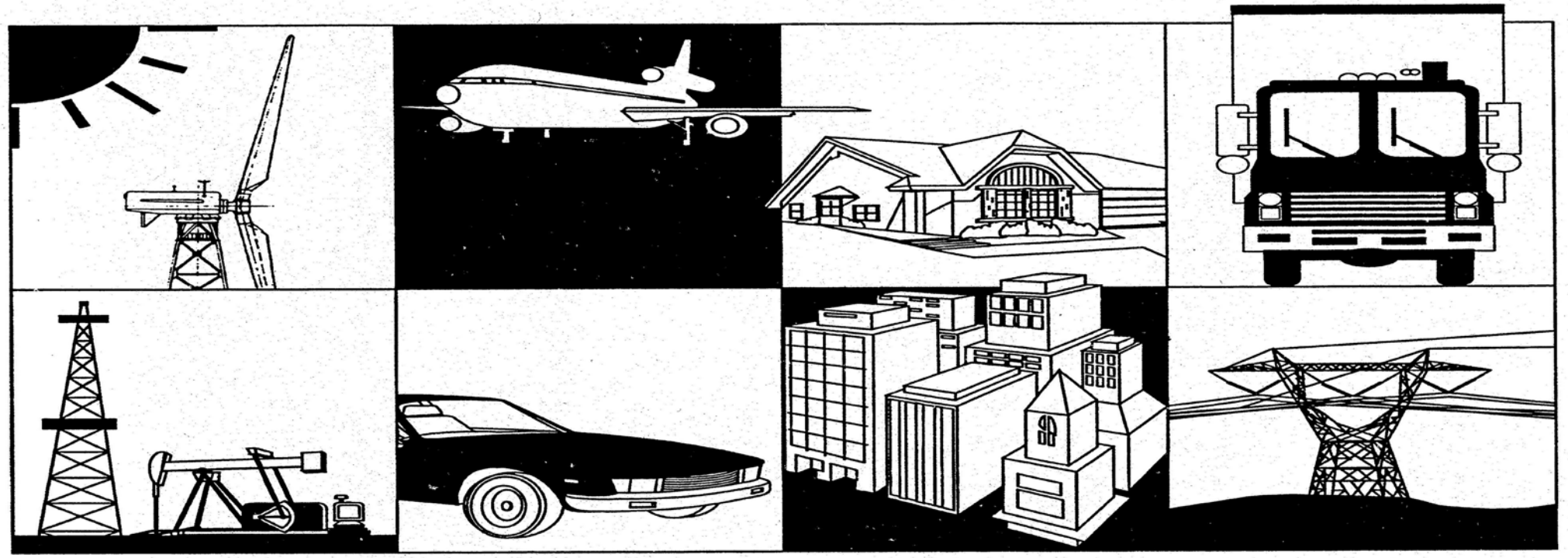
MIT Energy Initiative

From Cooperation to Competition – China in the Global Energy Transition

Robert C. Marlay

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“Breakthrough of the Year”

“Rise of the Renewables”

- In 2025, renewables produced more global power than coal
- Markets for RE tech. growing, likely > $2 Trillion by 2035
- FF emissions neared “peak carbon” & expected to decline
- Solar/wind set records with low-cost, advanced technology

Remarkable Cost Reductions

- In most markets, RE is now cheapest source of new power
- Since 2010, the levelized cost of energy (LCOE) for:
  - Solar PV has fallen by 89% to $44/MWh
  - Onshore (land based) wind down 71% to $33/MWh
  - Offshore wind down 63% to $78/MWh
- For other RE, LCOEs are higher, but dispatchable:
  - New hydro rose to $62/MWh
  - New bioenergy declined to $86/MWh
  - New geothermal rose to $89/MWh, and
  - Concentrated solar power rose to $115/MWh

Record-Breaking Globel Build-Out in 2025

- Capacity additions of RE increased by 16% to 800 GW
- 23rd consecutive year that RE set expansion records
- Solar PV (75%); wind (20%); plus, hydro, bio, geo, CSP
- 30 countries installed over 1 GW of solar PV each



Solar PV over Fish Farm, China

By Comparison:

- LCOE of new CCGT was $100/MWh; in U.S., $55/MWh

China's Energy-Related National Goals – A Combination of Environmental Necessity & Need for Economic Resilience

Economic Growth

- Historically, population was impoverished *
- Goals: economic growth, rising incomes, full employment, strong exports, global markets

Energy Security

- Insecure Imports -- Oil (72%); N. Gas (40%)
- Goals: self-reliance and energy resilience

Air Quality

- During 2010-2015, China experienced a pivotal moment; air was routinely "Dickensian" bad
- 90% of cities exceeded air quality standard
- 30% of cities experienced acid rain
- Goals: acid-free, healthy air, and blue skies

Climate

- China is world's largest contributor of GHGs
- China pledged to peak GHGs by 2030 and reach carbon neutrality by 2060 (Paris Accord)
- Goals: world leadership on climate solutions

* From 1958 to 1978, China's GDP was < $100 per capita.

Smog Crises in 2013, 2014

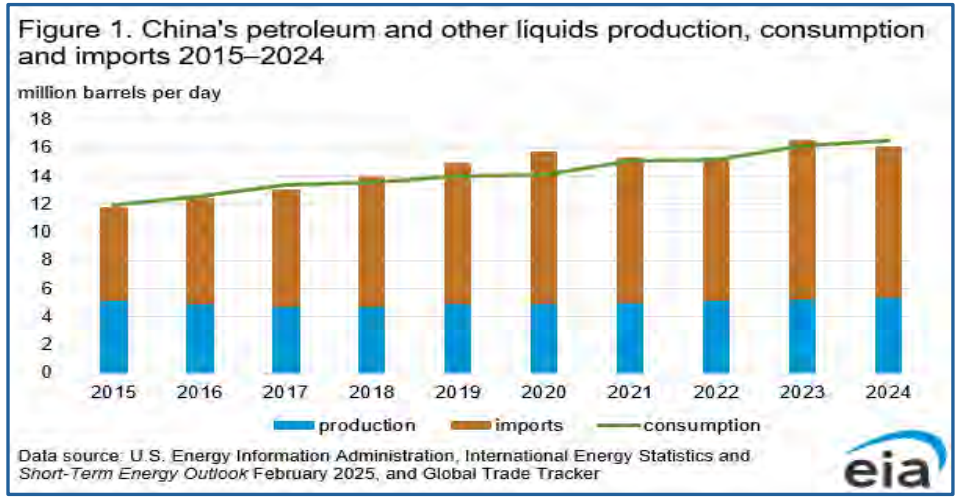
In 2013, peak daily average of PM2.5 was 569 μg/m³, briefly up to 900 μg/m³ (WHO guideline is 15 μg/m³); in 2014, there were 13 events of severe air pollution.



Cityscape Obscured



N95 Masks Needed



The U.S. and China Have Had a Long History of S&T Cooperation – One Recent Example is the U.S.-China CERC

U.S.-China Clean Energy Research Center: 2009-2018; 58 projects; 1,000+ scientists; more than 100 business partners; U.S. business endorsements.

	Focal Areas
Industry	• Industrial efficiency (focus on energy-intensive industries) • Cross-sector opportunities (e.g., motor systems, pumps, lighting)
Buildings	• Commercial building efficiency • Residential building efficiency
Transportation	• Vehicle efficiency and electrification • Commercial freight optimization • Smart growth • Air, rail, shipping, freight infrastructure
Electricity	• Renewables • Distributed energy resource integration
Integration/ Modeling	• Base economic assumptions • Feedback impacts (supply/demand interactions) • Scenario analysis • Internal analysis coordination
Documentation	• Summaries and reports • Multimedia and web documentation
Outreach	• Support of 13th Five Year Plan • Syndication with key stakeholders

U.S.–China Clean Energy Research Center
中美清洁能源研究中心



U.S. and Chinese officials sign endorsements of mutually agreed *Technology Management Plans* establishing rules for owning, protecting, and licensing intellectual property of collaborative work under the U.S.-China CERC Nov.11, 2011.

Thank You

International Cooperation in Science & Technology

Well-Managed Int'l S&T Cooperation Affords Benefits – It Can:

- Provide a platform to keep pace with and accelerate innovation
- Open a portal to a landscape of global energy R&D (U.S. is but a fraction)
- Facilitate knowledge sharing and information exchanges
- Enable access to data from costly demonstrations of other countries
- Create avenues to global markets – opportunities for U.S. innovators
- Leverage U.S. resources; informs/guides future investments
- Build relationships helpful to diplomacy and "soft power" projection

There are Risks – Which Can Be Avoided or Managed

- Potential threats to national security
- Potential threats to American innovators and their intellectual property
- Potential threats to U.S. competitiveness and technology leadership

Agreements Can Outline Principles for U.S. Participation

- Protect national security and intellectual property
- Recognize fair trade, with reciprocal agreements, transparency mandates, data reciprocity, and mechanisms for dispute resolution
- Be aware of int'l R&D, emerging technologies, and global markets
- Advance U.S. competitiveness, when weighing risks v. benefits
- Pursue U.S. leadership in international standards-setting bodies, especially those that affect U.S. industry and export markets
- Promote goodwill by assisting countries in identifying and helping to solve certain problems



E.O. to guide clean energy innovation RD&D in international collaborations



Mission Innovation MI 3.0 to include demo projects

Renewed U.S.-China Science & Technology Agreement, Dec. 2024, with revised (restricted) scope.