



Energy  
Transitions  
Commission

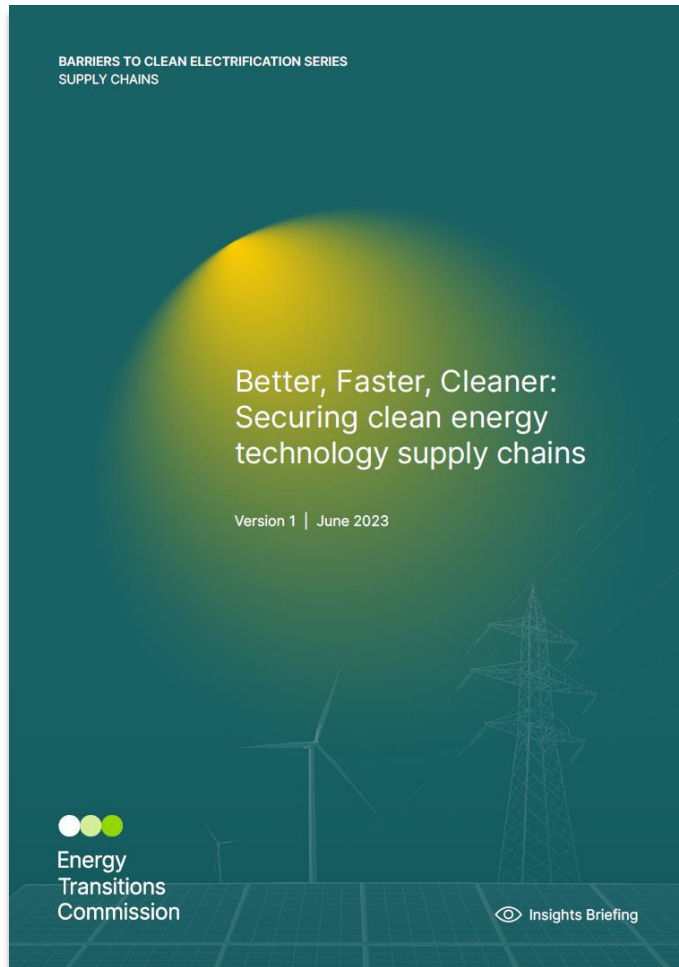
# ***Key Debates***

*ETC Commissioners meeting  
27<sup>th</sup> June 2024*

# Key debates 1 – Supply chains



# Reminder: the ETC looked at clean energy supply chains in 2023



June 2023

**Conclusion:** at the global level, there are no inherent barriers to the scale-up of clean energy supply chains.

**However**, three **cross-cutting risks** require **clear actions** from policymakers and industry:

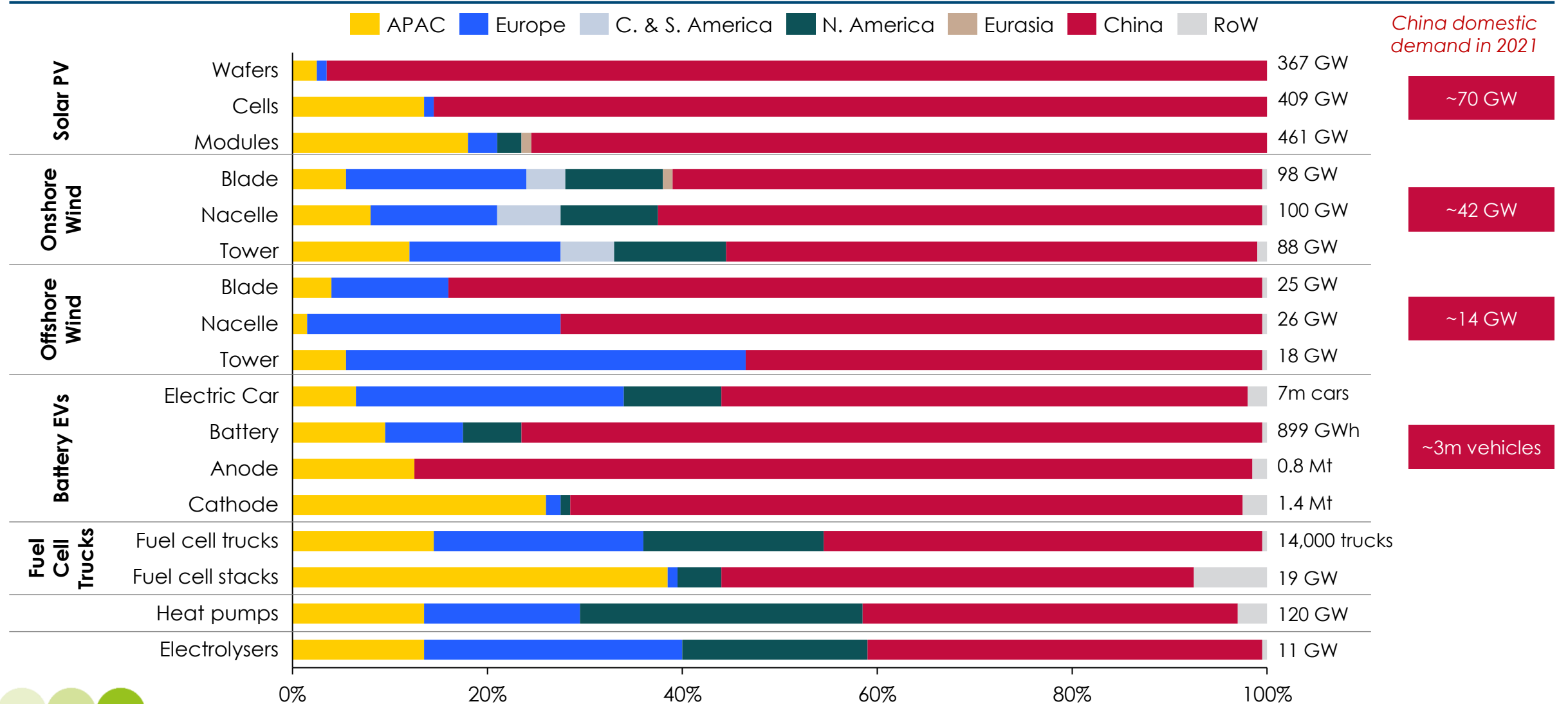
- 1** There **could be tight markets for some key input materials**, notably for some raw materials (lithium, copper) as well as shorter-lived volatility or delays for some more complex components.
- 2** There are **specific environmental and social risks** especially relevant to solar PV and batteries.
- 3** There is a **high degree of concentration of production** across many steps of clean energy technology supply chains.

**Focus of this presentation**



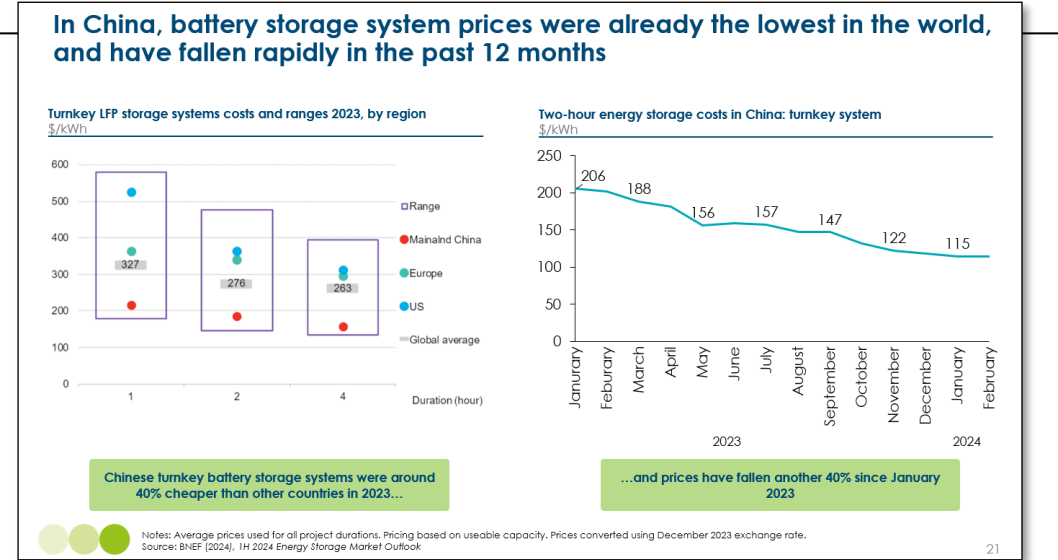
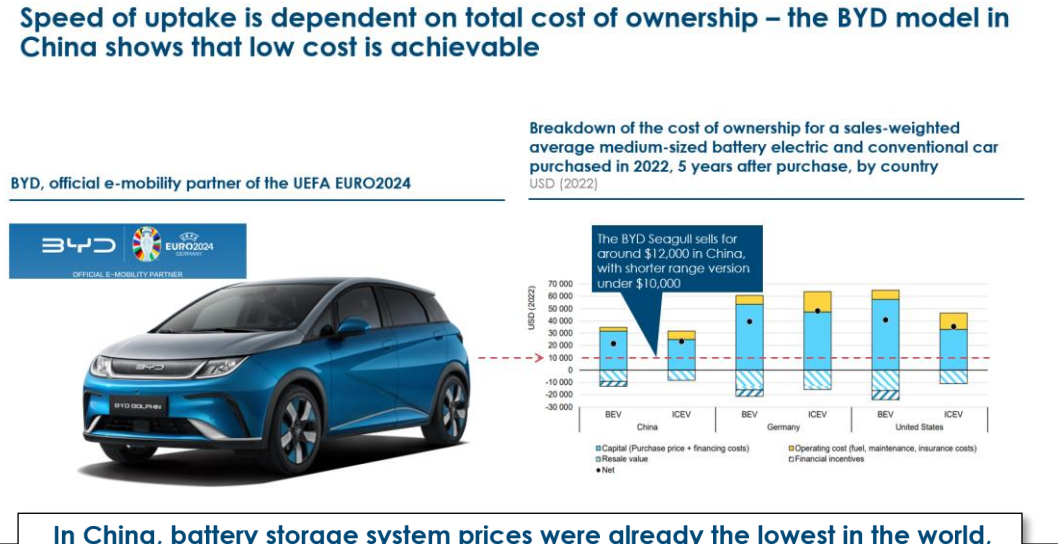
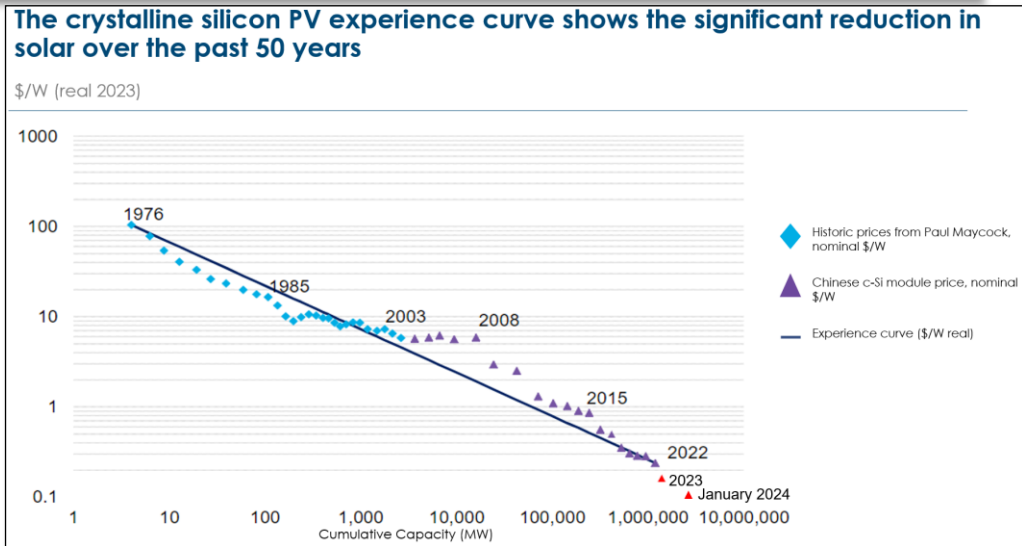
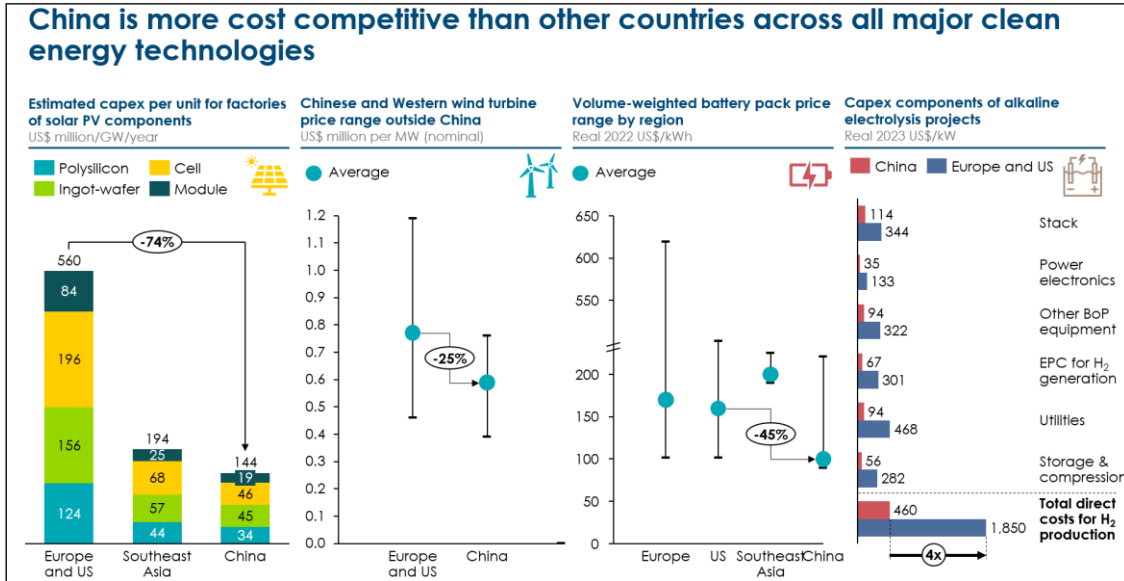
# Today, China dominates many segments of clean energy technology supply chains

Share of global manufacturing capacity for clean energy technologies and components, 2021, %



Source: IEA (2023), Energy technology perspectives

# China has been at the core of cost reductions and technology advancement in key sectors



# Five major components have driven China's competitive position



## Economies of scale

- Larger-than-average scale of manufacturing units enabling lower costs per unit



## State & financial support

- Cheap financing
- Strong drive for export-led model of development
- Clear five-year plans with targets for energy, manufacturing etc



## Carbon & environmental costs

- Somewhat neglected historically, e.g. not dealing with environmental impacts of REE<sup>i</sup> mining, no carbon price until v recently for power
- Trade-off in favour of economic development



## Export infrastructure

- Extensive country coverage with large-scale export infrastructure



## Domestic demand

- Growing domestic capacity to meet rising demand
- Domestic renewables installations have risen rapidly – largest solar PV, onshore wind, BEV market






## Lower manufacturing costs



Note: [i] REE – Rare Earth Elements

# Public discourse on this re-balancing varies significantly across key geographies

	<p>Concerns on national security risks dominate US government public discourse for challenging supply chain status quo</p>	<p><b>Sen. Chuck Schumer Calls for Probe of Chinese Rail Tech Amid Security Concerns</b></p> <p>Security experts and members of Congress have raised the alarm about CRRR because it is owned by the Chinese government, warning of prior cyberthreats and hacking attacks linked to Chinese intelligence officials</p> <p><b>US House committees investigate Ford Chinese battery partnership</b></p>	<p><b>Biden administration will investigate national security risks posed by Chinese-made 'smart cars'</b></p> <p>Officials are concerned that features such as driver assistance technology could effectively be used to spy on Americans.</p>
	<p>The EU's approach is more concerned with accelerating clean tech deployment whilst ensuring fair-trade practices</p>	<p><b>European Commission wary of trade measures to protect solar industry</b></p> <p>The European Commission has warned about the potential impact of trade measures on Europe's renewable energy rollout, but has shied away from outlining emergency measures to address the continent's solar manufacturing crisis.</p> <p>Mercedes-Benz boss urges Brussels to cut tariffs on Chinese EVs</p>	<p><b>'Everything has changed': foreign auto groups embrace local technology in China</b></p> <p>EU does not want to decouple from China but must protect itself, says EU trade chief</p>
<p>LATAM</p>	<p>LATAM countries welcoming of Chinese tech., unsettling neighbours</p>	<p><u>'Global China' is a big part of Latin America's renewable energy boom, but homegrown industries are key.</u></p> <p>Lithium, essential for EV batteries, could be South America's white gold.</p>	<p>Chinese green technologies are pouring into Latin America</p> <p>That is prompting anxiety in the United States about security, coercion and competition</p>
	<p>India between protectionism and deployment</p>	<p>May 2023: Exclusive: India considers cutting solar panel import tax to make up domestic shortfall</p>	<p>March 2024: <b>India to Resume Curbs on Solar Imports to Boost Local Producers</b></p>





# Key policy developments in clean energy supply chains since the publication of the ETC's June 2023 Report



# Mapping of existing policies to build-up and protect domestic manufacturers (1 of 2)

## Key takeaways:

- China's strong domestic position enables it to focus on accelerating deployment.
- India, looking to boost nascent industry, proactively tries to build-up and protect domestic manufacturers.



		Domestic manufacturing build-up	Domestic manufacturing protection <sup>i</sup>
	Solar PV	<ul style="list-style-type: none"> <li>• <b>Central government deployment legislation:</b> China's central government adopted plan to install 1200 GW of solar and wind by 2030.</li> <li>• <b>Local government targets:</b> centralised legislation has been translated into yearly solar and wind installation targets for local governments, which drive project pipeline.</li> <li>• <b>Installation mandates:</b> 26 provinces have mandates for new utility-scale wind and solar projects to include an energy storage system.</li> </ul>	
	Wind		
	EV Batteries		
	Solar PV	<ul style="list-style-type: none"> <li>• <b>Manufacturing subsidy:</b> production-linked incentive scheme for sales of domestic PV modules<sup>ii</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Import tariff:</b> 40% tariff on modules imported from all geographies.</li> <li>• <b>Domestic content rules:</b> eligibility to certain government support schemes dependent on sourcing PV components from domestic sources.</li> </ul>
	Wind	<ul style="list-style-type: none"> <li>• <b>Concessional custom duty (CCD):</b> CCD on the import of critical components for wind turbine production.</li> </ul>	
	EV Batteries	<ul style="list-style-type: none"> <li>• <b>Manufacturing subsidy:</b> production-linked incentive scheme (budget of US\$ 2.4 billion) for manufacturing of battery components.</li> </ul>	

Note: [i] Industry protection consists of trade barriers intended to favour domestic manufacturing. [ii] Production Linked Incentive (PLI) Scheme for High Efficiency Solar PV Modules, introduced in April 2021.

# Mapping of existing policies to build-up and protect domestic manufacturers (2 of 2)

## Key takeaways:

- Though available US and EU funding are in theory comparable in size, US has been much more effective at operationalising access to funding than the EU.
- US is also taking a more aggressive stance on trade barriers, whereas EU is wary of slowing down pace of deployment.

		Domestic manufacturing build-up	Domestic manufacturing protection <sup>i</sup>
	Solar PV	<ul style="list-style-type: none"> <li>• <b>Grants:</b> available through ecosystem of EU funds, e.g. InvestEU and Innovation funds.</li> <li>• <b>Total of ~US\$ 40bn</b> (~€ 37bn) available for clean energy manufacturing, but unclear and difficult access.</li> </ul>	
	Wind		<ul style="list-style-type: none"> <li>• <b>Anti-subsidy investigation:</b> EU anti-subsidy investigation into the imports of wind turbines from China</li> </ul>
	EV Batteries		<ul style="list-style-type: none"> <li>• <b>Anti-subsidy investigation:</b> EU anti-subsidy investigation into the imports of EVs from China</li> </ul>
	Solar PV	<ul style="list-style-type: none"> <li>• <b>Tax credits:</b> IRA<sup>ii</sup> offers production and investment tax credits (AMPTC<sup>iii</sup> and AEPITC<sup>iii</sup>) to domestic manufacturers of solar PV components, wind turbines and battery components.</li> <li>• <b>Total of ~ US\$ 35bn</b> available for clean energy manufacturing, clear and easy access.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Import ban:</b> ban on import of solar PV products with components made in Xinjiang</li> <li>• <b>Import tariff:</b> 14% import tariffs on PV cells and modules made in China</li> </ul>
	Wind		
	EV Batteries		<ul style="list-style-type: none"> <li>• <b>Subsidy ineligibility:</b> battery materials from 'Foreign Entities of Concern' (incl. China) make EVs ineligible for IRA consumer tax credit for purchase of new vehicle.</li> </ul>

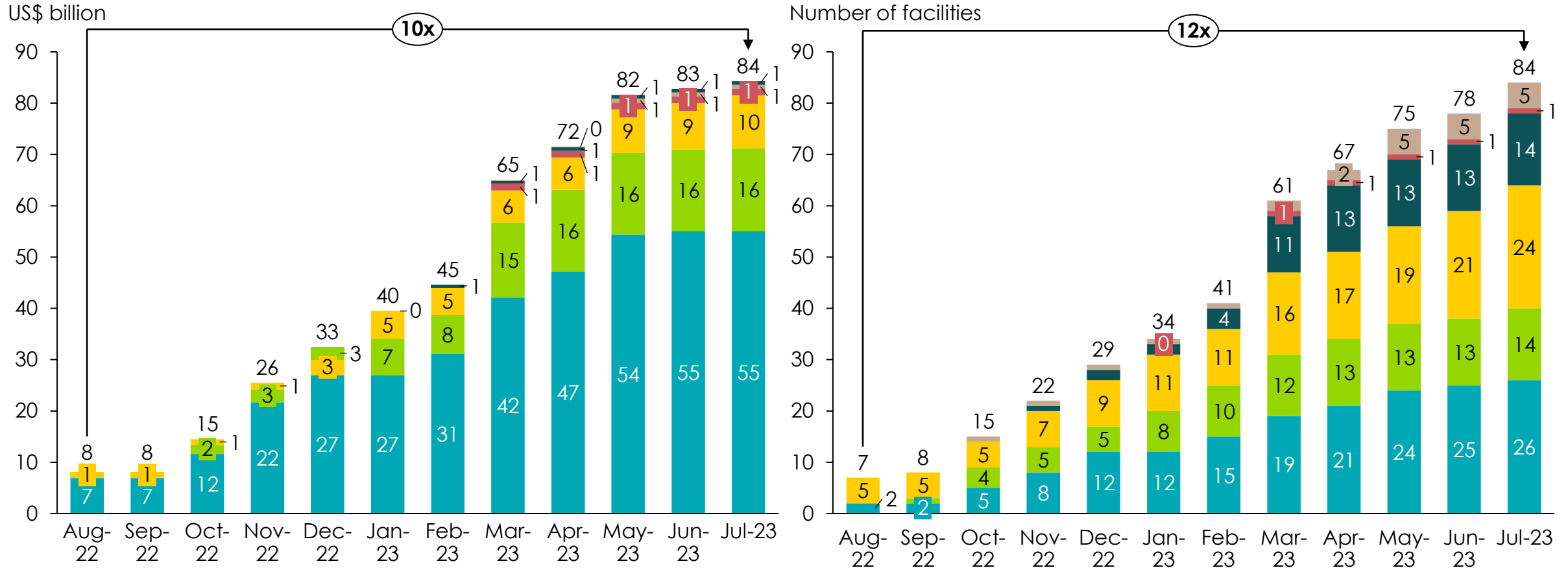
Note: Excludes policies from individual EU member states. [i] Industry protection consists of trade barriers intended to favour domestic manufacturing. [ii] IRA – Inflation Reduction Act. [iii] AMPTC - Advanced Manufacturing Production Tax Credit; AEPITC - Advanced Energy Project Investment Tax Credit.

# US: passage of the IRA has led to an unprecedented boom in clean-tech manufacturing investments

## Investments in clean-tech manufacturing capacity since passage of IRA (Aug. 2022)

LHS: value of investments in US\$ billions; RHS: number of facilities

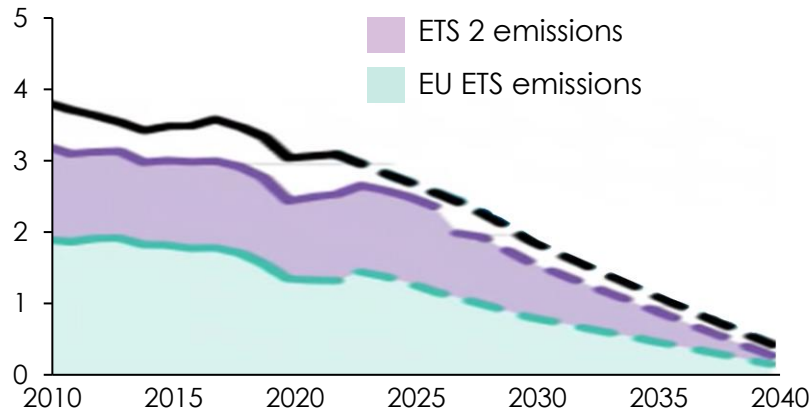
■ Battery 
 ■ EV 
 ■ Solar 
 ■ Wind 
 ■ Mining 
 ■ Electrolyzer



# EU CBAM should be a major driver of industrial decarbonisation domestically and abroad

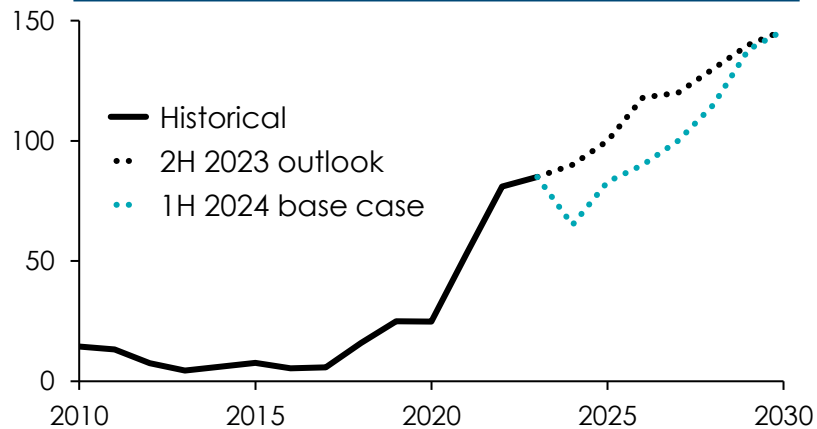
EU ETS emissions caps and possible 2040 target

Billion metric tons of CO<sub>2</sub>e



Historical and forecast price of EU emission allowances

EUR/metric ton, nominal



## Carbon Border Adjustment Mechanism (CBAM)

- A price on the carbon emitted during the production of carbon intensive goods imported into EU
- Current transitional phase lasts between 2023 and 2025. Final phase from 2026
- Aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS)

## EU Batteries Regulation

- Importers are required to make declarations on performance classes and maximum limits on the carbon footprint of light transport and rechargeable industrial batteries
- Implemented from 2024 onwards

## Likely impact

- Accelerated decarbonisation of EU heavy industry
- Accelerated decarbonisation of industry and supply chains in other countries such as China and India?

# Four potential impacts resulting from tariffs on supply chains and production locations

1

Re-routing of China's supply chains via intermediate countries – which may produce further US policy response

2

Impact on production likely to be smallest where the product is commoditized, and China have a significant cost advantage e.g solar

3

Bigger impact could occur on location of battery / EV production given other advantages of co-location close to customer

4

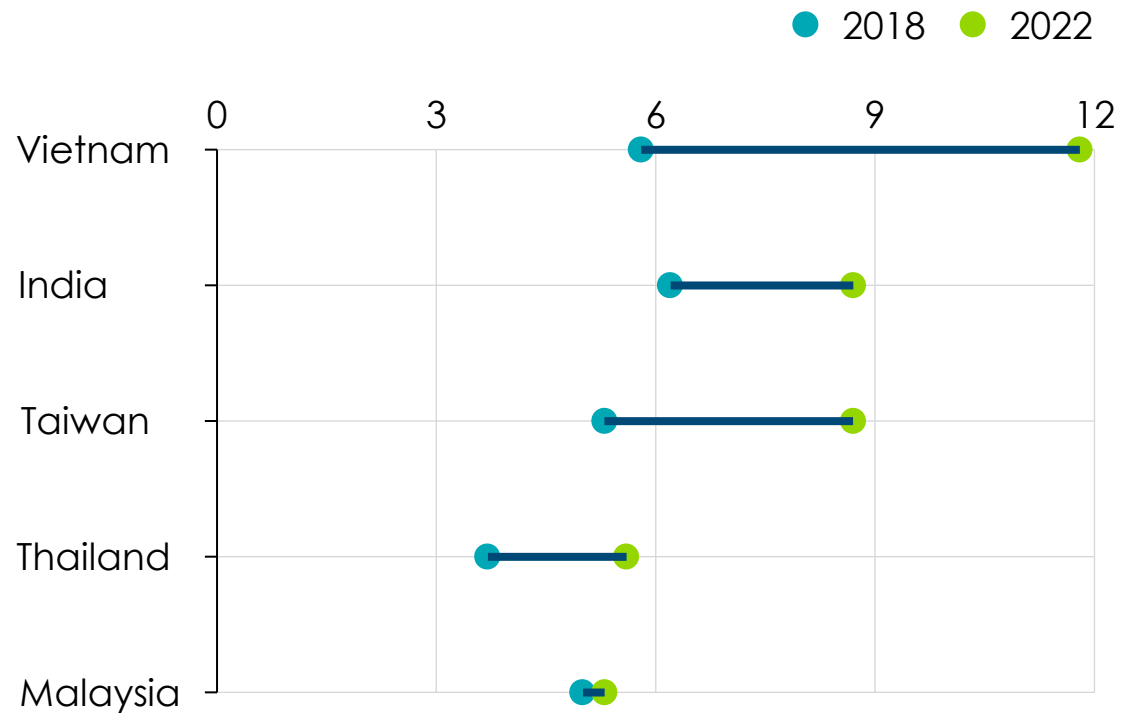
Chinese overcapacity and low costs will drive low price exports to countries unconcerned by China supply ( e.g. solar PV in Africa )



# 1 Is China supply rerouting via southeast Asia?

## United States manufactured goods

% of total imported from selected countries\*

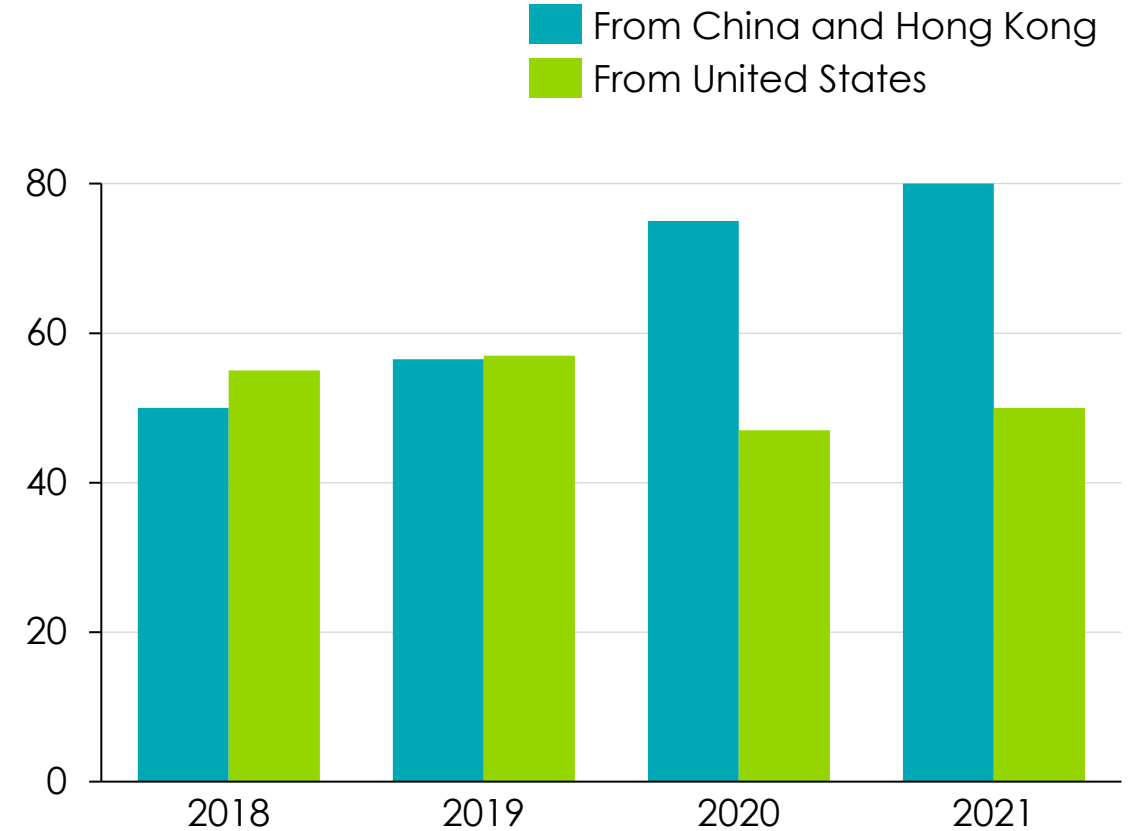


\* Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam

Source ; Kearney

## Direct investment in Indonesia, Malaysia, Philippines, Thailand and Vietnam

\$bn

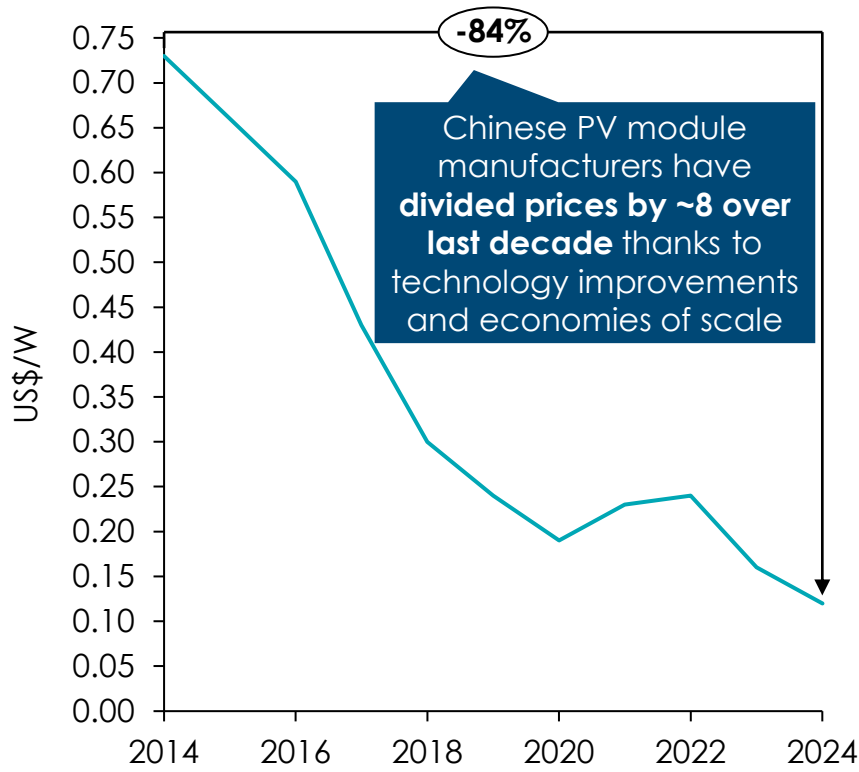


Source ; The Economist , How America is failing to break with China , August 8<sup>th</sup> , 2023

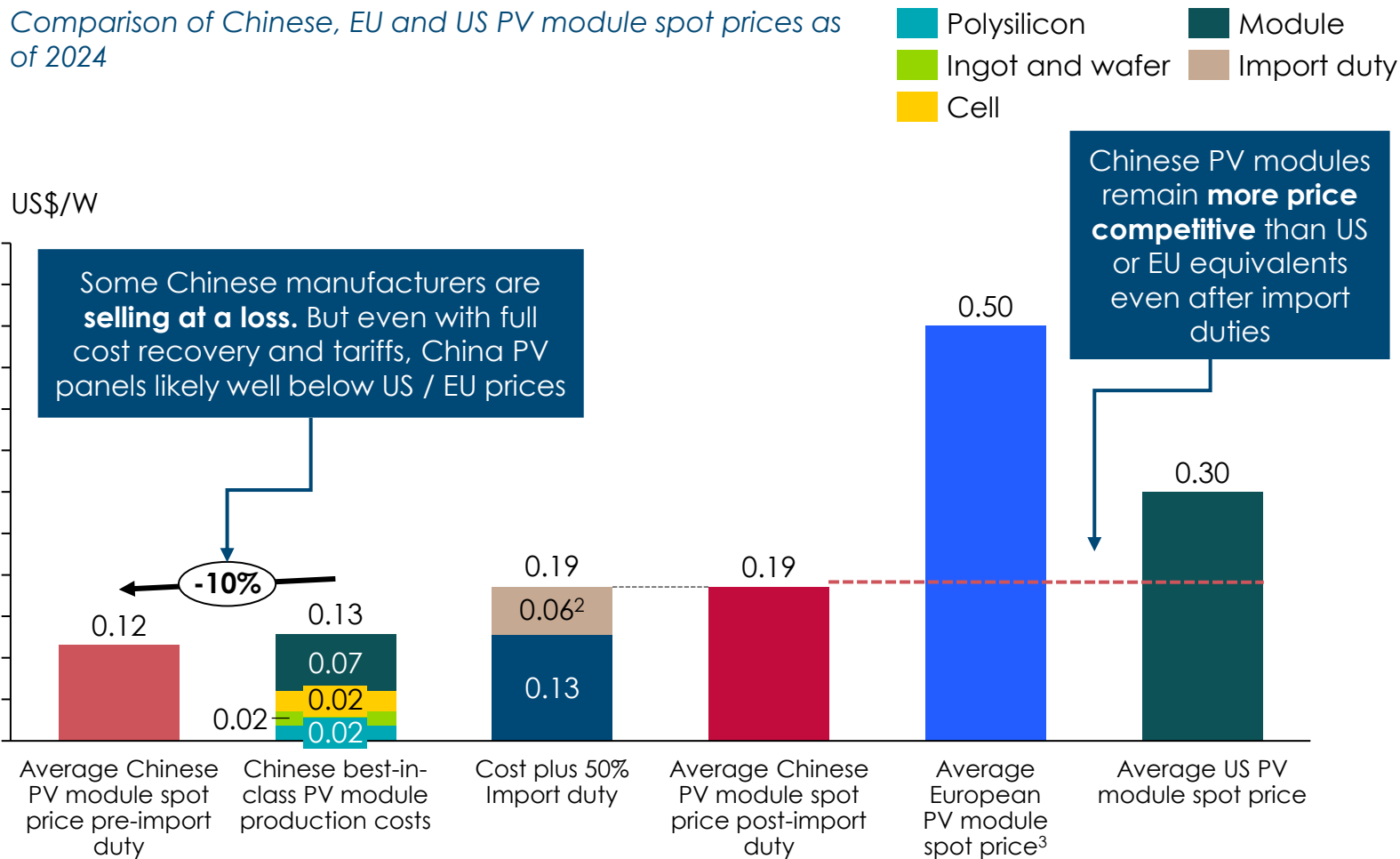
# Import tariffs are unlikely to plug the cost gap with low-cost geographies which have achieved steep cost declines over the last decade

Example: consistent cost reductions have made Chinese PV modules more price competitive than EU or US equivalents even after import duties

Annual average spot price of monocrystalline silicon modules (c-Si) from China<sup>1</sup>



Comparison of Chinese, EU and US PV module spot prices as of 2024



Note: [1] Due to lack of China-specific data, BNEF lowest quote spot price data is used as proxy for Chinese manufacturers spot price, reflecting the fact that Chinese manufacturers have consistently achieved lowest prices. [2] Assuming an import duty of 40% (highest import duty observed to date in solar industry). [3] Due to limited number of EU- and US-based manufacturers, prices of specific manufacturers are used as proxy for EU and US average PV module prices (First Solar for the US, Meyer Burger for the EU).  
 Source: BNEF (2024), Online Data Explorer: Solar – Spot Price Index; BNEF (2024), Solar Supply Chain Index, March 2024: Pitched Battle; First Solar (2023) Annual Report; BNEF (2024), EU's Solar Onshoring Goal Hit by Possible German Closure; Infolink (2024), Spot Price.

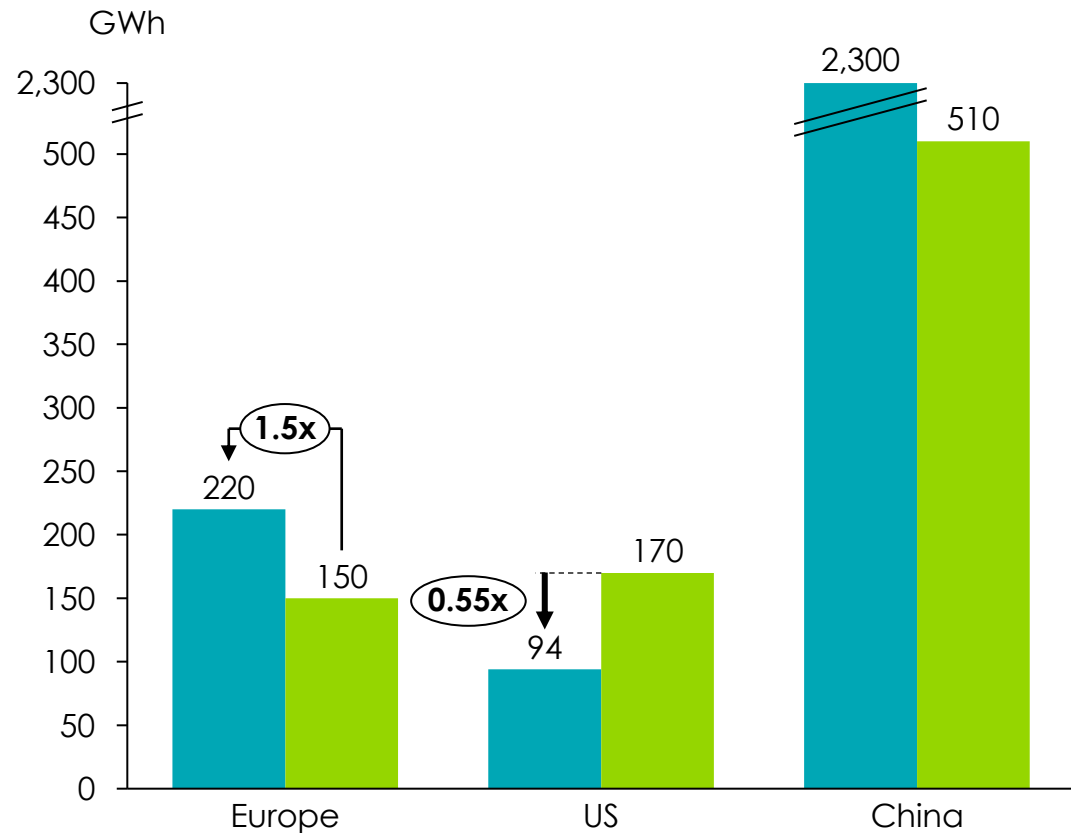


# In contrast, the greater market fragmentation visible today in EV batteries is expected to remain prevalent over the coming years

Today, Europe and US are already well placed to meet domestic demand with local production

2023 values

- Domestic battery manufacturing capacity<sup>i</sup>
- Total battery demand<sup>ii</sup>

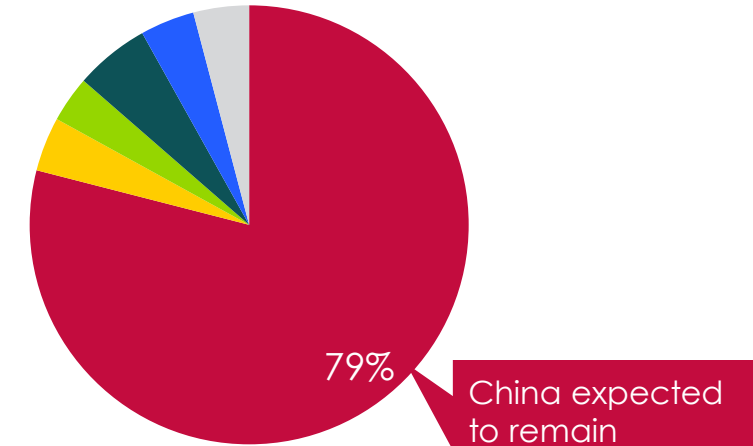


Moving forward, China is expected to remain dominant overall, but Europe and US will gain market share

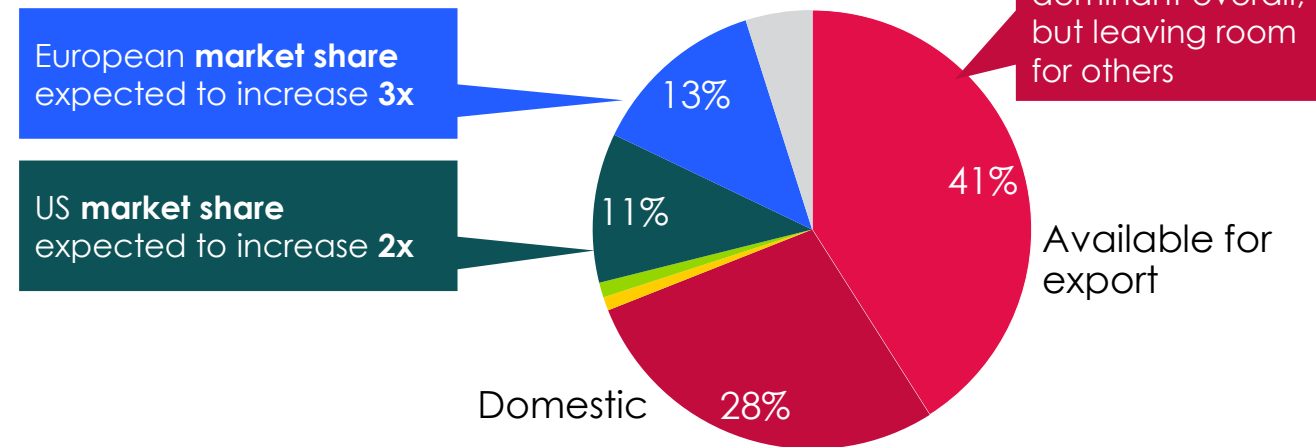
Country market share of battery production, %

- China
- S. Korea
- Japan
- United States
- Europe
- Other

2021: 1040 GWh



2031: 6990 GWh



Note: [i] Encompasses capacity of all fully commissioned battery manufacturing plants in designated location. [ii] Encompasses battery demand for passenger vehicles, commercial vehicles, two- and three-wheelers, buses and stationary storage.

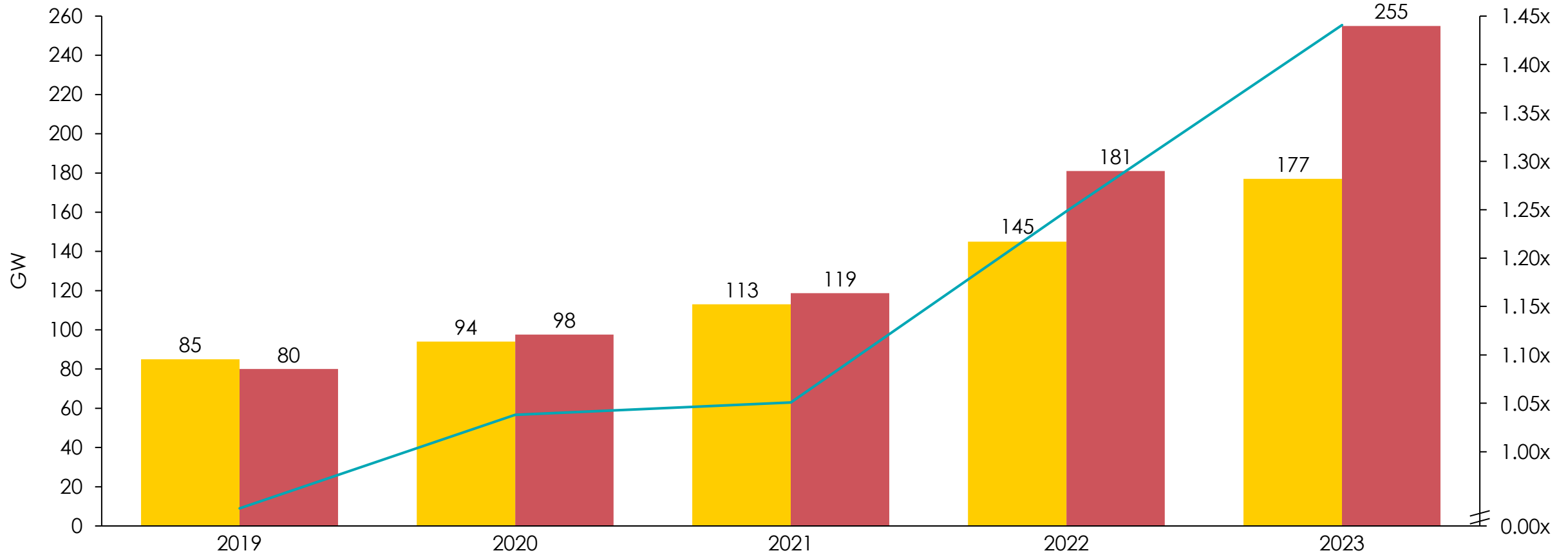
Source: BNEF (2023), Online Data Explorer: Electric Vehicles; IEA (2022), Global supply chains of EV batteries; Benchmark Mineral Intelligence (Aug 2022), Lithium-ion battery gigafactory assessment.

# 4 Additionally, market overcapacity leaves little to no room for new entrants, with China's export capacity vastly exceeding global demand

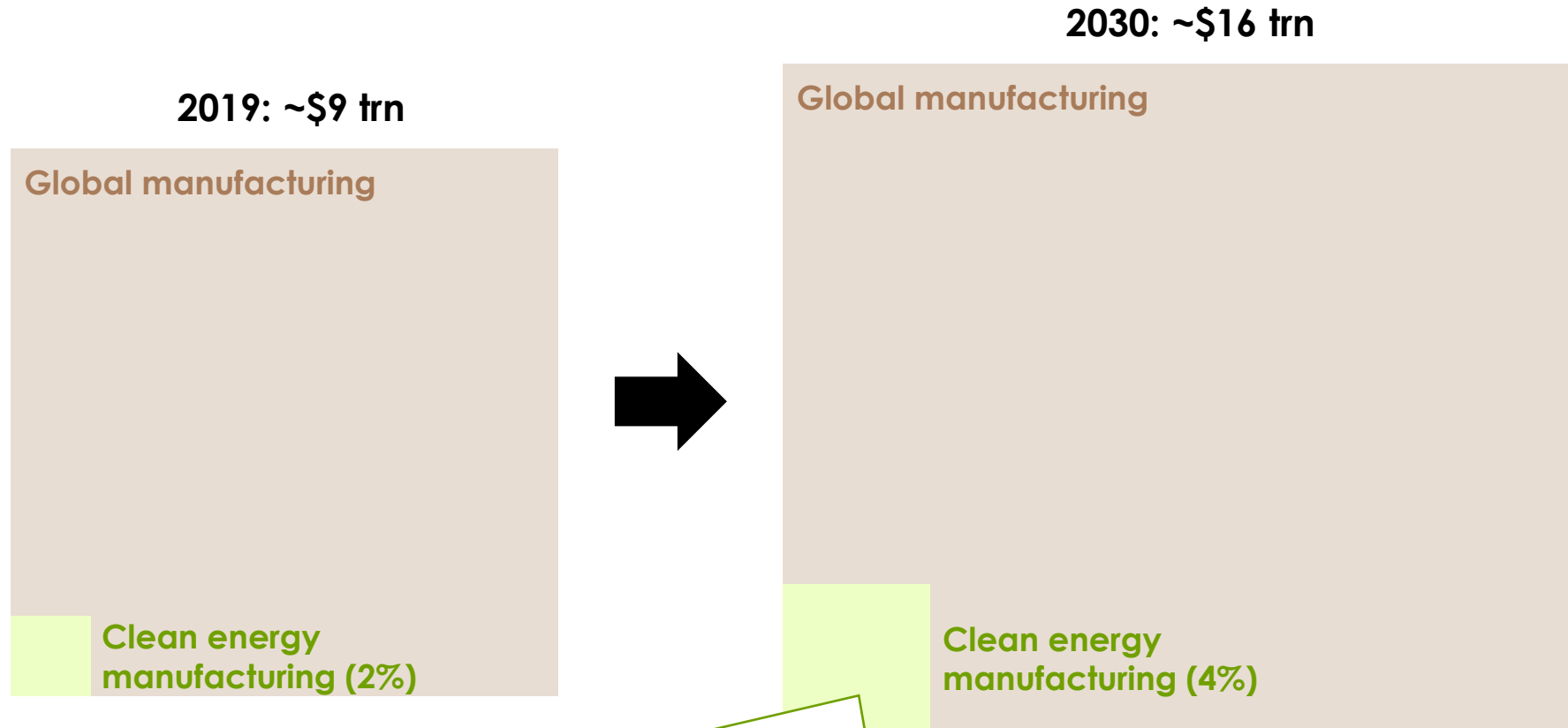
Comparison of global solar installations and Chinese cell and module exports,

GW

■ Global installations excluding mainland China — Market overcapacity: Chinese exports/global installations excl. China  
■ Mainland China cell and module exports



# In theory, the growth in clean energy manufacturing presents a strategic and commercial opportunity for all



IEA: key mass-manufactured clean energy technologies\* have a market of ~**USD 650 billion a year by 2030** – more than 3x today's level – if countries worldwide fully implement announced energy and climate pledges.

- 1) **Clean energy manufacturing** will become a bigger part of overall global economy
- 2) Overall global manufacturing / industry has to become cleaner and more **carbon-competitive**
- 3) Benefits to domestic **political economy of jobs**, productivity growth and export capacity

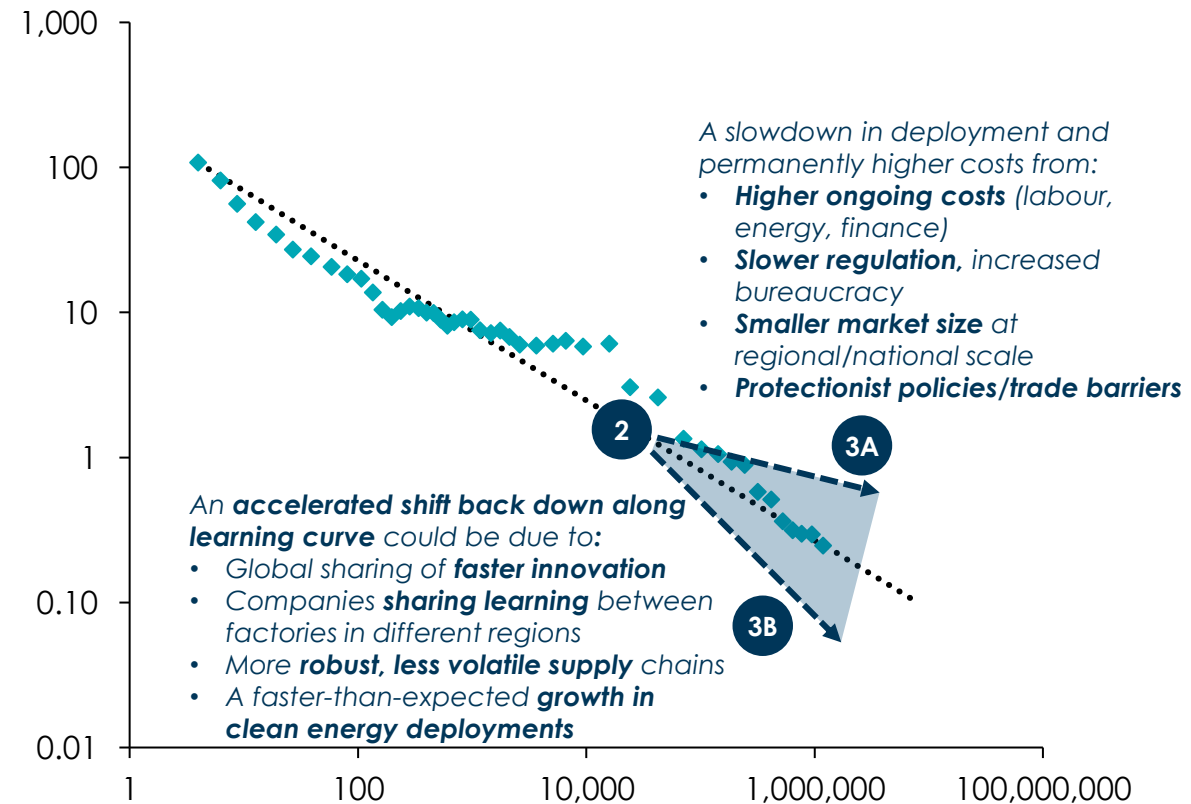
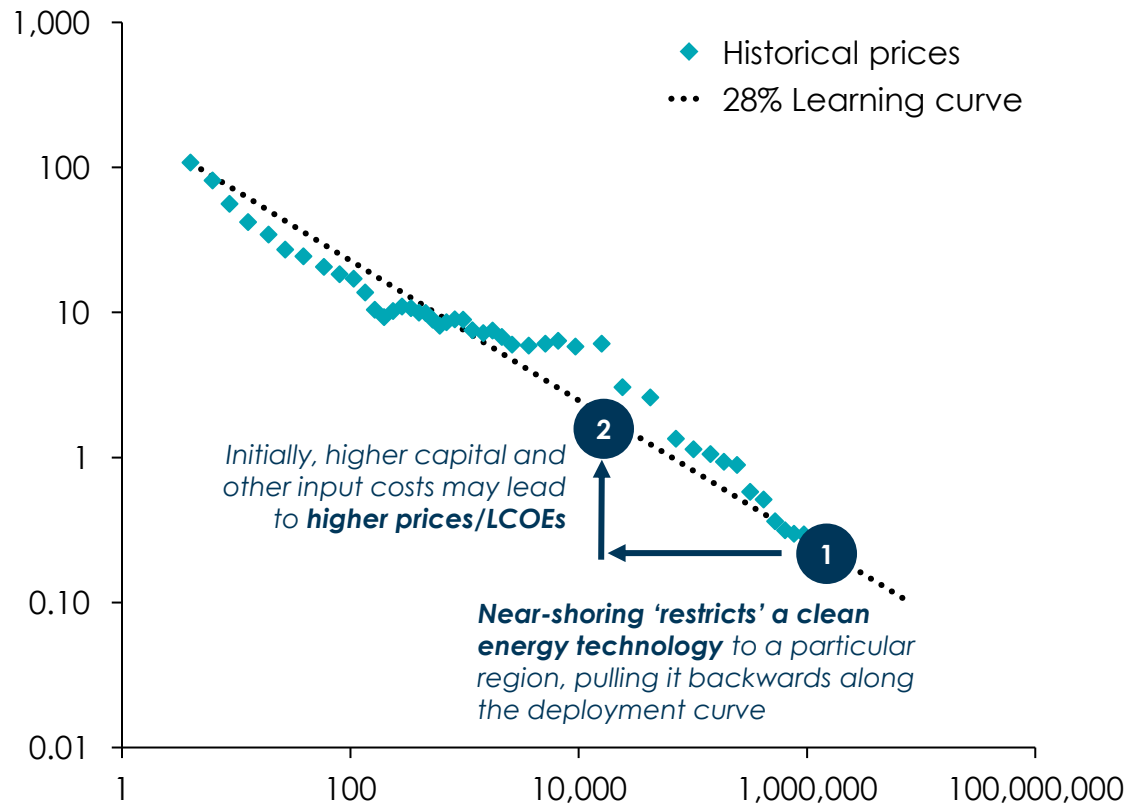


\*Excludes installation and construction costs, and not including power grids  
Source: Oliver Wyman/Oxford Economics (2020), *Manufacturing industries 2030 – Beyond COVID-19*; IEA (2023), *Energy Technologies Perspective*

# The challenge will be to ensure that any policy interventions on supply chains continue to move technologies down cost reduction trajectories

**Solar Example:** Initially, near-shoring dynamics can be seen as moving back and up a clean energy technology 'learning curve', which is why any such efforts must be accompanied by policies to ensure technology costs continue to go down

Solar learning curve: US\$/W (Y-axis); MW (X-axis)



Source: BNEF (2022), 4Q Global PV market outlook; Helveston et al. (2021) Quantifying the cost savings of global solar photovoltaic supply chains; Way et al. (2022) Empirically grounded technology forecasts and the energy transition

# Additional tariffs aimed at Chinese EV imports, as EU Commission provisionally concludes China value chain benefits from unfair subsidisation

## China small EV leadership

China EV OEMs ahead of European in quality and cost, especially small affordable EVs, e.g.

- BYD Dolphin € 29000
- BYD Seagull \$10-12000 (in China)

Large scale Chinese exports to Europe beginning

## CEO of Stellantis Europe

“ The Chinese “can reduce the price much lower than you even think in your wildest dreams”



“ Many brands sell similar EVs in China for roughly half the price in Europe. They can absorb higher tariffs, cut prices and still make high profits

## EU policy considerations

Need for cheap EVs to prevent political backlash against 2035 ICE sales ban

Industry split – Mercedes Benz and VW opposed to tariffs

- Creates good competition
- Fears of China retaliation on EU exports



**Anti subsidy investigation – on rules-based approach – with differentiation by specific producer**



**Additional\* tariffs of 17-38 % introduced e.g.**

- BYD + 17.4%
- SAIC + 38%

**But no opposition (so far) to Chinese EV / battery companies manufacturing in EU e.g.**

- BYD in Hungary
- CATL in Germany

# Nine principles to guide policy?

## General

1	<b>Diversifying supply chains is legitimate and rational objective:</b> major countries will not accept near 100% Chinese supply of key clean technologies
2	<b>CBAM and other environmental standards are not protectionist but;</b> <ul style="list-style-type: none"> <li>• Essential drivers of <b>supply chain decarbonisation</b></li> <li>• Means for developed countries to take <b>responsibility for imported emissions</b></li> </ul>

## Optimal economic approach

3	<b>100% autarky is neither realistic nor desirable:</b> aim for significant local know-how and capacity
4	Follow <b>fact-based approach to unfair competition concerns:</b> China price advantage primarily reflects tech leadership and structural cost declines, not dumping
5	Deploy <b>time-bound subsidies to build local industries, not permanent tariffs:</b> permanently protecting structurally higher-cost industries increases consumer costs and slows energy transition
6	<b>Welcome foreign products</b> where there are <b>no local substitutes at a good price</b> , or where <b>low cost is particularly important at this stage</b> of the transition.

## Geopolitical and Security

7	Adopt an <b>approach to intelligence security that is truly intelligence-based, not paranoid:</b> semiconductors are militarily important, solar panels are not
8	Recognise that <b>energy security risks of clean tech imports are much smaller than those of fossil fuel imports:</b> once installed, clean tech assets provide energy services over asset lifetime

## Location versus ownership

9	<b>What matters is location, not ownership:</b> location drives investments, jobs and technology transfers.
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# Questions for debate

1. How are changing global supply chain dynamics affecting the energy transition?
2. How to balance local supply chain development versus low cost rapid energy transition ?
3. Do you agree with the proposed 9 principles ?
4. Is this a set of issues on which ETC could / should comment ?

