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Investor Presentation | Asia Pacific

Asia Summer School: Energy Meets Compute

Energy shocks have become more frequent, making energy security critical in an AI world. US\$5trn investment needs should start a golden age in energy investment to secure AI, food and tech supply chains after a decade of underinvestment. An investment supercycle unlocking US\$9trn in value beckons.

See our note: [Asia Energy Security and AI: Energy Meets Compute: Supercycle Recharges](#)

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ASEAN UTILITIES AND INFRASTRUCTURE
Asia Pacific
Industry View In-Line

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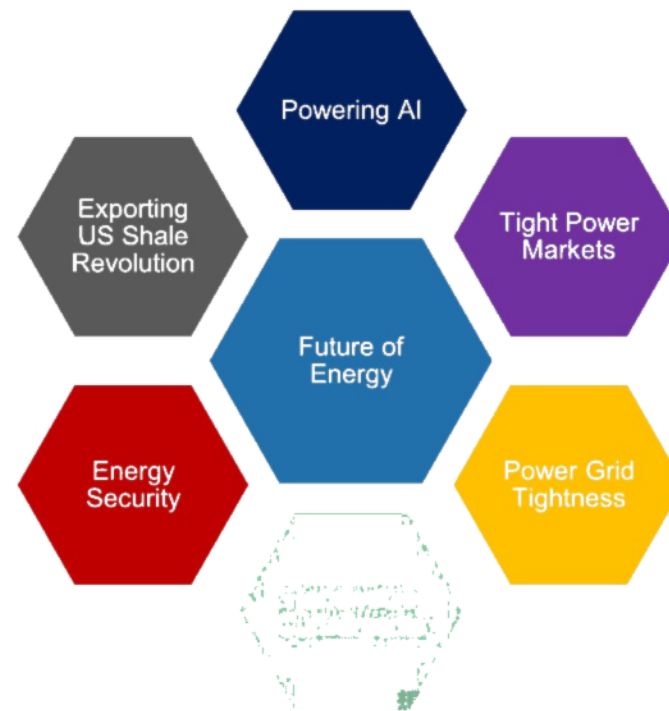
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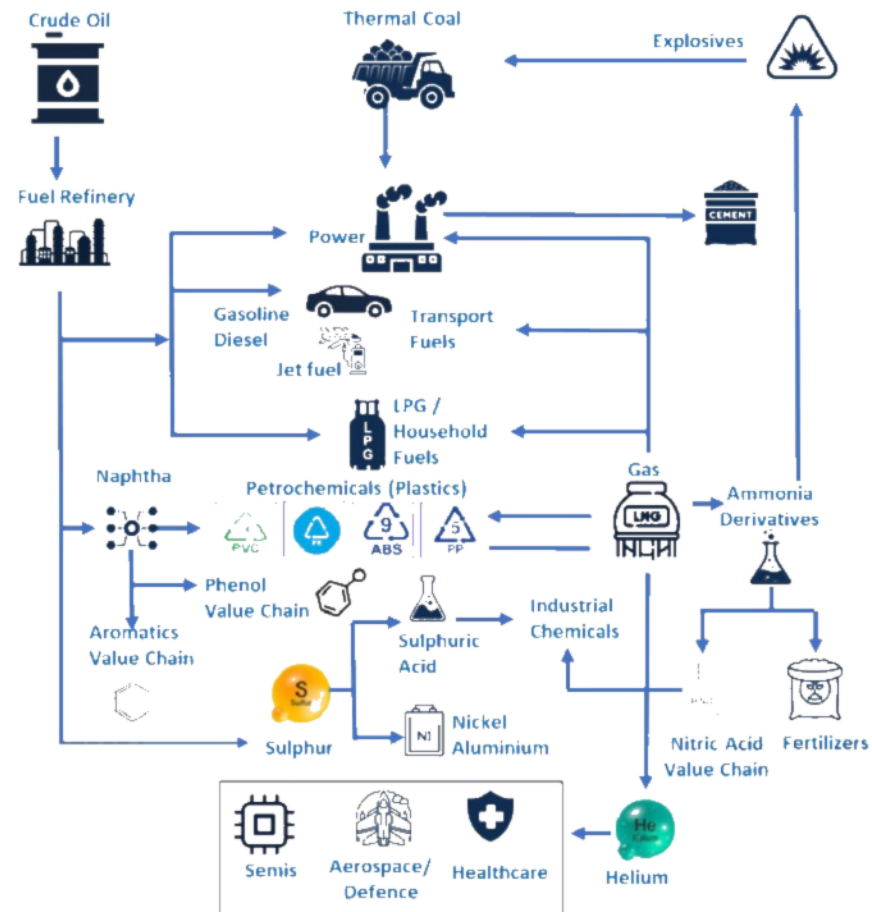
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The Diffusion in Energy Markets



Structural themes and challenges will drive a paradigm shift and require a co-existence of oil, gas, renewables and coal energy markets

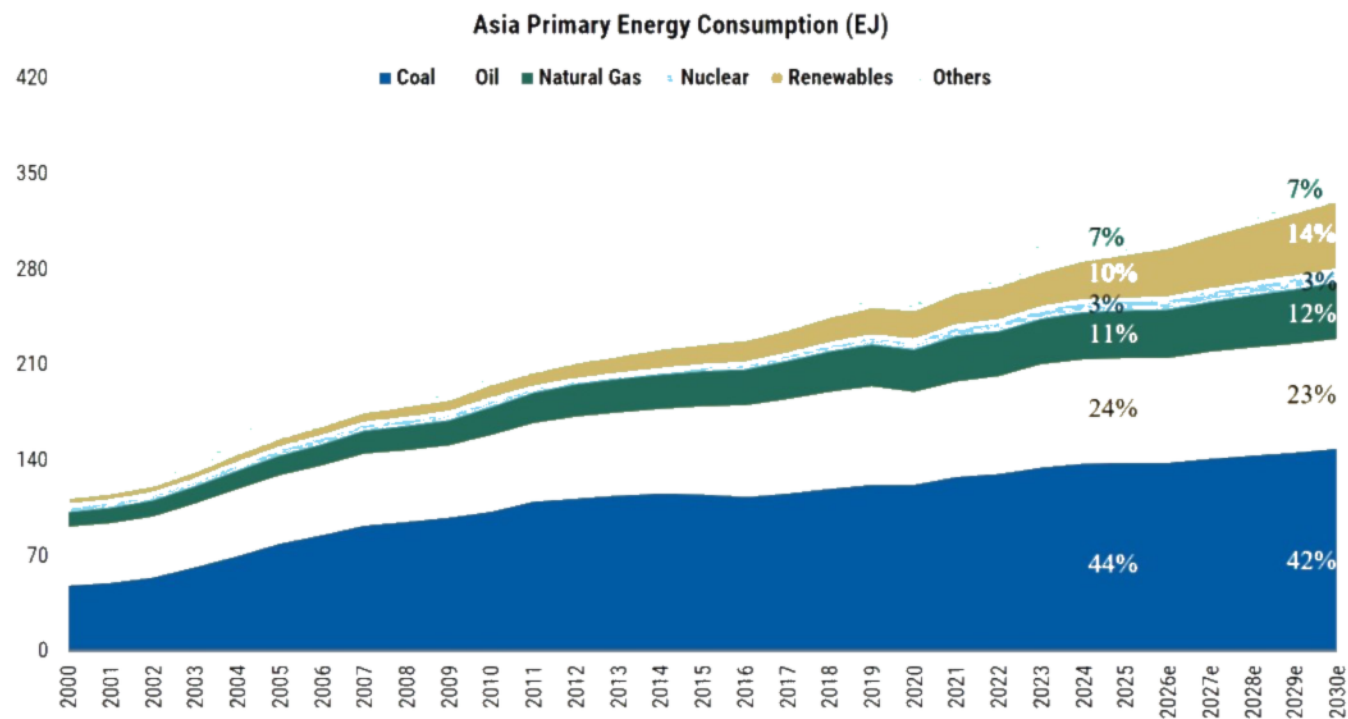
Energy Security: Circularity in Energy supply chains remains underappreciated



Source: Morgan Stanley Research

Asia's Energy Demand Keeps Growing

Asia's Energy Consumption: Steady Growth with AI and Industrial Demand Tailwinds

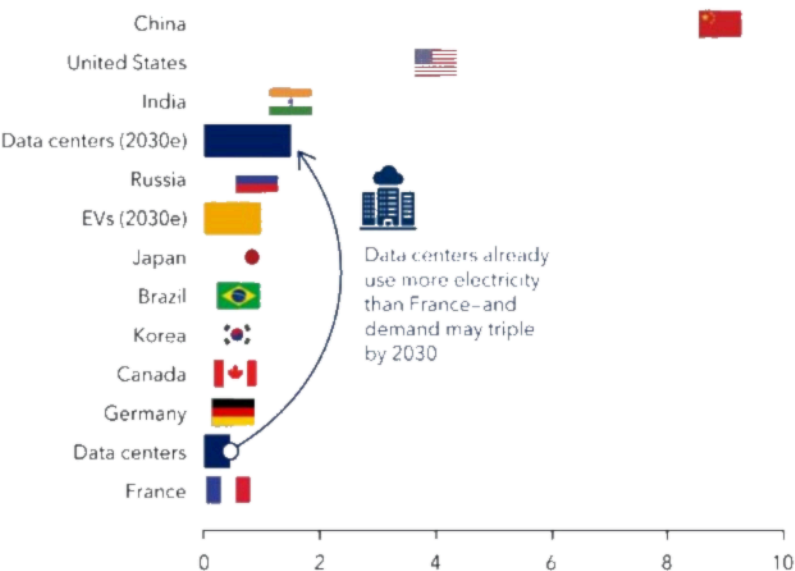


Asia's primary energy consumption to expand at a 2.7% CAGR through 2030, with powering AI at 5% of the energy mix

Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

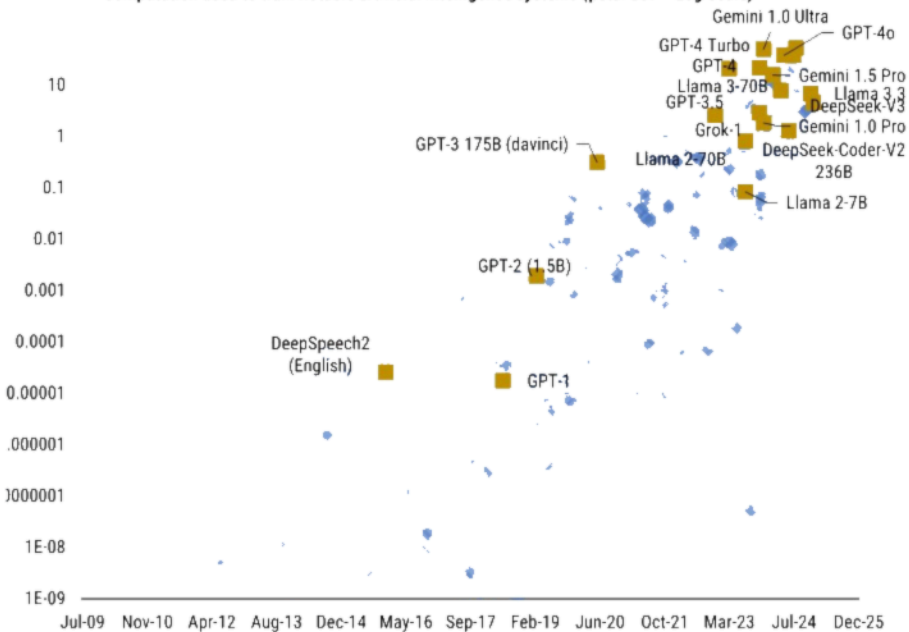
AI requires a lot more energy

Electricity demand 2023; thousands of terawatt-hours



Data centers already use more electricity than France—and demand may triple by 2030

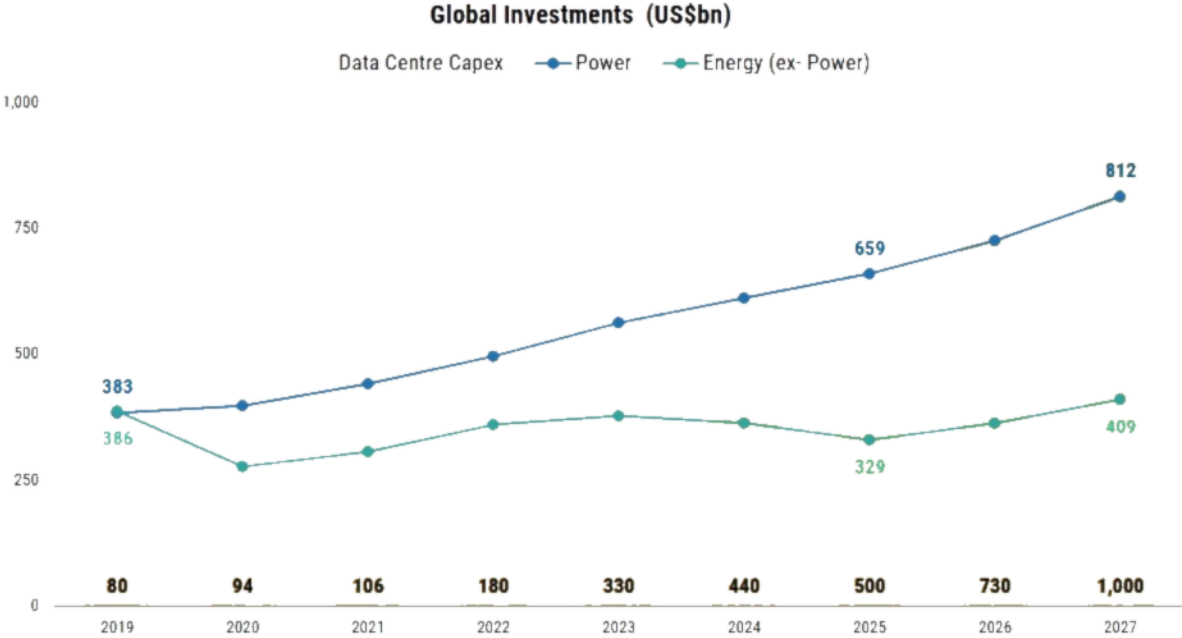
Computation used to train notable artificial intelligence systems (petaFLOP - Log Scale)



A ChatGPT query requires 10 times as much energy as a Google search, and every evolution of an AI model requires 10x more compute (and hence energy) to train

Source: International Energy Agency; Organization of the Petroleum Exporting Countries, IMF Estimates, Epoch, OurWorldInData, Morgan Stanley Research

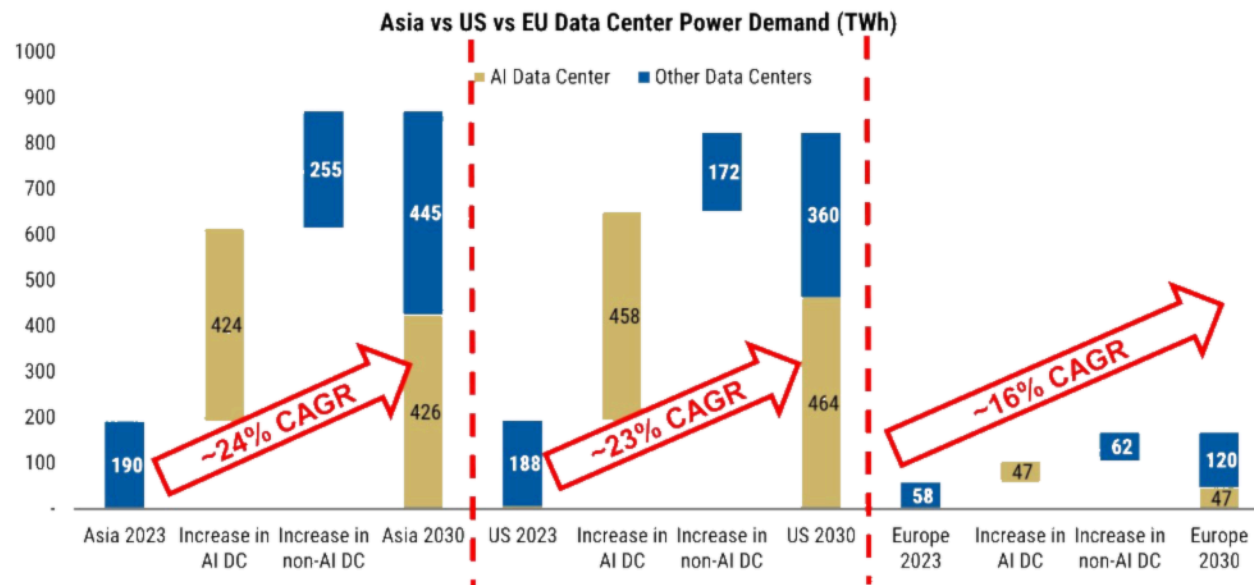
A lot more Energy Investments Needed



Global AI data center capex is set to surpass investment in both power and oil & gas

Source: International Energy Agency; Organization of the Petroleum Exporting Countries, IMF Estimates, Epoch, OurWorldInData, Morgan Stanley Research

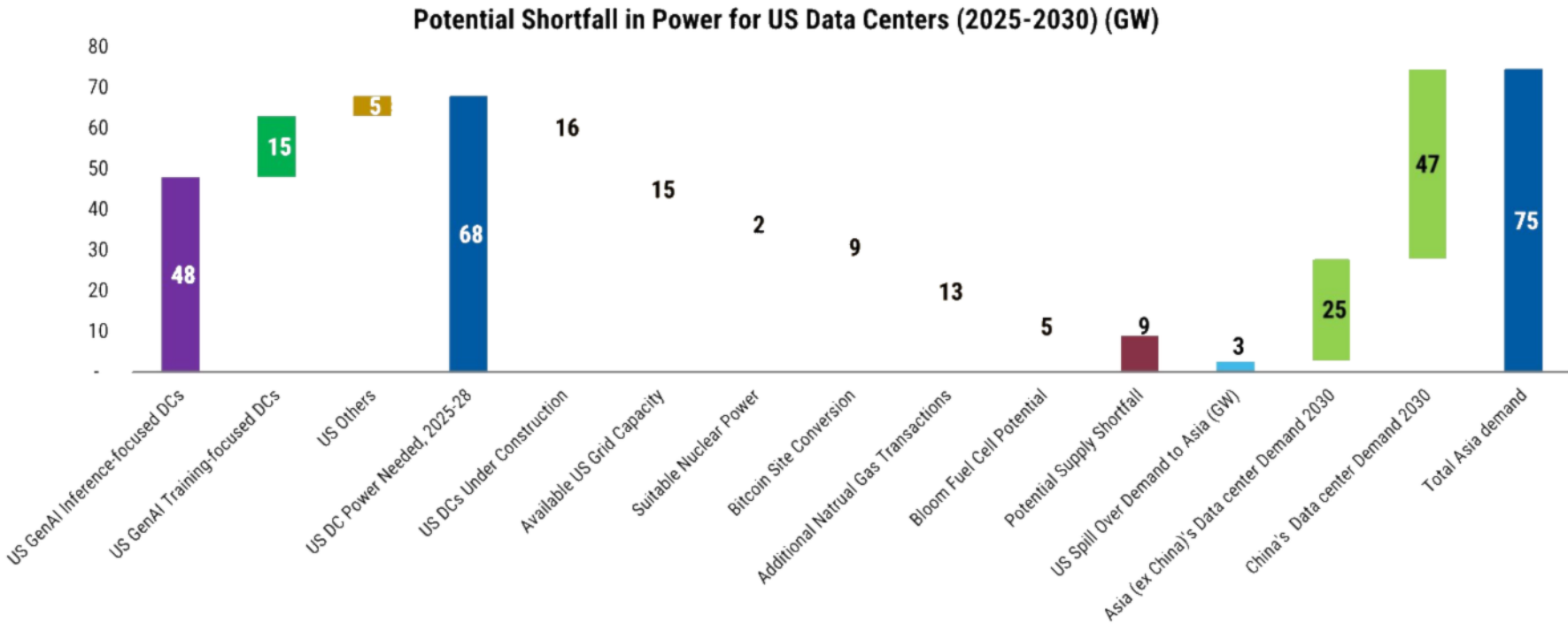
Powering AI: Asia vs US vs Europe Data Center Power Demand



We estimate Asia's DC power demand CAGR to be ~24% over 2023-30, exceeding that of the US and Europe, driven by faster AI inference demand and more investments committed to the region

Source: Morgan Stanley Research estimates.

US Power Supply Chain Constraints Also Help More AI Capacity in Asia

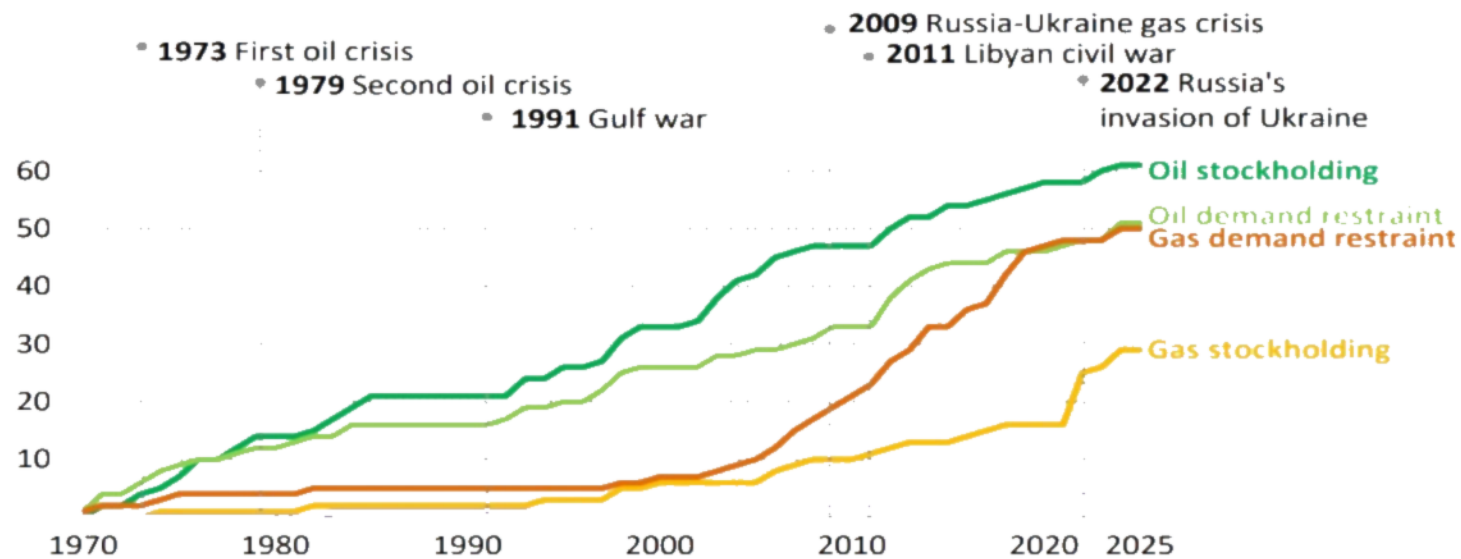


We estimate ~1GW of potential power shortfall for US DCs factoring in suitable nuclear and fuel cell power with a possible 6GW spillover to Asia

Source: Morgan Stanley Research estimates

Asia's Energy Security: In Perspective

Energy Shocks have been getting more Frequent



Since the 1970s, global events and energy crises have triggered a rise in emergency response and energy security policies worldwide

Note: The analysis focuses on 85 countries, covering 93% of global primary energy demand, 87% of global oil demand and 95% of global natural gas demand.

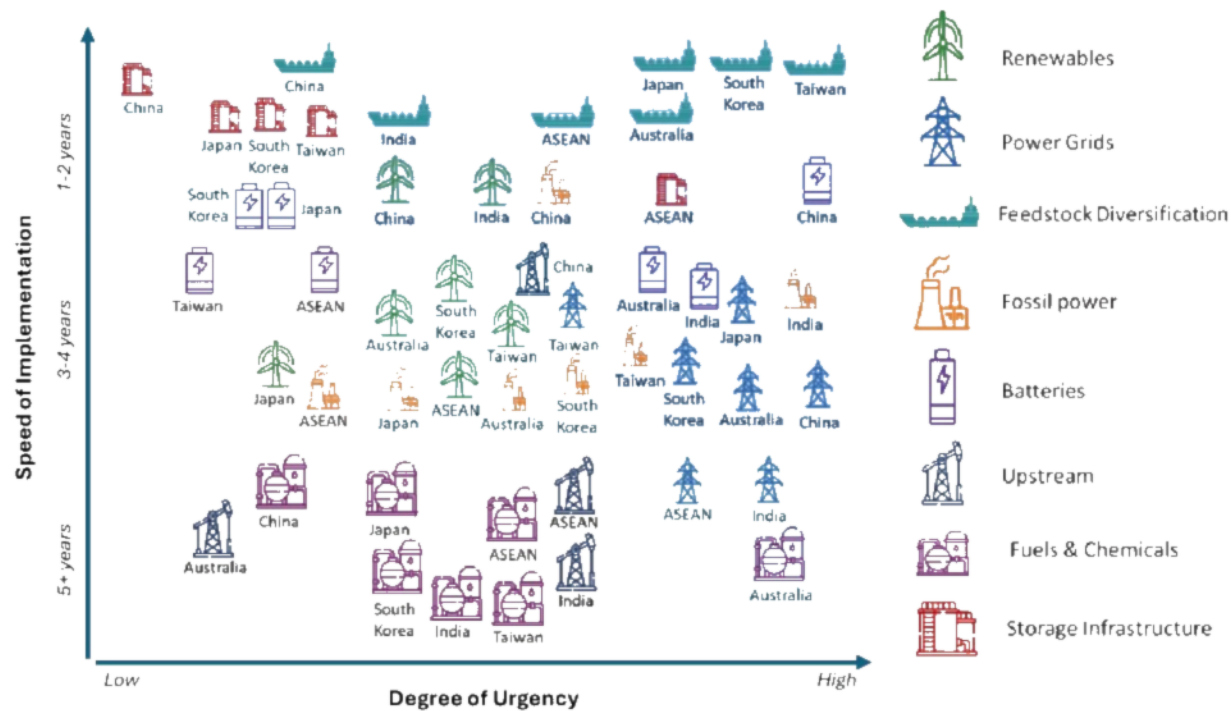
Asia Imports More Than a Third of its Energy Needs

Power Generation Resiliency (% of Total Generation)	Imported				Self Reliance				
	Coal	Natural Gas	Nuclear	Total Imports	Coal	Natural Gas	Nuclear	Renewables & Others	Total Self Reliance
US	1%	2%	17%	20%	14%	38%	1%	27%	80%
Europe	7%	14%	19%	40%	2%	2%	2%	55%	60%
LATAM	1%	10%	NA	11%	1%	15%	2%	NA	18%
Middle East	0%	0%	NA	0%	0%	85%	5%	NA	90%
China	6%	1%	4%	11%	49%	2%	0%	38%	89%
India	3%	1%	3%	7%	66%	1%	0%	26%	93%
Japan	30%	34%	10%	74%	0%	0%	0%	26%	26%
Australia	0%	0%	NA	0%	44%	18%	0%	NA	61%
Singapore	NA	94%	NA	94%	NA	0%	0%	NA	0%
Malaysia	51%	12%	NA	63%	6%	28%	0%	NA	33%
Thailand	8%	21%	NA	29%	2%	38%	0%	NA	41%
Philippines	47%	8%	NA	54%	16%	9%	0%	NA	24%
South Korea	30%	29%	30%	88%	3%	2%	0%	7%	12%
Taiwan	29%	51%	1%	82%	0%	0%	0%	18%	18%
Vietnam	26%	7%	NA	33%	25%	3%	0%	NA	28%

Asia's needs for oil and natural gas for the transport and power sectors should see a shift toward coal, energy storage, and dependable fuels

Source: Morgan Stanley Research estimates.

Asia's Energy Security Implementation vs Urgency Matrix

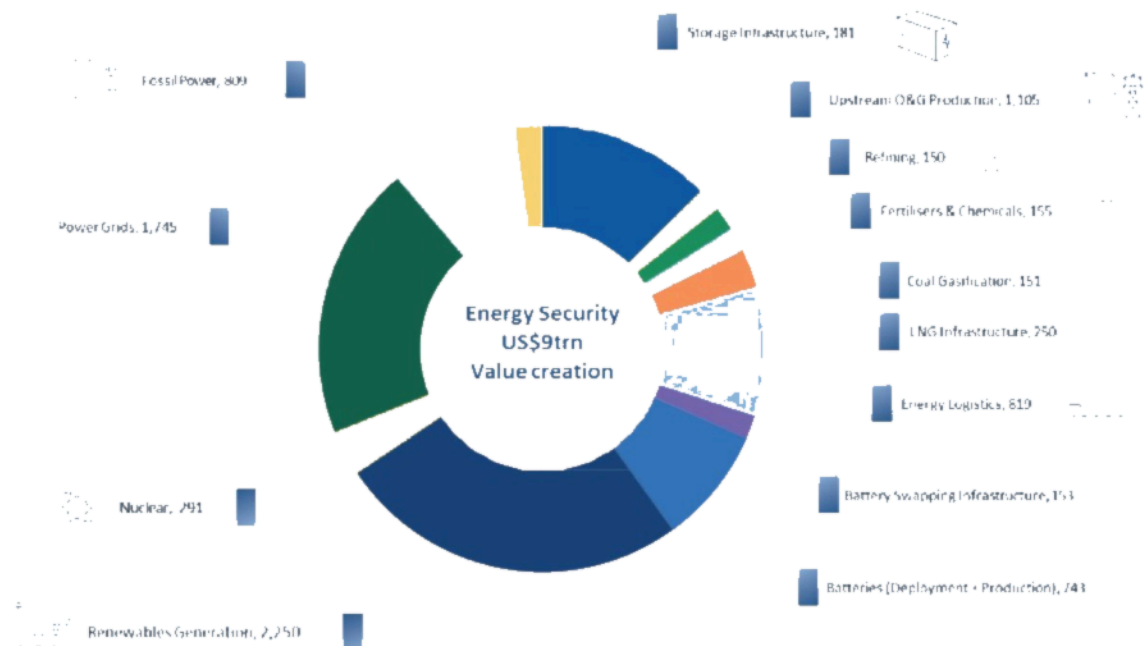


Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

Bottom Line: Best Energy Security and Powering AI Ideas

1. **Own dependable energy assets that are helping power AI:** Assets that give nations the ability to further energy self-sufficiency, such as nuclear, renewables, energy storage, greater domestic oil, and natural gas production and fuel refining.
2. **Diversification of energy sourcing to the US, LatAm, and within Asia:** Own tankers, LNG export and import infrastructure, and midstream pipeline assets.
3. **Accelerating nuclear power, fertilizer and power grid deployment,** as combating power shortages becomes even more critical. Data centers cross-subsidise households, with tiered power prices reducing affordability concerns.
4. **Oil and gas exploration picking up steam; coal gasification capacity builds set to double with return of coal-based power:** Own oil services and coal equipment manufacturers.
5. **Demand for metals and uranium likely to surprise:** Copper, aluminum, uranium, and nickel should see significant demand tailwinds from power and energy security infrastructure build.

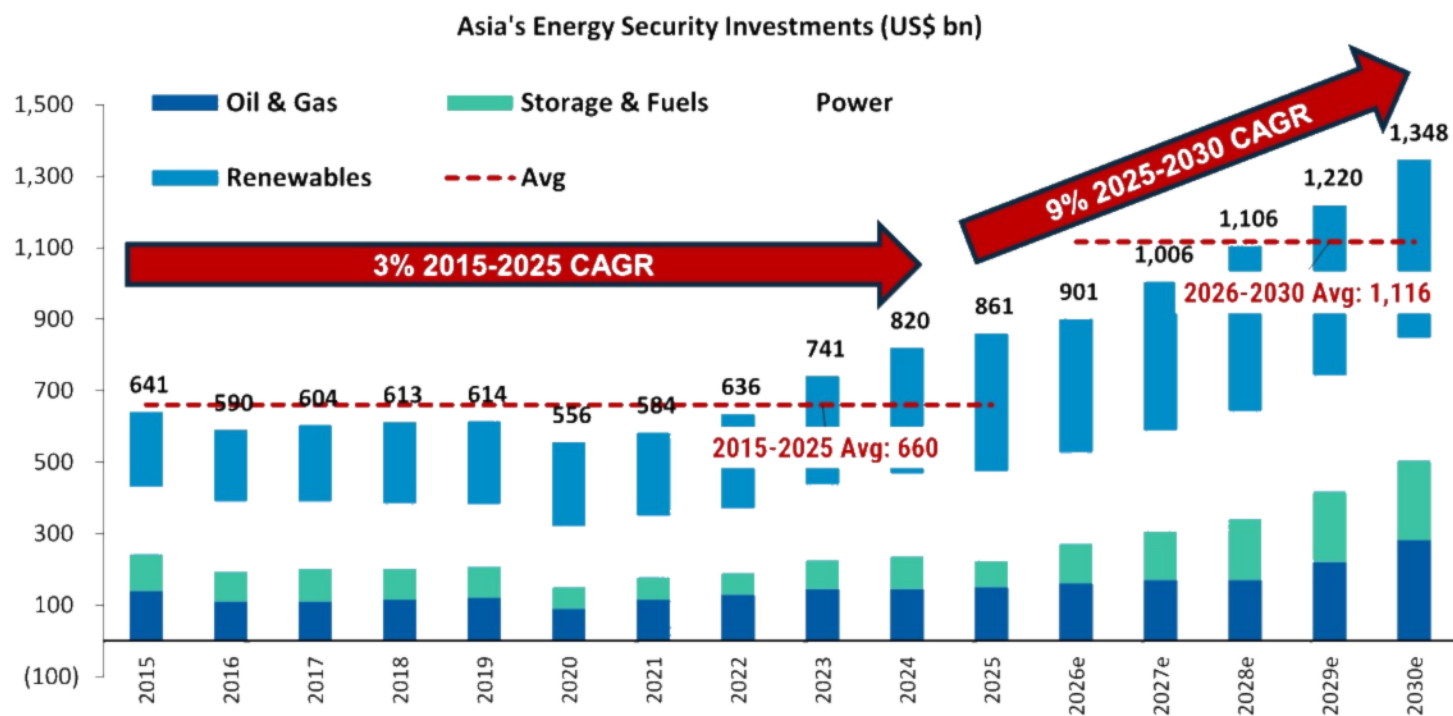
Energy Security & AI: The US\$9trn Value Creation Opportunity in Asia



We see a nearly 1.6x torque to the value creation as US\$5trn+ in investments across the region ensure security of tech, AI, food, and energy supply chains, unlocking US\$9trn in value

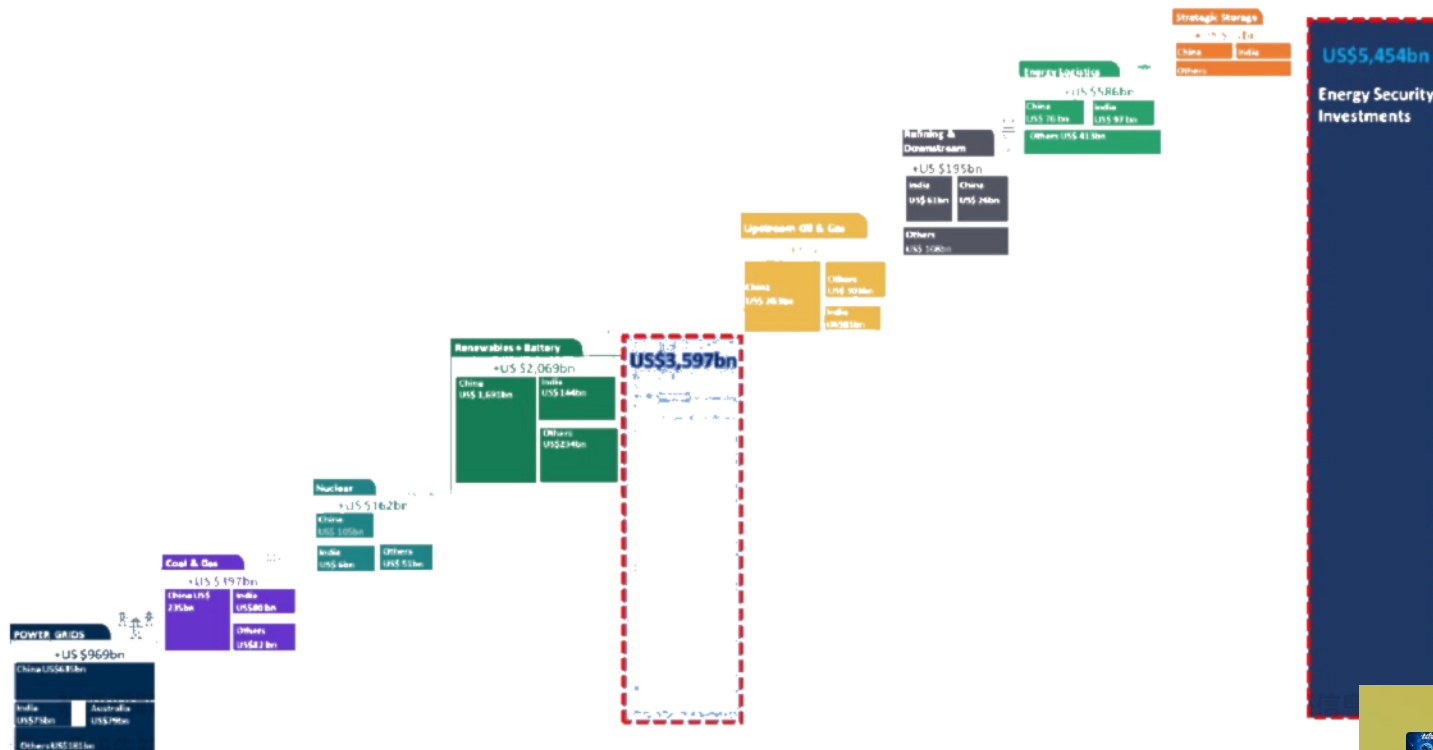
Source: Morgan Stanley Research estimates.

Surprise #1: Asia's Average Annual Energy Investments to Double by 2030



Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

What's Driving the US\$5+trn Supercycle?



Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

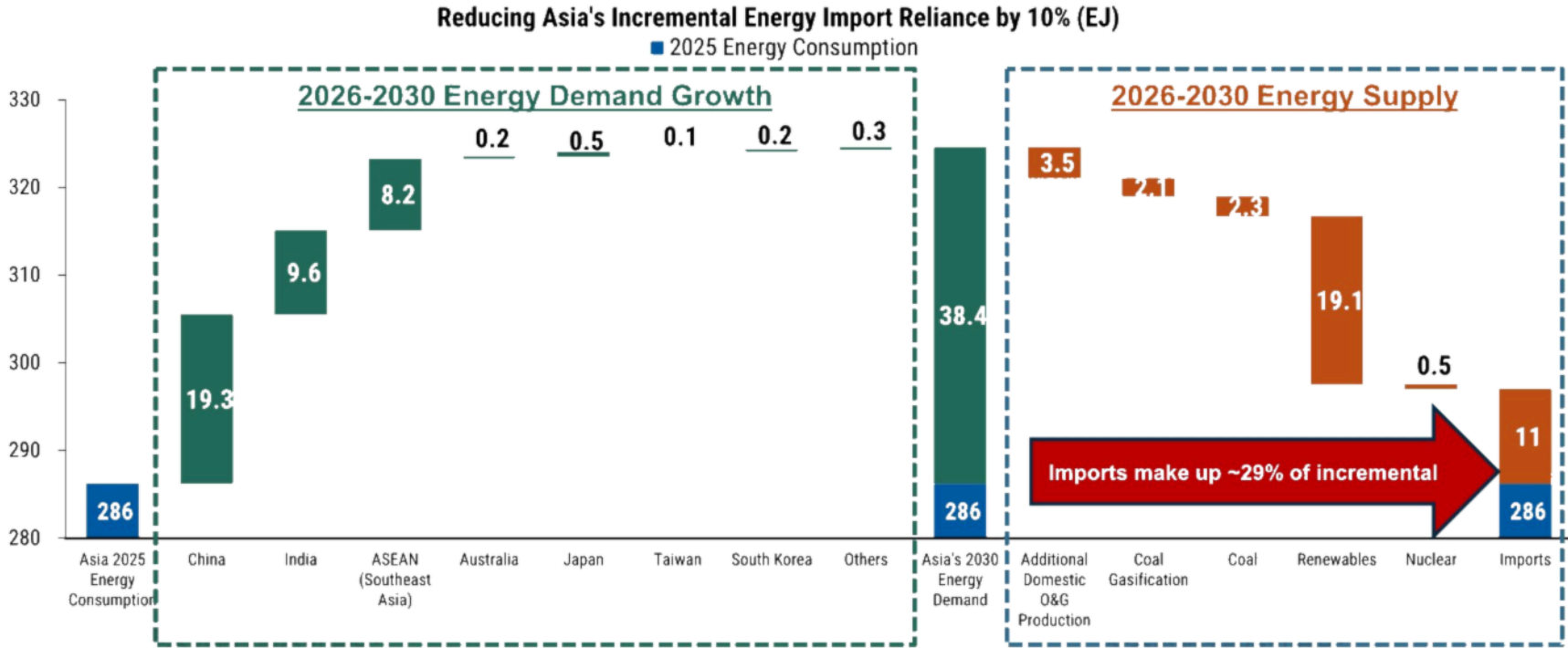


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US\$1+trn in New Investments = Lower Import Energy Reliance



US, Europe, and Japan power consumption is expected to grow 2-3x faster than in the previous decade

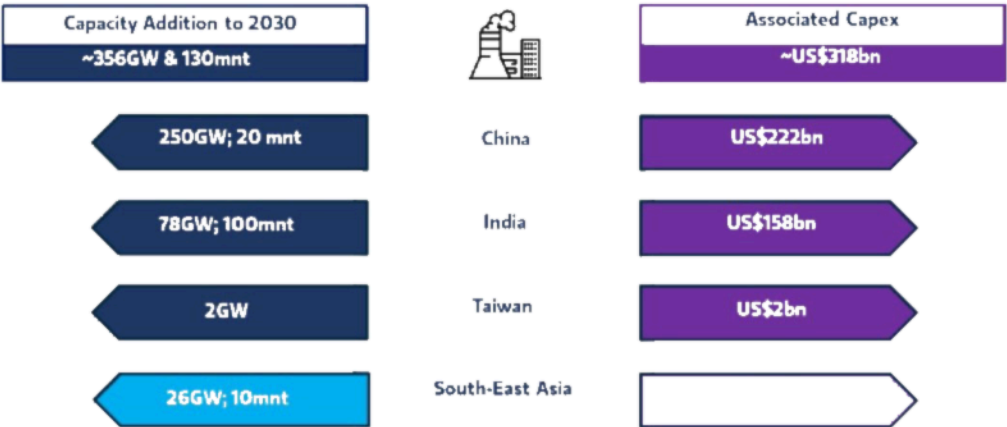
Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

The Return of Coal in Asia's Energy Mix

Surprise #2: The Return of Coal to Secure AI's Need for Energy

COAL and COAL GASIFICATION

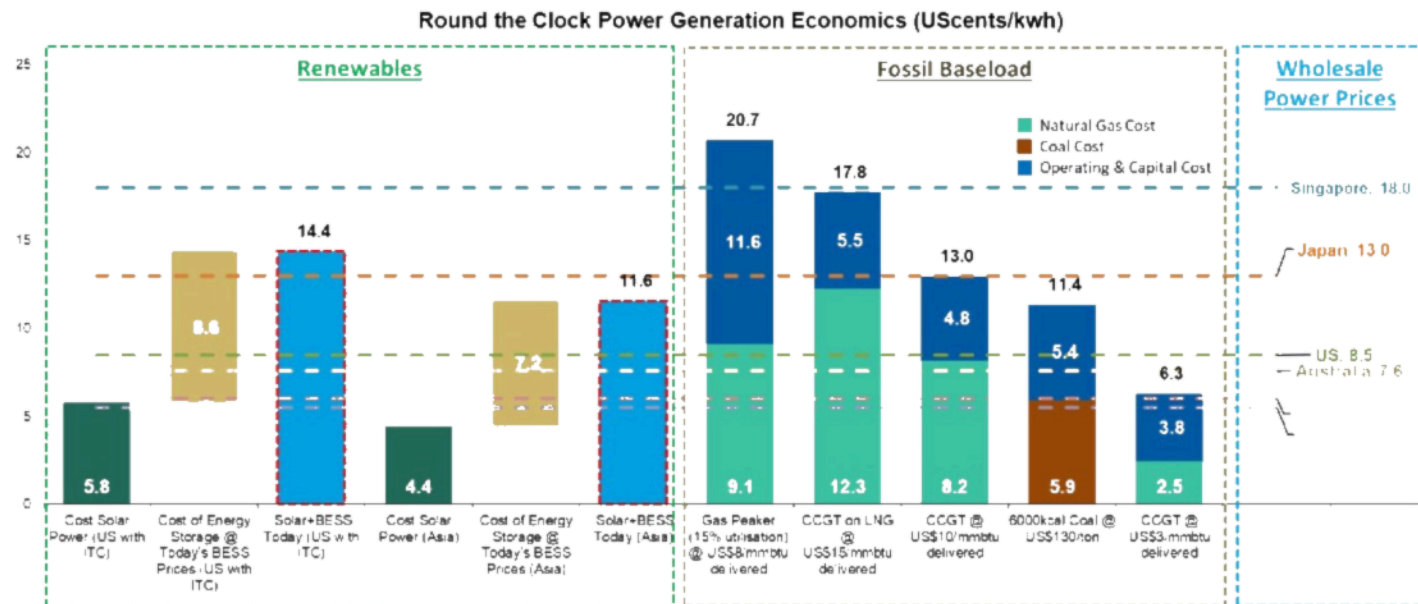
Rising power demand, energy security concerns, and coal to gas substitution are driving a new coal investment cycle across Asia



We expect Asian markets to spend US\$318bn in coal investments, driven by higher power demand and coal-to-gas switching

Source: Morgan Stanley Research estimates.

Comparing Power Generation Economics



US shale revolution will be exported to Asia for the first time at scale in 2027, with repercussions across the powering AI and energy security thematics

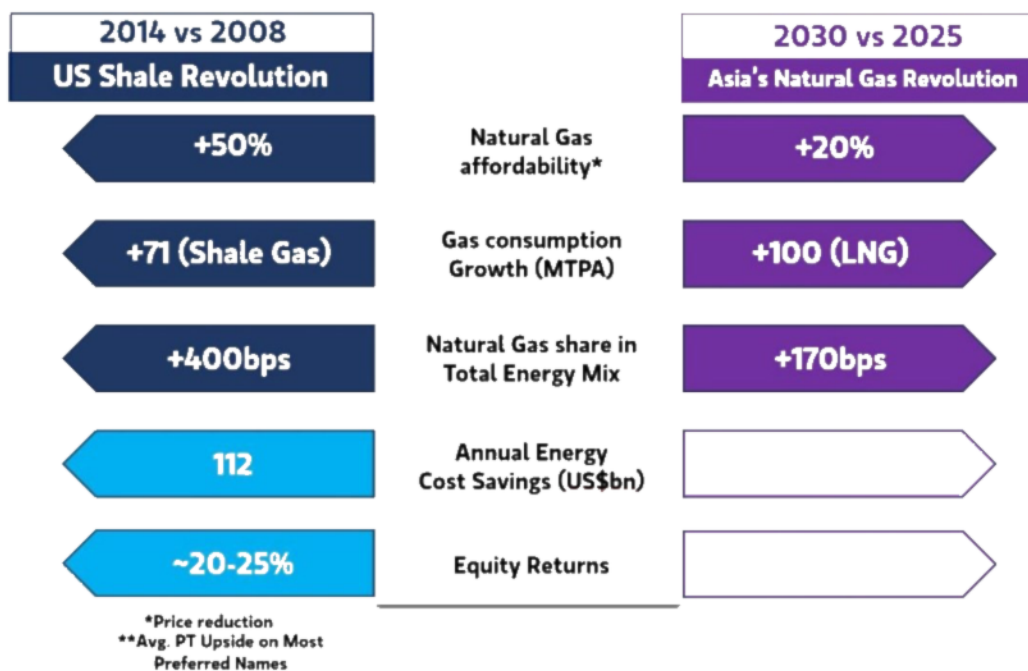
Source: Morgan Stanley Research estimates.

Diversification of Asia's Energy Mix

Surprise #3: Diversification of Energy Sourcing to the US & LatAm

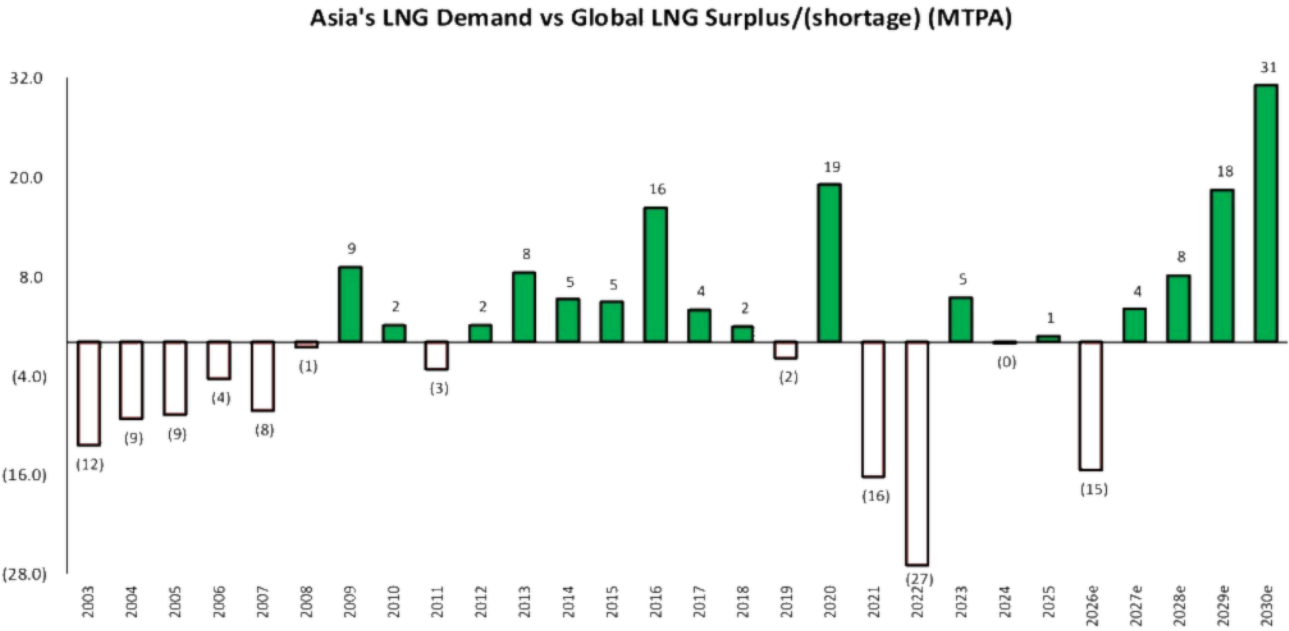
Exporting the "US Shale Revolution" to Asia

Driven by 120+MTPA of new Global LNG export capacity by 2030



Source: Morgan Stanley Research estimates.

The Supply Chain Shift: More US Energy for Power and Plastics



US shale revolution will be exported to Asia for the first time at scale in 2027, with repercussions across the powering AI and energy security thematic

Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

The Supply Chain Shift: Economies are Onshoring Critical Supply Chains

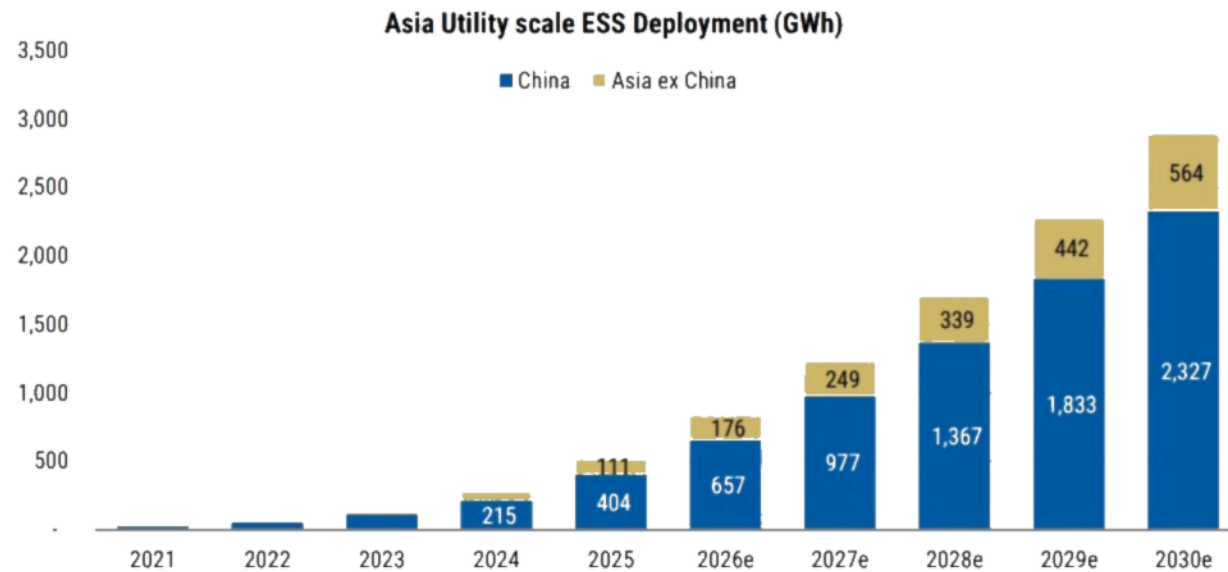
Capacity Company	F27						F28						Level of integration
	Polysilicon (Mtpa)	Ingot	Wafer	Solar cell	Module	Integrated	Polysilicon (Mtpa)	Ingot	Wafer	Solar cell	Module	Integrated	
Reliance	40,000			20.0	20.0	20.0	40,000			20.0	20.0	20.0	Polysilicon to module
Shri Sai Electricals		5	5	5	5			10	10	10	10		Polysilicon to module
Premier Energies			2	8	11	11		8	10	10	11	8	Ingot to module
Mundra Solar	30,000			10	10	10	30,000			10	10	10	Polysilicon to module
Waaree Energies		10	10	5	26	10		10	10	15	28	10	wafer/ingot to module
Renew Power				7	7	7				7	7	7	wafer to module
Tata Power Solar				4	4					4	4		Cell & Module
Renew-sys				3	6					3	6		Cell & Module
Vikram Solar				12	21			12	12	21		6 (F29)	Module
Saatvik Solar					4					5	9		
Goldi Solar				4	14					4	14		Cell & Module
Jupiter Solar				6	2					6	2		Cell & Module
Emmvee				3	7					3	7		Cell & Module
Websol				2	1					2	1		Cell & Module
Rayzon Solar					12						12		Module
First Solar					3						3		Module - vertically integrated
Others					20						40		
Total	70,000.0	15	17	87	171	58	70,000	28	42	108	203	55	

India's solar manufacturing buildout is accelerating rapidly,
with major players building integrated facilities

Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

More Energy Storage & Grid Investments Needed

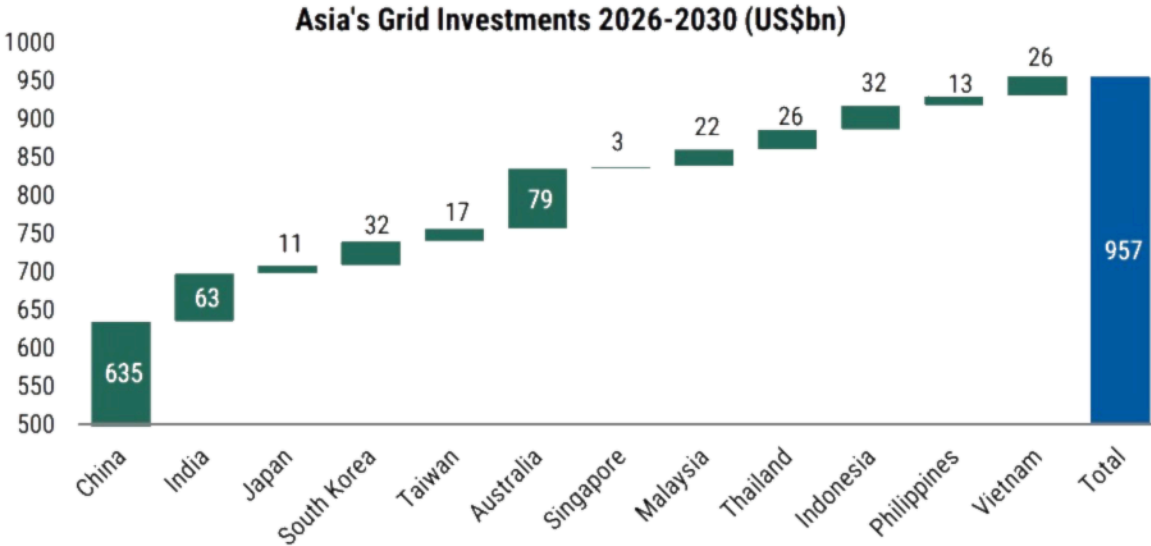
Surprise #4: Energy Storage Expands Rapidly, Even in Markets Outside of China



Coupled with high renewable deployment, we expect ESS additions of around 2700GWh by 2030

Source: Morgan Stanley Research estimates.

Surprise #5: Power Grid Deployment Boom

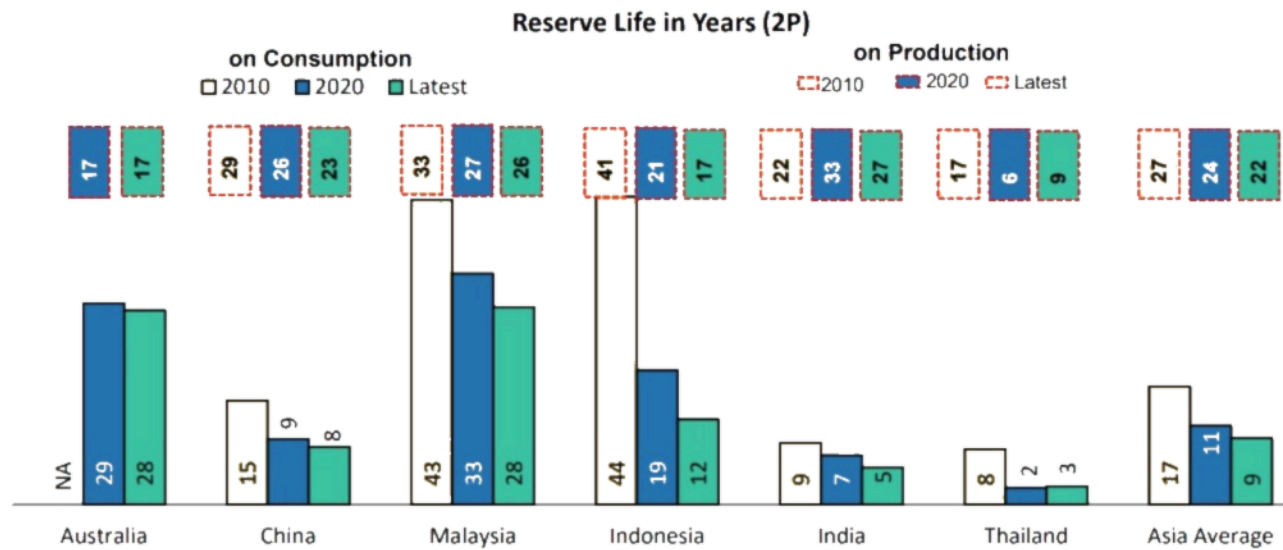


A lack of grid capacity is emerging as a critical bottleneck, driving higher levels of congestion and demand growth. Access to power via the grid is key in this 'Age of Electricity' and is a US\$1trn investment requirement.

Source: Morgan Stanley Research estimates.

Reducing Asia's Oil & Gas Import Reliance

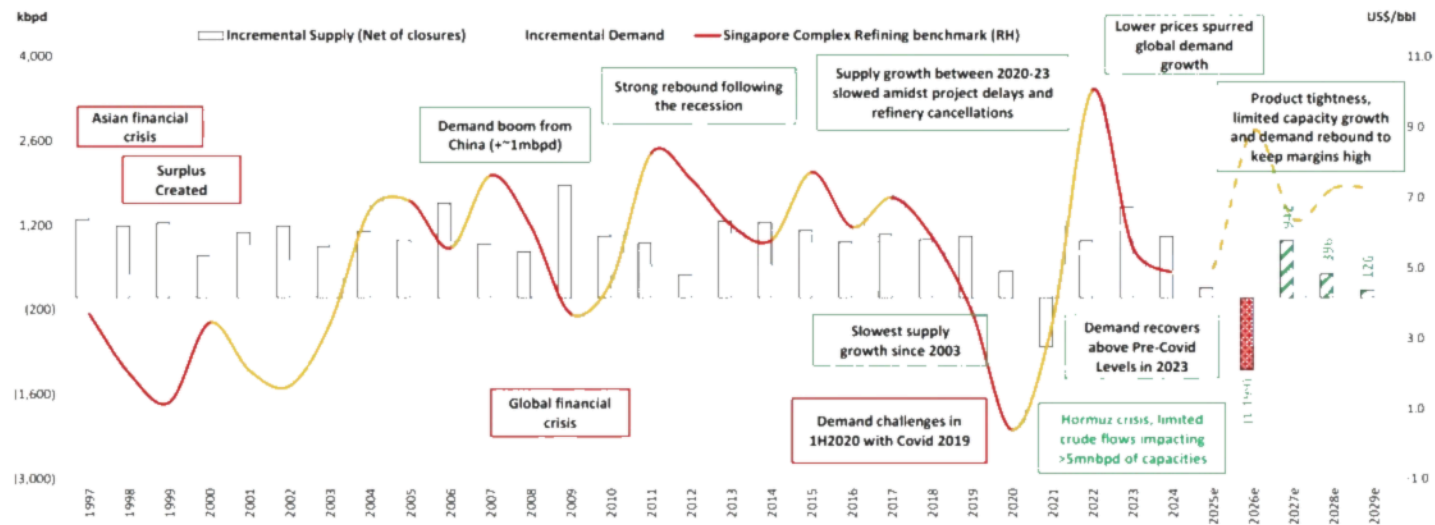
Surprise #6: Upstream Energy Picks up Steam & Coal Gasification Capacity Builds Double



Asia's reserve life based on energy consumption averages 9-10 years (vs ~15 years on production). implying that Asia's reliance on external energy will remain elevated

Source: Morgan Stanley Research estimates.

Fuel: A New Refinery Needed Every Year



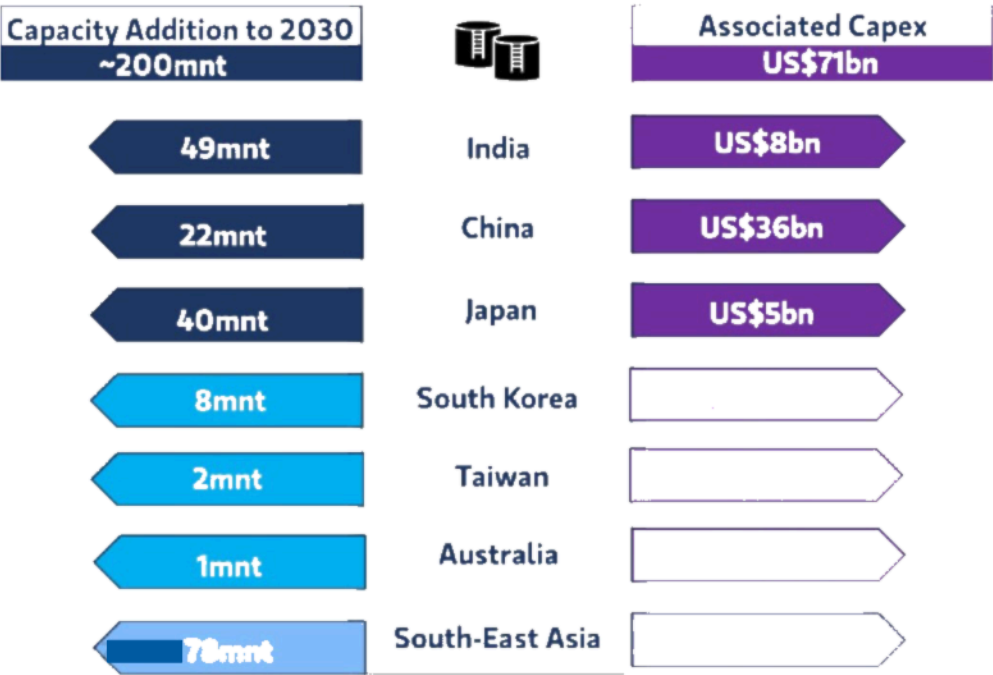
The refinery cycle in perspective: Much tighter as capacity growth remains below consumption growth by nearly 30-40%

Source: Statistical Review of World Energy, Morgan Stanley Research estimates.

Strategic Reserves: A Multi-year Capex Cycle

Storage Infrastructure

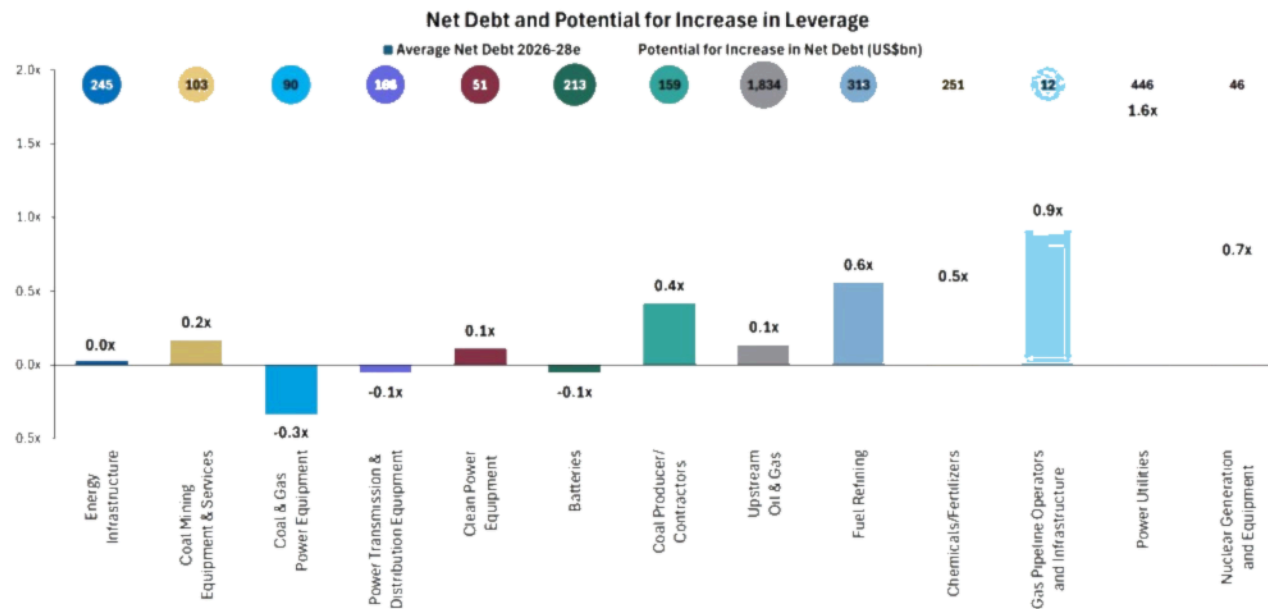
Rising energy security needs and the push to build strategic reserves are driving investments across Asia's storage infrastructure



Source: Morgan Stanley Research estimates.

How are New Investments Funded?

Surprise #7: Corporate Balance Sheets are Well Funded to Capitalize on Energy Security

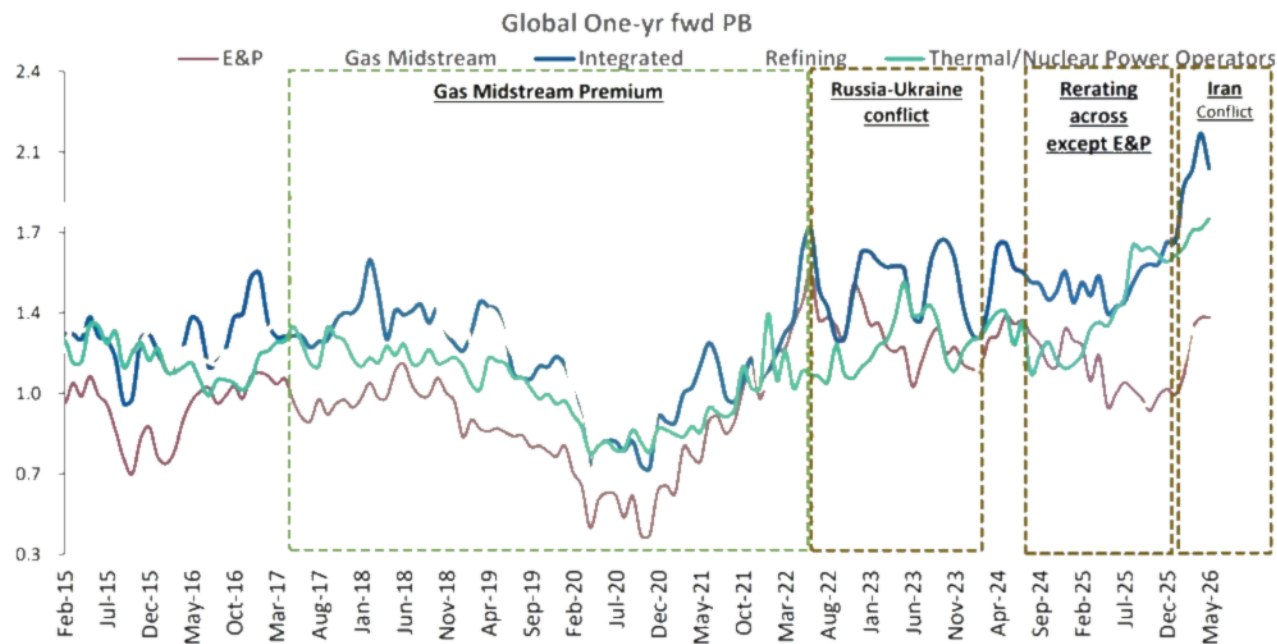


Funding energy security: Corporate balance sheets are strong, with limited debt as companies have been behind the curve on growing investments vs. consumption growth.

Collectively, we see a US\$4trn potential for funding by debt on 2028 multiples

Source: Refinitiv, Morgan Stanley Research estimates.

Learnings From Power Supply Chain Re-rating: Getting Broader Across Energy



Power supply chain has re-rated 20-50% in the past two years, as the consumption growth outlook has changed. The story widens to all dependable energy

Source: Refinitiv, Morgan Stanley Research.

Asia Energy Security Exposure Guide

Key Surprises	USA	CHINA	EMEA	INDIA	JAPAN	SOUTH KOREA	TAIWAN	ASEAN	AUSTRALIA
Surprise #1: Asia's energy capex will double by 2030.	   	    	   	  	  				
Surprise #2: The Return of fossil to Secure AI energy needs	 	 	 	 	 		 	  	
Surprise #3: Diversification of energy sourcing to the US, LatAm	      		 		     				
Surprise #4: Domestic O&G production & refining picks up		     		    	    	 		    	   
Surprise #5: Energy storage expands rapidly						 			
Surprise #6: Accelerated nuclear and power grid deployment	 	    	   	    	   		 		
Surprise #7: Corporate balance sheets can support 75% of investment		   		   	   	 		   	  

Source: Morgan Stanley Research