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# Securitization of energy supply chains in China

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**Abstract**

Energy policies in China, the world's largest energy consumer, are an important factor in shaping the global energy system. While scholars agree that energy security is a major driver of China's energy policies, there is insufficient understanding of what exactly constitutes China's energy security from the policy perspective. We apply recent insights from the Global Energy Assessment, particularly the idea of vital energy systems, and the securitization theory to propose a framework for explaining China's energy security policies in their historic evolution. We pay specific attention to explaining how particular energy supply chains are constructed and securitized. We draw data from over 300 Chinese and over 100 English publications and 30 interviews with energy officials and experts in China. We demonstrate that China's focus on vulnerabilities of its oil supply chain at the expense of improving the reliability of domestic electricity supply is not accidental. It has its roots in historic events, properties of energy systems, as well as the presence of powerful institutional agents interested in securitizing the oil supply chain but not other vital energy systems. We suggest that this focus on the oil supply chain is likely to be maintained in the future, possibly accompanied by increasing concerns over natural gas supply chains. Our proposed framework for energy security policy analysis can be used for other countries and jurisdictions.

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# 1 Introduction

Energy policies in China, the world's largest energy consumer, are an important factor in shaping the global energy system and its governance [1]. While scholars e.g. [2-5] concur that energy security is among the key drivers of these policies there is less agreement and understanding of what exactly constitutes China's energy security and how it translates into policy discourse and measures.

One reason for this lack of clarity is that the literature often lacks an explicit method for attributing a particular energy issue to energy security concerns. Most scholars implicitly equate China's energy security with the security of its oil imports [6] [4]. However, already in 2003, Chen Xinhua (cited in [7]), a former programme manager for China at the International Energy Agency (IEA), was dissatisfied with this focus and stated that "energy security must first be dealt with domestically".

More recently, [8] and other scholars have highlighted domestic energy issues relevant to China's energy security: most notably the reliability of electricity supply. Some have attempted to draw very broad boundaries of energy security: for example, [9] list 16 dimensions of energy security, extending to 'minimiz[ing] destruction of forests, land and soil' and 'provid[ing] available and clean water', but curiously excluding reliability of electricity and oil products supply chains. These authors' interpretation of energy security as a sum of perceptions of various stakeholders is not suitable for defensibly drawing the boundaries of energy security and for prioritizing and reconciling conflicting or opposing opinions or opposite. It cannot explain why and how energy issues become energy *security* issues and thus important policy drivers [10].

In spite of the repeated assertion in scholarly literature that "oil imports are merely one dimension of China's energy security concerns and not even the most important" [11], China's energy security policies have focused almost exclusively on oil supply chains, particularly on oil imports. Casted as *the* energy security issue, oil supply has continuously commanded attention of China's leaders, despite other acute energy problems.

Researchers use different theories to explain this stubborn and seemingly irrational focus on oil supply chains. The most popular "fragmented authoritarianism" model developed by [12] and used by [13], [6], [14], [15], [1], [8] [11] and [16], sees policy choices as results of negotiations between bureaucratic interests rather than of rational pragmatism or of democratic processes. In this framework, the focus on oil is largely explained by the traditional power of the giant State Owned Enterprises (SOEs) in the oil sector. [11] elaborates this theory demonstrating how botched governance reforms of the 1990s and the early 2000s as well as the low status and

capacity of the central energy authorities resulted in this configuration of power within the energy sector.

Constantin [2] proposes another approach to explaining China's energy security policies. Instead of considering power as exclusively vested in institutions, Constantin derives it from ideas or policy paradigms which he calls 'frames'. He loosely identifies oil security with the 'strategic' frame, coal and electricity generation with the 'market' frame, and environmental sustainability (including energy efficiency and decentralization) with the 'scientific development' frame. In support of this 'ideational' view of policy making, Constantin refers to the traditional importance of ideology in China's policy and the fact that in spite of the peculiar setup of China's energy governance, most of its energy security policies are not unique but instead 'mimic' policies of other countries (most notably Japan, the U.S. and Russia).

Although the 'institutional' and the 'ideational' approaches provide plausible explanations for the existing China's focus on oil supply security they both fail to predict whether and under which conditions this focus might change. Constantin expresses explicit optimism about the 'new energy security' becoming the main focus of China's energy policy as the 'scientific development' paradigm prevails (Though he retains some pessimism explained by what he calls China's 'primordial' preference for autarky). Likewise [1] and [8] observes that energy policy-making in China is becoming more 'like in the U.S.' (i.e. reflecting a wider range of interests and able to produce pragmatic decisions). Based on this observation he also expects the shift of the energy policy towards domestic energy issues and even climate change mitigation. In contrast to these expectations, there is little empirical evidence that China's pre-occupation with energy security extends much beyond oil, and some scholars predict that China will react to its oil supply chain vulnerabilities even more forcefully in the future.

In light of these unanswered questions and disagreements the aim of this article is to propose and apply an explanatory framework for China's energy security policies. Our framework does not reject the institutional or ideational theories of policy making but enhances them to specifically explain energy security policies. First, we draw on the concept of securitization [17] to explain how an energy policy issue may become an energy *security* issue. Secondly, we use several ideas - especially that of vital energy systems - from the Global Energy Assessment [10] to explain securitization of certain energy supply chains through their representation as vital energy systems. In analyzing how energy supply chains become 'vital energy systems' we draw on a recent theory of Global Production Networks (GPN) [18] [19] which consider the importance of governance institutions in shaping GPNs and thus energy supply chains. Synthesizing insights from these three scholarly traditions allows us to develop an approach, explained in the 2nd section, which not only throws light on energy security policies of China, but may also be useful as a framework for energy security policy analysis in other countries.

# 2 Framework and Method

## 2.1 Theoretical Framework

According to the securitization theory, a policy problem becomes a *security* issue if an agent manages to cast it as an 'existential threat', or a 'supreme priority' which requires treatment and intervention by extraordinary means [17]. Echoing this logic, an energy policy problem is an energy *security* issue if it is presented and perceived as affecting the stability (and in critical situations, the survival) of a nation [20], the 'functioning' [21] and 'continuity'[22] of the economy or the realization of 'major national values and objectives' [23].

According to [17], securitization of a problem requires the presence of 'securitization agents' capable of successfully labeling it as a 'security issue' by using the rhetoric of certain structure and rules. Our analysis focuses on identifying the agents as well as the rhetoric instrumental for securitizing certain energy policy issues and energy supply chains in China. It is based on the assumption that successful securitization rhetoric should identify an energy supply chain that can be portrayed as (a) critically important (b) highly vulnerable and (c) possible to protect. In other words, it should convincingly answer three questions[1]:

* What to protect?

* From what risks?

* By what means?

With respect to energy, the first question "What to protect?" is closely linked to the concept of a *vital energy system* introduced in the Global Energy Assessment [10] and further elaborated by [26]. A vital energy system has two essential characteristics. First, it is "vital" in a sense that it supports critical functions of a modern society. Secondly, it is a "system" which means that it consists of elements (natural resources, technical infrastructure, and social institutions), which are connected to each other stronger than they are connected to elements outside the system. This means that in case of a disruption the elements within the system can be substituted by one another much easier than by the elements from outside the system.

Vital energy systems can be defined by their geographic or sectoral boundaries. Geographically, it is possible to speak of energy security of an individual nation, a sub-national region, or, for example, the global energy system as a whole. Sectorally, it makes sense to speak of security of primary energy sources, energy carriers or end-use

[1] These questions are mentioned by [24], with reference to [25]. They are subsequently used to construct an analytical framework for energy security assessment by [26].

sectors, as well as complete energy supply chains. A combination of sectoral and geographic boundaries yields a potentially large number of vital energy systems that may in principle become the focus of energy security policies and unpacks variegated geographies of "global energy dilemmas" [27]. Only certain energy supply chains become securitized: those which can be cast as under threat by powerful securitization agents, which leads us to the second question.

The second question - "From what risks?" - requires identifying critical vulnerabilities of vital energy systems [26]. Energy systems can be disrupted by unexpected and drastic but relatively short-lived events, called shocks [23], or by gradually unfolding long-term pressures called stresses [28] [22]. Disruptions may occur as interruptions of the physical flows of energy, or as disruptive price movements [29] [22] [23]. The origins of disruptions can be classified into three groups: intentional actions by foreign actors (the *sovereignty* perspective), predictable technical and natural risks (the *robustness* perspective), and the remaining factors which are neither intentional actions nor predictable phenomena (the *resilience* perspective) [20]. Successful securitization requires presenting the vulnerabilities as significant and immediate which may be easier with respect to certain categories of risks and more difficult with respect to others[2].

Concerning the third question - "By what means?" it is reasonable to assume that the agents of securitization are interested in promoting responses which are feasible and desirable given their own capacities and interests as well as the policy context of a particular nation, in our case - China. In the condition of uncertainty characterizing most security challenges it is also likely that the responses to similar threats by other countries will play a role in choosing energy security policy measures.

### 2.2 Method

In accordance with the proposed theoretical framework, this study analyses the co-evolution of issues, institutions and ideas in China's energy security in the 1950s-2010s with a focus on the three key questions defined in the previous section. Each question is answered with respect to three distinct periods: (i) the years preceding 2000 (the first documented mention of China's 'energy security' appeared in 1994 and the first Chinese academic publication on this topic - in 1998), (ii) the early 2000s following China's entry into the World Trade Organization (WTO) in 2001, and (iii) recent years (since 2005) after China's launch of the West-East Gas Pipeline in 2004, its release of the Renewable Energy Law in 2005 and the first comprehensive Energy White Paper in 2007, and the establishment of the National Energy Administration (NEA) in 2008 to promote integrated energy governance.

[2] A significant body of psychological research shows that the perception of risks is based on the 'availability' of *past* events for retrieval from (collective) memory rather than on objective analysis of probability of *future* events.

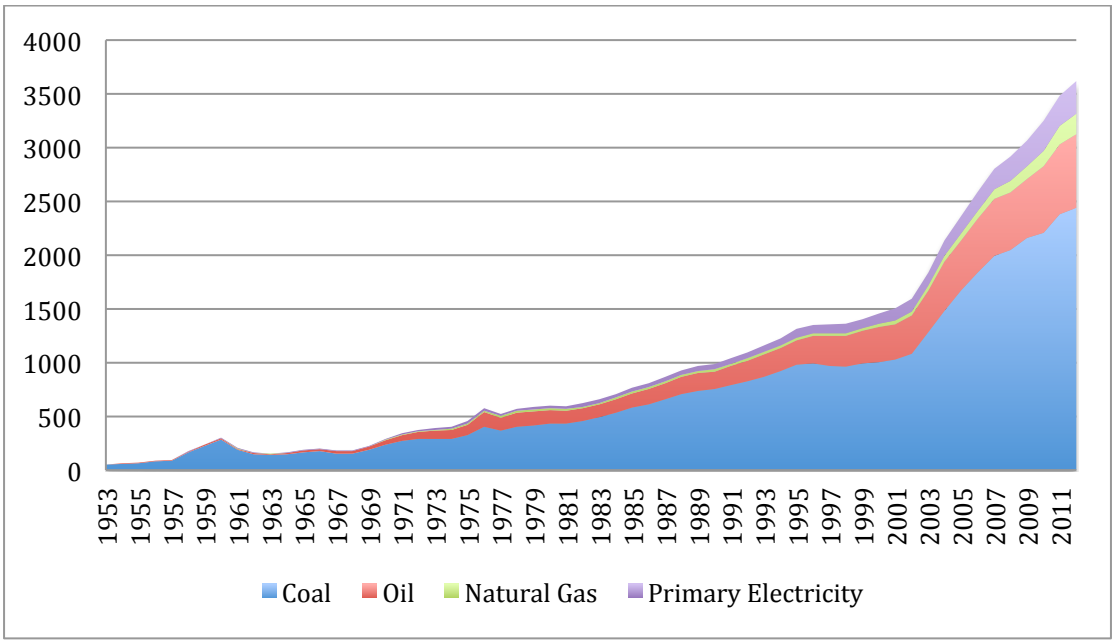
This analysis is based on a review of over 100 pieces of English-language and over 300 pieces of Chinese academic literature on energy security in China as well as the actual dynamics of Chinese energy system in the three time periods. It also reflects our interviews (30 in total) with the National Reform and Development Commission (NDRC), Ministry of Land and Resources (MLR), NEA, different affiliates of the Chinese national oil companies (NOCs, including CNPC/PetroChina, Sinopec and CNOOC), international oil companies (IOCs, e.g. BP and Shell), downstream gas players (e.g. Beijing Gas, China Gas, Towngas and China Gas Association), power grid and power companies (e.g. State Grid, CNOOC Gas and Power Group, and China's Light Power Co.) as well as non-governmental organisations (NGOs, e.g. Transition Institute) in Hong Kong and in Beijing during September 2012 and March-June 2013.

# 3 Results

## 3.1 What to protect? Energy supply chains and related institutions

In China, as in many other nations, oil supply chains historically formed the first vital energy system. Wartime experiences highlighted the link between oil supplies and the ability of the nation to defend itself. Zhu De, the Commander-in-Chief of the People's Liberation Army in the 1950s observed that "without oil, fighter planes and tanks are no better than dog-beating sticks (*dagoubang*)" [30]. At the same time, Mao Zedong stressed that "oil is necessary for development; those that fly in the sky and those that run on the earth cannot work without oil" [30]. This explains why, though oil only made up a small share of China's total energy supply (Figure 1), Chinese policy-makers were concerned about oil supply chains long before they adopted the term "energy security".

**Figure 1. China's primary energy supply 1953-2011**




In the 1950s and the 1960s China relied on oil imports from the Soviet Union which were discontinued for political reasons in the early 1960s. During the 1960s and 1970s, China's oil supply also suffered from the U.S.-led trade blockade. In the following 2-3 decades China has managed to develop its own oil reserves including the giant Daqing Oilfield, which provided oil not only for the domestic economy but also for some modest exports [31]. However, the growing demand and the depletion of domestic reserves resulted in China becoming a net oil importer in 1993. Literature on oil as a matter of energy security in China emerged almost immediately following this fundamental shift.

A search for the keyword "Chinese energy security" (*zhongguo nengyuan anquan*) in the Chinese Economic News Database, run by [32], finds 181 results between 1 January 1990 and 1 June 2013, with the earliest (and the only one before 2000) dating back to 13 October 1997, entitled "The role of oil in the economic development of China: The irreplaceable strategic resource" [33]. The article essentially equated oil security with energy security on the grounds that China's oil endowment per capita is low and is bound to increasingly rely on "foreign oil" (*yangyou*).

This prediction turned out to be true. Due to an unabated rise in transportation oil demand (averaging 9% per year during 2000-2009, significantly faster than industry's 5% per year [34], depletion of domestic reserves, and the lack of substitutes for oil as liquid fuel, the import dependence on oil in China exceeded 30% in 2000 and is approaching 60% in 2013. OPEC predicts that China will become the world's largest crude oil importer by 2014 [35], despite currently being the 5th largest producer of oil in the world.

Though China has maintained an intensive focus on securing its oil supplies, the way it has drawn the boundaries of the oil supply chain has transformed over years. In the 1990s, China tried to increase domestic production, while passively receiving unavoidable oil imports; in the 2000s it began to face the music and actively manage not only its oil imports but also regional and global oil markets from where it receives oil. As we explain below this included not only acquisition of overseas assets and active pro-oil diplomacy but also measures to protect and diversify global trade routes.

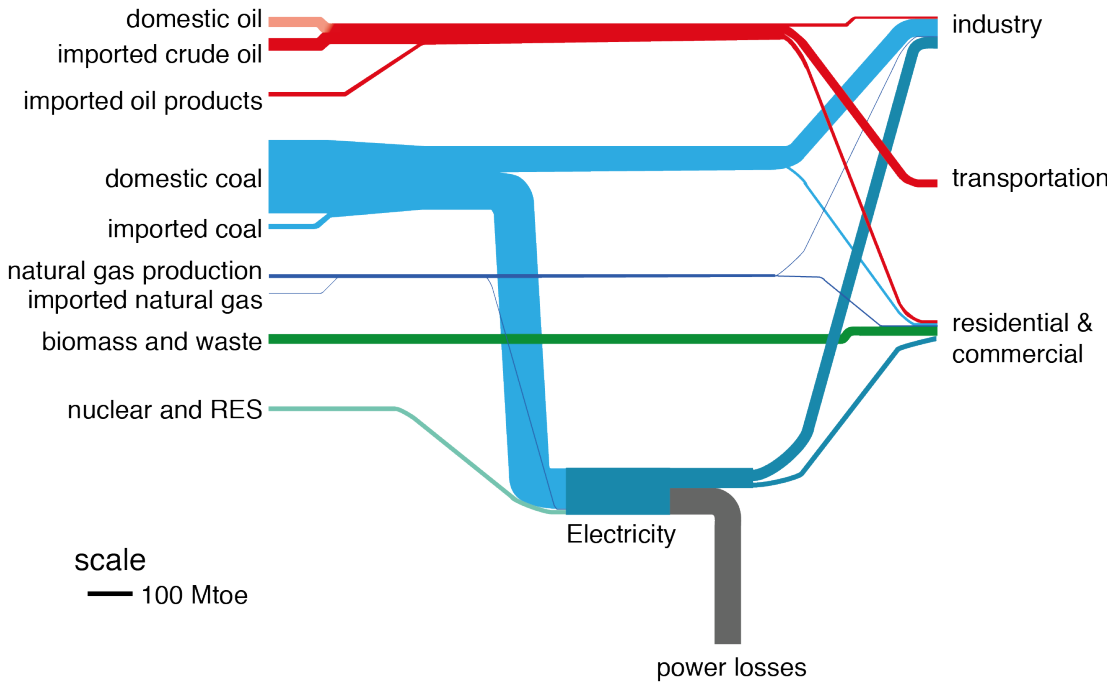
With all its importance, oil and the energy services it provides in the transport and the military sector is not the only energy system vital for China. Another one is electricity. Similar to motorized transport, the importance of electricity to China has dramatically increased in recent decades. As a result of a massive rural electrification program starting in the 1980s, China achieved an electrification rate of 99.4% in 2009 [36]. The development of energy-intensive industries, urbanization and economic growth have contributed to a remarkable increase in electricity demand.

In most developed countries, the electricity sector relies on diverse fuels and is therefore less vulnerable than the transport sector, which depends primarily on oil. In contrast, the diversity of fuels used for electricity supply in China is comparatively low: it primarily relies on coal, which fuels around 70% of thermal power generation ([36], see also Figures 2 and 4). This may present a problem for three reasons. First, although China has large coal reserves it may need to import more coal, especially for the needs of coastal economic centers located away from major coal deposits. Secondly, constructing a large number of new coal power plants may be difficult due to social opposition as these developments are widely (and rightly) perceived as 'dirty'. Thirdly, China's government may consider it unwise to depend largely on one single energy source for electricity generation and may view diversification of the power sector as an integral part of development and modernization. Continuous coal supply

is a necessary but not sufficient for electricity reliability which also depends on adequate capacity and reliability of generation, transmission and distribution infrastructure.

In addition, natural gas has been emerging as an important fuel for heating, electricity generation and industrial processes. At present, natural gas supplies only a small share of Chinese energy needs (Figure 2) and, in contrast to oil, it is easily substitutable (for example by coal in electricity generation). However, China's use of natural gas is projected to increase faster than any other fuel. The most recent Five-Year Plan (the 12th for 2011-15) aims to raise the share of gas in the energy mix from 4% to 8% by 2015 [37]. The IEA [38] predicted that Chinese demand for natural gas, now around the size of the German and British gas markets combined [39], is expected to rise to match that of the entire European Union by 2035. Moreover, most of this gas will need to be imported either in the form of LNG or through the rapidly expanding network of land pipelines from Central Asia, Myanmar and possibly Russia. Our interviews with NDRC indicate that gas security is bound to attract more attention, because the use of this fuel for residential heating is hardly substitutable Some natural gas supply interruptions have already occurred, for example in 2011, partly due to China's seriously inadequate peak-shaving gas storage capacity.

**Figure 2. Vital energy systems in China, 2010**




The figure shows the main energy systems in China. Energy flows are indicated by the thickness of the lines (see scale). The system which includes oil, oil products and transport (red on the Figure) has been securitized in China's energy policy. The system which includes coal, electricity, and industrial energy consumption (blue and blue-green on the figure) has not been securitized. The Figure illustrates the importance of oil imports and lack of substitutes for oil products in transport. Sankey diagram is modified from [IEA 2013, http://www.iea.org/Sankey/index.html, China, accessed July 30 2013] and represents

2010 data. Energy flows less then 10 Mtoe, statistical differences, exports (which amount to about 35 Mtoe and are mostly comprised of oil products), stock exchanges, bunkers and "energy own use" (energy used in the energy industry) are not depicted.

Figure 2 is a stylized representation of the main energy systems in China. It shows how oil and oil products supply for the transport sector is distinctly separate from coal supply for the needs of industry and the residential and commercial sector (including through power generation). These different technical systems also form a foundation of distinct governance institutions.

In China, there is no single body that governs the energy sector as a whole at the national level. The former Prime Minister Zhu abolished the Ministry of Energy in 1993 in order to expose the energy sector to market forces. In 2003, the NDRC established the Energy Bureau but its capacity was limited by lack of resources and political influence. The National People's Congress established the National Energy Leading Group (ELG) supported by the State Energy Office (SEO), with an objective of balancing the influence of large energy companies, especially NOCs [40]. The ELG was able to intervene to solve particularly prominent problems but it was not involved in the day-to-day operations of the energy sector. The SEO's bureaucratic rank of a vice-ministry, was below that of the NDRC and some NOCs so that this body was not particularly powerful.

China's energy governance at the national continues to be fragmented. For example in addition to the NDRC there are 15 other government departments dealing with energy issues, which results in incoherent, disjointed and lengthy policy-making (Figure 3). To address the problem of fragmentation in 2010, the government established the National Energy Commission (NEC) to replace the ELG and the National Energy Agency (NEA) to replace the SEO. The NEC is led by the Primer and composed of heads of 21 other central bureaucracies with strong political clout. However, it is an *ad hoc* body that meets irregularly and has advisory rather than decision making role. It has no budget, staff or residency [8].

**Figure 3. Energy governance in China**

The 15 Minister-level Actors are State Asset Supervisory and Administration Commission (SASAC), Ministry of Science and Technology (MIIT), Ministry of Land and Resources (MLR), Ministry of Finance (MOF), Ministry of Commerce (MOC), Ministry of Transportation (MOT), Ministry of Railway (MOR), Ministry of Water Resources (MOWR), Ministry of Agriculture (MOA), Ministry of Environmental Protection (MEP), Ministry of Human Resources and Social Security (MOHRSS), State Administration of Work Safety (SAWS), State Electricity Regulatory Commission (SERC) and State Administration of Taxation (SAT).

The oil supply chains are primarily controlled by NOCs which were formed out of the former Ministries of the Petroleum and Chemical Industry as part of the economic reform in the 1980s [41]. The power of NOCs reported by many authors e.g. [6] was confirmed in our interviews with the NEA, the NDRC, NOCs and a number of industry insiders. [40] believes that NOCs became especially powerful between 1993 and 2003 when former Prime Minister Zhu Rongji was in control of China's economic policies. The political influence and ambitions of the "petroleum clique" (politicians who achieved status through careers in the oil industry) is ubiquitous [42] and their political, financial and human capacities far exceed those of fragmented government institutions that govern the energy sector [1] [11][14][40][43]. Appointed by the Central Committee of the Chinese Communist Party, the leaders of NOCs have direct informal access (or *guanxi*) to top Chinese leaders.

Despite their importance, coal supply and electricity supply chains have never been associated with institutions with political influence comparable to that of NOCs. This is in part, because electricity and coal extraction are governed at the provincial or regional level. In contrast, the emerging natural gas supply chain is controlled by powerful NOCs such as PetroChina and thus may become securitized in the future.

### 3.2 From what risks? Evolving realities and stubborn perceptions

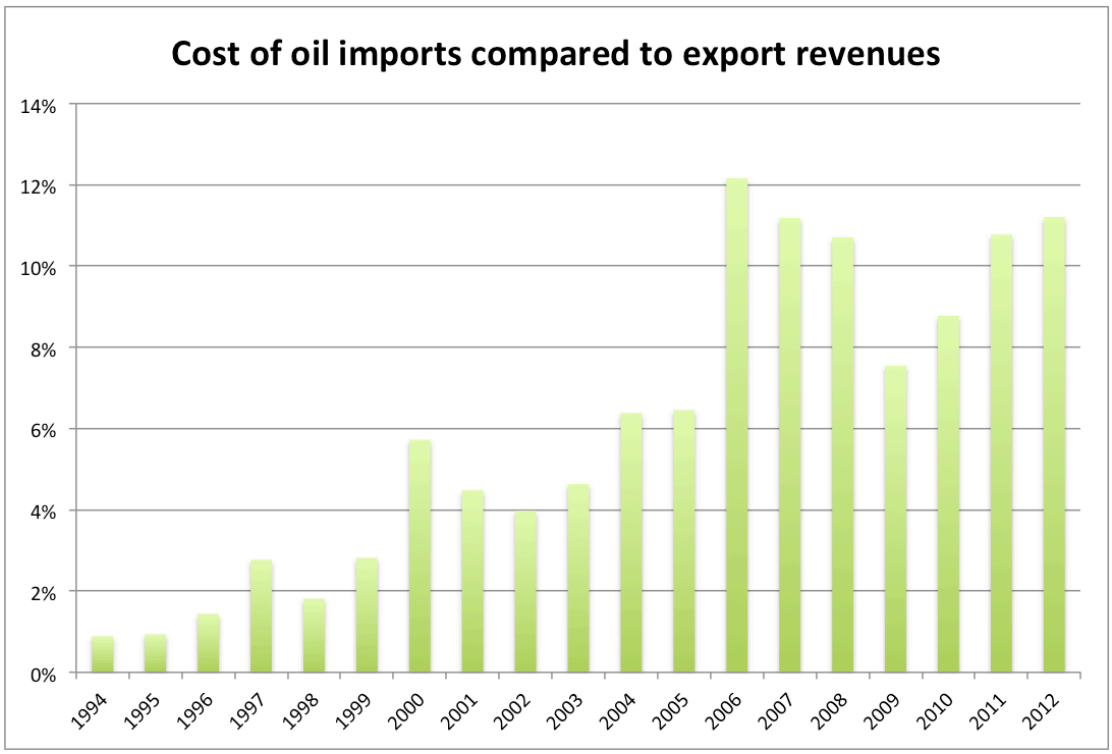
The very fact that China must import oil, a vital and irreplaceable fuel, has always

been unnerving for Chinese leaders. This unease can easily be explained by painful historic memories of the U.S. oil trade embargo and the termination of the Soviet strategic oil program. China learned a lesson that imported oil is not reliable: it can easily be interrupted by hostile parties for political reasons. This gave birth to what [2] calls a strategic frame, [6] calls an economic nationalist approach, and [20] call the sovereignty perspective on energy security. The central idea of this policy paradigm is that risks to vital energy systems originate from intentional actions of foreign agents and thus should be assessed and managed in terms of who controls energy, power balances, interests and space for maneuver.

When China became a net oil importer in the 1990s, the global oil market was very different from what it was at the time of the oil embargoes in the 1950s-1970s. Since the 1970s, no single exporter has been capable of significantly disrupting the oil market due to its increased liquidity and diversity. This, however, did not mean that the sovereignty perspective was dismissed. In fact, the chief discourse around the time China became a net importer was that in the event of a conflict, hostile powers would be able to block oil imports by disrupting the trade routes. Gen. Douglas MacArthur's bold claim in 1951 that the United States controls the shores of Asia "has never been forgotten or underestimated by the PLA [People's Liberation Army] Navy" [44]. Such concerns seemed especially relevant during the 1990s amidst increasing tensions between China and the U.S. over Taiwan, the U.S. opposition to China's WTO entry and renewal of most favored nations (MFN) status for, as well as the NATO bombing of the Chinese embassy in Belgrade.

In the 1990s, there was another problem with oil imports: their considerable economic price. China used to export oil to gain hard currency in the 1970s and 1980s. Joining the oil importing club meant that China lost a great deal of foreign currency income. [6] points out that the remarkable jump in the bill of oil imports between 1999 and 2000, despite the sheer efforts to restore oil self-sufficiency, triggered a heated debate on China's energy security in the late 1990s.

**Figure 4. Percentage of China's costs of crude oil and oil product imports over GDP (current prices)**




With dramatically increased exports of non-energy goods in the early 2000s, China gained significant hard currency reserves which caused the economic concerns associated with oil imports to somewhat fade. Nevertheless, the increase in the cost of oil imports was so fast that even in spite of China's remarkable economic growth, their costs have continuously increased as a share of GDP (Figure 4). In fact in 2004, 2006 and 2011 they exceeded the net export-import balance and in 2012 were virtually equal to the balance . Moreover, this very rise of China's economic power flared Sinophobia, or the fear of China, and thus further boosted sovereignty concerns inside China. Events such as the prevention of the attempts of Chinese National Offshore Oil Corporation's (CNOOC) to acquire California-based Unocal in 2005 and Calgary-based Nexen in late 2012 and early 2013 confirmed the view widely shared by Chinese political scientists and military analysts, of oil as a 'strategic' geopolitical commodity [45]. The U.S. unilateralism under George W. Bush administration and its "return to Asia" strategy under Obama administration provided a boost to this view.

[46] rightly observed that China regarded the invasion of Iraq by the United States in 2003 as a de facto aggressive attempt to gain control of Iraqi oil, which coincided with the emerging debates on peak oil at the global level. Chinese leaders thus inferred: if the United States was anxious enough about oil to launch a full-scale invasion, then energy security and future oil availability must have been strictly important and

urgent. Indeed, in 2003, then President Hu Jintao publicly claimed that "certain powers" were bent on controlling the Malacca Strait, through which more than 80 percent of oil imports into China travel, and threatening the security of China's sea lanes of communication (SLOC) of oil. This perception constituted the so-called "Malacca Dilemma" argument [4,47].

In the 2000s, China's growing 'appetite for oil' has surprised the IEA and alarmed other major energy consumers, triggering the so-called "China Energy Threat" (CET) discourse. Scholars of international relations have shown great enthusiasm in investigating the implication of China's external oil strategy for the potential revisionist alteration in global political economy (e.g. [48] [49] [50] [51]) and the "resource wars" and collaboration among oil-consuming countries [52-54] [55]; [56]. The CET, interestingly, reinforced the Chinese impression of international Sinophobia mentioned above and fed China's mistrust of the world energy market (the analysis in the following section will display how Chinese leaders have attempted to "calm down" the overheated energy economy and the CET).

Despite all the concerns about potential disruptions to imports of oil to China, no such disruptions have occurred in the last 20 years. At the same time, both oil products and electricity supply have recently experienced a series of major interruptions resulting from domestic rather than geopolitical factors. For example, the massive power shortage of 2004 affected 27 out of China's 31 provinces, municipalities and autonomous regions [57]. The power shortage was created largely because of under-investment in installed capacity due to the 1998 Asian Financial Crisis and unpredicted jump in electricity use due to fast economic growth and industrialization. The erratic 2008 winter storms affected large portions of Southern and Central China with unusually heavy snow, ice and cold temperatures causing severe power shortages in 19 provinces, due to disruption of coal transportation. Ironically, coal shortages caused problems with transportation, which further aggravated coal deliveries.

Such events prompted both Chinese and international scholars to reflect on domestic vulnerabilities of energy supply chains. For example, [58] unequivocally called for more research on "domestic, non-war/non-adversarial challenges" that China faces in the energy sphere, and less on the "wars, blockades, and embargoes" dimension of energy security. Likewise, [2], [7], [59] and [5] agree that the actual vulnerabilities of China's oil supplies have been overstated, while those of other domestic challenges, such as the country's high energy intensity [44] [60] [61], disruptions of electricity [62] and oil product supplies [34] have been seriously overlooked.

Many scholars see inadequate institutional arrangements, aptly termed by [11] 'institutional insecurity', at the heart of vulnerabilities of domestic energy supply. With respect to the oil supply chain, institutional insecurity stems from the lack of an effective link between the international crude oil market and domestic markets for oil products. China's crude oil prices have been linked to international markets, however,

its domestic prices for diesel and other oil products are still largely regulated [63]. Oil refineries pay high prices for crude oil and sell the refined products to end-users at artificially low prices. When China sees a sudden surge in demand for, say, diesel, this cannot translate to higher prices automatically; rather wholesalers and refiners, state-owned or private, can only choose between reducing their output, exporting their oil products or storing them in hopes of future price hikes [64]. [15] insightfully suggests that a number of retail oil shortages seemed to stem from monopolistic behavior of national oil companies. He speculates that PetroChina and Sinopec deliberately reduced supplies of oil products in November 2003, March 2005, March 2006 and October 2007 as bargaining chips to lobby the NDRC to raise retail oil prices.

Likewise mobilization of upstream oil and gas supply chains by major NOCs makes it problematic for smaller companies to supply these fuels to China. According to our interview with PetroChina, Guanghui Energy, a listed company, has reportedly obtained two oil and gas concessions in Kazakhstan, but found that they cannot sell the oil and gas directly to Chinese consumers, but have to ask PetroChina to import it first and then buy it back at a price set by PetroChina before distributing to consumers.

Our interviews with PetroChina and downstream gas players suggest that at present China's gas storage capacity is less than 2% of its annual demand, whereas it should be at least 10-15% of demand to mitigate gas supply disruption. NOCs, especially PetroChina do not have the incentive to build gas storage because it is not profitable. NOCs are not motivated to do so partly because their profits have been dropping as the costs of the gas imports (both pipeline gas and LNG), which account for an increasing share vis-a-vis domestically-produced gas, are higher than the nationally regulated prices at which they sell gas to downstream players.

The dominance of NOCs, combined with price regulation may also impede or stall the development of domestic shale gas in China. PetroChina alone already controls about 70 percent of the known shale gas deposits in China. An interviewee from the CNPC Advisory Center, however, pointed out that PetroChina is not motivated to develop its shale basins because doing so is too capital intensive, which is not economically justifiable at the current (regulated) domestic gas prices. Our interviews with downstream gas firms confirm that the emerging natural gas industry may come to face institutional shortages and insecurity as those which the oil sector faces.

Institutional shortcomings have also plagued the power sector. China's energy systems were both *shocked* by unplanned blackouts such as the one in 2008 and *stressed* by the so-called 'planned' or 'quantitative power shortages' (*zongliang quedian*) (e.g. in 2004-2005), which result from inadequate investment in generating capacity. More recent power shortages were caused by suppliers' reluctance to invest in additional capacity under high (market) coal prices and low (regulated) electricity prices [65]. Another cause of shortages is the additional demand for electricity from over 100 million

electric appliances purchased by rural and small town residents following the government subsidy introduced in 2008-2009 [66]. Institutional problems have reportedly complicated connection of renewable energies to the power grid [67].

In summary, the risks to vital energy supply chains in China include not only, and not primarily, potential disruptions of oil imports but also vulnerabilities of refined oil products, electricity and, in the long run, gas supply to a variety of threats ranging from extreme weather events and infrastructure failures to 'institutional insecurity'. These vulnerabilities were acknowledged by the government, for example in two national energy policies also known as the 'energy white papers' published by the NRDC in 2007 and 2012 ([68]; [69]).

Despite this acknowledgement, the sovereignty perspective remains predominant in assessing energy security risks. For example, although the white papers cover a wide range of energy issues: from energy pricing mechanisms, to energy-related air pollution and from unconventional resource development to promotion of renewable energies, they still equate energy security with the continuity of oil supply. The "Current Energy Development" section of the 2012 energy white paper has a subsection of energy security, which reads:

> "Grave challenges to energy security. The country's dependence on foreign energy sources has been increasing in recent years. In particular, the percentage of imported petroleum in the total petroleum consumption has risen from 32 percent at the beginning of the 21st century to the present 57 percent. Marine transportation of petroleum and cross-border pipeline transmission of oil and gas face ever-greater security risks. Price fluctuations in the international energy market make it more difficult to guarantee domestic energy supply. It will not be easy for China to maintain its energy security since its energy reserves are small and its emergency response capability is weak." [69].

In our interview with members of the NEA unit that actually drafted the white papers we asked why they do not regard such issues as electricity shortage as energy security problems, they explained:

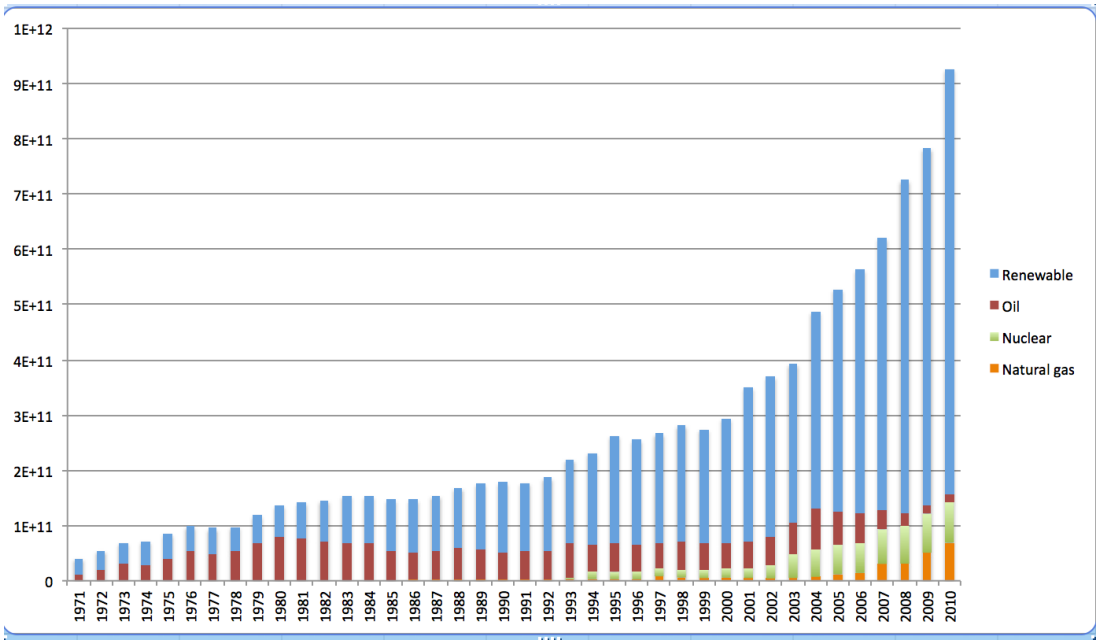
> "We need to ask 'energy security for whom?' Our country does not really have an electricity supply problem. Although we sometimes face some power shortage problems during peak seasons and in some provinces, these problems are short-lived and localized, and most importantly, these problems can be solved by ourselves. Oil imports are different. If our oil imports are cut off, it affects the whole nation, not just certain provinces, and we no longer maintain *zili gengsheng*

(self-reliance). …Natural gas is an emerging issue of energy security because its import dependency and its role in China's fuel mix are climbing quickly…If China were heavily dependent on coal imports, coal could also be an energy security issue."

### 3.3 By what means? The evolution of energy security policy measures

In the 1990s, China's energy security policies were focused on oil with the overall goal to increase domestic outputs and avoid imports. Chinese political leaders sought to regain oil independence lost in 1993, echoing the Maoist mentality of *zili gengsheng* (self-reliance). China sought to increase domestic oil production by stabilizing eastern oilfields and developing western and offshore oilfields. At the same time China sought to conserve oil by curbing the scale and increasing the efficiency of oil consumption. It passed the Energy Conservation Law in 1997 and called for the gradual elimination of energy intensive and polluting technologies in 1999. It also shut down hundreds of inefficient smaller refineries, and modernized larger refineries. It continued to switch power generation from oil to other sources [34] (Figure 5). In 1994 and in 1998, China imposed temporary import bans on crude oil and oil products to increase domestic prices for supporting exploration, production and refining activities of national oil companies (NOCs)[6].

**Figure 5. Electricity production from non-coal sources in China 1971-2010, kWh/year**




Since none of these measures reversed the growing dependence on foreign oil, in the early 2000s the self-sufficiency paradigm gradually gave place to the 'going-out'

mentality[3]. The motto of China's energy security policy at that time could be summed up as **"**go out and calm down**".** This occurred in parallel to China's entry into the WTO (in 2001) and the country's increasing ease with the global economic system. As an emerging economic power, China gave up its oil isolationism and actively started learning how to manage the risks associated with the rising dependence on global oil markets. In this period China's policies included such measures as encouraging diversification of oil suppliers, acquisition of overseas oil assets by NOCs [7] [70-76], the construction of overland pipelines to circumvent the "Malacca Dilemma" [77] [4], the modernization of military and merchants fleets to protect sea-lane of communication and deter the U.S. from military blockades [78]; [79,80], the expansion in the relative share of the Chinese-flagged tankers in global oil trade [81], and bilateral cooperation with oil-rich states through energy diplomacy [82] [83] [84] [85]. China also adopted domestic measures to enhance oil security, for example by preparing for the establishment of strategic petroleum reserves (SPR) in 2004 [86].

Despite the visibility of all these measures, their actual contribution to energy security has been subject to debates [5].

- First, the overseas production of equity oil by Chinese NOCs is seldom shipped back to China because of the pricing difference inside and outside China.
- Second, oil imports from Chinese NOCs or foreign suppliers are equally vulnerable to disruptions of sea-lanes.
- Third, the Malacca Dilemma, articulated during peacetime, seems to be overstated given alternative trade routes such as the Sunda and Lombok straits (through which Japanese tankers travel).
- Fourth, transnational pipelines (e.g. Myanmar-China) cannot circumvent the Malacca Dilemma at wartime, as they are easily disabled by military means. For this viewpoint, we have interviewed analysts from PetroChina and Sinopec who require anonymity. While we expected our Sinopec informant would be negative about the PetroChina-owned pipelines, we were surprised that even our PetroChina informant came to the same conclusion and pointed us to consider the geopolitical dilemma inside Myanmar.
- Fifth, shifting between suppliers does not necessarily increase energy security. Table 1 shows that the changes in the supplier regions between 2001 and 2011 did not affect the diversity of suppliers as measured by the standard

[3] The 10th Five-Year Plan, presented in 2001, puts the preservation of supply security at the top of its energy strategy. In order to reach that goal, the plan puts the emphasis on innovation in production technologies and expects the accelerated development of national energy resources, or the pursuit of the going out policy which encourages investments in foreign assets, on the creation of a strategic reserves, on the diversification of supply sources, and on the development of alternative fuels.

HHI used by the IEA [87]. Moreover, shifting from Middle Eastern to African suppliers reduces the share of Middle Eastern oil in the overall imports, but at the same time exposes the oil supply chain to additional political risks if oil is procured in less stable countries. [59] reinforces this argument by citing the result of an assessment of operational risk by *The Economist* on 150 markets in the world, which suggests that among the ten most risky countries, six are major oil partners of China. Moreover, increasing diversity comes at the expense of increasing the overall distance oil has to travel to reach China.

**Table 1. China's Crude Oil Import by Region, 2001 and 2011**

| | 2001 | | 2011 | |
|---|---|---|---|---|
| | Mt | % | Mt | % |
| Middle East | 33.9 | 56.2 | 130.0 | 51.2 |
| Africa | 13.5 | 22.5 | 60.1 | 23.7 |
| Pacific Asia and Eurasia | 8.7 | 14.4 | 8.6 | 3.4 |
| Western Hem. & Others | 4.2 | 6.9 | 55.0 | 21.7 |
| **Supplier's Regional Diversity (HHI)*** | | 0.39 | | 0.37 |
| **Total** | 60.3 | 100.0 | 253.8 | 100.0 |

Sources: (Tian, 2004), 11(Tian, 2012), 60),

* HHI can vary between 0 and 1 where 1 corresponds to the lowest diversity (all supplies come from one source); IEA considers HHI between 0.3-0.8 corresponding to medium diversity of crude oil suppliers: countries with this level of diversity are, for example, the Czech Republic, Ireland and Sweden (Jewell, 2011).

In recent years, China's energy policy has gradually moved beyond oil to protect other, domestic, vital energy systems. This does not mean that oil supply chains have lost the attention of policy makers. Quite the contrary, oil is still cast as critical and in fact the only fuel which is explicitly linked to energy security. However, it is obvious that even securing oil supplies requires a wider range of responses. The 2012 white paper contains a section titled "Deepening Institutional Reform in the Energy Sector" which calls for "accelerating the construction of a legal regime for the energy sector", "improving the market mechanisms" and "tightening administration of the energy sector" in order to "safeguard the country's energy security" [69].

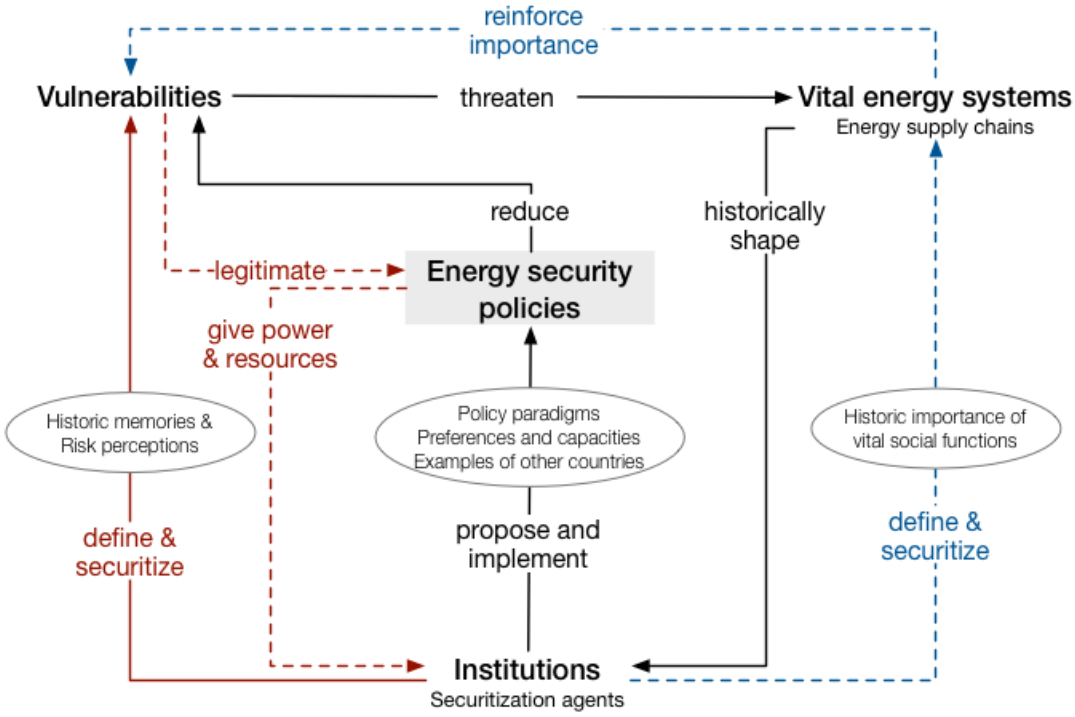
In recent years, a staggering growth in renewable energy technologies and nuclear power has occurred in China, in part prompted by the Renewable Energy Law (2005). There are also prominent experiments in Carbon Capture and Storage (CCS),

coal-and biomass co-combustion and other modern energy technologies. Also in 2004, the Chinese government launched a vigorous program to tackle the problem of high energy intensity and resolved to reduce intensity by 20% of 2005 levels between 2006 and 2010 [88].The official discourse does not explicitly link these developments to energy security though as we discussed in section 3.1 there are a number of reasons why Chinese leadership may want to move away from excessive reliance on coal in the power sector. Part of the strategy of reducing its reliance on coal are the efforts to increase utilization of natural gas, which China primarily needs to import from other countries. Gas deals have been secured with Asia-Pacific, Central Asian and Middle Eastern countries. It is no accident that the "new perspective on energy security" (*xin nengyuan anquan guan*) proposed by President Hu Jintao at the 2006 G8 Summit in St Petersburg includes calls for greater international cooperation on oil and gas, but also the need to manage domestic demand for these fuels [7]. The speedy approval of the East-West Gas Pipeline signals the fact that the central government pays serious attention to securing gas supplies [1].

# 4 Discussion

Our analysis shows a complex relationship between vulnerability of energy supply chains, the institutions that govern these supply chains and political discourses on energy security. There are several overarching observations arising from this illustrated in Figure 6.

**Figure 6. The interplay of issues, ideas and institutions reinforcing the focus on oil in China's energy security policies**




The figure portrays the interplay of issues, ideas and institutions in shaping energy security policies in China. The straight black lines and text show visible and 'rational' connections. Vital energy systems have their vulnerabilities which can be reduced by energy security policies, which are proposed and implemented by the institutions, which are in turn historically shaped by vital energy systems. This simple dynamic is complicated by two less visible self-reinforcing feedback loops (one shown in red and one in dashed lines). Both loops include the fact (dashed red lines) that (real and perceived) vulnerabilities legitimate energy security policies and that these policies in turn give power and resources to energy institutions. This incentivizes the institutions to become 'securitization agents', i.e. to (a) define/securitize vulnerabilities in such a way that they further legitimize the preferred policies (solid red line) and (b) portray energy systems as more important and vital in order to reinforce the importance of vulnerabilities (dashed blue lines). The system is further affected by ideational and contextual factors. For example, assessment and definition of vulnerabilities is influenced by historic memories and cognitive risk perception factors (given more importance to shocks and to 'hostile' rather than 'natural' disruptions). The boundaries of vital energy systems are drawn subjectively with reference to which social functions are considered 'vital'. Finally, policies are proposed with reference to policy paradigms (e.g. Self-sufficiency, going-out, market self-regulation), examples of other countries (e.g. The U.S. Carter doctrine, Japanese and Korean 'going out' or Russian resource nationalism) as well as policy preferences and capacities.

The first observation is that energy realities do matter in shaping policy focus on a specific energy system/supply chain. This occurs through two interrelated mechanisms locked in a positive feedback loop. Initially, a vital energy system/supply chain captures the attention of policy makers through a combination of its importance and vulnerability. For example, oil plays a unique role in China (and most other emerging economies) for at least three 'objective' reasons [10]::

a) it both dominates and lacks substitutes in defense, transportation, and food production;
b) its use is rapidly and steadily growing primarily due to the growth in demand for mobility services;
c) its national (and global) resources are limited, regionally concentrated, and often perceived as insufficient to provide for this growth in demand.

Due to these characteristics of the oil sector, it is natural that the state established powerful institutions to govern and secure oil supply chains. Setting up such institutions triggers the second mechanism, the emergence of powerful interests vested in the oil sector, which potentially become securitization agents. These interests (in China's case represented by NOCs) are naturally keen to amplify both the vitality and vulnerability of oil supply, in other words, 'securitizing' oil supply chains. Securitization of oil supply chains, in turn, lifts them 'above politics' and gives the state (and by extension the NOCs) the right to treat them by extraordinary means, which further strengthens the power of securitization agents[4].

Such a positive feedback loop reinforcing the importance of oil is lacking in the case of another key energy supply chain associated with electricity supply and coal extraction in China. Although electricity is essential for many functions of Chinese society, it can be produced from different fuels, by different means and by multiple actors, so that it appears less vulnerable. The electricity-coal supply chain is governed at the local and the regional levels. As a result, this supply chain lacks powerful institutional advocates able to securitize it at the national level. Since

Our second observation is that securitization agents may exploit the ambiguities always surrounding the vulnerabilities of vital energy systems. Most risks are difficult if not impossible to assess objectively (e.g. the questions "how large is the probability that a foreign power will blocade the straits of Malacca?" or "what is the future price of shale gas?" do not have easy answers). In order to securitize a particular issue, it is advantageous to emphasize the risks that are more easily perceived as 'critical' and 'existential'. Due to their psychological 'availability', painful memories of oil embargoes in China have served as easy prompts to portray future risks to oil supply

[4] Securitization of oil is supported by the fact that this fuel is critically important for the military, which has a say abound any security issue.

chains as significant. To paraphrase Kahneman (2011), the difficult question about future risks has been substituted by an easy question about past disruptions conveniently ignoring the fact that the present oil market are very different from the ones in the 1960s. Psychologically it is much easier to solicit a response to risks associated with hostile actions and potentially high-profile one-off events than it is to mundane and creeping problems caused by natural and technological factors such as electricity blackouts. Our analysis shows that the process of securitizing oil import supply chains has also been reinforced by behavior and attitudes of external actors ranging from the CET rhetoric to the Gulf wars. Once the securitization agents 'proved' that the U.S. treats oil supplies as a 'strategic' security commodity, it was not difficult to argue that these deserve the same treatment in China.

We have observed that it is easier to represent something that arises outside of national borders as a 'security' issue, since traditionally, security has always been a national-level matter, even the *raison d'être* of the modern nation state. Although many developed countries have somewhat departed from this narrow view of security and scholars have pointed out that the notion and scale of "national", is socially constructed, constantly evolving and shaped by "trans-local" dynamics [89][90], the Chinese government remains rigid with equating 'security' with 'national security'. In this view, risks to national energy security are something that affects the nation as a whole and is likely to originate externally, from other nations. This policy paradigm explains why it is much easier to cast a highly hypothetical oil embargo or an attack on oil trade routes as a national security issue (*guojia anquan wenti*) than to securitize widespread domestic electricity or coal shortages which are considered merely "socio-economic issues" (*shehui jingji wenti*).

This is not to say that policy-makers are totally dominated by perceptions when it comes to identifying risks to vital energy systems. In fact, at least some of the risks to the oil supply system are rationally highlighted in China's energy security policy. These include the scarcity of national oil endowments, the unabated rise of demand, low diversity of suppliers, the concentration of trade flows through the straits of Malacca and the dysfunctional price formation mechanisms. All in all, it seems that policy making is more 'rational' (i.e. responsive to issues) when it comes to stresses and more 'ideational' (i.e. guided by perceptions and ideas) when it comes to shocks. This is no surprise since cognitively it is extremely difficult to deal with shocks 'rationally' since it requires assessment of probability and magnitude of consequences of rare future events, a task humans are not very good at. As a result, the sovereignty dimension of insecurity, such as oil blockades imposed by other states and "resource wars", is understood as "high politics" and has received more "national" attention. The robustness and resilience dimension of insecurity [20], such as power grids failure, are considered "low politics" and are thus seldom portrayed as a vital part of "(national) energy security".

Our third observation is that the answer to the last energy security question "By what means?", i.e. determination of energy security policies, may influence the answers to the first two questions. Indeed, it is at this stage that resources are distributed, power is allocated, and therefore the stakes are especially high. We observe that China's energy security policies often serve the already powerful interests of 'securitization agents', are closely aligned with policies in other areas, influenced by examples of other countries and reflect the dominant ideas constrained by existing capacities. For example, the 1990s attempts to avoid oil imports by boosting domestic supplies reflect the maoist idea of self-sufficiency and state's role in the economy. The acquisition of the overseas oil assets in the 2000s not only serves the powerful interests of NOCs but is also closely aligned with the "going out" policy and new market principles as well as possibly inspired by the example of Japan. Discussions of using military means to protect trade routes and the offensive 'oil diplomacy' clearly reflect the interests and capacities of the military but it also mimics the U.S. strategy of projecting its power into its areas of 'vital interests' (the Carter doctrine).

Since powerful actors see such responses as convenient, non-disruptive, and beneficial to their interests, they are naturally inclined to interpret the problem so that it fits their preferred solution. For example, the interest of NOCs in acquiring more overseas assets translates into highlighting the danger of foreign control over oil resources. This can also explain why although Chinese policy-makers pay increasingly more attention to policy measures, such as promoting renewable energy, nuclear power, electric vehicles, natural gas vehicles and advanced clean coal technologies, they rarely cast these measures as energy security measures.

# 5 Conclusions and Recommendations

This article examines and explains the evolution of energy security policies in China, particularly its persistent focus on oil imports despite the increasing importance of reliability of domestic electricity supply. To explain the securitization of energy supply chains, we have proposed and applied a framework for explaining energy security policies in terms of three interrelated questions: What to protect? From what risks? And by what means? This framework considers both institutional and ideational factors of policy-making and draws from the theory of securitization, the recent insights and concepts from the Global Energy Assessment and the idea that institutions play an important role in constructing supply chains within global production networks.

As we show, policy answers to the three questions do echo the realities of energy systems. Policy makers think in terms of energy supply chains (mor broadly, energy systems) and can clearly see both why particular energy supply chains are vital for national stability and survival and what are these chains' vulnerabilities in the short- and in the medium-term. In contrast, many criticisms of energy security policies as irrational are based on a misunderstanding by scholars of systemic nature of energy security concerns, which could be brought back to focus by the concept of vital energy systems.

At the same time, our analysis demonstrates that energy security policies are also influenced by institutional interests, policy preferences and capacities, historic memories (especially high-profile disruptions such as embargoes), governance paradigms (e.g. self-sufficiency, market self-regulation, national security, or the 'going-out' mentality) and examples of other countries experiencing energy security pressures. All these factors can delay or shape in a particular way policy response to energy issues. Thus, powerful institutions such as NOCs or the military may 'securitize' certain energy supply chains to their own benefit and resist securitization of other competing agendas.

Our analysis can also provide tentative predictions on the evolution of China's energy security policy. In the next few decades oil supply chains will continue to be cast as a vital energy systems and thus the discourse on energy security is likely to retain oil supply chains in its focus. At the same time, oil policies may experience further profound transformations. For example, if the U.S. becomes self-sufficient in its oil supplies and withdraws its military and political presence from oil-rich regions (Middle East and Africa), China may need to fill the vacuum and actively engage in these regions to guarantee their stability [91].

As gas consumption grows, its supply chains may also become securitized. This is especially likely since Chinese institutions that control the import of natural gas are

likely to be the same that have dealt with oil supplies and thus familiar with the benefits of and methods for representing their business as a national security matter. Of course, securitizing gas supply chains may be more difficult due to two factors: first, in electricity generation it can be substituted (e.g. by coal) and second the global market may experience a surplus of gas due to unconventional gas production in North America and elsewhere.

In the next few decades, technological transformations, possibly induced by climate policies and the eventual scarcity of cheap conventional oil, may significantly affect China's energy security landscape. In particular, oil may lose to natural gas, liquified coal, biofuels, electric propulsion or even hydrogen its exclusive monopoly on being *the* fuel for motor vehicles. At the same time China's coal imports may significantly grow (possibly in conjunction with clean coal technologies) and the inadequate capacity to deliver domestically produced coal to distanced consumers may persist.

The framework proposed in this article can be used to provide insights into the possibility of securitization of natural gas, coal, biofuels, nuclear fuels and hydrogen supply chains in China and other countries. At the same time our analysis show that such securitization may be triggered by factors, events and perceptions which may be difficult if not impossible to exactly predict.

## Glossary

| | |
|---|---|
| CCS | Carbon capture and storage |
| CET | "China Energy Threat" discourse |
| CNOOC | China National Offshore Oil Corporation |
| CNPC | China National Petroleum Corporation |
| ELG | National Energy Leading Group |
| GDP | Gross domestic product |
| GPN | Global production network |
| IEA | International Energy Agency |
| IOC | International oil company |
| MFN | Most Favored Nation |
| MLR | Ministry of Land and Resources |
| NDRC | National Reform and Development Commission |
| NEA | National Energy Administration |
| NEC | National Energy Commission |
| NGO | Non-governmental organization |
| NOC | National oil company |
| SEO | State Energy Office |
| Sinopec | China Petroleum & Chemical Corporation |
| SLOC | Sea-lane of oil communication |
| SOE | State-owned enterprise |
| SPR | Strategic petroleum reserve |
| WTO | World trade organization |

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