28 Feb 2023
<https://www.renewable-ei.org/en/activities/reports/20230228.php>

3. Canada

The Canadian Critical Minerals Strategy

FROM EXPLORATION TO RECYCLING:
Powering the Green and Digital Economy for
Canada and the World

Canada

The Canadian Government has announced a sizeable C\$3.8bn in funding to back the country's new critical minerals strategy in a bid to make Canada a global leader in producing electric vehicle (EV) batteries.

Critical Minerals are the Building Blocks for the Green and Digital Economy



A Strong Foundation

Since 2015, the federal government has taken action to build Canada's clean economy and create good middle class jobs. This includes:

- ✓ Putting in place a federal carbon pricing system, which puts money back in the pockets of Canadians and gives businesses the flexibility to decide how best to reduce their emissions;
- ✓ \$15 billion for the Canada Growth Fund to incentivize private sector investment into projects and companies that will grow Canada's clean economy at speed and scale;
- ✓ \$8 billion for the Net Zero Accelerator to make large-scale investments in clean technologies;
- ✓ \$4.2 billion for the Low Carbon Economy Fund to support the installation of emission-reducing technologies for provinces and territories, businesses, Indigenous communities, and other organizations;
- ✓ \$3.8 billion for Canada's Critical Minerals Strategy, which will help make Canada a global supplier of choice for the critical minerals that are the bedrock of clean and digital technologies;
- ✓ \$3.9 billion to make zero-emission vehicles more affordable for Canadians and Canadian businesses, and to build new charging stations across Canada;
- ✓ \$1.5 billion for the Clean Fuels Fund to encourage investment in the production of clean fuels, including clean hydrogen and biofuels;
- ✓ \$4.7 billion for the National Trade Corridors Fund for investments in our ports, roads, railways, and airports;
- ✓ \$33.5 billion for the Investing in Canada Infrastructure Program to support new investments in public transit; green infrastructure; community, culture and recreation infrastructure; and rural and northern communities;
- ✓ \$35 billion for the Canada Infrastructure Bank to attract private capital to major infrastructure projects and help build more infrastructure across the country; and,
- ✓ \$2.6 billion for the new Canada Innovation Corporation, which will support Canadian businesses in investing in research and development.

Source: Canadian Government Dec 2022,

<https://www.canada.ca/en/campaign/critical-minerals-in-canada/canadian-critical-minerals-strategy.html>

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.



The sun sets over the Posco steel mill in Pohang, South Korea, on July 17, 2018. The city is increasingly seen as the country's new capital for the electric vehicle battery industry.

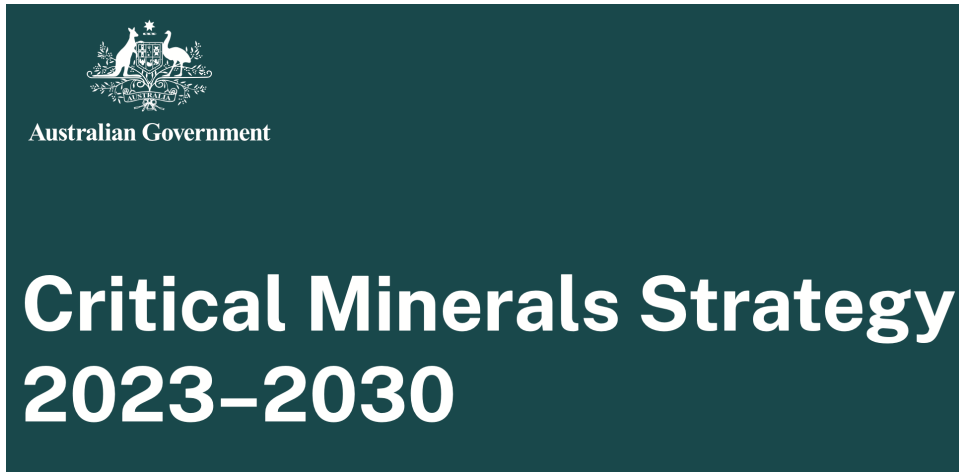
A South Korean city home to one of the world's biggest steelmakers is betting its manufacturing expertise, billions of dollars in investments and government incentives can help it dominate a 21st century industry: electric vehicle batteries.

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.

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

Source: Bloomberg's Heejin Kim 16 March 2023
<https://www.bloomberg.com/news/articles/2023-03-15/battery-makers-plow-31-billion-into-remaking-korean-steel-hub>

4. Australia's Critical Minerals Strategy



Create diverse, resilient and sustainable supply chains through strong and secure international partnerships

We will supply processed critical minerals to diversify global markets and support Australia's access to priority technologies. This includes working with international partners to build secure, resilient and sustainable supply chains that reduce market concentration. We will enhance our high environmental, social, and governance (ESG) credentials and our status as a trusted and reliable trading partner.

Build sovereign capability in critical minerals processing

We will move up the critical minerals value chain and increase Australia's footprint in downstream processing. We will make high-value products that build new industries and strengthen our domestic resilience to supply chain shocks.

Use our critical minerals to help become a renewable energy superpower

We will unlock our vast potential as a major supplier of the critical minerals needed to decarbonise the global economy. Australia's critical minerals sector will help the world decarbonise, including enabling Australia to reach our own legislated targets of 43 per cent below 2005 levels by 2030 and net zero by 2050.

Extract more value onshore from our resources – creating jobs and economic opportunity, including for regional and First Nations communities

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

4. Australia's Critical Minerals Strategy

South Korea-Australia Integrated Mining-Batteries-EV Cooperation



CLIMATE ENERGY FINANCE

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

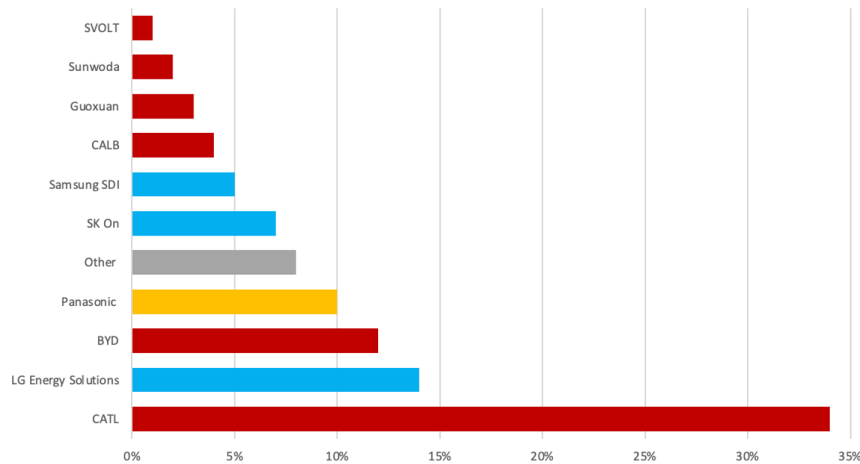
Source: Climate Energy Finance
www.climateenergyfinance.org

29 June 2023

4. Australia's Critical Minerals Strategy

South Korea-Australia Integrated Mining-Batteries-EV Cooperation

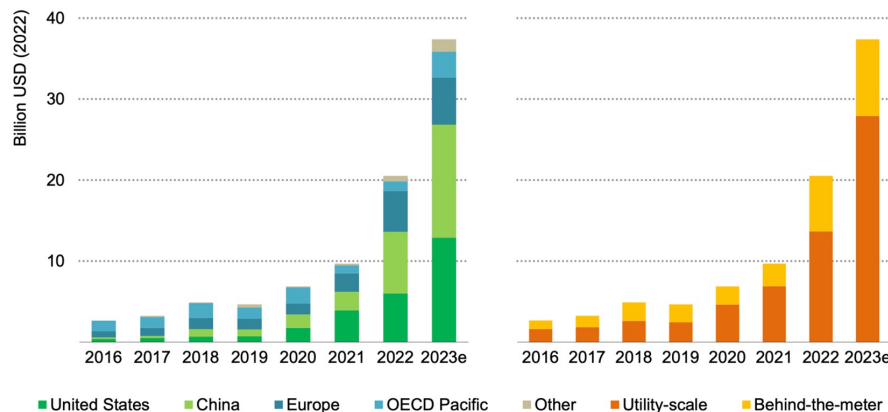
Figure: Global EV Battery Manufacturer Market Share 2022:



Source: SNE Research, CleanTechnica

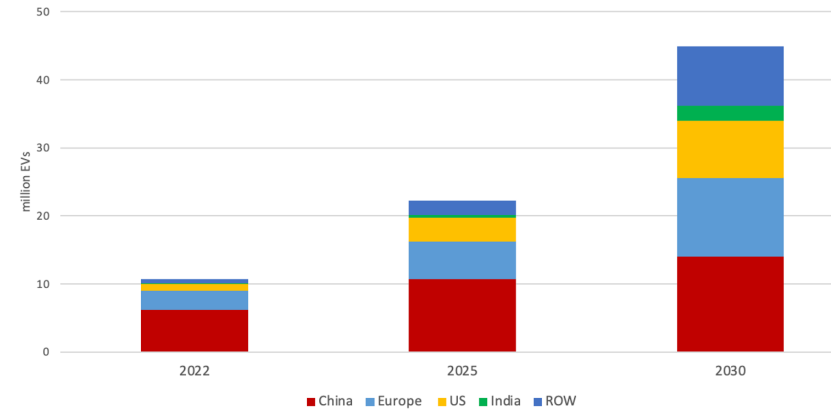
Figure 6.1: Global Investment in Battery Storage is Set for Rapid Growth in 2023

Battery storage investment by geography (left) and segment (right), 2016-2023e



Source: IEA calculations based on Clean Horizon (2023), BNEF (2023) China Energy Storage Alliance (2023)

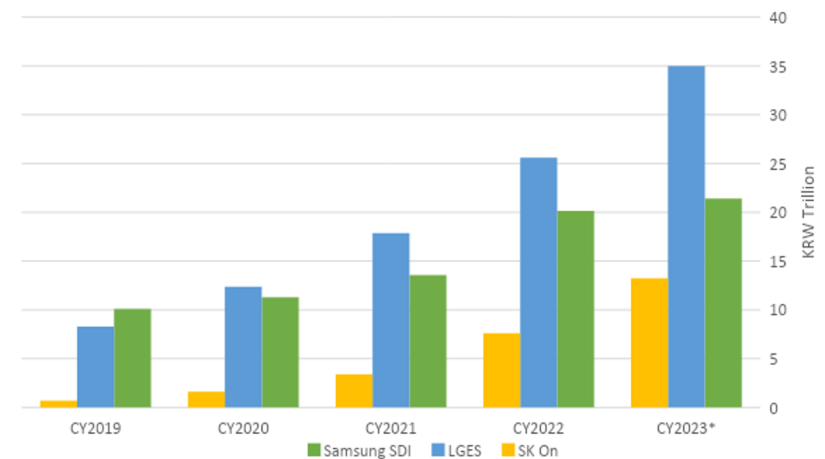
Figure: Global EV Sales 2022 with 2025 and 2030 Forecast



Source: IEA Global EV Outlook 2023, CEF Calculations

Note: Forecasts under Announced Pledges Scenario

Figure: Revenue Growth of SK Firms Battery Divisions 2019-2023



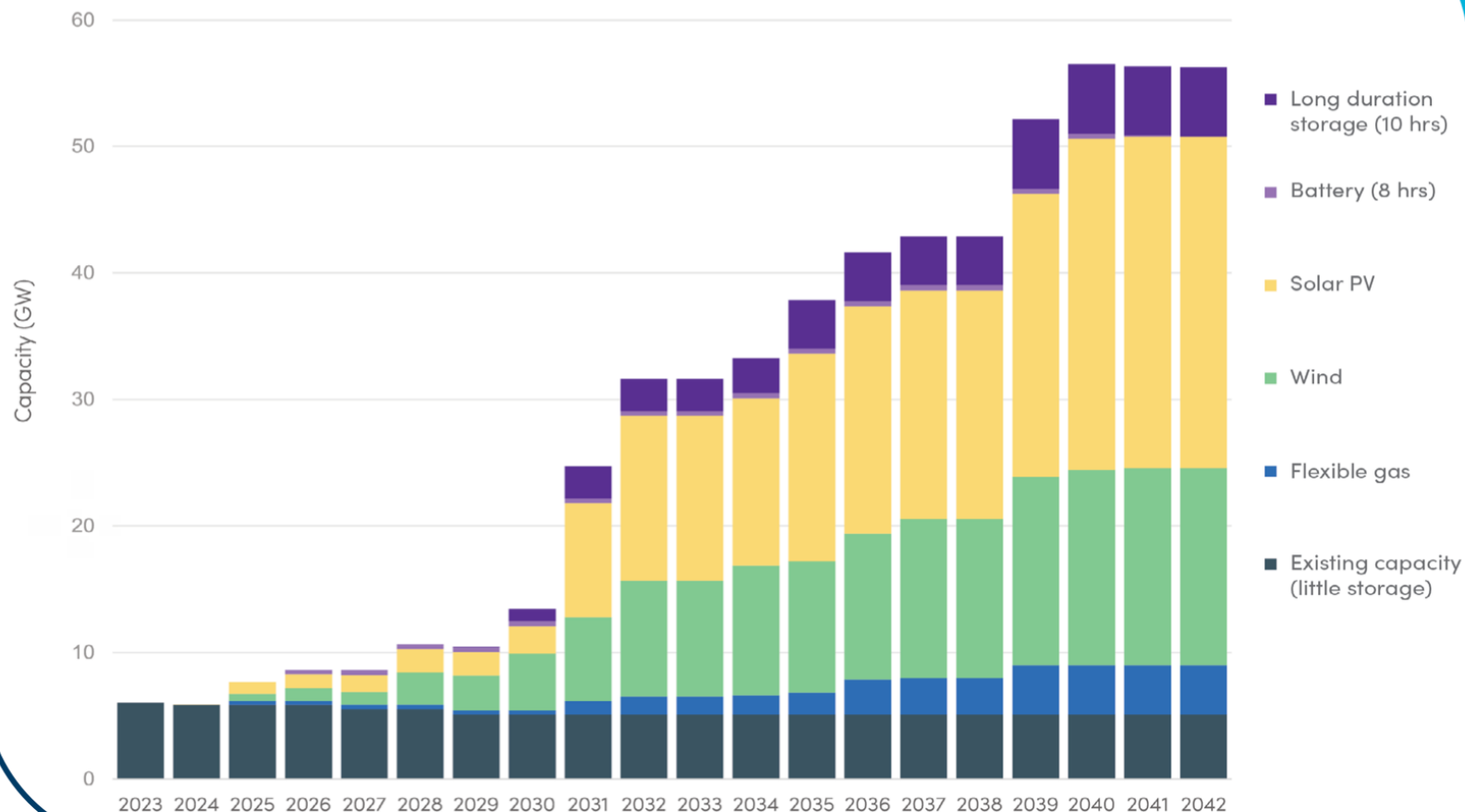
Source: Company Accounts, CEF Calculations

Note: CY2023 data annualised from 1QCY2023 Earnings

5. Exporting Embodied Decarbonisation

SWIS Demand Assessment: 50GW of RE + Storage needed for WA by 2042

Figure 3: New capacity type



5. Exporting Embodied Decarbonisation

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



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 PILGANGOORA.

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 grant³ with Pilbara Minerals now funding \$67.4M of the remaining budgeted construction expenditure.