TO: Jonathon Hathaway, Research Program Director, NSDPI
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SUBJECT: Important Data Sources on Next-Generation Energy, Power, and Storage in China
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This source review presents a collection of academic references shaping our research that is organized by the following topics: China's Electricity Grid Infrastructure, Key Advancements in China's Energy Technology, Energy Policy Evolution and AI Advancements, and Investment Trends. Each entry includes a brief description outlining the scope and relevance of the material. To denote different sources, titles that are underlined represent a database while non-underlined sources are from academic journals or documents. The majority of the sources are drawn from Western scholarship and reports. In addition to academic literature, our research was supplemented by primary Mandarin language sources from reports and government white papers. Although our research extends beyond the brief survey of references that are included in this document, the sources that have been chosen aim to guide researchers on further academic literature and key information regarding aspects of China's power generation. Included in this review are numerous databases and mapping sources that aim to provide an overview of China's energy infrastructure through outlining power generation stations, transmission stations, and energy storage. Though it is important to note that through open-source research, it is difficult to validate accuracy or the latest numbers due to the limited information released by the CCP. Therefore, the databases that are provided outline a reliable source of the current information and overview of grid infrastructure that is known from using satellite imagery, investment reports, and Chinese white papers among other open sourcing.

China's Electricity Grid Infrastructure: Lucia

Review of the Development of China's Natural Gas Industry in the Background of Carbon Neutrality. 2021. Retrieved From:
https://www.sciencedirect.com/science/article/pii/S2352854022000195

Description: This academic report goes into detail about the importance of investing into research and design of battery storage to reach China's goals of carbon reduction and expanding the influence of renewable energy in energy source make-up. This paper gives a review of current investments and developments of large-scale storage technologies in China while addressing some of the continued challenges and market barriers. Additionally, the paper examines the investment into BRI electricity infrastructure and how the energy storage supply chain can be reexamined for financial stability, cross-border investments and research into new designs and technologies. The paper ends with three policy recommendations for China which include: 1. moving forward with carbon pricing agenda; 2. Tapping the potential of the domestic capital market; 3. Scaling up energy storage supply chains in BRI countries for multilateral cooperation

Open-Source Mapping of China's Energy Infrastructure. 2024. Baker Institute. Retrieved From: https://www.bakerinstitute.org/open-source-mapping-chinas-energy-infrastructure

Description: The mapping of China's Energy Infrastructure by the Baker Institute at Rice University's Center for Energy Studies provides an overview of different infrastructure contributing to power generation, transmission and distribution, and energy sourcing. Starting as a map and analysis of China's oil industry including pipelines, storage, and refineries; the Baker

Institute has since expanded to include infrastructure of natural gas and power plants from different energy sources. To use the maps for analysis, additional research layers that have been added are emerging technologies that are shaping China's energy infrastructure and serve to change the landscape of energy production and transmission across China. The methodology of producing this map was relying upon open-source documents in Mandarin Chinese to identify and understand the landscape of China's energy infrastructure and policy. Additionally, using open-source GIS data, software developed individual pinpoints of energy infrastructure. Based on the most recent and known data on energy infrastructure, this dataset was last updated in October 2024.

China Institute of Public and Environmental Affairs. Retrieved From: https://wwwen.ipe.org.cn/MapLowCarbon/Energy.aspx

Description: Compiled by China's Institute for Public and Environmental Affairs, this map compiles data from each province into year-by-year data on electricity consumption and electricity generation in TWh. In addition to electricity consumption, the map gives a breakdown of province consumption of different energy sources such as coal, natural gas, etc. This database has additional data maps such as Solar Power Station Map which provides location, the project type, and capacity of different solar generation stations across China. The data that is compiled into these maps help to analyze different trends in generation and consumption across China as well as identifying potential challenges and solutions such as new power generation projects.

China Nuclear Reactor Database. Retrieved from: https://world-nuclear.org/nuclear-reactor-database/summary/China

Description: Compiled by the World Nuclear Association, this database provides information for each of China's 58 operational and 32 under-construction nuclear reactors. The database details the reactor name, model type, process, and capacity for all the reactors. For the under-construction reactors, it includes the construction start date. For the operational reactors, it includes grid connection date, load factor percentage, and total electricity generated in 2023. Additionally, the database provides satellite imagery and map location for each of the reactors. This information is useful for analyzing China's current and future nuclear generation capacity.

Global Energy Monitor China Coal Plant Tracker. Retrieved From: https://globalenergymonitor.org/projects/global-coal-plant-tracker/tracker/

Description: Compiled by the Global Energy Monitory, this tracker provides a table-format database and interactive map of operational and retired coal-fired power units with a minimum 30 MW capacity. The table view contains information on individual units within each coal-fired power plant including the owner, capacity, status, start year, and province. Furthermore, though not compiled into a comprehensive dataset, the map contains the coordinates for each power plant. On a higher level, the interactive dashboard provides net coal generation capacity statistics per year from 2000. This information is useful for comprehending China's coal energy generation capabilities and geographic distribution of generation capacity. The most recent information is for 2024. This dataset is updated biannually and was last updated in April 2025.

Global Energy Monitor China Oil Gas Plant Tracker. Retrieved From: https://globalenergymonitor.org/projects/global-oil-gas-plant-tracker/tracker-map/

Description: Compiled by the Global Energy Monitor, this database provides global in addition to China specific information on the locations of Oil and Gas Power Plants. Through specifically looking at the China data provided through map format, GEM provides the status and numbers of operating, previous, constructed, and announced power plants in addition to their combined capacity. By looking at specific power plants provided on the map, GEM has in-depth data on each power plant including coordinates based on satellite imagery, MW capacity, the specifics of individual units based at the power station, and parent company investors. In addition to the map database, GEM compiles additional information into power station tables for data comparison of power stations. For Oil and Gas plants in China those that are listed in the dataset are units operating at 50 MW or above. This dataset is continuously updated and was last updated in January 2025

Global Energy Monitor China Wind Tracker. Retrieved From:
https://globalenergymonitor.org/projects/global-wind-power-tracker/tracker-map/

Description: Compiled by the Global Energy Monitor, the China Wind Tracker provides a comprehensive overview of the operating, announced, and constructed sites of both onshore and offshore wind farms. GEM additionally provides data on wind farm installation types designating farms designation based on onshore, offshore hard mount, offshore floating, or offshore yet unknown. For those under construction, data is included on their projected capacity, operating year, location, and ownership. Capacity of each wind farm installation is given in MW with additional information on cumulative capacity of all Chinese wind farms. It is important to note that GEM only includes wind farms that are operating at or planned to be operating at 10 MW of capacity or above. This dataset for global wind data was last updated in February 2025.

Global Energy Monitor China Nuclear Tracker. Retrieved From:
https://globalenergymonitor.org/projects/global-nuclear-power-tracker/tracker-map/

Description: The China Nuclear Tracker, compiled by the Global Energy Monitor, offers information about the location of nuclear power projects both on the global scale, and specifically in China. The source provides detailed information on 347 nuclear projects, their names and locations, reactor type, design capacity, ownership, and development stage. The interactive database further provides a map that illustrates the spatial clustering and company concentration– color-coded by development stage and reactor type. Specifics of the nuclear technology at each power plant can also be found with differentiation between the different types of nuclear reactor technology at each power plant. This dataset was last updated in July 2024.

Global Energy Monitor China Hydropower Tracker. Retrieved From:
https://globalenergymonitor.org/projects/global-hydropower-tracker/tracker-map/

Description: The mapping of China's Hydropower Tracker, compiled by the Global Energy Monitor provides a dataset of hydropower facilities. Projects could be single, double, or multi-turbine generators. It includes all facilities at this capacity threshold for operating, announced, pre-construction, and under construction units. Some data are also included for plants that are either shelved, mothballed, retired, or canceled. The map can be zoomed in to focus on a specific region, and most solar panels have a satellite view attached. It also provides information about the start year, technology type, location accuracy, status, and capacity. Various technology types are tracked in the dataset, including conventional storage, run-of-river, and pumped storage facilities.

For each hydropower project over 45 MW, a wiki page is created which offers more information such as coordinates, turbine type, and technology type. This source was last updated in April 2025.

Global Energy Monitor China Solar Tracker. Retrieved From:

https://globalenergymonitor.org/projects/global-solar-power-tracker/tracker-map/

Description: The mapping of China's Solar Tracker, compiled by the Global Energy Monitor provides a dataset of utility-scale solar photovoltaic (PV) and solar-thermal facilities. It covers all operating solar farm phases with capacities of 1 megawatt (MW) or more, and all announced pre-construction, construction, and shelved projects with capacities greater than 20 MW. This source shows solar technology that is operating, announced, in construction, planned, or shelved/cancelled. The map can be zoomed in to focus on a specific region, and most solar panels have a satellite view attached. It also provides information about the start year, technology type, location accuracy, status, and capacity. For each solar project, a wiki page is created which offers more information such as coordinates. This source was last updated February 2025 but is continuously running.

Key Technology Advancements: Charis

Paul Breeze. 2019. Power Generation Technologies (3rd Edition): Chapter 1, An Introduction to Electricity Generation. Retrieved from
https://app.knovel.com/kn/resources/kpPGTE001C/toc

Description: The first chapter of Power Generation Technologies (3rd Edition) provides a foundation overview of how electricity is generated and delivered. It is especially useful for readers new to the subject and gives an introduction to the structure of the electricity grid. It breaks down the structure into generation, transmission and distribution, and storage, and gives context for current operations and challenges around the world. The chapter paints a broader picture of how advancements in power technologies fit into the grid. It also details a brief history of liberalization of the energy sector and its consequences. The chapter mostly uses accessible, non-technical language to explain the roles, relevance, and connections between the various components of the grid. A potential drawback is that the chapter does not delve into how these technologies work individually, though additional chapters in the book address this. The book was published in 2019.

Wenying Chen et al. 2010. Clean coal technology development in China. Retrieved from
https://www.sciencedirect.com/science/article/pii/S0301421509004145?via%3Dihub

Description: This paper outlines coal's dominant role in China's energy system and the significant environmental challenges of heavy coal reliance. The paper highlights the necessity of clean coal technologies to mitigate pollution and improve energy efficiency from coal. It reviews China's advancements in high efficiency combustion, coal transformation, integrated gasification combined cycle, and carbon capture and storage technology. The paper provides both high-level overview of China's coal use and detailed review of coal technology innovation. One potential drawback is that the paper does not explain how specific technologies like carbon capture and storage and supercritical units work. This paper was published in 2010, and significant advancements in clean coal technology have been made since then.

Information Technology & Innovation Foundation. 2024. How Innovative is China in Nuclear Power? Retrieved from https://itif.org/publications/2024/06/17/how-innovative-is-china-in-nuclear-power/

Description: This report from Stephen Ezell examines China's rapid advancements and strategic goals for nuclear energy, highlighting China's leadership in developing 4th generation nuclear reactor technology and small modular reactors (SMRs). It points to state-driven initiatives and significant technology transfers as key drivers of China's progress in both fission and fusion technology. This paper is highly relevant as it lays out both China's nuclear technology advancements and how it achieved them. Nuclear energy is a key focus for China's energy transition. The report also outlines implications of China's nuclear energy leadership on the U.S. and provides recommendations for how the U.S. can regain its dominance in the nuclear energy sector. One potential drawback is the report does not provide explanations for how the various technologies work. The report was published in 2024.

Organization for Economic Co-operation and Development. 2021. An Energy Sector Roadmap to Carbon Neutrality in China: Chapter 4, Technology needs for the energy transition. Retrieved from https://www.oecd.org/en/publications/an-energy-sector-roadmap-to-carbon-neutrality-in-china_5f517ddb-en.html

Description: The fourth chapter of the report draws a roadmap for China to achieve net-zero emissions by 2060, and focuses on four key areas: electrification, carbon capture and storage, low-carbon hydrogen, and sustainable bioenergy. Electrification, primarily through electric vehicles and heat pumps, is projected to contribute to 13% of emissions reductions by 2060. Carbon capture and storage and various hydrogen technologies will be crucial in producing negative emissions. Sustainable bioenergy, especially combined with carbon capture and storage, will also contribute to emissions reductions. This chapter provides highly relevant projections for China's future energy sector outlook and identifies key technologies and implementation requirements for China to achieve its net-zero goal. One potential drawback is the chapter does not expand on how specific technologies like hydrogen production and enhanced oil recovery work. The report was published in 2021.

Policy Evolution and AI Advancements: Annalise

The Political Economy of Noncompliance in China: the case of industrial energy policy Retrieved From:
https://www.tandfonline.com/doi/full/10.1080/10670564.2015.1013374#d1e101

Description: Published in the *China Quarterly*, this report gives an overview of the difficulties China's central government faces in enforcing energy efficiency policies at the local level, focusing on energy intensity (EI) reduction during the 11th Five-Year Plan (2006–2010). Drawing from Douglass North's institutional theory, the study explains China's "second-best" institutions, also called federated authoritarianism, which is where the center sets rules and localities implement them. This article explains the variation in policy outcomes this type of government creates. Using the case of industrial EI, the article finds that implementation success depends heavily on local state capacity, the share of state-owned enterprises (SOEs), and cadre evaluation incentives. Regions like Shaanxi, with high SOE presence, saw strong compliance due to less local autonomy

and clearer incentives, while Guangdong, with strong private interests, resisted regulation. The paper is important to understanding China's policy implementation process, its consequences and its advantages. It shows that when central policies aligned with local promotion mechanisms can improve compliance, especially when local leaders are forward-thinking and career incentives reflect central goals. This framework is useful for understanding how China might manage rising energy demands from AI by adjusting institutional incentives to promote cleaner, more efficient energy use.

China's Electricity Market Reform: From an absolute to a relative monopoly.
Retrieved From: https://www.sciencedirect.com/science/article/pii/S0301421512007215

Description: Published in Energy Policy in 2010, this article traces the evolution of China's electricity sector from a centrally controlled monopoly to a partially liberalized but still state-dominated system. The article outlines four main reform phases: pre-1985 monopoly, the gradual opening to private and foreign investors (1985–2002), the rise of a "relative monopoly" by state-owned enterprises (post-2002), and calls for deeper reform by 2015. While reforms initially aimed to break up centralized control and introduce market mechanisms, the restructuring ended up consolidating power among a few dominant SOEs, which limited competition and innovation. From 2003 to 2010, the Big Five energy companies significantly expanded their capacity, yet their market dominance increased, with one firm eventually controlling 60% of the nation's installed capacity. This concentration created inefficiencies, distorted prices, and reduced adaptability, posing risks for China's ability to meet modern, tech-driven energy demands like AI. The article calls for stronger market reforms, grid access for independent producers, and transparent pricing to avoid deadweight loss and ensure that China's power system can support its future growth sustainably. These insights are especially relevant to understanding how the current structure of China's energy market may constrain its response to rising electricity demand from AI and data infrastructure and the evolution of China's energy policy before 2015.

Electricity Market Creation in China: Policy Options from Political Economics Perspective
Retrieved From: https://www.mdpi.com/2071-1050/10/5/1481

Description: Published in 2018, Electricity Market Creation in China examines the 2015 power sector reform, which aimed to transform China's electricity system from a state-owned monopoly into a market-oriented structure. The reform introduced competitive trading mechanisms between power generators and large users, extended the Direct Purchase of Large Users (DPLU) policy, and partially deregulated the retail and generation segments. Despite these reforms, transmission and distribution remain dominated by two state-owned grid companies. The article highlights that while earlier reforms (e.g., in 2002) failed due to persistent shortages, distorted pricing, and entrenched monopolies, the 2015 reform marked a shift by assigning grid companies demand-side management responsibilities and encouraging renewable energy integration through priority grid access and cross-provincial transmission. The reform also laid groundwork for a more flexible electricity market with bilateral contracts, auctions, and electricity futures. This is directly relevant to your research, as it shows how post-2015 policies are beginning to reshape how China's grid handles growing and increasingly volatile demand—especially from power-intensive technologies like AI and data centers: by liberalizing energy sales and modernizing grid functions.

Quantitative Mapping of the Evolution of AI Policy Distribution
Retrieved From: https://www.sciencedirect.com/science/article/pii/S0040162521006211

Description: This article, published in 2020 offers a macro-level analysis of China's national AI policy development by statistically examining 294 central-level policy documents from 1990 to 2019. The study identifies four key stages in China's AI policymaking: a low-activity emergent period (1990–2011), a development surge (2012–2014), macro policy planning (2015–2017), and a phase of targeted policy implementation (2018–2019). The research highlights a sharp increase in AI-related policy attention beginning in 2012, with key government agencies—such as the Ministry of Science and Technology, the State Council, and the National Development and Reform Commission—issuing coordinated plans tied to Five-Year Plans and national industrial strategies like *Made in China 2025* and the *New Generation AI Development Plan*. Policy goals evolved from scattered initiatives to more integrated and sector-specific targets, such as smart manufacturing, cities, and healthcare. The shift toward practical implementation is marked by numerous pilot programs and demonstration zones beginning in 2018. This article is relevant because it shows how China's central government has actively structured its AI development as a national priority, using top-down planning to align emerging technologies like AI with infrastructure, economic modernization, and energy policy, which are factors that directly affect electricity demand and policy coordination.

China's AI Development Model in an Era of Technological Deglobalization
https://ucigcc.org/wp-content/uploads/2024/05/Arcesati-China-AI-Development-04.25.24.pdf

Description: Published in 2024, Rebecca Arcesati examines how China is restructuring its AI and computing infrastructure in response to geopolitical decoupling from the U.S. and global technology ecosystems. A core focus is China's *National Integrated Computing Power Network* (NICPN), a megaproject aimed at distributing AI computing needs across regions through smart grid-like systems such as "China Computing Net," spearheaded by the state-backed Peng Cheng Lab. These initiatives attempt to optimize compute efficiency and energy use, especially by shifting power-intensive data storage and model training to energy-rich western provinces—directly aligning with your research on how AI demand reshapes grid usage and energy policy. The piece also highlights China's "whole-of-nation" approach to coordinating foundational AI model development across firms, labs, and state entities, which has implications for energy-intensive AI training. It warns of inefficiencies, duplication, and potential fragmentation due to bureaucratic coordination challenges.

China's Global Energy Interconnection Report. 2023. Rand Corporation. Retrieved From:
https://www.rand.org/pubs/research_reports/RRA2490-1.html

Description: Published by the Rand Corporation, this report gives an overview of China's Global Energy Interconnection Initiative through the GEIDCO non-profit which supports the Belt Road Initiative's Global Electricity Projects. Through analyzing GEIDCO's establishment, governance, and funding alongside China's rhetoric and investment, researchers draw a parallel between the CCP's influence on GEIDCO's initiatives. In expanding the connectivity of China's electricity grid Rand identifies three groups of motivations falling under economic, political, and environmental that China has towards the projects and policies of the GEI. Additionally, through analyzing the implementation of GEI projects alongside pre-existing Chinese SOE control over numerous country-specific electricity industries numerous challenges and concerns are highlighted.

These include the dual use of electricity and energy technology for military and espionage purposes, creating an interconnected global electricity system that centers around Chinese control, and the undermining of country's sovereignty over respective energy systems. This report was last updated in December of 2023.

Investment Trends: Dillon

China Investment Report. 2017. International Energy Charter. Retrieved From: https://www.energycharter.org/fileadmin/DocumentsMedia/Other_Publications/20171123-China_Investment_Report.pdf

Description: The 2017 China Investment Report, conducted by the International Energy Charter, offers an assessment of China's foreign energy investment patterns. Using data from 2005-2016, the report examines the volume of investment into energy sources such as oil, gas, and renewables while considering their volume, regional distribution and sectoral focus. It further contextualizes such trends within China's Belt Road Initiative and the role of China's central government, state-owned enterprises (SOE), and geopolitical objectives. The report finds that China tends to favor weak regulatory environments, particularly in Central Asia and Sub-Saharan Africa, as SOEs can secure more favorable investment terms, avoid stringent regulatory and labor standards, and exert greater geopolitical control over their assets. It further finds that China prefers mergers and acquisitions or equity investments into existing infrastructure projects over greenfield development– investments into the construction of new infrastructure– signaling a long-term strategy of asset control rather than short-term profit. The report further concludes that China's energy infrastructure investments tend to function as instruments of political leverage, aligning with resource-dependent governments and revealing structural weaknesses in global energy governance frameworks.

The China Brief: Energy and AI Coordination in the 'Eastern Data Western Computing'. Plan. 2025. Aaron Stokols. The Jamestown Foundation. Retrieved From: https://jamestown.org/program/energy-and-ai-coordination-in-the-eastern-data-western-computing-plan/

Description: Volume 25, Issue 4 of the Jamestown Foundation's China Brief analyzes the AI Coordination in the 'Eastern Data Western Computing' initiative, a project that links eastern data demand centers with energy-rich western provinces through state-controlled infrastructure planning. The article focuses on how provinces such as Guizhou and Inner Mongolia are being developed into national computing hubs by leveraging their comparative advantage in renewable energy, abundant land, and favorable climate conditions that lower cooling and operational costs for data centers. Central to the initiative is the coordination between local government, SOEs, and tech companies in regard to grid reform and infrastructure buildout to support artificial intelligence and cloud computing capabilities. The article argues that such buildout into the Western provinces has effectively increased the computing capabilities of China without overburdening the national grid–positioning its AI development within a long-term, state-backed energy strategy that the U.S. currently lacks.

China's energy investment through the lens of the Belt and Road Initiative. 2020. Dongmei Chen and Phillip Galkin. Retrieved From: https://www.elgaronline.com/edcollchap-oa/book/9781789901764/book-part-9781789901764-15.xml

Description: Published in an academic volume by King Abdullah's Petroleum Studies and Research Center, this chapter provides an overview of China's overseas energy investment strategy under the Belt and Road Initiative (BRI) and emphasizes the role of broader geopolitical and security goals within their energy investment. Chen and Galkin trace China's shift from pre-BRI upstream oil and gas acquisitions driven by national oil companies (NOCs) to a more state-coordinated model centered on energy corridors, infrastructure finance, and industrial cooperation post-2013. Their analysis further emphasizes the role institutions, such as the China Development Bank and the Export-Import Bank, in both directly and indirectly financing energy projects, particularly in risky environments where private capital is hesitant to enter. Yet their analysis further concludes that China tends to pursue energy infrastructure projects in politically unstable countries, such as Pakistan and Myanmar, for geoeconomic statecraft and strategic leverage rather than energy capacity.

How green is the "Belt and Road Initiative"? – Evidence from Chinese OFDI in the energy sector. 2020. Liu et al. Retrieved From: https://www.sciencedirect.com/science/article/pii/S0301421520304365

Description: Published in the peer-reviewed journal Energy Policy in 2020, this article analyzes the environmental composition of China's OFDI in the energy sector under the BRI. Using a dataset of 2,504 Chinese overseas energy investments between 2010 and 2019, the authors assess the scale and nature of fossil versus renewable energy projects across different regions. The study finds that while the share of renewable energy projects (particularly solar and wind) has increased over time, fossil fuel investments, especially coal and hydropower, still dominate in terms of project count and financial value. The analysis shows that investment patterns vary significantly by host-country income level and institutional quality, with low-income countries receiving a higher share of fossil energy projects due to looser environmental regulations and greater energy demand. A key finding is that Chinese energy OFDI is more likely to be "green" when host countries have stronger environmental governance or when Chinese firms face reputational pressure from international actors, suggesting that project type is responsive to external norms. The authors conclude that although China has promoted a "green BRI" rhetorically, its energy investments abroad remain structurally carbon intensive.

China Global Investment Tracker. American Enterprise Insttiute. 2024. Retrieved From: https://www.aei.org/china-global-investment-tracker/

Description: Published by the American Enterprise Institute, the China Global Investment Tracker is a publicly accessible database that records Chinese investment and construction projects abroad exceeding $100 million, with filters for country, sector, and Belt and Road Initiative affiliation. Focusing exclusively on energy-sector entries, the data reveals that Chinese firms such as PowerChina, Sinopec, CNPC, CNOOC, and China National Nuclear remain dominant players in overseas energy infrastructure. In 2024 alone, China initiated major energy deals in countries including Saudi Arabia, Pakistan, Angola, Malaysia, and Kyrgyzstan, many of which exceeded

half a billion dollars in value. These projects are heavily concentrated in fossil fuel infrastructure and hydropower, with fewer large-scale renewable initiatives, despite China's green development messaging. The tracker underscores a consistent pattern: Chinese energy investments target politically unstable or low-governance countries, reflecting a state-driven strategy that prioritizes strategic access and influence over commercial return or climate alignment.