Reform of Electric Power Sector
(1949–2024)

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August, 2024

1. Why Electric Power Sector Matters?

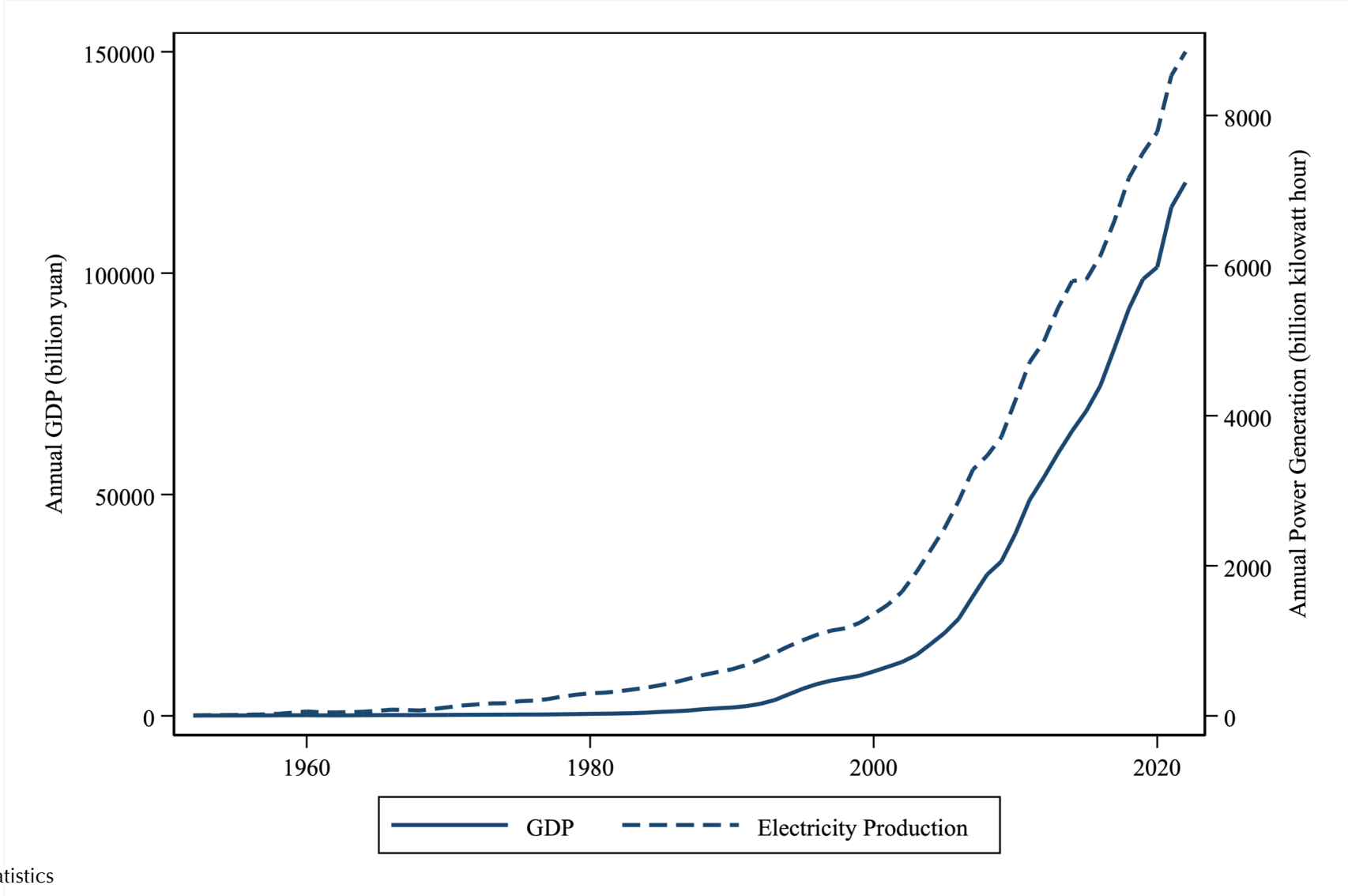
Literature Review (1)

- **Bureaucracy:**
  - Principal-agent / patron-client:
    - Agent's interests not align perfectly with principal's interests (Moe, 1984; Holmstrom and Milgrom, 1994)
    - Multiple principals / multitask problems: agent of both ministry and local government (Holmstrom and Milgrom, 1991; Laffont and Martiomort, 2002)
    - Central-local relations / sectoral-territorial relations (*Tiao-Kuai*) under authoritarianism / fragmented authoritarianism (Lieberthal, 1992; Lieberthal and Oksenberg, 1998; Mertha, 2006, 2009)
  - Developmental state:
    - Embedded autonomy: bureaucracies and firms in the making of industrial policies (Evans, 1995)
    - Pilot agency + zaibatsu / chaebol (Amsden, 1989; Evans, 1989; Johnson, 1982; Wade, 1990; Woo-Cumings, 1999)
    - Technocracy: Rise of red engineers / technocratic class and advantageous position of public sector in China (Andreas, 2009)
- **State-owned Enterprise (SOE):**
  - Institutional complementarity and incentive compatibility:
    - LME-market mechanism, CME-para public organization(Katzenstein, 1978, 1987; Hall and Soskice, 2001; Hall, 2015)
  - Communist economies-SOE?:
    - Soft budget constraint and paternalism (Kornai, 1980, 1986)
    - Policy burden (Lin et al., 1998)
    - Partial reform equilibrium (Olson, 1982; Hellman, 1998)
  - Between state and market:
    - Markets socialism (Przeworski, 1991); state capitalism (Huang, 2008); bureaucratic and economic market (Zhou, 2018)

Literature Review (2)

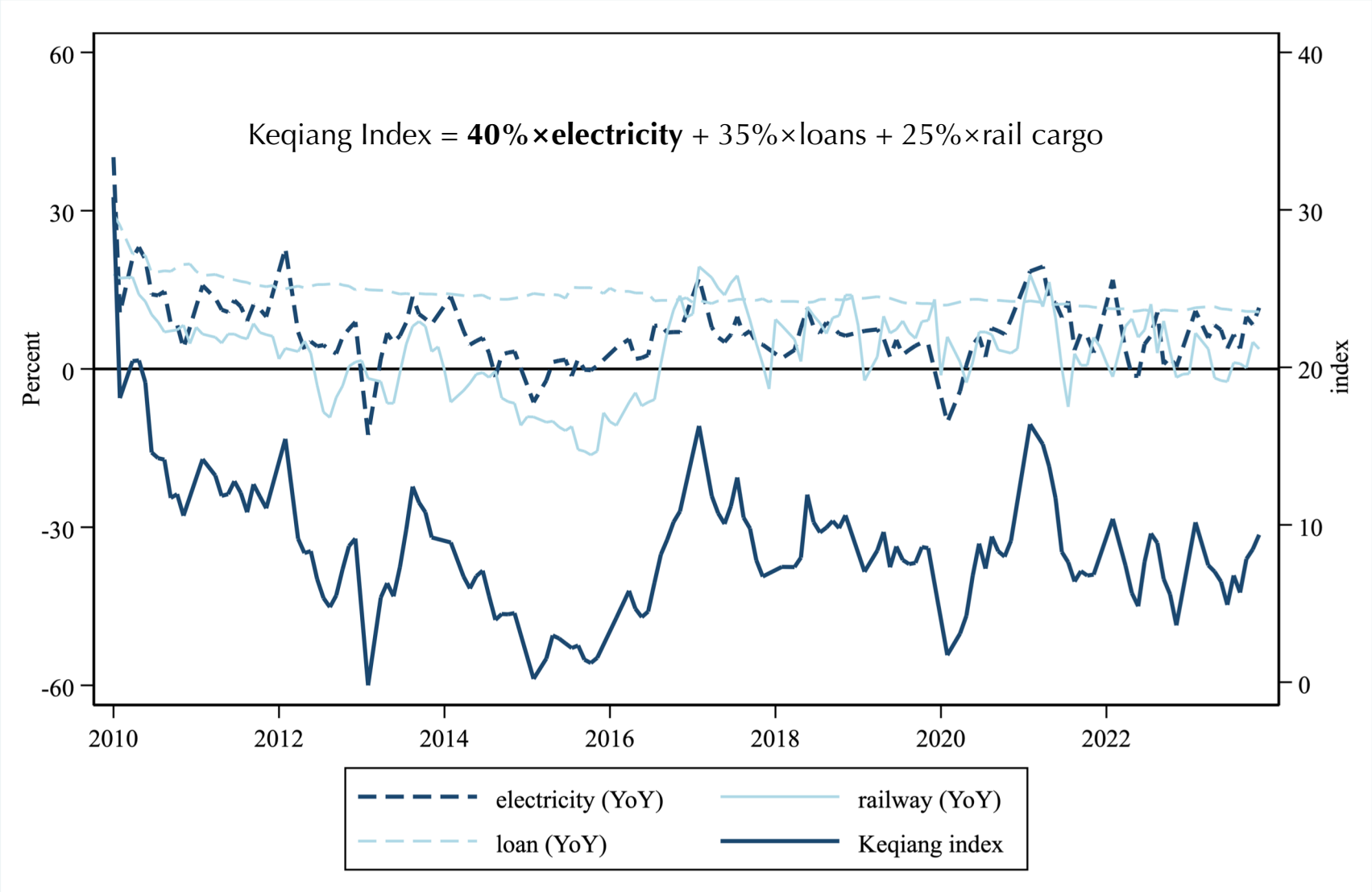
- **Sectors studied:**
  - Telecommunication (Zheng and Zhang, 2011; Zheng et al., 2014), Steel (Walder, 2014), Oil and Coal (Cao and Wang, 2022; Huang, 2023), Railway (Ma, 2021, 2023), Automobile (Lu and Feng, 2005), Construction (Walder, 2024), …
  - Electric power (Xu, 2002, 2017), but focus more…
    - Comprehensive introduction on electric power sector in China (Xu, 2002, 2017), … but what does it mean to the political and economic development?
    - On the central-level and the role of technocrats (Yeh and Lewis, 2004)
    - On the policy making (e.g., construction of power stations, ultra high voltage lines, etc.) (Mertha, 2008; Xu, 2018)
- **Why electric power sector matters?**
  - Politics: the politics of distribution, "who gets what, when, and how" (Lasswell, 1936)
  - Economy: the foundation for economic growth
  - Publicly owned Electric Power Sector in comparison:
    - *The Economist* (1978): Australia (100%), Brazil (100%), Britain (100%), Canada (100%), France (100%), West Germany (75%), Holland (75%), Indian (100%), Italy (75%), Japan (0%), Mexico (100%), South Korea (75%), Switzerland (100%), United States (25%)
    - OECD (2015): Electricity and gas account for **21%** of all SOEs by value in OECD countries (biggest apart from Finance)

Why Electric Power Sector Matters? (1)



Data source: National Bureau of Statistics

Why Electric Power Sector Matters? (2)



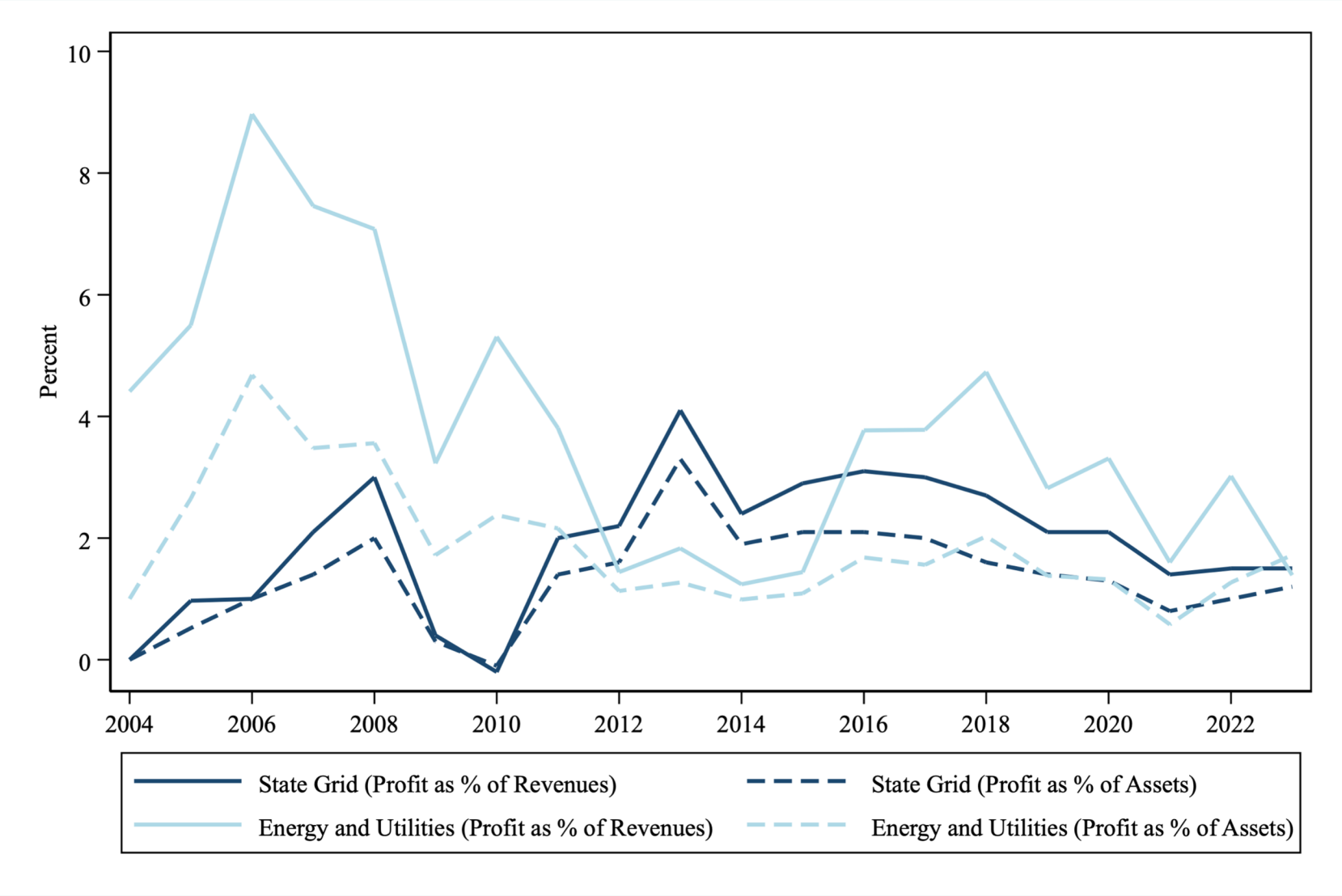
Data source: National Bureau of Statistics

What is it…Corporation Giant? (1)

- Fortune 500:
  - 2000: State Power Corporation (87)
  - 2014–2023: 2 grid corporations + 5 generation groups + 2 construction
  - Energy and Electric Power Sector: 7 out of 29 corporations worldwide (2023)
- Generation Corporations are de facto / actual power supplier, **However**…?

Name	2004 Rank	2023 Rank	2023 revenue (million $)	
State Grid	46 (1 in China)	3 (1 in China)	530,008.8	
Southern Power Grid	–	83	113,674.0	
China Energy Investment	–	76	121,583.6	
China Huaneng Group	–	209	63,284.3	
State Power Investment	–	262	54,021.7	321,609.1
China Huadian	–	323	45,113.4	
China Datang	–	396	37,606.1	
Power China	–	105	99,019.6	
China Energy Engineering Group	–	256	54,889.5	

What is it…Corporation Giant? (2)



Data source: Fortune 500

What is it…Bureaucracy?

- Consider…:
  - Predecessor: Soviet-style industrial ministry
    - Fuel Industry, Electric Power Industry, Water Resources and Electric Power, Energy
  - Organization structure: five-level bureaucratic hierarchy
    - Central-regional-provincial-prefectural-county
  - Personnel appointment: quasi-government
    - Top leaders appointed by the Central Organization Department of CCP
    - Leaders possess corresponding administrative ranks: central (sub-minitrial-level), provincial (bureau-director-level), prefectural (division-head-level), county (section-head-level)
  - Operation: embeddedness
    - Highly embedded into locality
    - While operate under the guidance of the central corporation
    - Similar to other vertical sectors / *Tiao*
  - Primary purpose:
    - to ensure the demand for electricity in support of economic and social growth is met
    - to safeguard national energy security
- In most cases, **However**, at provincial or lower level, electric power sectors are operated as companies

A Puzzle

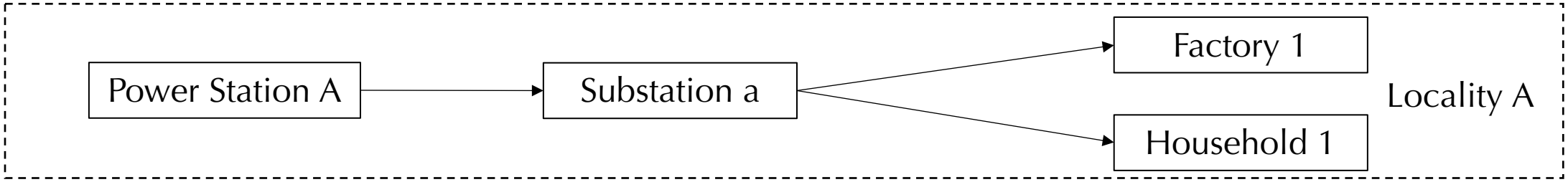
- How does an industrial ministry transition from a bureaucracy to a corporation giant?

- Or more specifically, how does the electric power sector (especially the power grid) evolve from **a peripherical industrial ministry** to **a primary central SOE**?

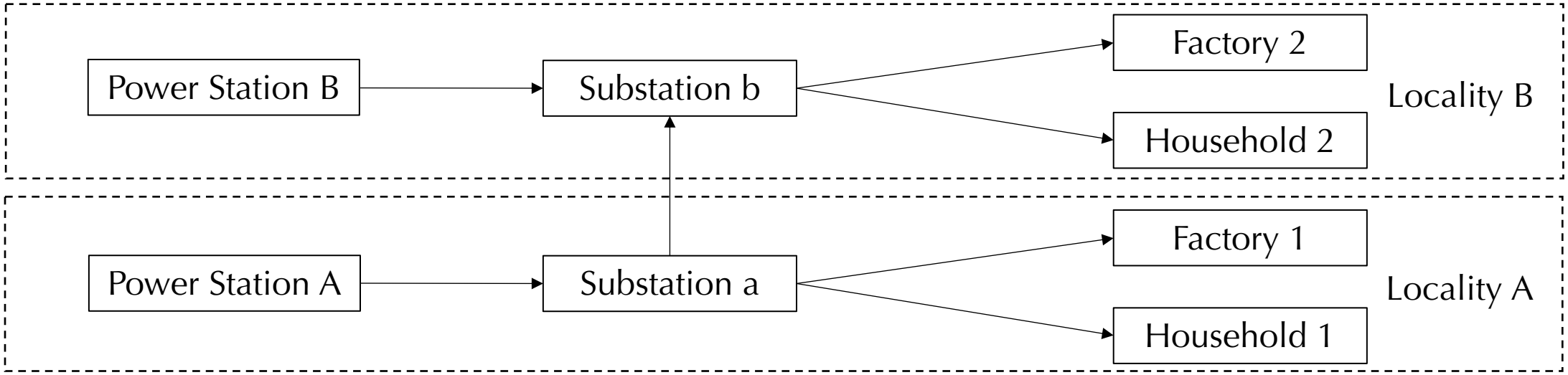
- How to define SOE conglomerates?

- How to explain?
  a. Sectoral-sectoral relations? - Fragmented authorities among different sectors
  b. Sectoral-territorial relations? - Bargaining between central ministry / SOE and local governments
  c. Or even government-business relations?

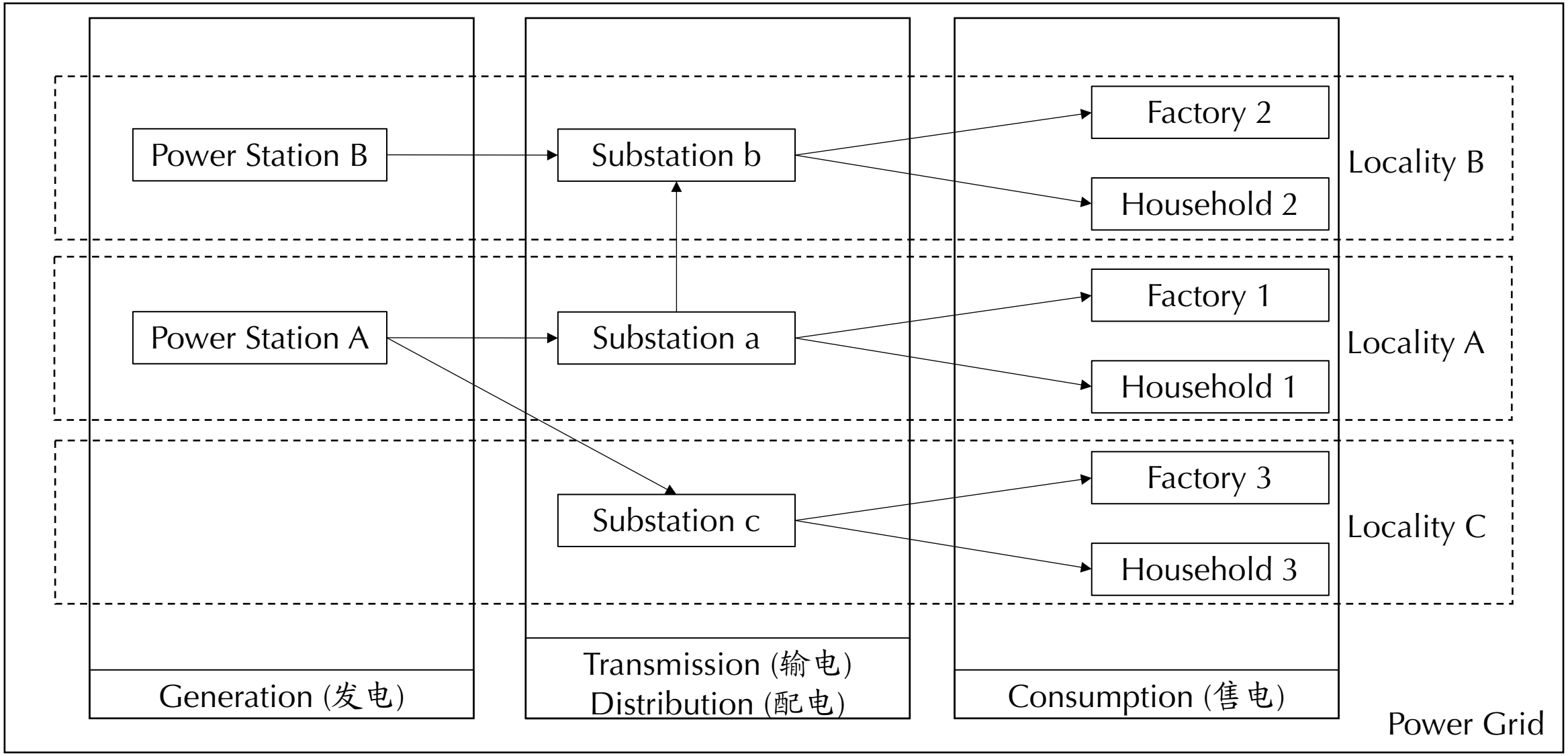
Segments of Electric Power Sector



Segments of Electric Power Sector



Segments: Sectoral-Territorial



2. From Bureaucracy to Corporation Giants

Planned Economy Period (1)

- Ministry of Fuel Industry (燃料工业部), October 1949:
  - **Why?**
    a. Energy industry was undeveloped
  - General Administration of Coal, **Electric Power** (电业管理总局), Oil, and **Hydropower Construction** (水力发电建设总局)
  - **Main business (by Electric Power):** 6 regional electric power bureaus (Northeast, North, East, Middle-and-south, Northwest, and Southwest)
  - **Auxiliary business (by Hydropower Construction):** survey, design, and construction
- Ministry of Electric Power Industry (电力工业部), July 1955: **1st time**
  - **Why?**
    a. "Gao-Rao Affair" (1953–1955) and dissolution of greater administrative regions
    b. To support economic growth, electric power industry was rapidly developing
  - Regional electric power bureaus
    - Beijing (leading Tianjin, Tangshan), Xi'an, Chengdu, Wuhan (leading Zhengzhou), Shanghai (leading Nanjing), and Shenyang
  - 2 construction administrations
    - Hydropower Construction and Electric Power Construction (电力建设总局)
  - If you are familiar with railway system in China…

Planned Economy Period (2)

- Ministry of Water Resources and Electric Power (水利电力部), February 1958:
  - **Why?**
    a. ”Uninterrupted revolution” (Mao, 1958), technological revolution, and “Hydro is the priority, and thermal is the subsidiary” (“水主火辅”)
    b. Sectoral bargaining: internalize
    c. Struggles against bureaucratism and redundancy
  - 1958 “Great Leap Forward”:
    a. 15 provincial electric power bureaus + 1 railway electric power bureaus
    b. Devolve power plants to provinces
  - 1960 “Readjustment”:
    a. Reestablish regional electric power bureaus
    b. Central–Regional–Provincial (business: ministry; personnel: provinces)
  - **Problem?**
    a. Peak regulation and frequency modulation?
    b. Barriers between provinces? * no interprovincial connected grid
- Military control, July 1967:
  - Dissolve the Ministry, and devolve to provinces
  - Alteration of Inner Mongolia Region (1969), 8 power plants subordinate to Northeast Electric Power Bureau

Reform Period (1)

- Ministry of Electric Power Industry, February 1979: **2nd time**
  - **Why?**
    a. Barriers between provinces
    b. Transmission does not match generation and consumption
  - Reestablish regional electric power bureaus
    - Northeast, East Bureau + Northeast, North, Middle, Southwest Bureau + South Office
    - Shandong, Fujian, and Guangxi
    - Guangdong (experimental province during the economic reform period)
    - Inner Mongolia (alteration of Inner Mongolia Region in 1969)
- Ministry of Water Resources and Electric Power (水利电力部), March 1982:
  - **Why?**
    a. Electric growth cannot catch up economic growth
    b. To prepare for the Three Gorges Project (22.5 million kilowatts)
  - Hydraulic and hydropower construction corporation (水利水电建设总公司): ″ Separating government functions from enterprise management″ (“政企分开”)
    - Administration of Construction from Ministry of Water Resources + Administration of Hydropower Construction from Ministry of Electric Power Industry

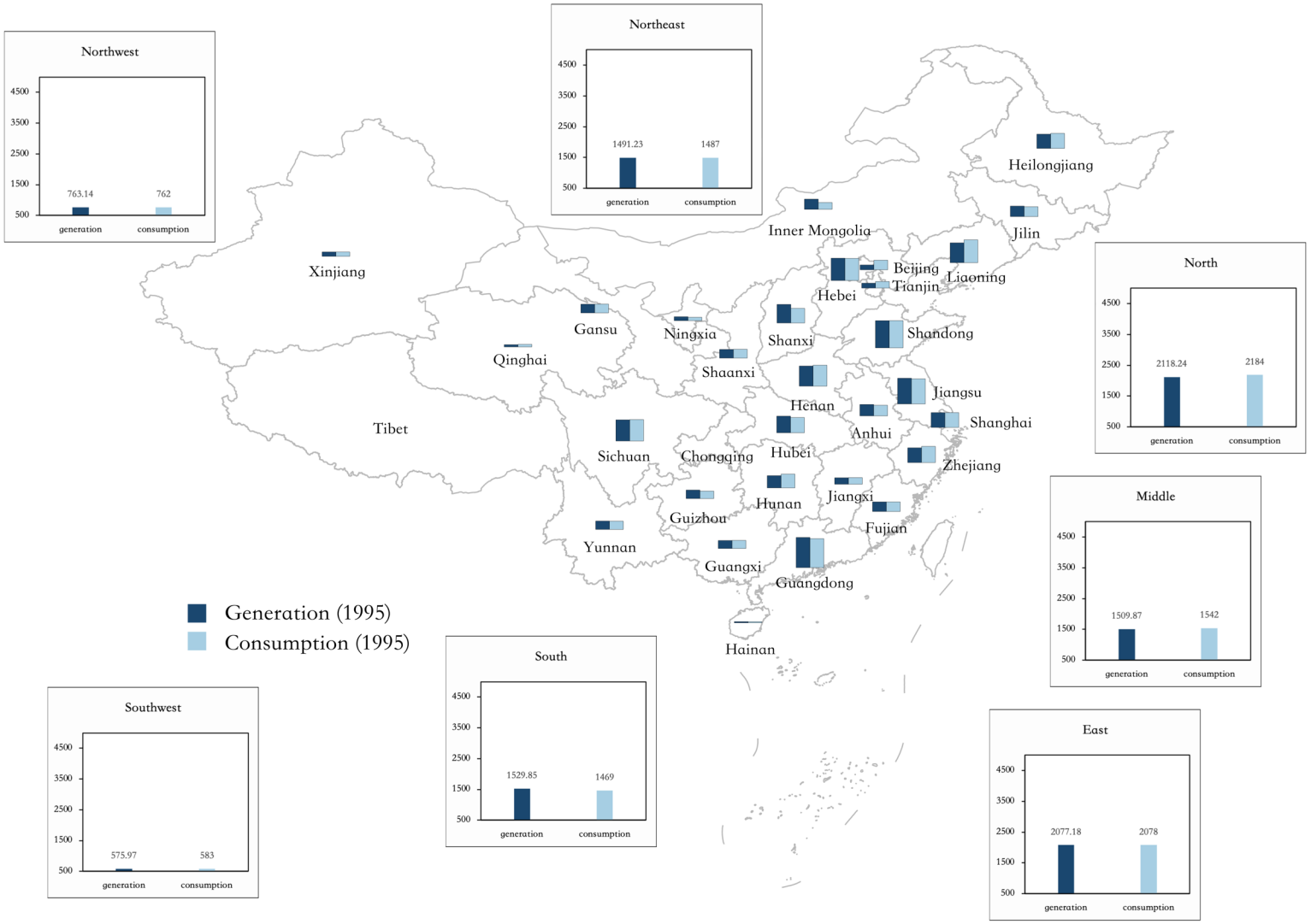
Reform Period (2)

- Ministry of Energy (能源部), April 1987:
  - ”Separating government functions from enterprise management, regarding a province as an entity, combining the power grid, centralizing dispatch, and fundraising for power industry” (Li, 1987) (“政企分开，省为实体，联合电网，统一调度，集资办电”)
  - **Why?**
    a. Electricity: Consumption >> Generation, insufficient investment and construction
    b. ”State supervises the electric power industry, and society constructs and operates the electric power industry.” (“政府管电，社会办电”)
  - Coal, Electric Power, Oil and Gas
    - Recall the system in 1949
  - China Huaneng Group (华能), August 1988
  - Provincial Power Corporations + South Power Joint Corporation (南方电力联营公司): “One institution with two names” (“两块牌子，一套人马”)
- Ministry of Electric Power Industry, March 1992: **3rd time**
  - **Why?**
    a. To deepen the reform
    b. Barriers between provinces

Establishment of State Power Corporation in 1997

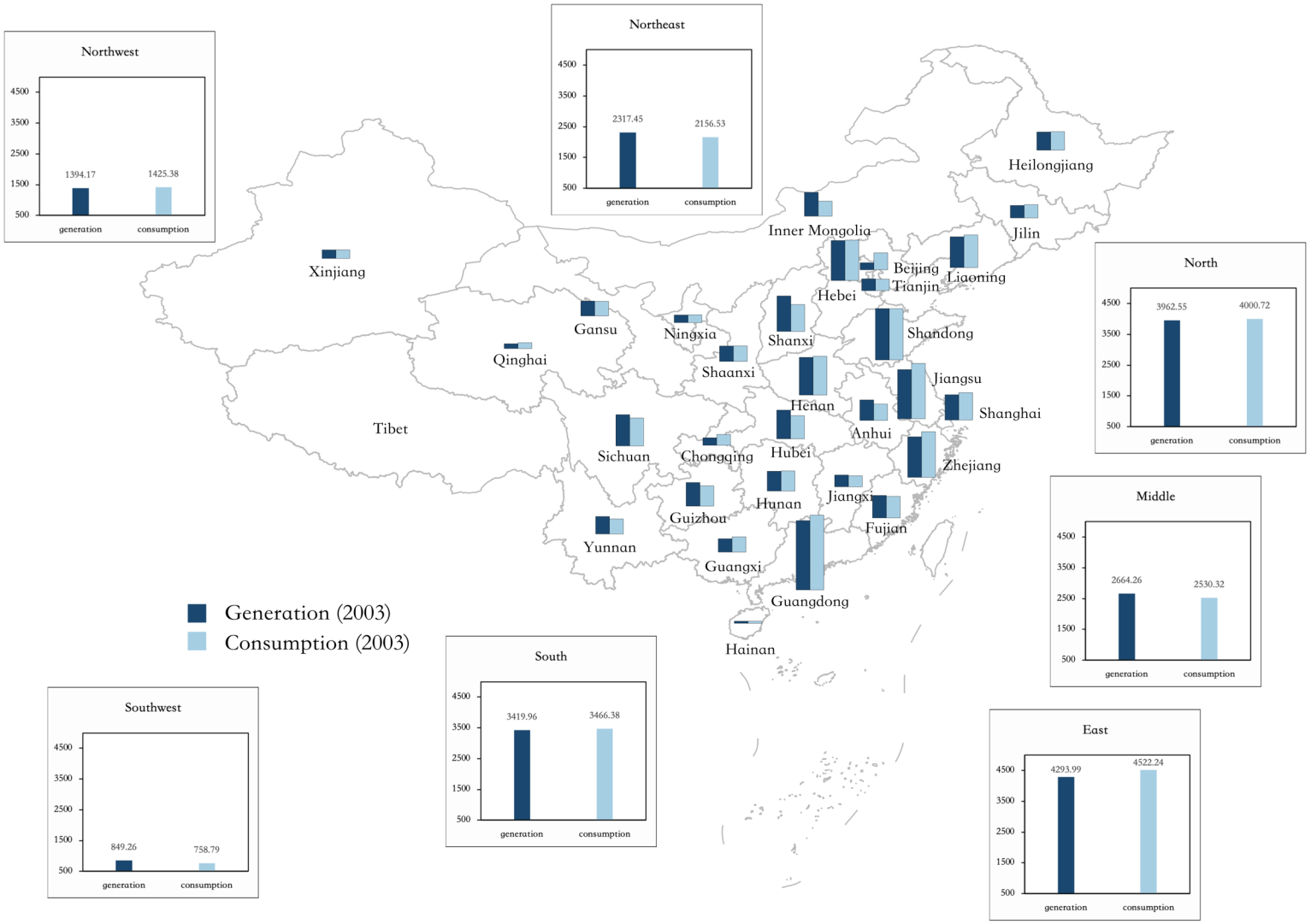
- State Power Corporation (国家电力公司), January 1997:
  - Ministry supervises the industry, and corporation operates the industry
  - **A Corporation Giant:**
    a. "One institution with two names"
    b. Generation + transmission + distribution + consumption
    c. 48.3% installed capacity, 77% generation
  - **4-Step Reform:**
    a. 1997–1998: central-level, separate ministry from corporation (dismantle the ministry)
    b. 1998–2000: provincial-level, provincial power corporations (transmission + distribution + consumption), and generation corporations
    c. 2001–2010: competitive national power market
    d. After 2010: separate distribution and consumption
- Experiments on the generation-side power market, 1998–around 2003
  - Plan: Shanghai, Zhejiang, Shandong, Liaoning, Jilin, and Heilongjiang
  - Implement: Zhejiang (2000)
  - **Problem?**
    a. Few generation corporations
    b. Seller's market: Consumption (demand) > Generation (supply), still oligopoly

Power Generation and Consumption in 1995



Data source: *China Electric Power Yearbook*

Power Generation and Consumption in 2003



Data source: *China Electric Power Yearbook*

Reconstruction in 2002

- **No.5 [2002] of the State Council**, December 2002:
  - *The Notice of the State Council on Printing and Distributing the Plans Regarding the Restructuring of the Power Industry*
  - "Separating plants from grids, main business from auxiliary business, power transmission from distribution, and constructing regional power market" (“厂网分开、主辅分离、输配分开、竞价上网”)
- The former State Power Corporation was dismantled and was reconstructed into 11 SOEs:
  a. 2 power grid corporations:
     - State Grid (国家电网):
     - China Southern Power Grid (南方电网)
  b. 5 power generation corporations:
     - China Huaneng Group (华能): reconstruction (1989)
     - China Datang Corporation (大唐): new establishment
     - China Huadian (华电): new establishment
     - China Guodian (国电): new establishment
     - China Power Investment Corporation (中电投): new establishment
  c. 4 construction corporations / auxiliary corporations:
     - China Power Engineering Consulting Corporation (电力工程顾问集团)
     - Hydrochina Corporation (水电工程顾问集团)
     - Sinohydro Corporation (水利水电建设集团)
     - China Gezhouba Group Company (葛洲坝集团)

Deepen Reform

- **No.9 [2015] of the Central Committee**, March 2015:
  - *Several Opinions of the CPC Central Committee and the State Council on Further Deepening the Reform of the Electric Power System*
  - ”Control transmission and distribution, marketize generation and consumption”（“管住中间，放开两头”）
- Reorganization on Construction Giants:
  - **Power Construction Corporation (中电建):** China Power Engineering Consulting Corporation + China Gezhouba Group Company, September 2011
  - **China Energy Engineering Group (中能建):** Hydrochina Corporation + Sinohydro Corporation, September 2011
- Reorganization on Generation Giants:
  - **State Power Investment Corporation (国电投):** China Power Investment Corporation + State Nuclear Power Technology Corporation (国家核电技术), July 2015
    - CPIC has nuclear power license, but lacks of technology
    - SNPT has technology (designing & construction), but does not have a license
  - **China Energy Investment (国能投):** China Guodian + Shenhua Group (神华), September 2017
    - To integrate upstream (Shenhua, coal) and downstream (Guodian, electricity) industries
    - To support the development of renewable resources

From Bureaucracy to Corporation Giants

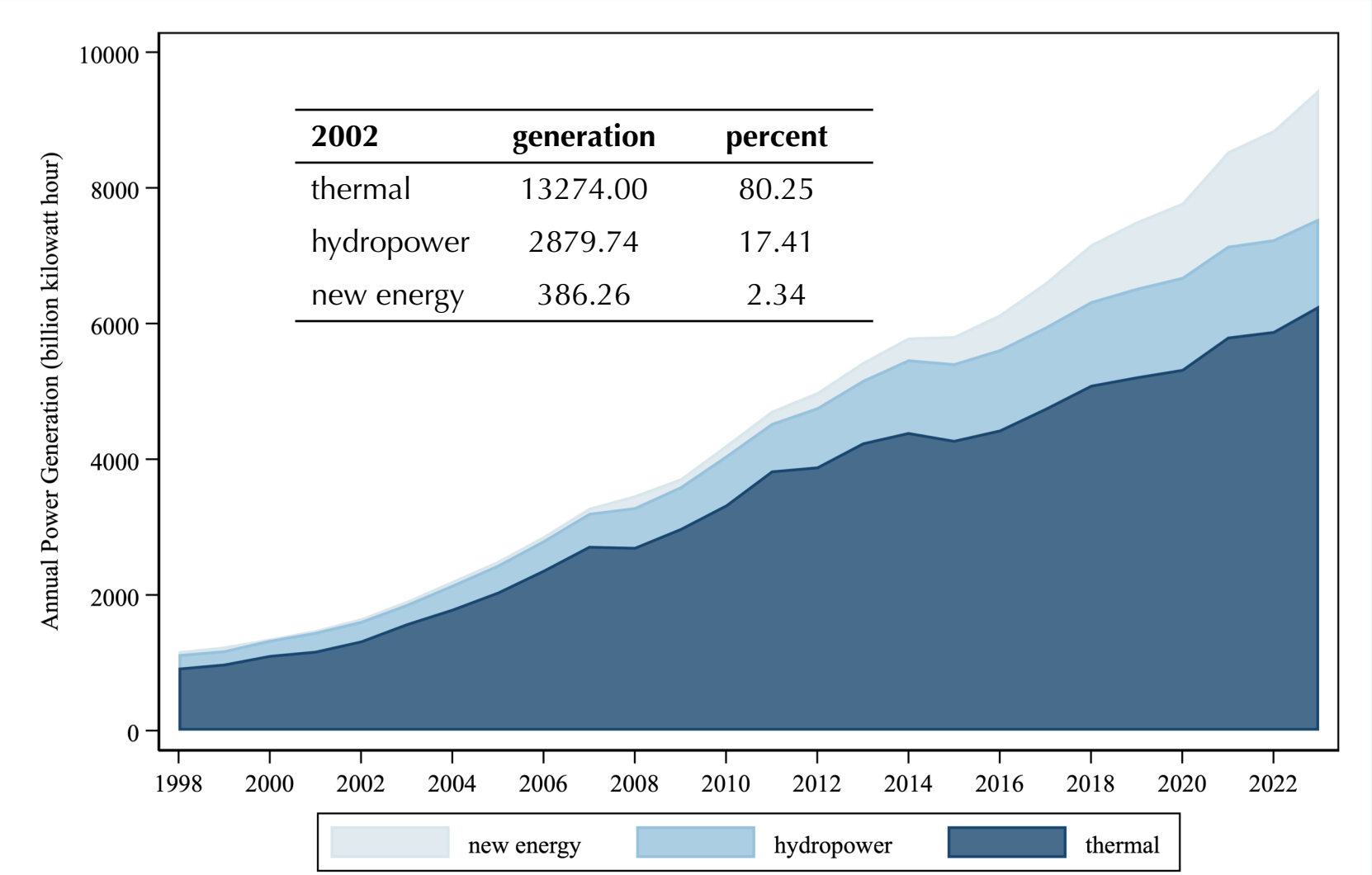
Year	Institution	Sectoral-sectoral	Central-local
1949–1955	Ministry of Fuel Industry	combine	central
1955–1958	Ministry of Electric Power Industry	separate	central
1958–1979	Ministry of Water Resources and Electric Power	combine	local
1979–1982	Ministry of Electric Power Industry	separate	central
1982–1987	Ministry of Water Resources and Electric Power	combine	local
1987–1992	Ministry of Energy	combine	central
1992–1998	Ministry of Electric Power Industry	separate	central + local?
1997–2002	State Power Corporation	separate	central
2002–2024	2 Grid + 5 Generation + 2 Construction	separate	central

Note: The relations refer to the power supply segment (i.e., transmission, distribution, and consumption) or the power grid part, rather than the power generation segment.

- Two Trends:
  a. Sectoral-sectoral: relation with energy sector, with water sector
  b. Central-local / Sectoral-Territorial: relation with local governments, with local electric power enterprises
- Ministry of Electric Power Industry as a transitional institution during the reform.

3. At Central, (Provincial,) and County Levels

Power Generation



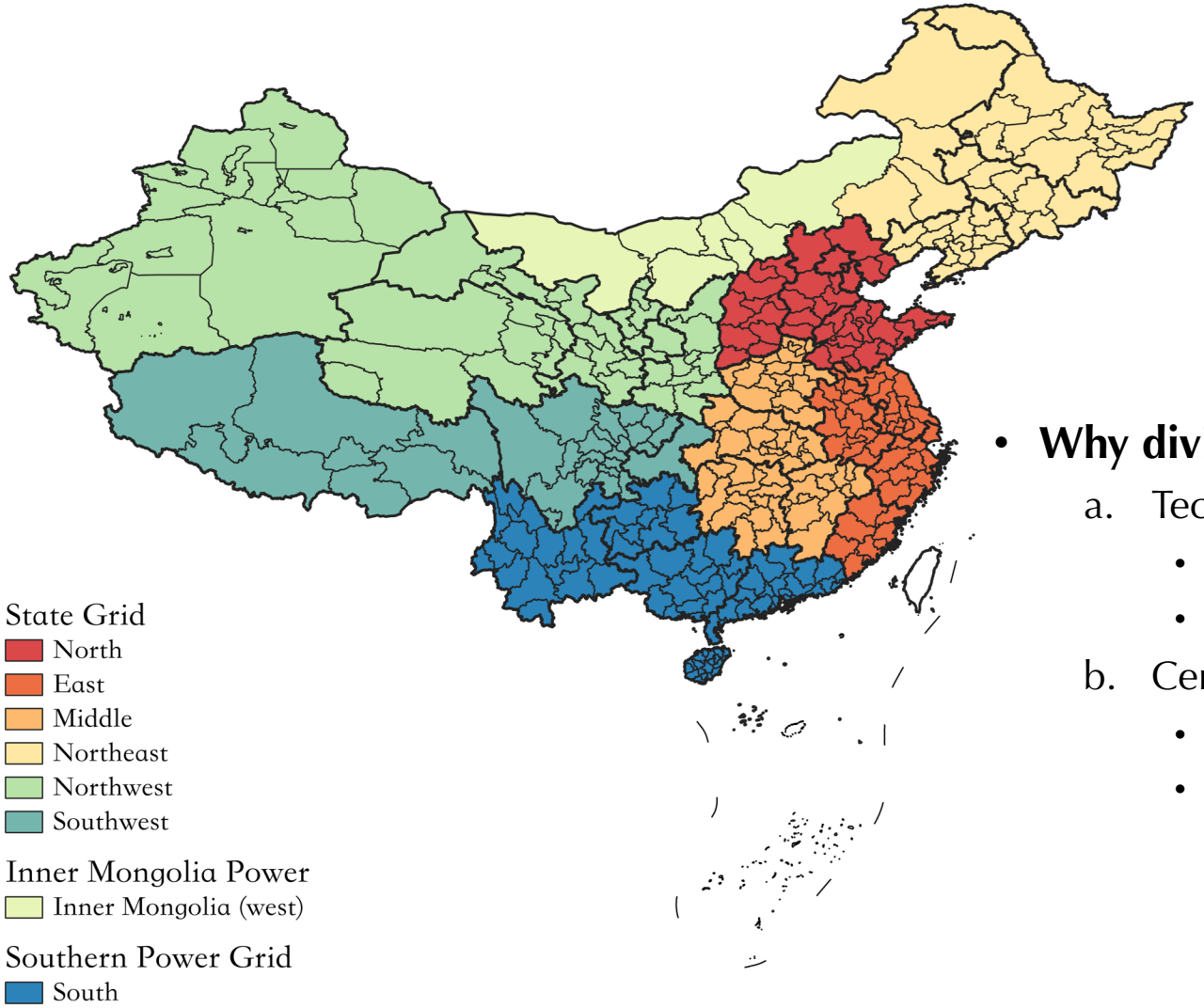
2002	generation	percent
thermal	13274.00	80.25
hydropower	2879.74	17.41
new energy	386.26	2.34

Data source: National Bureau of Statistics

Power Generation: Central to Local

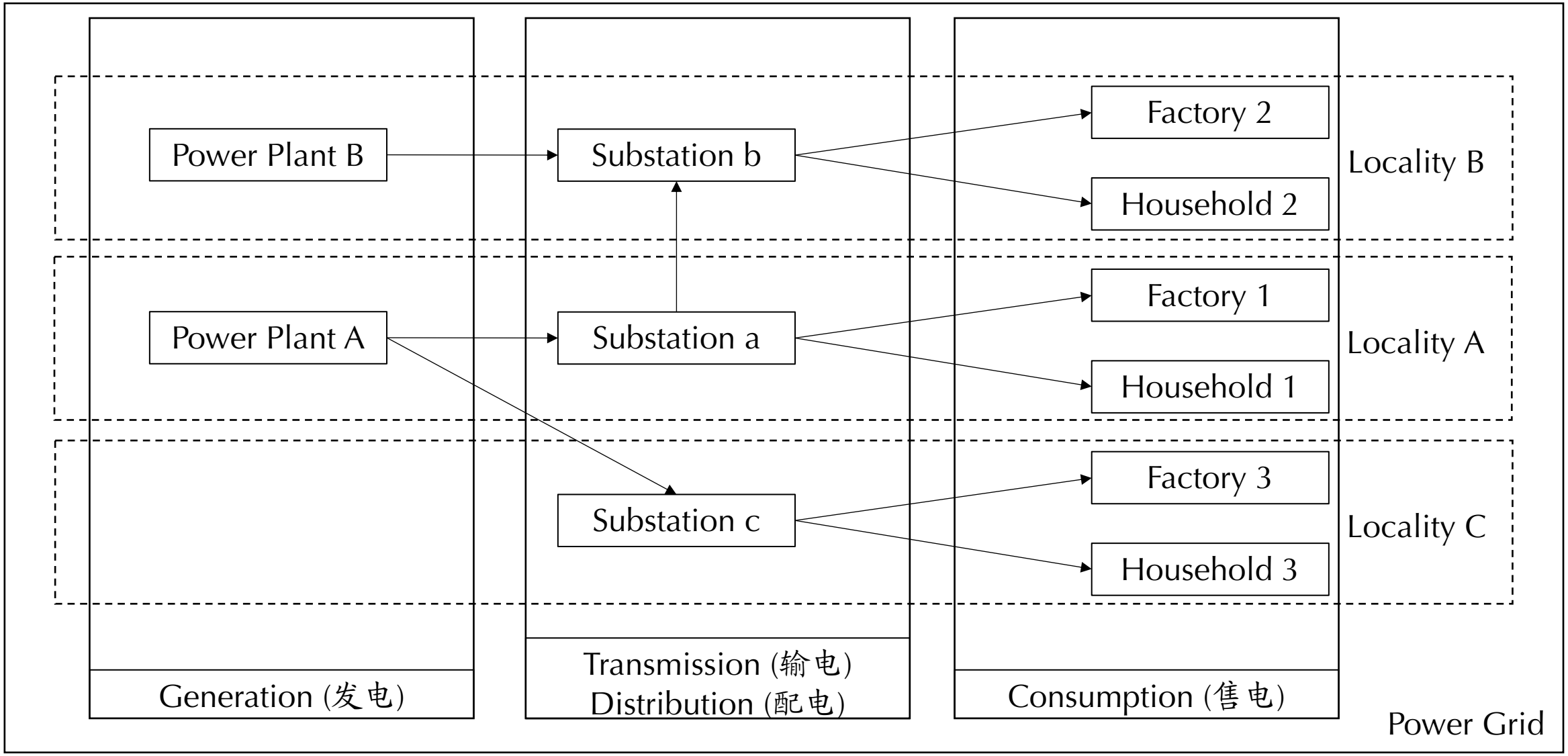
- Principles of reconstruction:
  a. Comparable asset size
  b. Reconstruct into 1 corporation in 1 province
  c. Each corporation no more than 20% of the market share in each region
  d. Power source:
     - **Thermal:** China Huaneng Group
     - **Thermal:** China Datang Corporation (from State Power Corporation)
     - **Hydropower / Gas:** China Huadian
     - **Wind:** China Guodian
     - **Nuclear:** China Power Investment Corporation
- Other central-related Generation Corporation:
  - SDIC Power Holdings Company (国投电力), Guohua International Power Company (国华电力), China Resources Power Holdings Company (华润电力), China General Nuclear Power Corporation (中广核)
- Other power sources:
  - Public-owned: province-owned (Zhejiang, Guangdong), city-owned, county-owned plants
  - Private-owned: factory-owned backup plants, joint venture plants, micro grid (e.g., solar generation on the household's rooftop)

Power Grid: Between Central and Provincial



- **State Grid:**
  - North (including Shandong), East (including Fujian), Middle, Northeast (including Inner Mongolia (east)), Northwest, Southwest (including Tibet)
- **Southern Power Grid:**
  - **Guangdong**, Guangxi, Hainan, Yunnan, Guizhou
- **Why divides into two corporations (and regional branches)?**
  a. Technocrat:
     - Unified national power grid
     - Or separated regional power grid
  b. Central-local relations:
     - Guangdong as a powerful player
     - West-to-East Power Transmission Project (西电东送): Guizhou→Guangdong

Power Grid: County-level



Power Grid: County-level

- **Patterns of County-level Electricity Supply:**
  a. Central Supply (直供直管, *zhigongzhiguan*, "directly by central"): around 760
     - County-level electric power enterprise is the subsidiary or the branch of provincial electric power company
     - Revenues and taxes contribute to the central finance
  b. Wholesale (趸售, *dunshou*): around 1,040
     - County owns the electric power enterprise
     - Due to insufficient power generation within the supply area, the enterprise has to purchase electricity from the provincial electric power company
     - Revenues and taxes contribute to the local government
  c. Local Supply (自供自管, *zigongziguan*, "by county itself"): around 600
     - County owns the electric power enterprise
     - County power grid independent from (not connected to) the provincial power grid
     - Revenues and taxes contribute to the county-level finance
- **What cause the differences?** (Ma and Ye, forthcoming)
  a. the particular historical environment when *tiao* expanded (temporal):
     - Planned economy period: high embeddedness (central supply); Economic reform period: low embeddedness (wholesale / local supply)
  b. the level of economic development in locality (spatial):
     - Developed region: high embeddedness (central supply); Undeveloped region low embeddedness (wholesale / local supply)

Concluding Remarks

- How is the oligopoly formed?
  - Monopoly in upstream sectors:
    a. Thermal: monopoly in coal and oil sector
    b. Hydro: flood control, irrigation, water supply, inland navigation, etc.
  - From *peripheral* to *primary*: partial reform
    - Supply-side market: marketize in the power generation segment
    - Dispatching and regulating: to ensure the demand and to safeguard energy security in the power transmission and distribution segment
- Or more broadly, how to define SOE giants?
  - From *bureaucracy* to *corporation giants*
- Possible definitions?
  a. Natural monopoly? – Maybe only the power transmission segment
  b. Public goods provision?
  c. Pilot agency + zaibatsu / chaebol?
  d. Principal & Agent? – Agent of whose? Ministry? Corporation giants? Local governments?