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Abstract

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INTRODUCTION

China has become the second largest electric power market in the world, running the world's biggest electricity system that produces around 25% of the world's electricity and more than 7% of the world's greenhouse gas emissions. The annual value of electricity sales are up to $600 bn and annual new investment is around $137 bn. It is predicted that the Chinese power industry will invest over two trillion US dollars in the next 30 years, and that the nation's purchasing of power generation equipment alone will account for some 32% of the world's total.[1] Indeed, according to China Electricity Council (CEC) data, China's total installed power capacity had reached 1777 GW (gigawatt) in 2017, following a 10% plus annual growth rate since 2008.[2] Per capita consumption was low at around 3927 KWh (kilowatt hour) in 2014, suggesting a massive expansion of power infrastructure would be necessary if China's consumption is to approach the global average.[3] Even with the slowing GDP growth, it has been estimated that by 2030 China's power consumption will range between 5830 kWh and 8580 kWh per capita (He et al, 2015).[4]

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[1] "Meet and network with China's Electric Power business," *EP Shanghai 2009*, 8-10 July 2009, Shanghai International Exhibition Centre (INTEX), China. <www.ceejay.com.hk/EP%20Shanghai%2009.doc>

[2] Founded in 1988 by the State Council, China Electricity Council (CEC) is a consolidated organization of all China's power enterprises and institutions. "2017 electricity & other energy statistics" cited in China Energy Portal. < https://chinaenergyportal.org/en/2017-electricity-energy-statistics/>

[3] "Electric Power Consumption (kWh per capita)," IEA Statistics in The World Bank Data. https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?locations=CN

[4] Gang He, Jiang Lin, and Alexandria Yuan (2015), p. 1. While the upper bound remains in the latest projections of the World Energy Outlook - 2017 and the BP Energy Outlook 2017

To counter these enormous expectations and to support the development of China's electricity sector, the government launched a series of reforms at the end of the 1990s and early 2000s with a view to creating a more dynamic power market structure and to establishing a rational regulatory framework. The first time that China's electricity industry became subject to legislative control was with the passing of the first national electricity law in 1995 that guaranteed the development of the electric power industry and pledged to safeguard the legal rights and interests of investors, operators and users of electric power.[5] It was a landmark legislation that set the next stage of reforms in 2002 with the creation of the State Electricity Regulatory Commission (SERC) to establish a coherent bureaucratic framework for regulating the power sector. It also led to key regulations to supervise and regulate electricity-related issues such as pricing of electricity, and issuing and managing electric business permits that were promulgated in 2005 with a view to expand market forces. By 2013, however, SERC was folded into the National Energy Administration (NEA) that was established five years earlier, taking the fall for a decade of top-down reform initiatives that have not produced greater marketization of the power sector or enhanced domestic energy security.[6] In 2015, industrial policy direction shifted from privatization toward electricity price reform, electricity trading mechanism reform, dispatch plan reform, reduction of curtailment of renewable energy, and the opening up of distribution and retail

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edition, the lower bound was exceeded by the end of 2016 when China consumed 5919.8 TWh of electricity, "Electricity consumption China 2010-2016," STATISTA, https://www.statista.com/statistics/302203/china-electricity-consumption.

[5] Electricity Law of the People's Republic of China (Dec. 28, 1995).

[6] "Reform of energy policymaking less radical than expected," *South China Morning Post*, March 11, 2013.

business to new investors (Liu, 2015). However, the unfinished business of SERC has hung over Chinese planners. Leading up the National People's Congress session in March 2018, business media reported Chinese planners' intention to re-establish a dedicated energy ministry to oversee the country's vast oil, natural gas, coal and power sectors.[7] Surprisingly, this proposal fell through, leaving the electricity sector in an unsustainable state of reform impasse and regulatory uncertainties.

We argue that SERC's decade-long tenure should be understood as a political failure, for the agency was unable to wrangle away power from entrenched interests to achieve the political superiors' top priorities of marketization, energy security, and ecological protection. However, SERC's demise confirms China's need for a ministerial-level independent regulator, for the alternatives of a weak agency in NEA and greater market domination of the grid and generation companies have displaced Beijing from the driver's seat in steering the reform momentum. As a result, the current path of reform toward a more "market" based solution – defined in the State Council Document 9 of 2015 - will likely result in disorganised deregulation that will perpetuate chronic supply and demand imbalances and hampered China's transition to renewable sources.

The article is divided into three sections. The first section critically reviews the relevant comparative literature on industrial regulation, underlining China's complex and

[7] Josephine Mason, Benjamin Kang Lim, "Exclusive - China plans to create energy ministry in government shake-up: sources," Reuters, March 8, 2018. <https://uk.reuters.com/article/uk-china-parliament-energy/exclusive-china-plans-to-create-energy-ministry-in-government-shake-up-sources-idUKKCN1GK17E>; "China Plans New Energy Ministry to Replace the National Energy Administration," Latham & Watkins LLP, March 16, 2018. <https://www.globalelr.com/2018/03/china-plans-new-energy-ministry-to-replace-the-national-energy-administration/>

multipolar political landscape of government and corporate players for achieving the necessary autonomy of a regulatory state. The second section assesses the evolution of China's electricity sector, following four reform priorities and key developments that have come to define long-term challenges to marketization. The third section discusses the problematic alignment of industrial interests behind China's power sector reforms from SERC's establishment to its demise and the subsequent regulatory proxies. The conclusion considers the legacy of earlier partial reforms on Beijing's current push for marketization.[8]

1. THE EMERGENCE OF A REGULATORY STATE IN CHINA

The case study of the independent regulator in the power sector focuses on the political preconditions for and proper institutional role of the central government in expediting market formation the post-socialist planning environment. It reflects on three related themes in the interdisciplinary literatures on regulatory capitalism: 1) increasing pressures on the state in supporting domestic firms' global market competitiveness, discussed as "new industrial policy" for advanced economies (Rodrik, 2004) and "regulatory state" in China (Lin, 2005; Pearson, 2005); 2) "regulatory diffusion" (Levi-Faur, 2005; Jarvis, 2009, 2010) as states - under advice from international organizations and aiming to attract foreign capital - seek to adopt standard policy packages and institutional templates for sectoral governance; and 3) an anti-liberal model of "state capitalism" (Buzan and Lawson, 2014; McNally, 2012) that seems to converge with the resilience of authoritarian regimes

[8] Much of the data that have been used for this study have been collected in numerous meetings and interviews with government agencies and private sector participants in China's power sector from 2009 to today. In the absence of explicit references to a source, the identity of the source has been omitted by his/her request.

since what Samuel Huntington called the "third wave of democratization" in the 1990s. Each of these perspectives emphasizes a set of state-market relations that generate specific demand for increased regulations, while sharing a general, critical assessment of the Chinese central state for not putting in place functional capacities to steer the electricity market in a difficult dual transition toward market governance and greater input of renewable energy. Taken together the comparative theoretical insights point to the necessity of a central regulatory agency in effecting this transition.

A liberal strand of understanding of the rise of the "regulatory state" in China predicts bureaucratic adaptation to the predominance of market transactions with the Soviet planning economy falling by the wayside in all but a handful of industries (ADB, 2003; Yang, 2004; Pei, 2005). There are intrinsic analytical problems in a zero-sum view of the plan and the market, most crucially in understating the complex duality of the Chinese government's roles as a significant owner of newly privatized firms and as the regulator of industries. Within this duality, Beijing balances between short-term financial gains and market predictability against persistent market distortions and longer-term political and social costs of sustaining oligopolistic firms. In the energy and electricity sectors, the State-owned Assets Supervision and Administration Commission (SASAC) holds controlling shares in the large petrochemical, power generation and grid companies. Hence key measures such as electricity price liberalization affects not only corporate profitability but also the fiscal stability for various levels of the government and the electricity consumers' sense of economic justice. A regulatory state would presuppose the reconciliation of contending institutional interests within the State Council and ministries, which is unfeasible given the "fragmented authoritarian" structure that governs policymaking process and bureaucratic

exchanges in Beijing (Lieberthal and Lampton, 1992). Subnational governments incorporate the regulatory demand from Beijing, while coping with their own complex stakeholder roles in state-owned enterprises.[9] From Beijing's vantage point, market creation is largely about facilitating horizontal integration – i.e. transactions across administrative jurisdictions – through the vehicle of restructured SOEs that consolidate transactions in their extant or newly allocated protected territories.[10] The Chinese power sector suffers extraordinary geographical fragmentations of power supply bases, transmissions infrastructure, and markets. The large grid and power generation companies have been charged by political superiors to manage these intra- and inter-sectoral coordination and collective action problems, but continuing market failures would push national regulators to step up their lawmaking and institution building efforts (Hira et al, 2004; Rodrik, 2004; Hausmann & Rodrik, 2006; Vogel, 1999).

A relative neglect of comparative regulation theories is the institutional risks in creating new regulatory bodies. The institutionalization of new state capacities for interventions is in itself a major disruption to the existing power balance, and once created regulatory agencies raise a new set of risks and coordination problems for the political principals and stakeholders (Acemoglu and Robinson, 2008). As subjects of regulation, state-controlled energy corporations have exerted a direct influence on the natures of competition as their dominating market shares, exclusive networks of upstream and

[9] Gillespie and Peerenboom (2009). For accounts of local stakeholders' resistance to the restructuring of the oil and petrochemical industries, see Lin (2009) and Lin and Chen (2013).

[10] For surveys and representative case studies of Chinese marketization, see Fei (1998), Garnaut et al (2005); Green and He (2005), Kennedy (2005), Lin KC (2008); Lin YM (2001); Nolan (2001); Sutherland and Ning (2009); Wang et al (1999).

downstream integration, and policy privileges virtually guarantee corporate viability and significant rent from oligopolistic collusion. Therefore, regulatory efforts produce frequent collusions and constant renegotiation of market rules and reform implementation between the industry and government agencies (Andrew-Speed and Dow, 2000).

Industrial restructuring points to a central dilemma of the Chinese party-state's self-preservation. Even as the central bureaucratic elite attempts to build state capacities to implement sustainable market reform, it cannot prevent sub-national state agents – i.e. regulators, local officials, state-appointed managers – from acting strategically for short-run gains at the expense of the overall design. Several of the reform measures we examine in the Chinese power sector would seem half-baked, tentative, or broken up in sequence, not because the reformers do not know what they were doing but that they deliberately refrained from a coherent and complete sequence of changes that might produce a dangerous backlash that combines fiscal, economic, and social disruptions. Our analysis focuses on the SERC that was created in 2002 as a supra-ministerial agency with a mandate stipulating a wide-ranging authority over power generation, transmission and distribution. SERC was the first non-financial, independent regulatory body in the post-command economic administration, and ended on a whimper in 2013 with its functions reassigned to NEA – a unit of the NDRC. A systematic understanding of its political and institutional context of its decade long existence helps us to anticipate the form and effectiveness of the new regulatory models that have also been considered for other sectors and policy areas in China.

2. FROM BREAKING UP STATE MONOPOLY TO COORDINATING MARKET OLIGOPOLY

Until the 1990s, the development stages of the electricity sector aligned with the broader industrial policy undertakings of the Communist party-state. From 1949 to 1985, the monopolistic Ministry of Electric Power Industry (MEPI) provided electricity production and service as a vertically integrated monopolized utility and also oversaw all functions of power generation, transmission and distribution.[11] The growth of the sector remained negative throughout the 1960s and 1970s, and as China's economy took off in the 1980s the state monopoly struggled to meet the country's growing electricity demand (Zhang, 2004). From 1985 onwards and consistent with the general approach to enterprise and fiscal reforms, Beijing pursued decentralized governance with policies providing sector-specific finance for local governments to invest in electricity generation and planning authorities over electricity utilities and markets (Zhang and Heller, 2004; Wirtshafter, 1990.[12] Even as the majority of transmission and distribution assets remained in the control of the central government, the proportion of state-owned generating assets was reduced to 46% by the mid 1990s with the remaining 54% staying in the hands of local governments and the independent power producers (Wong J and Wong CK, 1998). With an overall capacity of 236.54 GW, a nation-wide generation surplus was achieved by 1996 that ranked China second in terms of the installed electricity generating capacity and output in the world. Starting in the second half of the 1990s and through the first decade of the 2000s, central

[11] The MEPI was rebranded on a number of occasions - Ministry of Fuel Industries (1949-55); Ministry of Electric Power Industry (1955-58; 1979-92); Ministry of Water Resources and Electric Power (1958-79).

[12] The principal of "Who is Generating Power Should Benefit from" is stated in the State Council Regulation No. 72, *Provisional Regulation on Encouraging Fund Raising for Electric Power and Multiple Rates of Power Tariff*, 1985

government struggled to maintain incentives for local capacity expansion while seeking regulatory powers to check the worst excesses of local protectionism, government-business collusion, highly inefficient capital usage, and behaviors leading to environmental degradation. From 2007, Chinese planners promoted renewable energy and pushed for electricity market reform as essential to achieving China's sustainable development goals, which gained urgency with the global recession and Chinese economic growth slowdown since 2008. SERC played a critical role in cosponsoring many of these reforms with other ministries, but constantly operated with its hands tied against the entrenched corporate and bureaucratic interests. This section assesses the gap between SERC's formal mandate and its operational autonomy and authority.

2.1 Long-term objectives of institutional reform

The institutional reform of China's power sector revolves around four core policy challenges requiring complex coordination between the domestic market, industrial players, and bureaucracies at central and local levels:

1) Electricity supply security in line with China's growing energy demand: Beijing faces chronic problems of managing energy usage cycles and the unequal distribution of power generation areas and consumption centers across China. The dynamics of the alternating shortage and surplus crises are complex are likely amplified by the local political distortions that produce boom-and-bust cycles in capital formation and local state protectionism and market fragmentation (Walton and Finn, 2005; Zhu and Li 2003).

2) Market creation after the socialist plan: Given the initial absence of functional market signals, central state regulator acts to compensate for deficiencies in the market, in particular with respect to energy prices and access to energy transmission networks. Beijing asks power and grid companies to provide for public goods such as upgrading the power grids, stable prices, energy delivery and service standards across China's vast territories, in return for private goods such as and policy aids on technological upgrading and priority access to banks and stock markets for the capitalization of power companies (Xie, 2009; He, 2003).

3) Coordination of upstream-downstream interests: Industrial analysts often point out conflicts of interests among coal producers, generators, and transmission and distribution companies. These businesses have traditionally come under different lines of administration, and remained weakly mediated by market forces and deeply embedded in local socioeconomic networks. Until quite recently, planners operated under the premise that direct competition in regional markets was likely to be ineffective, and thus price liberalization would cause unacceptable levels of volatility.[13] Instead, the State Council has occasionally intervened to promote long-term supply contracts between coal suppliers and power plants to improve risk management and profitability (Ng, 2008). It has also established guidelines for price increases and cross-regional differences that attempt to spread the costs of rising inputs. These interventions keep Beijing at the center of a Catch-22 dilemma of reacting to failures of competition and being blamed for not pushing for liberalization.

[13] The restructured petrochemical industry set a precedent for administered prices. Lin (2008).

4) Future-proofing and strategic policymaking: under the Hu and Xi administrations, Chinese planners have made domestic and international commitments to ecologically sustainable development under lower GDP growth rates. As the world's largest greenhouse gas emitter, China has rapidly scaled the technological frontiers to become the world's leading investor in renewables and producer of clean-energy products. In the process, industrial policies have become more complex and challenging as the main reform objective of "growing out of the plan" (Naughton 1995) can no longer be singularly defined as separating out governmental and managerial spheres in SOEs and expanding the scope of market transactions. Successive bureaucratic overhauls and changing policy demands on SOEs reflect these economic strategic complexities. We will focus below on the introduction of renewable energy generation and dispatch system reform.

These four challenges have been a distinct feature throughout the evolution of China's electricity sector particularly since the mid-1980s. Varying stages of policy changes leading up to state-led privatization and liberalization in the 2000s reveal an intricate balancing act the government is forced to play in the creation of more competitive market to satisfy the power demand of the growing economy. The independent central regulator emerged in this context as an agency of policy innovation and interest mediation.

2.2 Between a Rock and a Hard Place: SERC's precarious institutional standing

From 1997 to 2002, the government sought to leverage the monopoly power of State Power Corporation (SPC) to overcome the local protectionist tendencies of provincial. Under the decentalized approach to power sector development, local governments and the centrally controlled grid companies started to exhibit increasing conflict of interest. The grid companies, despite the agreed "Transmission and Distribution" principle, often raised electricity tariffs for their state-affiliated generating plants all the while compressing the ongrid prices and volumes for the provincial plants and other IPPs (Zhang and Heller, 2004). These measures markedly undermined the implementation of the "New Plant, New Price" policy as well as the planned unification of transmission and distribution. Provincial protectionism as an emerging phenomenon also began to lay barriers for the opening of transmission and distribution channels to the IPPs from other provinces and regions, for example in blocking the uploading of generated capacity from neighboring provinces.

This horizontal integration approach gave way to further restructuring of SPC by separating the power generating business from the grid transmission (State Council, 2002), creating five generating companies (Huaneng, Datang, Huadian, Guodian, and State Power Investment Company) and two grid companies roughly along geographical lines. The State Grid Company (SGC) is responsible for most of northern China, and the China Southern Grid Company (CSGC) covers the economically thriving southern provinces.

At the national ministerial level, the SERC was established in 2003, endowed with authorities to manage the state monopoly break-up, oversee industry reforms, and promote a competitive market structure of the power sector (State Council, 2002 and 2003). Echoing the long-term reform objectives for China's power sector, the 2002 electricity sector reform had multiple goals. It sought to create a fair and competitive power market structure with a

wholesale market and independent regulation; to improve efficiency and lower costs; to optimize resource allocation and promote development and national grid interconnections; and to continue the rural electricity structural reforms (Zhang and Heller, 2004). To achieve these goals, the SERC was mandated with wide-ranging statutory powers that, in addition to the regulatory function, provided the agency with the authority to stipulate and enforce technical standards and propose tariffs and adjustments to government electricity pricing authority, and to investigate market violations (State Council, 2003). The mandated powers provided the agency with an authoritative statutory platform to oversee the electricity sector. Over the course of its decade long existence, SERC proposed several significance marketization initiatives in price transparency and liberalization, anti-trust measures, experiments in spot markets and information sharing among market players, and expansion of renewable energy sources.

INSERT FIGURE 1 HERE

The reformed electricity market structure is depicted in Figure 1. It displays the parallel roles of NDRC, SASAC, and other relevant ministries alongside the SERC in commanding the sector's industrial segments from generation to transmission and distribution. This new governance structure, put in place in 2008, failed to clearly elevate the position of the regulator and instead placed the SERC right back in the midst of fragmented bureaucratic politics that demanded compromises and resource exchanges among agencies with overlapping jurisdictions.

In principle, effective regulation follows, or should be determined, by the choice of the electricity structure. China's power sector on the whole deviated from the standard

best-practice model where electricity transmission is separated from generation and funded by transmission fees. In other words, China had a wholesale price on electricity that included both generation and transmission. This pricing decision has directly shaped sectoral interests, posing difficulties for marketization and regulation. For the transmission companies, namely the newly established State Grid and China Southern Grid Company, their only means to grow or be cost-effective has been by trading generated electricity of which they take temporary ownership (contrary to the standard 'unbundled electricity market model') from the State, regional, or provincially owned power generators, or private IPPs. If China's electricity sector were to follow the standard model, a federal regulator would regulate the transmission side. In this case, it would be the SERC. The shortcomings in the reform sequencing and institutionalization of competitive electricity market structures were indicative of higher-level politicized capture among the China's governing elites. The next section delves into the underlying power structures that impede the fulfilment of a fully competitive energy market, and explain the intensification of an underlying struggle between the informal leverages of local governments and grid and power companies and the new regulatory arms of the central government over the course of reform.

3. Political Pitfalls of Centralizing Electricity Market Governance

Ling Chen and Barry Naughton (2017) have described the coevolution of economic and political subsystems in China since 1999 as having gone through two phases – from 1998 to 2012, Beijing put in place a more sustainable set of power arrangements in finance and corporate governance, while continuing to offer local officials incentives and latitude for

driving high economic growth. With the economy reaching an unprecedented scale exposing problems of inefficient capital usage, corruption in officialdom, and environmental externalities, Xi Jinping shifted gear to top down initiatives giving central policy-makers "the maximum possible freedom of action" to overcome the system inertia against further structural changes in the economy. The following analysis of intra-ministerial politics, collusive local government and business interests, and the problem of renewable energy curtailment demonstrates the political resistance against centralized solution to cumulative problems in reforming the power sector.

3.1 Bureaucratic politics within the State Council

To begin with, the precarious institutional standing of the SERC and its inability to flex its wide-ranging formal mandates are best explained by the high level of politicization of energy policymaking within the State Council. The power sector reforms including the institution of the SERC took form during the tenures of Zeng Peiyan (1998-2003) and Ma Kai (2003-2008) as the Chairmen of the NDRC.[14] Both individuals were strong proponents of the power sector reforms and Ma Kai was a particularly strong proponent of the establishment

[14] Ma Kai joined the CPC in 1965 and has held various positions in the Central Planning function within the Party before becoming the NDRC Chairman in 2003. Zeng Peiyan in turn, while an equally long-running career within the Party, has a background as an electrical engineer and with Ministerial level appointments at the Ministry of Electronics Industry. He has also held financial planning positions within the State Planning Commission before his tenure as the NDRC Chairman.

of the SERC.[15] Their advocacy partly produced the decisive changes in the institutional structure in the 2002 reform, but also created the political conditions for the subsequent institutional standoffs and the dependence on high-level interventions in the form of a supra-ministerial leadership committee to push toward power reforms and mediate conflicting interests. Since 2010 that elite political impetus has been formally nested in the National Energy Commission (NEC), operating through a bureau (NEA) in the NDRC. Zhang Ping, the Chairman of the NDRC from 2008 to 2013, was a critic of decentralization of China's power sector and openly espoused a stronger central government involvement in the key substantive and technical areas of energy administration.

Despite the ambitious mandate entrusted upon the SERC, uncertainty regarding the highest-level political support left the agency in a weak political bargaining position. By statute, the SERC should have been an effective regulatory and oversight agency able to design, implement, and enforce effective energy policies, including controlling national, provincial, and regional transmission fees through its regional subsidiaries. Yet SERC ability to conduct regulatory monitoring and enforcement was severely affected by the NDRC's dominant position and powerful levers. Both the Price Bureau and later the NEA within the NDRC exerted such influence on the power sector that they typically left the SERC lost in the wake of their independent actions. The State Price Bureau with provincial branches under the Provincial Development and Reform Commissions (PDRC) is institutionally part of the NDRC and historically approves bundled wholesale and retail prices - a function that has a

[15] Interview with the National Energy Administration (NEA), 22 May 2009, and North China Electric Power University (NCEPU), 13 January 2010.

significant impact on the commercial viability of generating companies in the provinces.[16] The Pricing Bureaus additionally determine the price of coal, the primary input in electricity generation. NDRC also approves transmission licenses in the provinces and controls the benchmark price for transmission fees across the country.[17] In 2003, SERC spearheaded pilots in regional electricity markets. When risk-averse generators and consumers responded negatively to volatility in spot market prices, NDRC directed its Price Bureau to intervene by suspending price bidding and settling on-grid electricity according to contractual prices, effectively forcing SERC backed off.[18]

SERC had hoped to improve the regional competitive landscape in the power sector by proposing anti-trust laws at both provincial and regional levels in order to uproot the anti-competitive and collusive business conduct of transmission companies.[19] To force the grid companies, namely the State Grid and the Southern Power Grid, and their provincial and regional subsidiaries to abide by anti-trust laws, the regulator called for the support of the NDRC – which demurred citing its primary functions in price-setting and investment

[16] Interview with NCEPU, Beijing, 13 January 2010.

[17] Interview with World Bank official, Beijing, 13 January 2010. In practice, the PDRCs decide on the price of the transmission for pilot projects, thus providing the provincial governments with power to influence regional pricing.

[18] Announcement on Adjustment On-grid Tariffs by the Zhejiang Southeast Electric Power Company Limited, 24 June 2004. http://www.ukwire.co.uk/Article.aspx?id=200406240700260908A. For several years after, inter-provincial trading was mostly halted, occurring only to implement top-level energy strategies. Ho, Wang, Yu (2017), "China's Power Generation Dispatch," A Resources for the Future Report. <http://www.rff.org/files/document/file/RFF-Rpt-ChinaElectricity.pdf>

[19] It has been the ambition of the SERC to achieve significant antitrust responsibilities since the establishment of the agency. This was highlighted in the SERC 2007 report on *Study of Capacity Building of the Electricity Regulatory Agency SERC, P.R. China.*

approval mechanisms. Notably then, as the heads of the state-owned electricity companies were appointed and confirmed at the highest levels of government, namely the NDRC and the State Council, the exercise of the SERC's authority must be politically circumspect.[20] Given this, hopes for constructing provincial and regional electricity market where transmission companies abided by competitive market principles and adhere to regulated national transmission fees (as per unbundled electricity market model) were quickly dashed.

The NDRC's conduct in terms of information sharing also suggested a lack of interest in coming to the aid of the new regulator. The NDRC exclusively controlled all electricity generation and transmission (including distribution) relevant data at provincial and regional levels, which it often refused to share with the SERC, hence leaving the agency with few tools to improve transmission-related pricing problems or to design oversight procedures for regional governance and accountability mechanisms.[21] The NDRC also effectively acted as the final arbiter of whether or not a company can do business in the power sector. Most crucially, NDRC was in charge of the annual generation quota system that determined the output and profitability of most IPPs. NDRC also vetted power purchase agreements (PPA) in contractual negotiations between IPP and the grid companies, empowering it to weld significant influence over entry of private and foreign investment and exchange relations among firms.[22] In comparison, SERC's prerogative to issue licenses for market access

[20] Interview with Caijing Magazine, Beijing, 20 May 2009.

[21] Interview with a group of senior researchers at the North China Electric Power University (NCEPU), Beijing, 13 January 2010.

[22] Interestingly, problems with PPA had created an increasingly unpredictable and even inoperable environment particularly for foreign investors and power companies, leading to their declining participation in the first decade of the 2000s. Interview with Electricite de France (EDF), Beijing, 14 January 2010. Sun, Guo, and Zeng (2012).

including safety and standards certifications seemed relatively ineffectual in shaping the competitive dynamics of the electricity sector. Upon its creation in 2008, the NEA took the lead in power sector planning and promotion of new technologies, and later acquired the approval authority over new investments into the sector, further usurping SERC's relevance.[23] Generally speaking, throughout SERC's tenure the NDRC had surrendered none of its authority and instead only strengthened its authoritative grip on the power sector.[24]

Given the weakness of the SERC and the contentious government-business and central-local relations, Chinese leaders sought to add another layer of strategic governance of energy-related policies and industries. In 2005, the State Council established a National Energy Leading Group to serve as the highest political forum for addressing China's energy security issues, and also to provide a formal, unified governmental interface with the emerging corporate interests of the national oil companies.[25] In March 2008 the State Council's establishment of the National Energy Administration (NEA) as an agency housed within the supra-ministerial NDRC, and two years later the State Council established the National Energy Commission (NEC) as a ministerial-level forum cum policy research think tank to take rein of strategic policy-making and coordination.[26] While praised NEC as a "super energy institution" – mainly on the basis of its broad mandates and comprehensive range of ministerial stakeholders represented on the commission, rather than any specific capacity and influence as an agency – Zha and Yi (2016) acknowledged that "NEC has

[23] Interview with State Power Economic Research Institute, Beijing, 20 May 2009.

[24] Zha and Yi (2016), p. 133.

[25] Hafsi & Tian (2005); Lan (2007).

[26] "China Sets up National Energy Commission," *Xinhua News Agency*, January 27, 2010.

functioned on a crisis-driven basis."[27] In 2013 SERC was folded into NEA, which has undertaken the daily work of the NEC. Under the rhetoric of reducing excessive red tape, NEA in effect scaled back regulation by cancelling approval processes and acceptance checks and delegating to local energy regulatory offices the issuance of business permits for power suppliers.[28] In any case, NEC and NEA do not amount to a dedicated supra-ministerial body on energy policy, which had been absent since the Ministry of Energy was disbanded in 1993. NEC has been unable to develop bureaucratic leverages independent of the influence of the NDRC - this is perhaps best seen in light of the power sector reforms imposed by Zhang Ping, the former Chairman of the NDRC, deviating from the 'independent' regulator model supported by his predecessors.[29] Initially led by former SERC head Wu Xinxiong, NEA did not advance ambitious power market reforms.[30] To start, NEA has less resource and a lower bureaucratic rank than SERC, and its multitasking – including international energy policy advisory and scientific cooperation – diluted the commitment to domestic regulation and reform implementation. It is likely that leading up to its demise in 2012 the SERC had

[27] "China-EU Energy Governance: What Lesson to be Drawn?" in Challenges of European External Energy Governance with Emerging Powers, edited by Michèle Knodt, Nadine Piefer, Routledge 2016, p. 132.

[28] Swedish Agency for Growth Policy Analysis (2014), "China's National Energy Administration - A short overview." http://www.tillvaxtanalys.se/in-english/publications/direct-response/direct-response/2014-07-04-chinas-national-energy-administration-----a-short-overview.html ; Kreab Gavin Anderson (2013) "China's NEA Gains New Regulatory Powers." http://www.kreab.com/wp-content/uploads/sites/17/2013/07/National-Energy-Administration.pdf.

[29] Interview with NCEPU, Beijing, 13 January 2010.

[30] "Reform of energy policymaking less radical than expected," *South China Morning Post*, March 11, 2013.

failed in its lobbying effort to support a supra-ministerial alliance between NEA and the SERC to administer the sector without overbearing oversight by the NDRC.

3.2 Market dominance of power companies

The dismantling of the SPC into five separate power generating companies and the two grid companies formed a two-tier market structure inside China's electricity governance system that strongly favoured the incumbent SOEs. The five state-owned power generating companies formed roughly half of the electricity market in 2009, while the rest was divided among other central government and provincial power generating companies and private companies.[31] As the NDRC controls the electricity generation price, also known as the regional benchmark, the other power generating companies are not in a position to seriously compete with the SOEs which have direct access to the NDRC in its non-transparent price-setting process.[32] Furthermore, with their size and national scope of business, the SOEs have superior access to the coal supply whose price they can manipulate and profit from by selling it to other power generating companies.[33] Consequently, provincial and private power companies face significant disadvantages in their long-term cost of production calculations.

In short, the current electricity market system in China protects the dominant position of the SOEs and prevents the creation of regional or provincial competitive market

[31] SERC Annual Report, 2009.

[32] Ibid.

[33] Interview with NCEPU, Beijing, 13 January 2010.

structures with a separate monopoly transmission company(ies) and distribution monopolies that are *ex ante* regulated by local regulators according to national guidelines. For example, in OECD (Organization for Economic Cooperation and Development) countries, the distribution monopolies can be responsible for retail sales. When small scale generators are allowed to sell electricity over the local distribution network, the distribution fees, which are analogous to transmission fees, are set by the local regulator. In China however, the distribution arrangements are more complex and problematic. A lack of clear division between transmission and distribution networks across China makes the pricing of distribution, and more generally the way the system works, very difficult to comprehend. In fact, no explicit distribution charges exist, only a regulated retail tariff to final consumers that is controlled by the NDRC.[34] The result is that the ill-defined authority lines of control over transmission and distribution networks seriously obscures the regulatory boundaries between the national, provincial, and regional levels, and inhibits the creation of competitive generation market and retail competition.

Whether the oligopolistic competition has resulted in net efficiency gains for electricity market is debatable and empirically inconclusive, but endemic rent-seeking is evidenced by the increased collusion between regional power market operators and the SOEs.[35] This collusion has been particularly striking as regards both electricity and coal pricing. While they do not own or control distribution networks, the provincial power companies do own inter-regional transmission systems and generation plants providing them with the resources to seek most beneficial power sharing deals with the SOEs. As the

[34] Ibid.

[35] Ibid.

SOEs can usually get away with non-compliance with NDRC imposed regulations, their collusion with regional governments and power companies is predictable.[36]

INSERT FIGURE 3 HERE

Since the demise of SERC, state-owned power and grid companies have been able to expand their market dominance and influence over reform proposals and outcomes. Combining their public mandate in achieving energy security with private interests in rent-seeking via dominant market positions, these SOEs have exhibited weak inclination to innovate beyond minimal compliance with State Council directives, as an organization with complex embeddedness in political, financial, industrial and utility-end user networks from the socialist legacy, they also show an inertia against relations with new partners including SME suppliers and private consumers such as homeowners.[37] This conservative dynamic has spilled over to the renewable energy sector, as Wei Shen (2017) observed the formation of a "policy community" in renewable energy starting in 2005, in which leading wind turbine and solar panel manufacturers and state-owned electricity utilities have framed the strategic preferences and policy priority in renewable energy by actively offering their expertise and negotiating and coordinating with state actors at both central and local levels. For example, the State Grid's enthusiastic promotion of smart meter and grid and ultra-high voltage transmission projects has been documented as private interests shaping technology choices, leading to criticisms that SGCC's investment exacts opportunity costs and could be

[36] Interview with World Bank official, Beijing, 22 May 2009.

[37] Mah, Wu and Hills (2017).

inconsistent with the broader reform design of the planners.[38] This "incumbent-led model" of "structural changes in socio-technical regimes" enables these firms to devise corporate strategies at their own pace, limiting the opportunity for regulators to lead.[39]

In face of delays in regulatory development and marketization, a major policy thrust in 2017 in the electricity sector was the State Council's endorsement of mega-mergers among the biggest power companies.[40] Guodian merged with China's largest miner Shenhua, allowing the former to secure coal supplies while enticing the latter to diversify from the fossil fuel business.[41] Two former units of the monolithic China Nuclear Industry Corporation, China National Nuclear Corporation (CNNC) and China Nuclear Engineering and Construction Corporation (CNEC), combined to form an integrated company competing against State Power Investment Corporation (SPIC) and China General Nuclear Power Group (CGNPC) in building nuclear power plants at home and abroad.[42] SPIC is rumoured to be in merger talk with Huaneng. The mergers conform to SASAC's stated goal to reduce the number of centrally-owned SOEs, and have been justified on the grounds of possible gains

[38] Mah, Wu and Hills (2017) conclude that "higher-order potential benefits" – e.g. the extensive use of demand response programmes and high penetration of renewable energy – were not realized from the capacity expansion. Also Xu (2018).

[39] Ibid.

[40] Stapczynski S , Guo A, Yang J. (2017), "China's $1 Trillion Power Industry Overhaul Is Just Starting". Bloomberg. August 31, 2017. https://www.bloomberg.com/news/articles/2017-08-29/china-s-1-trillion-power-industry-overhaul-is-just-starting

[41] "China Is Creating the World's Largest Power Company". Bloomberg News, August 28, 2017. < https://www.bloomberg.com/news/articles/2017-08-28/china-approves-guodian-shenhua-group-to-merge>

[42] "CNNC and CNECC soon to merge," China Policy, https://policycn.com/policy_ticker/cnnc-and-cnecc-soon-to-merge/

for wind power and reduction of coal power overcapacity. It is also possible that bigger central state firms, operating under greater price liberalization of transactions in recent years, could force marketization on smaller players and local governments. The most certain benefit is corporate profitability for the SOEs from greater market concentration, reduced price war, higher tariffs, and improved asset profile for stock market valuation and overseas direct investment. However, one should at least consider the political consequences and corporate governance risks of binding together former units of the state monopoly (AsianPower, 2017).

3.3 Resolving the Curtailment of Renewable Energy Inputs

The Chinese planners intend wind, solar, and biomass energy to make up 8% of China's power generation capacity by 2020.[43] The 2005 Renewable Energy Law provided financial incentives for renewable energy power generators and required grid companies to prioritise renewables in dispatch via mandatory procurement, which spurred rapid local government and private investment in wind and solar capacity building leading to overcapacity outcomes the NEA has not been able to manage.[44] Renewable energy curtailment has been estimated to be around 20% on average nationally over the past five years and reaching around 40% in

[43] China Leading Global Race to Make Clean Energy, *The New York Times*, 30 January, 2010. See also, China's Latest Leap: An update on Renewable policy, *Renewable Energy World*, 21 July, 2010. <http://www.renewableenergyworld.com/rea/news/article/2010/07/renewable-energy-policy-update-for-china>

[44] Interviews with NCEPU and EDF, Beijing, 14 January, 2010. Also Lam, Branstetter and Azevedo (2017).

some regions with high renewable energy output (Ho and Nielsen, 2017; Davidson, 2018). In partial response, central planners introduced in 2011 a unified national annual plan on wind power development has helped address the problem of fragmented authority for project approval. In 2016, a unified five-year plan for the whole power sector was jointly issued by NDRC and NEA, further aiming to put an end to the fragmented planning in various power sources of the previous decade (Qi et al, 2018). Experimental schemes were put in place after 2008 to allow some of the power generating companies to sell electricity directly to provincial grid companies and to distribute it to end-users without the involvement of the state-owned grid companies (Ni, 2006; Martinot and Li, 2010). According to the World Bank, a number of such pilot projects exist today and a greater number could eventually provide the national regulators with the preconditions for wider scope and oversight authority, and hence with the ability to reduce transaction costs in the national electricity market.[45] Studies of curtailment have blamed the grid companies for rejecting renewable inputs during periods of low fossil fuel prices and prioritizing fossil fuels in inter-provincial/regional transmission contracts.[46] As explained above, the root cause of the companies' resistance lies in China's institutional design of the electricity market, which has set a pattern of redistribution of economic rents and political relations motivating entrenched interest groups to minimize or deflect the impact of new policy directions.[47] The typical proposed solutions – e.g. raising carbon prices, implementing national cap-and-trade program, creating regional spot market, requiring full purchase of guaranteed RE generation,

[45] Interview with World Bank, 13 January 2010.

[46] Karplus, Davidson and Kahrl (2017); Branstetter, and Azevedo (2017).

[47] Karplus, Davidson and Kahrl (2017).

introducing a green certificate (REC) system, imposing penalties for unapproved capacity expansion[48], and reimbursing renewable energy providers and investing in supporting transmission infrastructure, etc. – all presuppose that central government takes decisive actions in delineating the structure of its electricity market, or is setting up a system for an functional and transparent 'unbundled' electricity provision mechanism. Given the intrinsic political problems, these reform steps are not feasible given the demise of an independent central regulator (Zhang, Andrews-Speed, and Li, 2018). As an illustrative example, Davidson (2018, p.300) notes that the most successful example of cross-jurisdiction exchange has been long-term auctions in parts of North Grid — Beijing, Tianjin, and Northern Hebei – which involve government interests closely tied with Beijing, "indicating the likelihood that a strong central government role was necessary to make this regional market happen."

4. CONCLUSION: REGULATORY CAPACITY IN FLUX

As China's transitional electricity sector finds itself under growing pressure to support the country's fast expanding economy, inflexible, inefficient, and even collusive institutional structures continue to hamper the designed power sector reforms (Du et al, 2009; Lin, Purra, and Lin 2011; Pollitt et al, 2017). Power struggle between the political elites, inability to reign in and adequately control regional and local power markets, collusive behavior even between regional administrative agencies in regard to transmission and distribution of electricity, and the controlling position of the NDRC all constitute enormous challenges to the power sector reformers. The case study of SERC helps to explain why China's power

[48] Interview with Asian Development Bank official, Beijing, 13 January, 2010.

sector governing institutions have seen little stability over the past two decades and policy norms – which play a significant role in the creation or reform of regulatory modalities in other transitional contexts – have yet to take root in China.

This institutional weakness corresponds to reform impasse in the past five years. Beijing initiated its latest round of electricity reform in 2015 with the State Council Document 9: "Furthering Reform of the Electricity Market."[49] Given difficulties with state-owned enterprise reform in general and other economic priorities in under President Xi Jinping's first four years, no breakthrough measures have been implemented.[50] The main objectives in this round of reform include trying out the principle of "cost plus reasonable profit" in transmission and distribution tariff, liberalization of the retail electricity market to attract diverse investors and to establish a relatively independent electricity trade center, and improving the generation dispatch mechanisms (Kahrl, Dupuy and Wang, 2016). Pilot programmes testing these reforms have been in place in select provinces, but have yet to reach widespread national implementation. This piecemeal approach, typical in the "experimental" approach (Heilmann, 2008) to structural reform in China, creates pockets of resistance to policy mandates and variability in policy outcomes such as growing disparities in price signals between provinces that run market pilots and those that do not (Kahrl, Dupuy and Wang, 2016; Pollitt et al, 2017). Nevertheless, there has been an encouraging rise in the amount of electricity sold through so-called direct trading – i.e. market-based

[49] "Six documents on power reform to release, pilot reform to expand", Xinhua Finance, August 26, 2015, http://en.xfafinance.com/html/In_depth/2015/134476.shtml

[50] As an indication of the central government's reticence on reform progress in this sector, electricity was mentioned only twice in passing in Premier Li Keqiang's Report on the Work of the Government on March 5, 2017. Li (2017).

mechanisms such as direct sales and centralized auctions – which reached 19% of total electricity consumption in 2016 and was expected to top 35% in 2017 (Wang, 2017). Until 2015, power producers had to sell electricity at prices set by the grid companies, resulting in higher prices that in recently years had not reflected the supply glut. Chinese industry users pay some 50% higher electricity cost than US industries. Recent establishment of some 28 electricity trading centers across China have allowed power-generating firms to negotiate supply contracts directly with end users such as large industrial companies or distributors, resulting in significant price drops. The major short-run loser is the State Grid, which announced that it lost 56 billion RMB in earnings in the first half of 2017.[51]

One might have expected the politics of power sector reform to have reached a turning point at the massive bureaucratic streamlining effort in March 2018, underpinned by President Xi Jinping's governance approach of centralized solutions to structural problems in the troubled Chinese economy.[52] Surprisingly, the energy and power sectors did not get a new national regulator.[53] Pending further information on the elite policy process, one could interpret the shelving of a new energy ministry either positively or critically. Instead of re-creating another agency that cannot overcome overlapping ministerial

[51] Huang K and Song S (2017) "China's Power Pricing Reform Burns 56-Billion-Yuan Hole in State Grid's Earnings." Caixin, June 29, 2017. https://www.caixinglobal.com/2017-06-29/101107481.html

[52] Shu Zhang, Se Young Lee, "China to merge regulators, create new ministries in biggest overhaul in years", Reuters, March 13, 2018. https://uk.reuters.com/article/uk-china-parliament/china-to-merge-regulators-create-new-ministries-in-biggest-overhaul-in-years-idUKKCN1GP00D

[53] "Xi shakes up Chinese government to cut bureaucracy, end turf wars", South China Morning Post, March 13, 2018. http://www.scmp.com/news/china/economy/article/2136939/china-unveils-sweeping-governmental-changes-cut-bureaucracy-and

jurisdictions and disentangle from powerful SOEs and clientelistic politics, Chinese President Xi Jinping has allocated his political capital to first reshape the organizational field of the State Council, notably in reducing the role of NDRC. NDRC's oversight function of China's carbon emissions is reassigned to the new Ministry of Ecological Environment, and its price supervision, inspection and anti-monopoly roles will be merged into a powerful State Administration for Market Regulation.[54] One begins to detect a rationalizing logic in Xi's approach to ministerial restructuring, prioritizing effective performance of general tasks over sector-specific administration that has been vulnerable to capture.[55] In contrast, a critical interpretation would question whether the March 2018 bureaucratic reshuffling paves the way for deep market reforms, or is yet another means of Xi's continuing consolidation of power by putting his supporters in power and asserting party control over state administration.[56]

In concluding we recall Andrews-Speed and Dow (2000) who astutely observed a decade ago that while the Chinese central government has lost or relinquished its vertical command and control, it has yet to take on new responsibilities in supervising or regulating horizontal, contractual relationships. Eighteen years later, Zhang, Andrews-Speed, and Li (2018) maintain that there remains an urgent need for a strong central government role in top-level design and supervision, market creation, and promotion of renewable energy. It

[54] "'Too big and too powerful': why Xi Jinping is reining in China's economic planning agency", South China Morning Post, March 14, 2018. http://www.scmp.com/news/china/economy/article/2137043/too-big-and-too-powerful-why-xi-jinping-reining-chinas-economic; "The 2018 Two Sessions in Review," Brunswick Group, March 2018. https://www.brunswickgroup.com/media/4124/brunswick-china-analysis-npc-2018-2018-03-22.pdf

[55] Lin (2007); Chen and Naughton (2017).

[56] Interview of a Beijing academic knowledgeable of the oil industry, 10 July 2018.

seems a matter of time before Beijing will support the re-establishment of a central regulatory body that could go beyond SERC's limitations.

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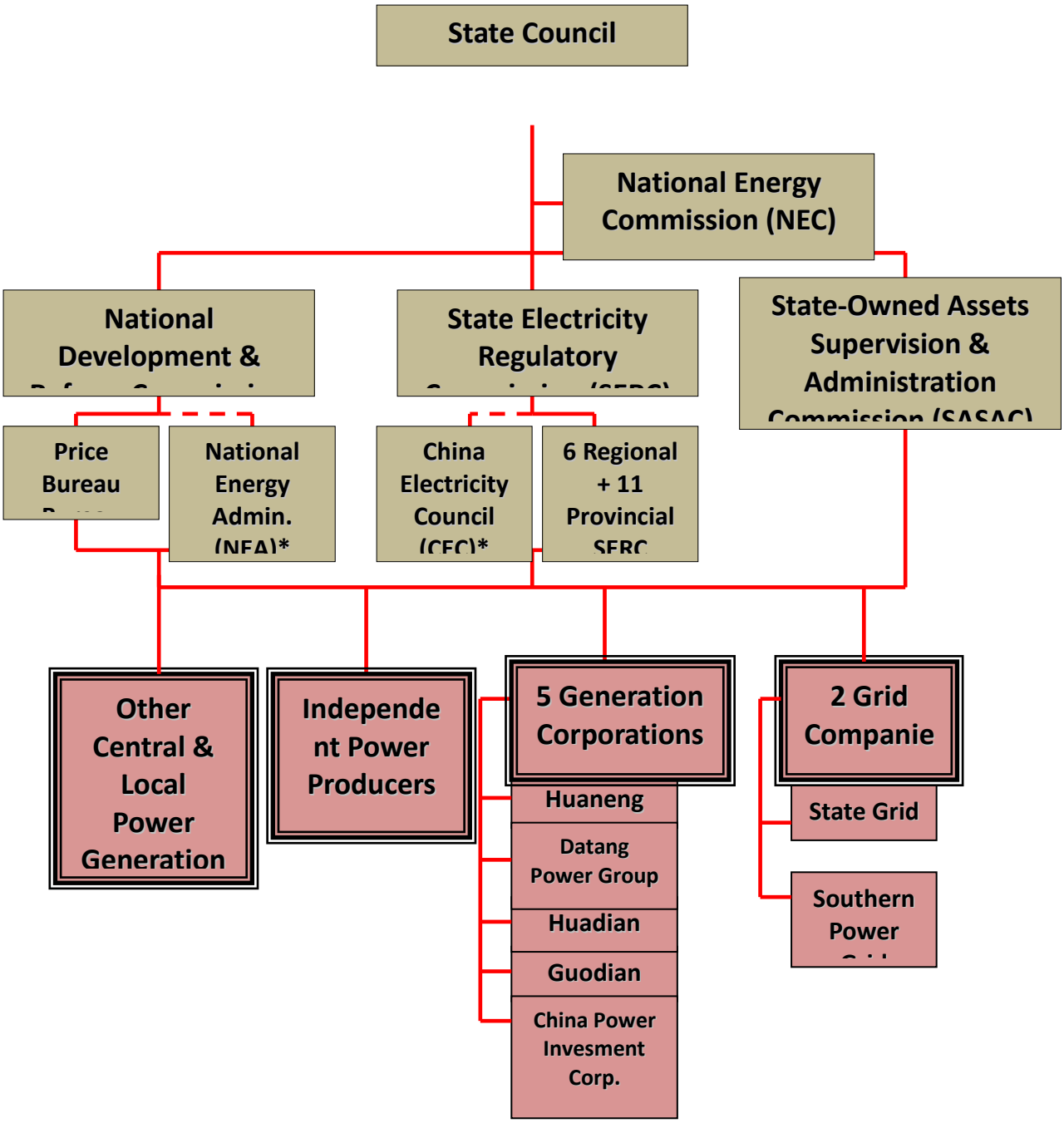

Figure 1. Electricity market structure after 2008 reforms

*CEC and NEA are independent organizations but under supervision of SERC and NDRC.

Source: LKY School of Public Policy research 2011 (National University of Singapore).

Highlights, “Transforming China’s Electricity Sector”

K-C. Lin and M. Purra

- China’s State Electricity Regulatory Commission (SERC) failed for political reasons
- Marketization runs counter to the interests of utilities companies and provincial governments
- The National Development and Reform Commission (NDRC)’s market levers are weakening
- Current structure of China’s electricity market leads to high renewable curtailment
- A centralized energy ministry is needed to achieve energy security and sustainable development