

China's Energy Transition

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The World Bank

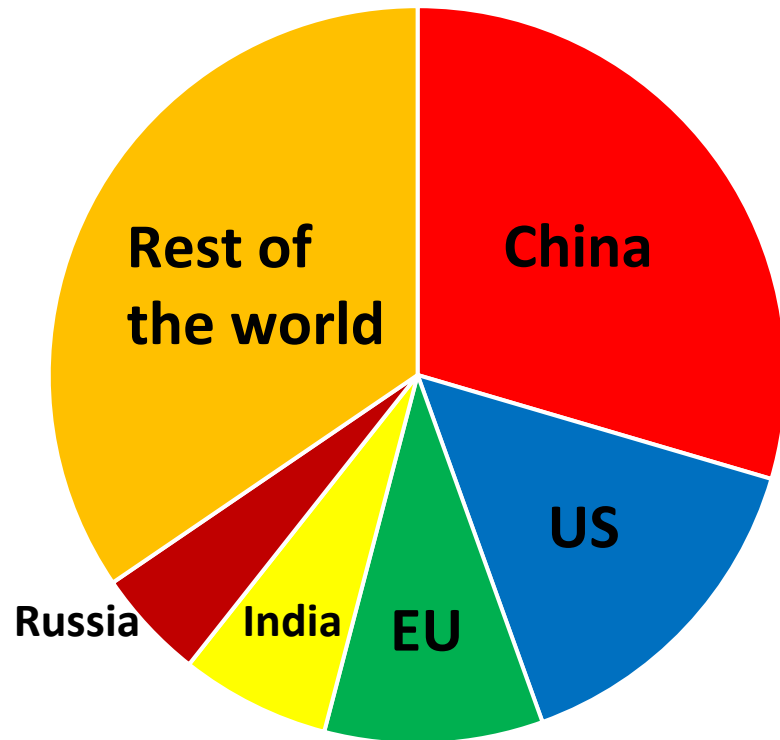
Vienna, November 7, 2012³

Structure of the Presentation

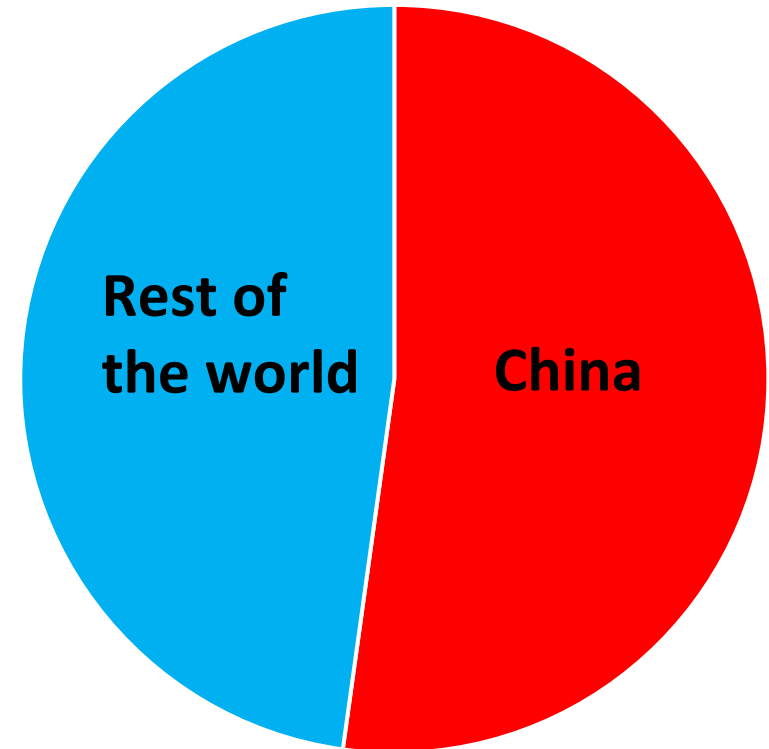
- **A tale of two Chinas:** the largest coal consumer and the largest renewable power in the world
- **Decarbonization pathways to reach net zero:** improving energy efficiency, greening the power mix with sector reforms, decarbonizing the industrial and transport sectors, and ensuing a just transition
- **The World Bank's support to energy transition in China:** conducive policies and reforms and market-based approaches coupled with green financing
- **China and the world:** China dominates global clean energy manufacturing (e.g. solar, wind, EV, battery)

China: the largest CO2 emitter and coal consumer in the world

China emits more CO2 than the EU and US combined

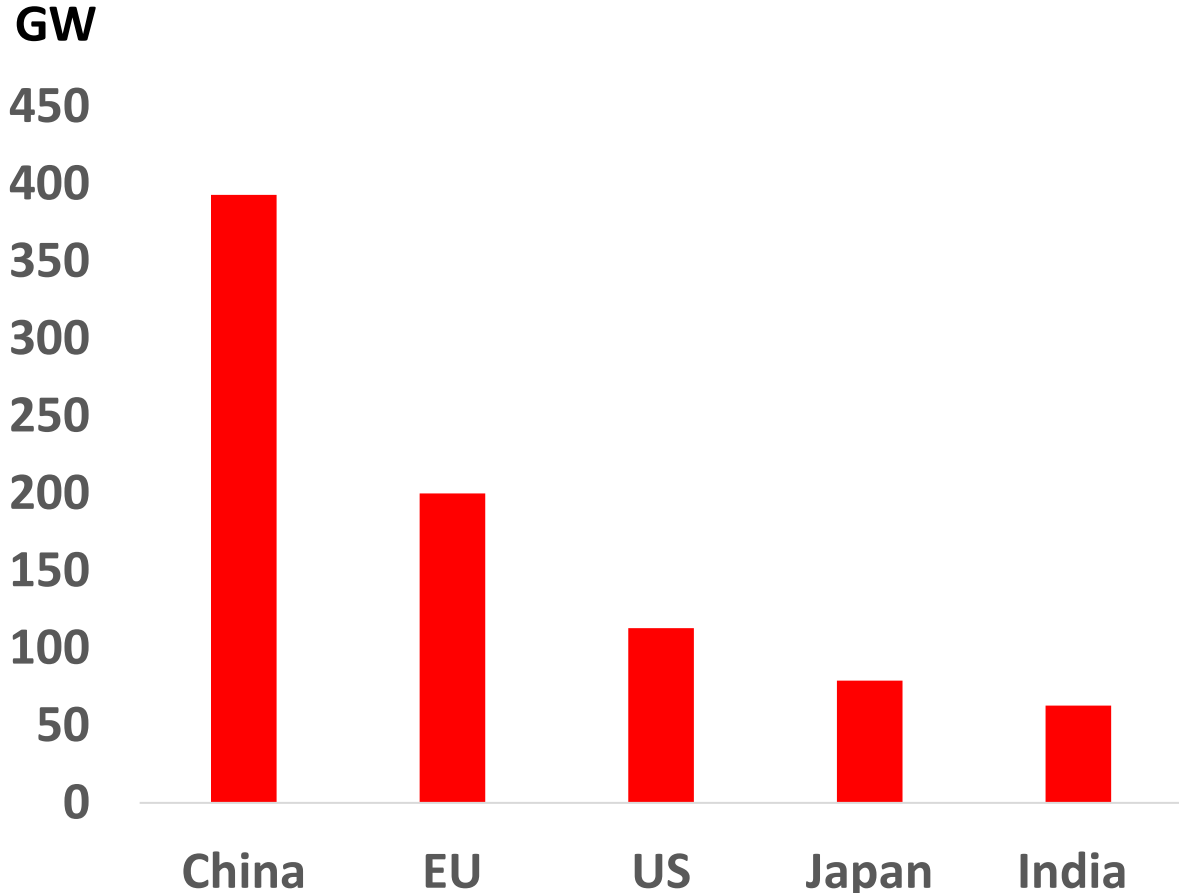


China burns more coal than the rest of the world combined

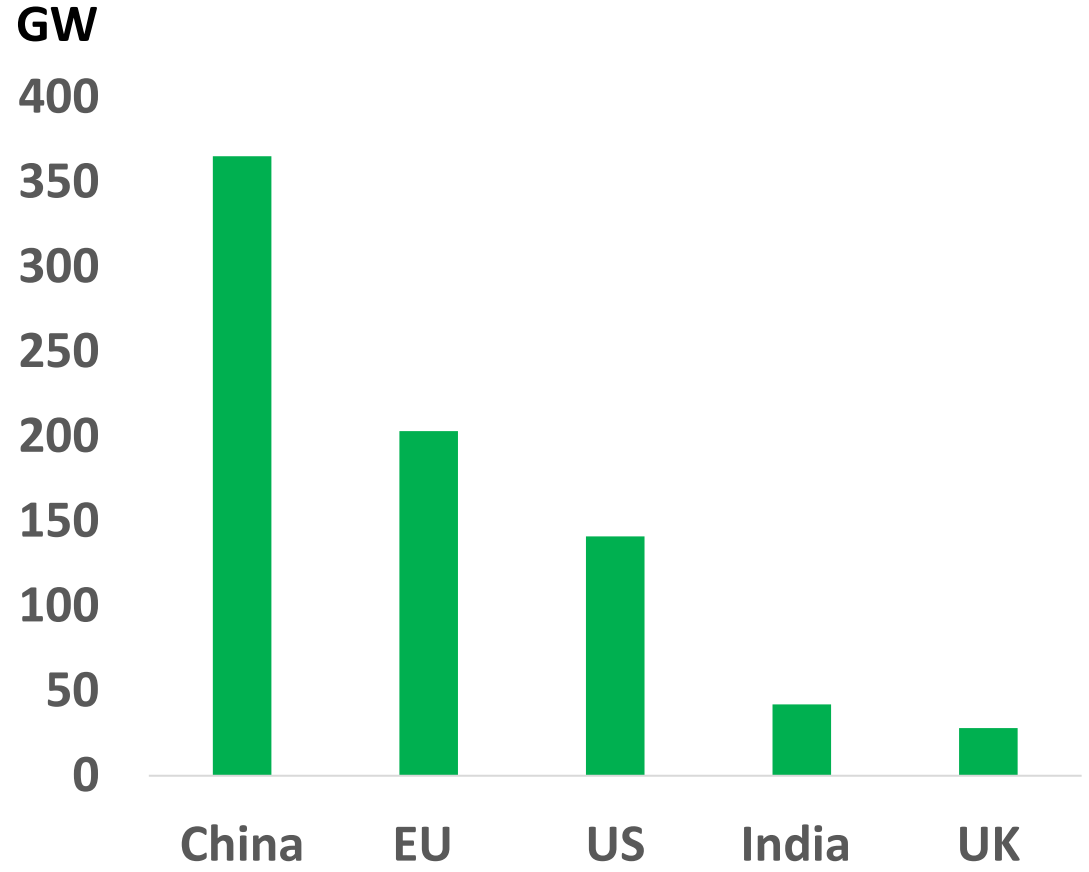


China: the global leader in renewable energy -- installing more solar and wind than the rest of the world combined

Global top five solar power capacity 2022



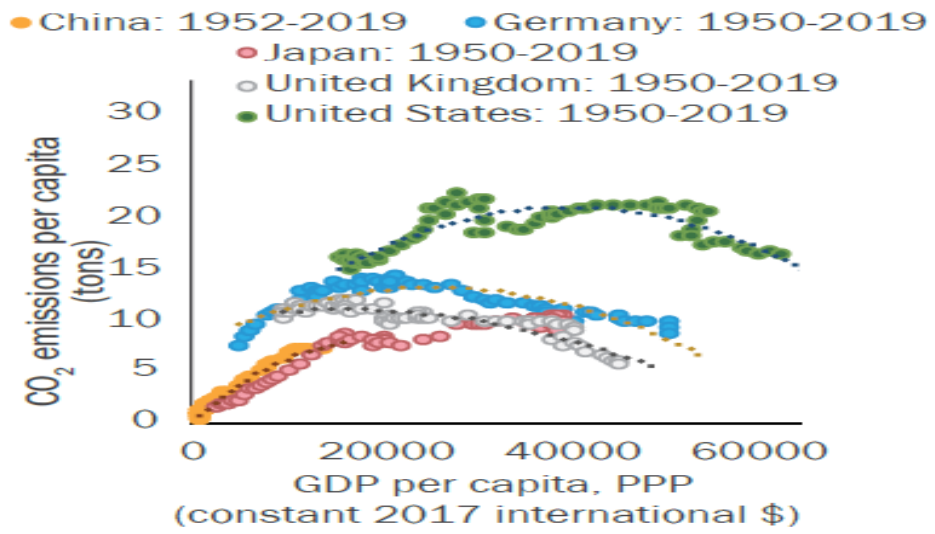
Global top five wind power capacity 2022



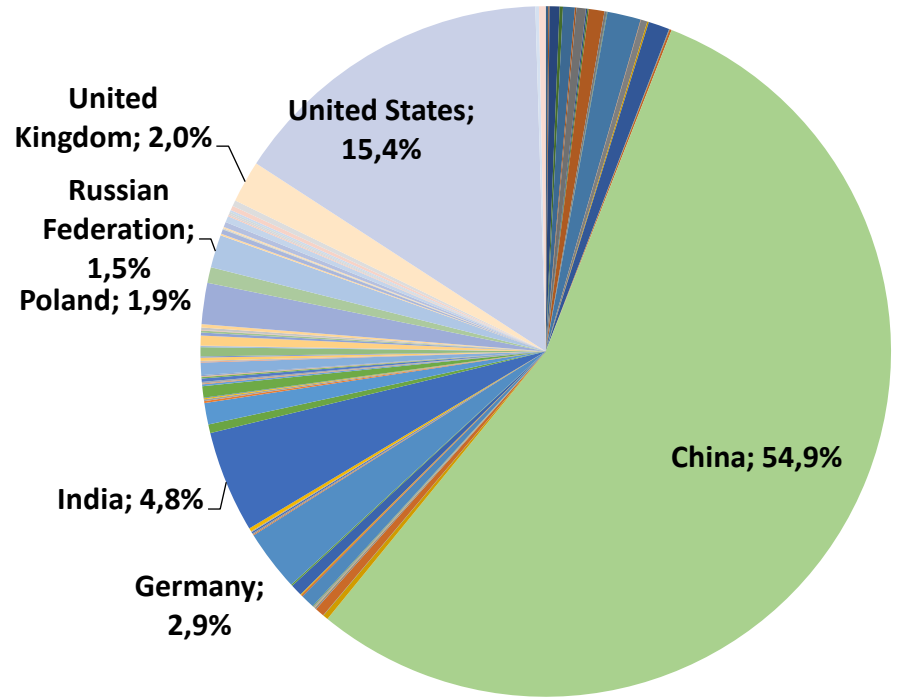
China: energy consumption and emissions decoupled from growth

China's energy consumption increased 9 times (600 Mtce to 5.4 Btce) to fuel a 94-fold increase in GDP (\$190 billion to \$18 trillion) from 1980 to 2022

China's transition to carbon neutrality will require decarbonization at a lower income level and at a faster pace than other major economies



China contributed to more than half of the global energy savings

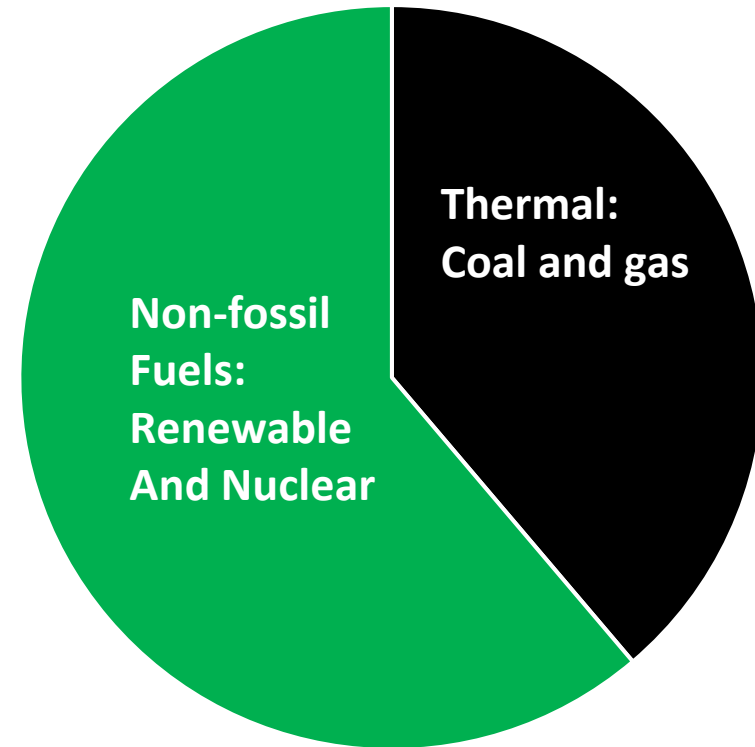
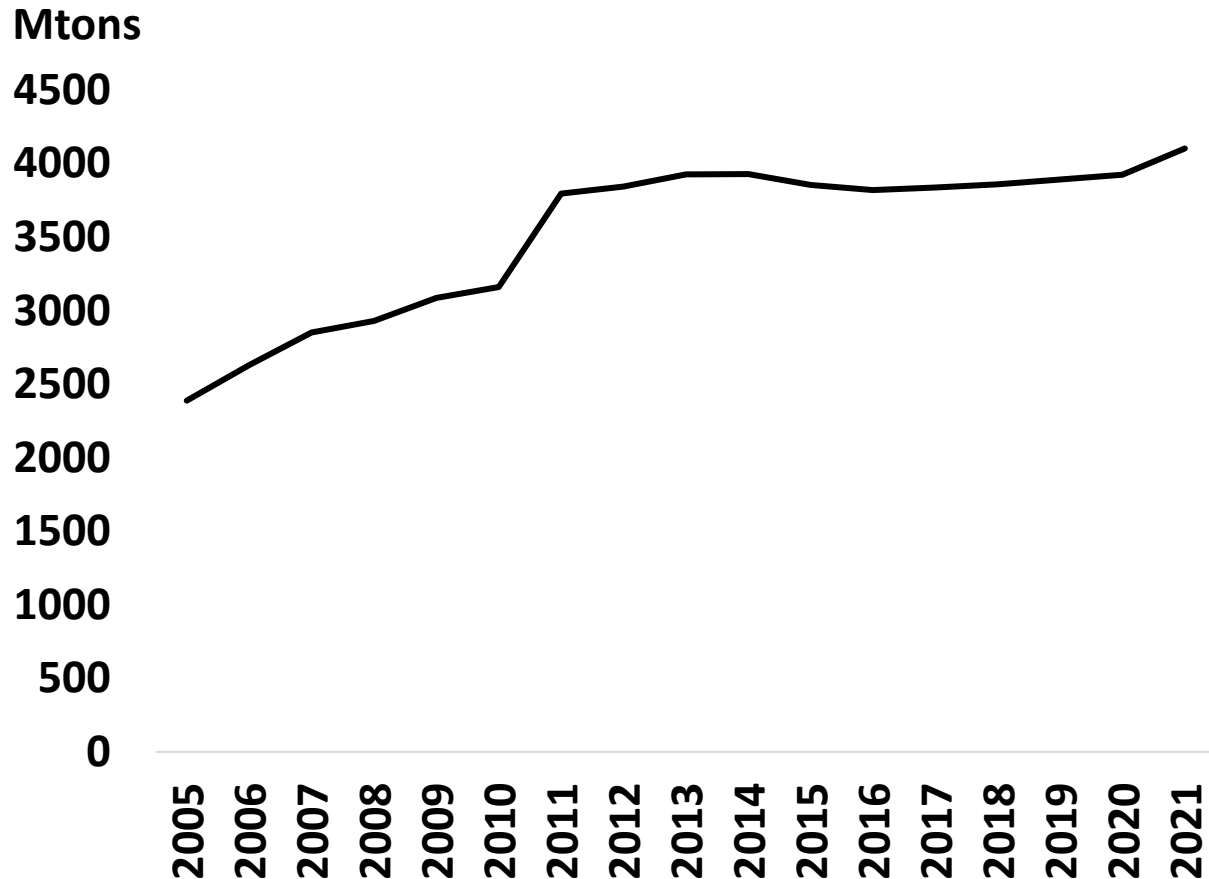


Source: WB Global Tracking Framework

China's coal consumption has plateaued since 2015, but bounced back in 2021, and coal's share in primary energy has steadily declined

China's coal consumption has plateaued since 2015, but bounced back in 2021

Thermal power accounted for less than half of Newly added power capacity since 2013



China is committed to reach emission peaking by 2030 and net zero by 2060

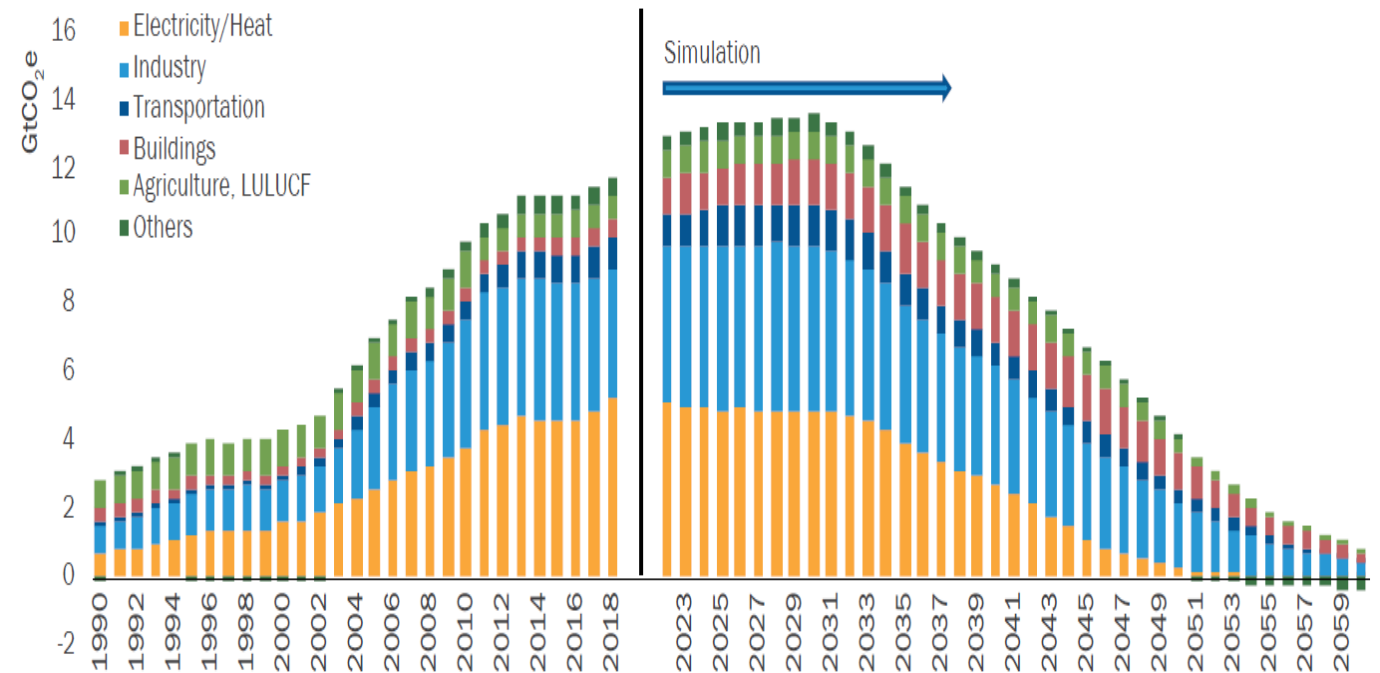
NDC commitment:

- Carbon intensity reduction: 60-65% from 2005-2030
- Non-fossil fuel in primary energy mix: 25% by 2030
- Solar and wind capacity: 1200 GW by 2030 (on track to be achieved 5-6 years ahead of time)
- Carbon emission peaking by 2030
- Carbon neutrality by 2060

Reaching net zero by 2060 is technically feasible

- Rein in energy consumption
- Electrify the end-user sectors and decarbonize the power sector, with power sector reaching net zero by 2040s
- Decarbonize the industrial and transport sectors
- Ensure a just transition

Decarbonization pathways to net zero

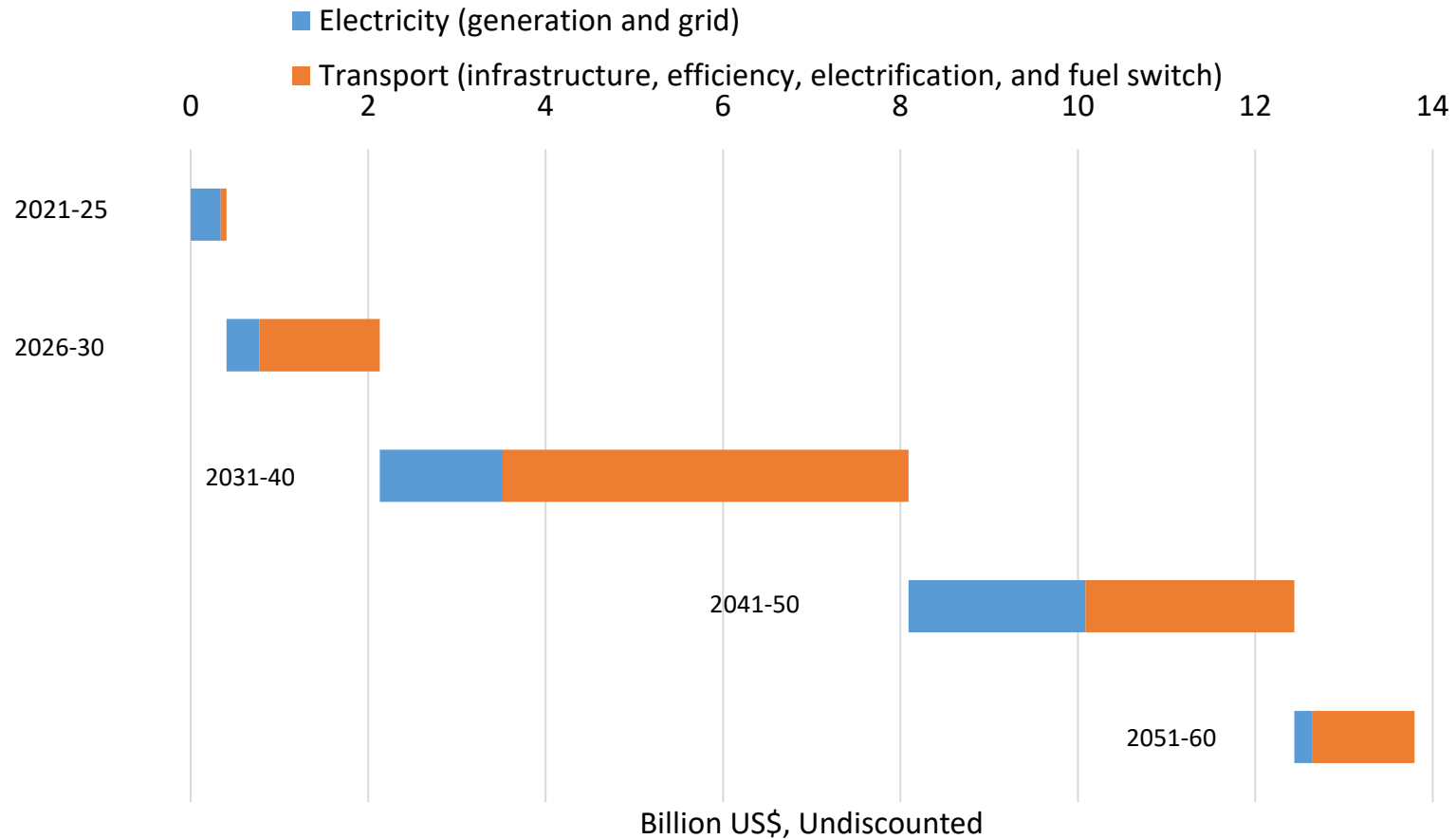


Source: World Bank staff estimates using integrated modeling framework with MANAGE CGE, TIMES China, and LEAP.

Note: The pathway is consistent with China's 30/60 goal and its revised NDC.

Reaching net zero by 2060 is economically feasible

The incremental cost is manageable: \$14 trillion (undiscounted) in the power and transport sectors from now to 2060, 1% of GDP



Source: World Bank Climate Change and Development Report

Decarbonizing the power sector with power sector reforms

- **Improving RE grid integration:**

- Improving power system planning
- Increasing the generation flexibility: gas, hydro, RE hybrid, and making coal power plants more flexible
- Scaling up energy storage (both battery and pump storage)
- Expanding transmission
- Promoting demand side management and weather forecast

- **Deepening and accelerating power sector reform:**

- Completely phase out coal generation quota
- Adopt transparent economic dispatch rules
- Increase inter-regional power trade
- Introduce ancillary service to remunerate energy storage service

Decarbonizing the industrial sector: energy efficiency and electrification, also requires green hydrogen and CCS post 2030

- **Rein in energy consumption**
 - **Shifting economic structure** towards less energy and carbon-intensive economy
 - **Shifting cities** towards less energy- and carbon-intensive urbanization and lifestyle
 - **Improving energy efficiency** with greater reliance on market-based mechanisms
- **Increasing electrification rate**
- **Adopting innovative technologies beyond 2030**
 - Green hydrogen
 - CCS

Decarbonizing the transport sector: Avoid, Shift, and Improve

- **Avoid:** adopting transit-oriented development to avoid the need to travel
- **Shift:** shifting to people centered public transport, improving integration across modes, and adopting pricing mechanisms (e.g. road toll, time of day pricing, congestion charge, parking fees)
- **Improve:** improving fuel economy standards, accelerating EV penetration, greening charging infrastructure (e.g. RE for charging, battery swapping, V2G), and adopting green hydrogen to hard-to-abate long-haul trucks and shipping

Ensuing a just transition

- Chinese coal mine industries: employing 6 million people
- Decarbonization could result in job loss of 1 to 2 million coal workers by 2030, disproportionately affecting inland lower-skilled men
- Mitigating impacts of coal transition on people and communities:
 - Enhance labor market flexibility and social safety nets
 - Provide re-training and re-skilling
- Mitigating impacts of coal transition on land: environmental reclamation and repurposing
 - Many coal mine companies have repurposed closed coal mine areas into solar parks and floating solar
- Supporting economic transition in coal regions

Government primarily relies on administrative measures to achieve the EE target, while WB introduced market-based mechanisms

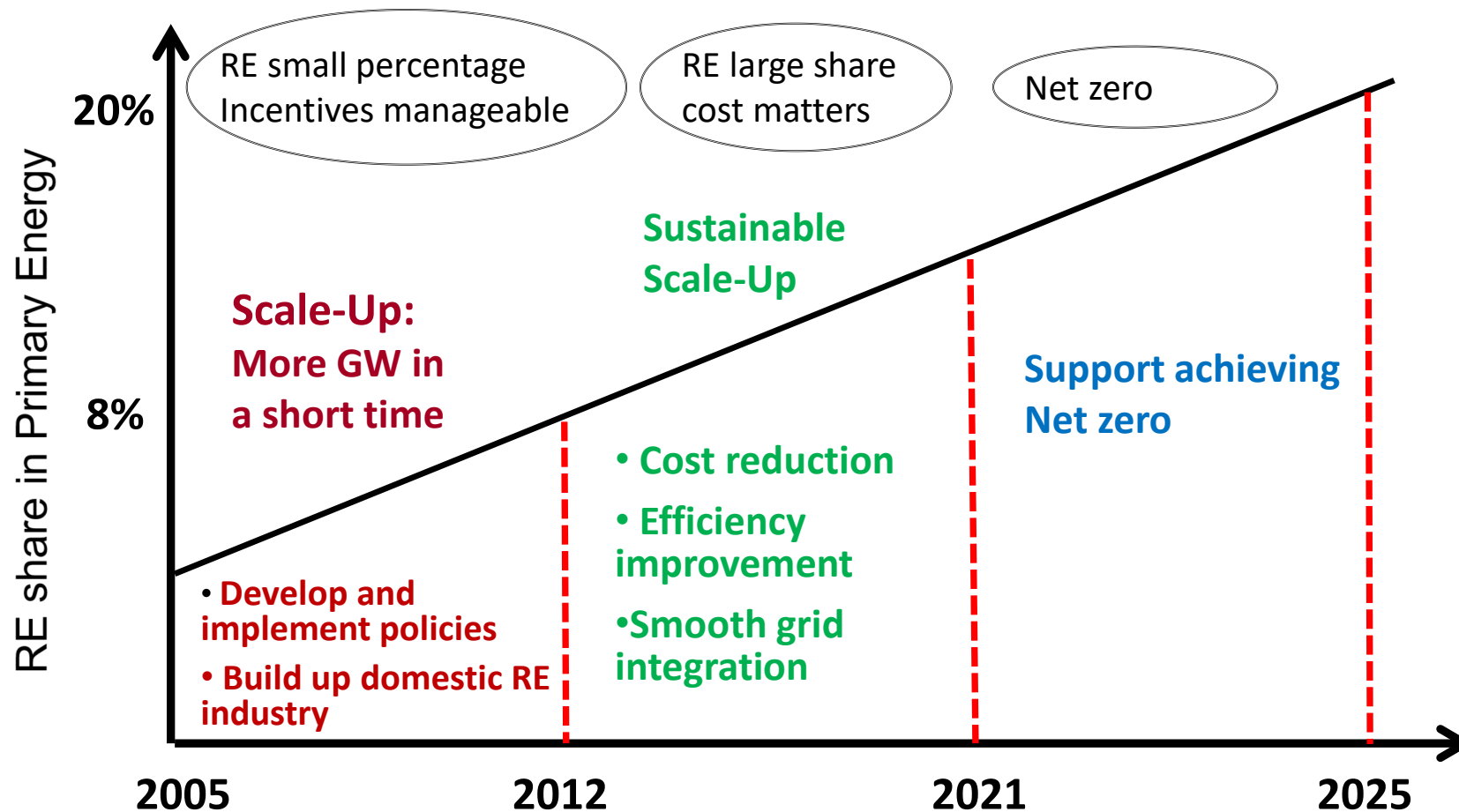
Government Program

- **Mandatory EE targets:** allocated to each province and top 10,000 priority enterprises
- **Mandatory** building, appliances, and vehicle **standards**
- Government **financial support**
- **Approval of new investments:** must meet EE standards
- **Institutional arrangement:** Prime Minister chairs the EE Leading Group

World Bank Programs:

- **Phase I:** Piloted 3 ESCOs as a market-based mechanism of delivery model in 1990s
- **Phase II:** Supported **ESCO industries in 2000s**
 - \$22M GEF grant **provided guarantees for ESCOs**, and **leveraged \$140M investments**
 - **ESCO industry:** growing from 3 to 7,000 with \$19B in EPCs in 2020 (60% of global market)
- **Phase III: China Energy Efficiency Financing Program in 2010s**
 - **WB loan (\$400M):** to three local banks for EE investment
 - **GEF grant (\$13.5M):** **policy support** and **capacity building** to participating banks
 - **Achievements: \$350M IBRD leveraged \$2,640M.** Annual energy savings of 4.4 Mtce and CO₂ emission reduction of 10.7 Mtons

China Renewable Energy Scale-Up Program (CRESP): Supporting RE policies and five-year plans – conducive policies are prerequisite for green financing

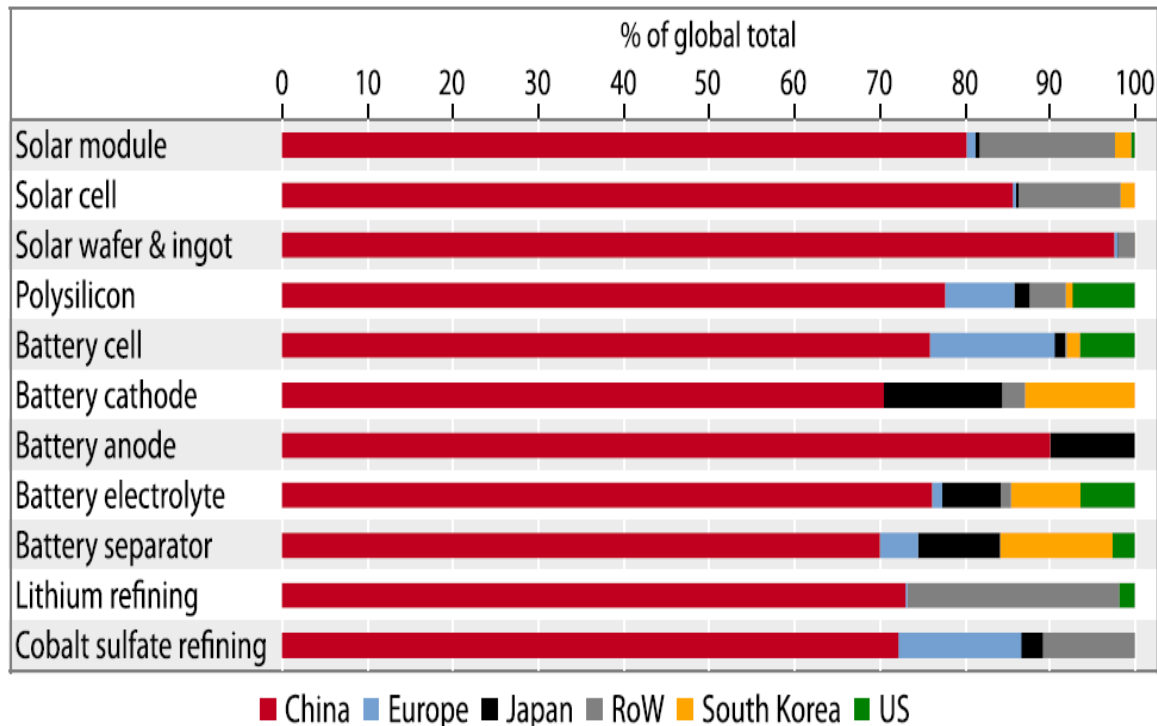


China and the world

China dominates clean energy manufacturing: 80% PV, 60% EV etc.

China dominates clean-energy manufacturing

Share of factories, by location



BNEF, Gavekal Dragonomics/Macrobond

US and EU: import tax vs subsidies for domestic industries

- **EU:** net zero target by 2050, and ban new internal combustion car by 2035
- **US:** Inflation Reduction Act provides at least \$400 billion to subsidize domestic clean energy development
- **Import taxes** increase the costs of clean energy, thereby reaching net zero targets, and make domestic industries less competitive