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The Political Economy of Low-Carbon Investment: the Role of Coalitions and Alignments of Interest in the Green Transformation in China

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THE POLITICAL ECONOMY OF LOW-CARBON INVESTMENT: THE ROLE OF COALITIONS AND ALIGNMENTS OF INTEREST IN THE GREEN TRANSFORMATION IN CHINA

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Foreword

Stepping up investment for the green transformation is one of the key challenges of our time. This Evidence Report makes an important contribution to the debate on how this can be achieved, focusing on investment for renewable energy in China.

We know that: (a) decarbonisation is essential for the future of human life on our planet, (b) shifting to renewable energy is an essential component of decarbonisation, and (c) huge investments are needed for a transition to renewable energy. We know less about how to bring about this increase in investment. It is therefore important to learn from those cases where substantial increases have occurred. This is what this report seeks to do.

China is a particularly interesting case. For the last five years, China has been the world number one in investment in renewable energy. Existing explanations tend to concentrate either on the enterprise or the state. The enterprise-focused explanations stress the business opportunity. Investment occurs because it is expected to be profitable. The state-focused explanations stress that the incentives provided by the state make the investment profitable. This report suggests that both explanations play a role but are not sufficient. It examines the role played by coalitions or alliances between enterprises and business.

The report does this in some detail. It shows that: (a) such alliances played a bigger role than generally acknowledged; (b) their importance varied with the sector (wind and solar) and over time; and (c) the alliances took different forms in different circumstances, and these forms were important for their relative success or failure. They included a range of actors on both the state and business side. A focus on state-owned enterprises would fail to capture these constellations of actors. Showing such a differentiated picture is important so that simplistic or misleading conclusions are avoided.

The big message of the report is that understanding the increases in investment cannot just rely on economic or state-centred reasoning. Political economy analysis is essential. By focusing on relationships between business and government actors the report recognises that the two sides need to interact. Public policymakers and implementers rarely have the required sector-specific knowledge for fostering investment. Investors in turn need advance knowledge of whether and how government is likely to guide the investment. Judgement of the political support of – or opposition to – policies is facilitated by close contact with policymakers and implementers.

Neoliberals view this with suspicion. They favour a greater distance between policymakers and investors stressing the risks of rent seeking and capture of the policy process by the investors. This report does not explicitly engage with this neoliberal view but we have discussed it elsewhere (Schmitz, Johnson and Altenburg 2015). We recognise that close relationships between public and private actors can be abused but we also stress that the risk can be contained through multiple forms of monitoring and counter-pressures. More importantly, the biggest risk is that investments in renewables do not occur if we rely on the market alone.

Successful close relationships of this form are not about providing business with unfair advantages. They are about recognising that businesses do not operate in a vacuum, but in specific economic and political contexts which are partly constructed, and which can be constructed in ways that are more or less supportive of investment. The coalition approach adopted in this report tries to understand how the *interactions* between public and private actors can make a positive difference.

Low-carbon coalitions of public and private actors can have a dark side but this report shows the bright side. It shows how such alliances contributed to the acceleration of investment in renewable energy in China. The report thus makes a major contribution in providing a realistic picture of how a remarkable increase in low-carbon investment was achieved.

(Hubert Schmitz, Professor, Institute of Development Studies)

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Abbreviations

BNEF	Bloomberg New Energy Finance
CDB	China Development Bank
CPIA	China Photovoltaic Industry Alliance
DRC	Development and Reform Commission
EPIA	European Photovoltaic Industry Association
EU	European Union
FIT	feed-in tariff
GE	General Electric Company
GW	gigawatt
HK	Hong Kong
HKEx	Hong Kong Stock Exchange
HR	human resources
IEA	International Energy Agency
IPO	initial public offering
kW	kilowatt
kWh	kilowatt hour
LSE	London Stock Exchange
MIIT	Ministry of Industry and Information Technology
MW	megawatt
NEA	National Energy Administration
NEC	National Energy Commission
NDRC	National Development and Reform Commission
NPC	National People's Congress
NYSE	New York Stock Exchange
PE	private equity
PV	photovoltaic
R&D	research and development
SASAC	State-owned Assets Supervision and Administration Commission
SOA	State Oceanic Administration
UNEP	United Nations Environment Programme
US	United States
VC	venture capital

1 Introduction

The primary motivation behind this research is the need to accelerate the supply of renewable energy because of the important role that it plays in mitigating climate change and in fostering sustainable development.

Understanding past drivers for low-carbon investment can help us identify those for the future, and what could accelerate such investment. Investment in renewable energy can be modelled as a problem of technical asset allocation or optimisation at the firm or sectoral level, but is not entirely explained by this approach – the context in which actors are involved, their motivations and the wider systems in which they operate must also be taken into account. The interactions between actors may sometimes accelerate investment and sometimes prevent it; however, understanding the dynamics of these processes is crucial if we are to shape them. This report is part of a two-part study focusing on the wind and solar power sectors in China and India, which aims to find and compare drivers for investment in renewable energy. This report takes the example of China.

Globally, the International Energy Agency (IEA) estimates that US$45tn of investments are required between 2012 and 2050 to reduce global carbon emissions by 50 per cent, and that 85 per cent of this investment will need to come from the private sector (IEA 2009). Annually, this averages at a little over US$1tn, half of which will fund the replacement of existing technologies, largely in developed countries. The remaining US$530bn is for investment in new capacity, the bulk of which (US$400bn per annum) will be in developing countries (IEA 2008). Indeed, during 2012/13, 90 per cent of the growth in energy demand came from emerging economies, led by India and China (IEA 2013). A large proportion of the investment in renewable energy sources will therefore need to be in these two countries.

Given the time-crucial nature of the climate question, many have assumed that a binding global deal is a necessary precursor to achieving the level of investment needed. This, however, remains elusive, and the political class in most countries continues to struggle with prioritising climate concerns above wider issues of welfare, development and competitiveness. More developed economies continue to press for the inclusion of emerging economies from the start, whereas the latter, citing the developed economies' historical responsibility for emissions and their greater capacity for change, make the ethical and practical argument that developed nations must take the first and greatest steps.

However, this deadlock aside, another dynamic of climate action has been suggested that offers a more optimistic alternative, which does not rely on a global deal and follows a far more bottom-up approach (Rayner 2010). It is clear that renewable energy in many countries – both developing and more developed economies (such as the United States) – is now attracting significant investment and may continue to grow. As countries invest in becoming low-carbon economies, they will have less to lose as global emissions cuts are agreed upon, making them more feasible. This process is already unfolding as a multiplicity of pressures from international and local regimes spurs modes of climate action (Keohane and Victor 2010). However, the precise drivers of this transformation are far from straightforward – for example, the policy regimes of both India and China do not show clear goals to mitigate climate change. The question we pose is: what exactly drives the investment in renewable energy?

For investors to commit large sums of money into projects whose timelines run into decades, they will need to be certain of the viability of the low-carbon sector – a certainty, which, as we have seen in the case of the European Union (EU), even the most committed governments may struggle to provide through policy measures alone. This research suggests that an alignment or coalition of interests of the various actors involved is required to keep the politico-economic dynamic of policy, policy implementation and investment on track.

Hence, an understanding of the full range of actors (federal, state-level, private and civic), their motivations and strategies is required. We expect the wind and solar power sectors to provide fertile ground for our exploration.

This China-based research examines ten case studies: four wind power and six solar power. They have been selected according to investment data and industrial characteristics. Each study covers the period during which investment in renewable technologies was at its peak and all are representative of the corporate financing at that time. For each, we reviewed all of the available literature (an abundance of papers and reports) and conducted face-to-face interviews. Our interviewees ranged from wind turbine and solar photovoltaic (PV) manufacturers, to employees of state-owned enterprises and banks, to local and central government officials (particularly from the National Development and Reform Commission and the Ministry of Commerce), as well as other researchers. While we adapted the interviews according to the particular interviewee, we also used a standard questionnaire that we gave to different stakeholders. A list of interviews can be found in the Annex.

The remainder of this report is structured as follows: Section 2 describes the political context of the wind and solar power sectors in China and gives a historical overview of their development; Section 3 describes the financing landscape within which the wind and solar industries have been operating; Sections 4 and 5 respectively analyse the wind and solar case studies, in particular the drivers behind investment in the industries and the role of coalitions and alliances; and Section 6 summarises the key findings of the research.

2 China's wind and power sectors: political context and historical overview

In 2011, China invested US$45bn in renewable energy, of which 68 per cent was in wind and 13 per cent in solar. China ended 2011 with more renewable power capacity than any other nation, with an estimated 282GW; one-quarter of this total (70 GW) was non-hydro (REN21 2012). This section introduces the context in which the policies affecting the wind and solar power sectors are made and gives a brief overview of the development of wind and solar power in China.

2.1 Political context

China is a unitary state administered by central government (national government) and four levels of local government: province (autonomous region and municipality directly administered by the central government); city; *xiàn* (county); and towns or townships.[1] Each level has a people's congress and government (Dong 2007). The commitments and roles of national and local government in policymaking and industrial development are very different.

The key actors in the energy policymaking processes at the highest level in China are the National People's Congress (NPC) and the State Council. The NPC is the nation's top legislative body with the highest authority. The State Council is the leading administrative unit responsible for implementing laws and policies of the national congress.

Under the State Council there are a number of major institutions implementing China's energy policies. In general, the National Energy Commission (NEC), National Development and Reform Commission (NDRC), National Energy Administration (NEA), and State-owned Assets Supervision and Administration Commission (SASAC) are the most significant at the central level.

The NEC is a high-level discussion body or thinktank with ministerial rank, and the highest-level agency to coordinate the overall energy policies. It is responsible for drafting the energy development strategy, considering energy security and development issues, and monitoring implementation.

The NDRC is a macroeconomic management agency under the State Council. It studies and formulates policies for economic and social development, maintains a balance of economic aggregates and guides the overall economic system restructuring. The commission is important in the energy industry since it approves major projects and controls the pricing bureau (including electricity pricing).

The NEA's mandate is to manage the country's energy industries, draft energy plans and policies, negotiate with international energy agencies and approve foreign energy investments.

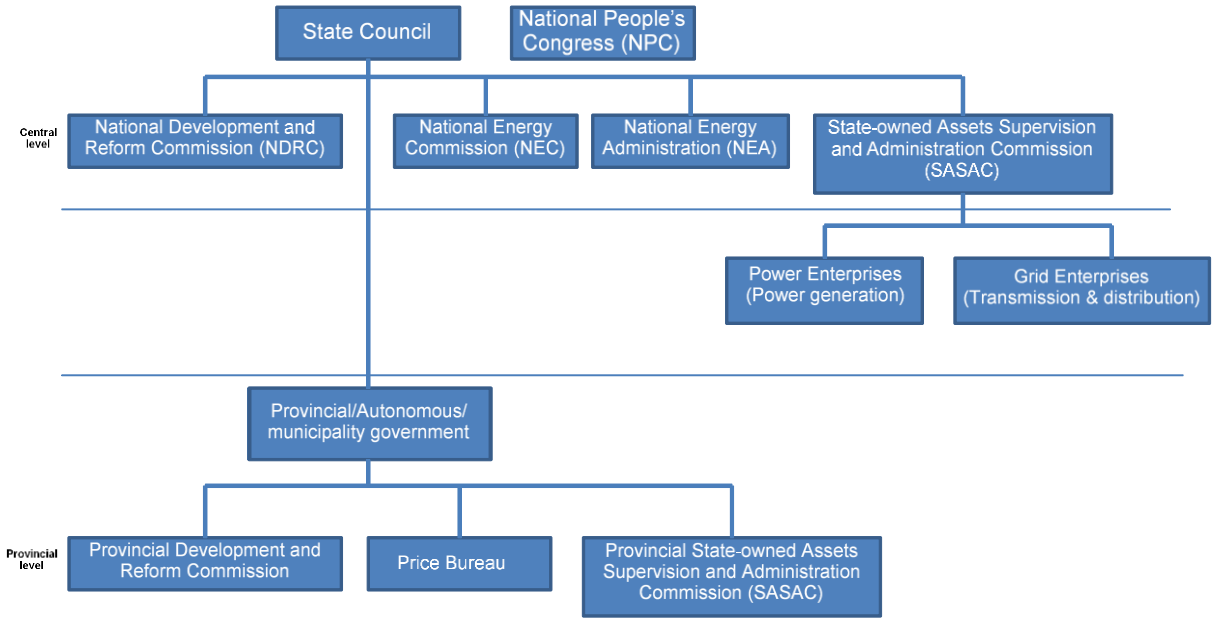
The SASAC is a special organisation directly under the State Council. It was established as the representative of the state to exercise ownership of state-owned enterprises. In terms of energy, these enterprises are the two monopoly state-owned grid companies and five state-owned power generation companies that resulted from the 2002 energy market reform; they constitute the current incarnation of the State Power Corporation of China. The two grid companies are the State Grid Corporation of China and the China Southern Power Grid. The five power generation companies are commonly known as the 'Big Five': China Guodian

[1] In this paper, local government mainly refers to cities and *xiàns*.

Corporation, China Huaneng Group, China Datang Corporation, China Huadian Corporation, and China Power Investment Corporation (Tsang and Kolk 2010).

Provincial governments can implement local pricing policies as the central government delegates local power to regional sub-divisions. Development and Reform Commissions at the provincial level are the key units responsible for formulating and implementing pricing policies for energy. The provincial SASAC is under the authorisation of provincial government to manage state-owned assets on behalf of the nation. Figure 2.1 illustrates governance arrangements in China's energy sector.

Figure 2.1 Governance arrangements in China's energy sector



Source: Adapted from Tsang and Kolk (2010).

To ensure that policies and programmes achieve planned goals, the State Council frequently restructures its administrative institutions. The Ministry of Energy was dissolved in 1993. From 1993 to 2003, the NDRC and the State Economic and Trade Commission were the two key policymaking institutions for energy development. In 2003, the latter was dissolved and the Bureau of Energy was formed within the NDRC. In 2008, the Bureau of Energy was reshuffled to become the National Energy Administration – a vice ministerial-level agency, although it found it difficult to carry out its tasks because the management of the energy sector was spread between so many agencies. In early 2010, the National Energy Commission was established as the highest-level agency to coordinate overall energy policies (Liu 2013).

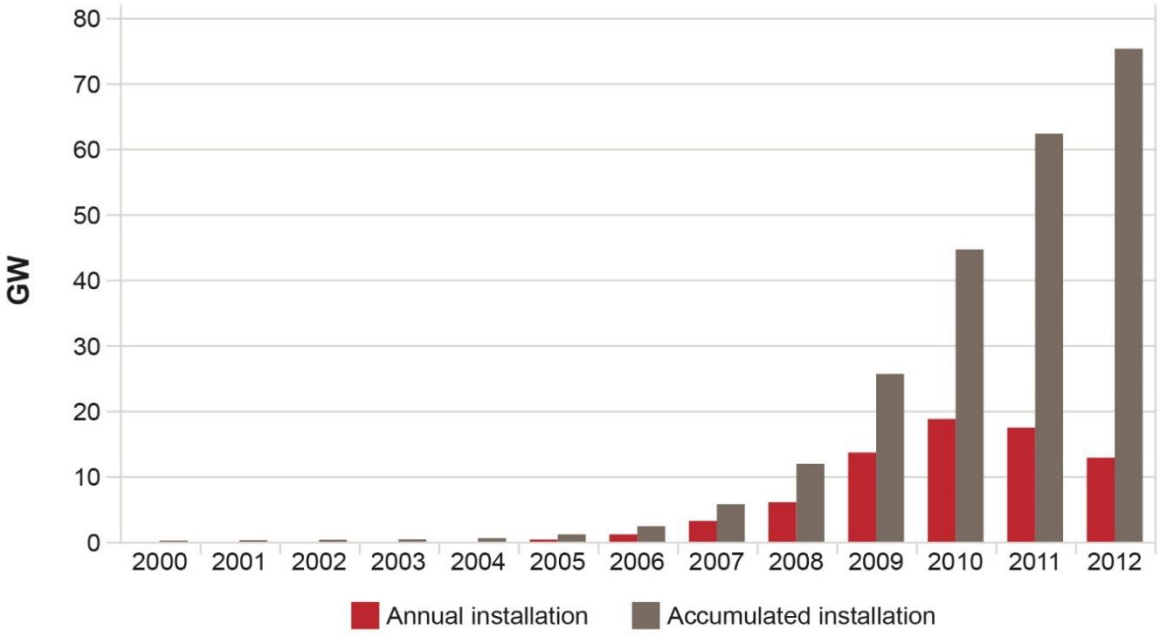
Central government holds other powers which may indirectly affect energy policy, especially as implemented by local government. These powers include the shifting of geographic boundaries of localities, firing or reshuffling local officials and reallocating funds to assist localities under certain conditions (Cheung 2009). Meanwhile, local governments are responsible for economic development and they have the power to make specific decisions about the use of land. The local government's motivation in the development of the local economy mostly includes political and economic incentives: personal promotion, rent seeking, pressure from upper-level government, and leadership of top officials (Ma Li 2012).

2.2 Historical overview: wind power – the policies, manufacturers and the market

The Chinese government has recognised the importance of renewable energy for some time, and listed it as one of its important strategies for achieving sustainable development. The 10th Five-Year Plan on Developing New Energy and the Renewable Energy Industry released in 2001 clearly stated that: 'the development and utilization of new energy and renewable energy is one of the key strategic measures to upgrade China's energy mix, to improve environment and to promote sustainable economic and social developments' (Xinhua Net 2001). The Renewable Energy Law released in 2005 even identified renewable energy development as a 'national strategy'. In the 'Decision of the State Council on Accelerating the Cultivation and Development of Strategically Important Emerging Industries' released in 2010, the new energy industry was listed as one of the seven strategic emerging industries receiving key support.[2]

China is rich in both wind and solar resources. Starting in 2000, the government initiated a series of programmes to increase access to electricity by developing wind and solar power. Later, wind was identified as a higher priority because of its economic and technical advantages.

Figure 2.2 Annual and accumulated installed capacity of wind power in China



Note: Installed capacity includes both off-grid and grid-connected plants.
Source: Based on data from Chinese Wind Energy Association (2013).

China's wind power industry began under the guidance of central government. Grid-connected plants were built from as early as the 1980s. The total installed capacity was 4.2GW in 1989,[3] and reached 62.4GW in 2011 (Figure 2.2). In general, wind power in China has gone through four stages: initial demonstration (1986–93), industry incubation (1994–2003), large-scale deployment (2004–10) and adjustment (2011–present). The central government has played the key role in each phase.

[2] The seven strategic industries include energy-saving and environmental protection, information technology, biology, advanced equipment manufacturing, new energy, new materials and new-energy vehicles.
[3] GW=106kW, MW=103kW.

2.2.1 Initial demonstration phase (1986–93)

The first wind farm was built in Malanwan, Rongcheng city, in Shandong province in May 1986. The Vestas V15-55/11 wind turbine had been imported with foreign exchange paid jointly by Shandong Province Government and the Ministry of Aviation Industry. Overall, this phase was characterised by the use of foreign grants and loans to construct small demonstration wind farms, and most of the projects were sponsored by foreign governments. The turbines were purchased from Denmark, Germany and other countries. The feed-in tariff (FIT) for wind generation was the same as that for coal.[4] The government mainly supported demonstration wind farm construction and research and development (R&D) programmes on wind turbines (Li *et al.* 2007).

2.2.2 Industry incubation phase (1994–2003)

During this phase both central and local governments enacted policy incentives to encourage the development of the wind industry. The Increasing-Acceleration Project,[5] Ride the Wind Program,[6] National Science and Technology Plan and other projects were introduced to promote the first batch of six wind manufacturers for technology importation, digestion and absorption (Li, Gao and Wang 2008).[7] During this period, a wind turbine manufacturing industry was established and a batch of enterprises led by Xinjiang Goldwind created a certain production capacity.

2.2.3 Large-scale deployment phase (2004–10)

The goal during this period was to facilitate technological progress and industrial development through large-scale wind farm construction. From 2003 to 2009, the central government implemented six rounds of bids for wind power project concessions with a total capacity of 14.05GW. At the end of July 2009, the NDRC enacted the 'Notice on Improving Wind Power Feed-in Tariff Policy', introducing four categories of FITs. The design of the policy followed Germany's FIT, and the electricity price was based on the tariff of the fifth bidding round for wind power project concessions. In 2009 and 2010, newly installed capacity was 13.8GW and 18.9GW respectively.

The rapid development of the wind industry was further helped when local government was granted the power to approve energy projects. According to the NDRC's 'Requirements on the Management of Wind Power Plants' enacted in 2005, plants with a capacity exceeding 50 megawatts (MW) had to be approved by the commission itself, but provincial government could approve those with a capacity below 50MW. This resulted in the '49.5MW phenomenon', i.e. developers favoured projects below 50MW, or they disaggregated large projects into several small ones, in order to reduce the length of time that they had to wait for approval and reduce the risks of being refused.

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[4] A feed-in tariff (FIT) is a policy mechanism designed to accelerate investment in renewable energy technologies. It achieves this by offering long-term contracts to renewable energy producers, typically based on the cost of generation of each technology. Rather than pay an equal amount for energy, however generated, technologies such as wind power, for instance, are awarded a lower per-kilowatt hour (kWh) price, while technologies such as solar photovoltaic (PV) and tidal power are offered a higher price, reflecting their current generating costs.

[5] Increasing-Acceleration Project: its full name was Increasing the Investment Strength and Accelerating the Pace of Transformation, a project implemented by the former State Economic and Trade Commission in technical reformation between 1994 and 1996. The project focused on making national industry policies, improving products' quality, decreasing material consumption, expanding exports, and increasing effective supplies of a number of selected enterprises with better conditions.

[6] Ride the Wind Program: introduced by the former State Development Planning Commission in 1996, this programme sought to promote the localised manufacture of large wind turbines and large-scale development. It mainly aimed to: (1) introduce advanced technologies by joint ventures or cooperation; (2) organise scientific and technological research projects and master the development technology of large wind turbine generation systems; and (3) provide special allowances for constructing domestic wind turbine demonstration fields and quality inspection systems.

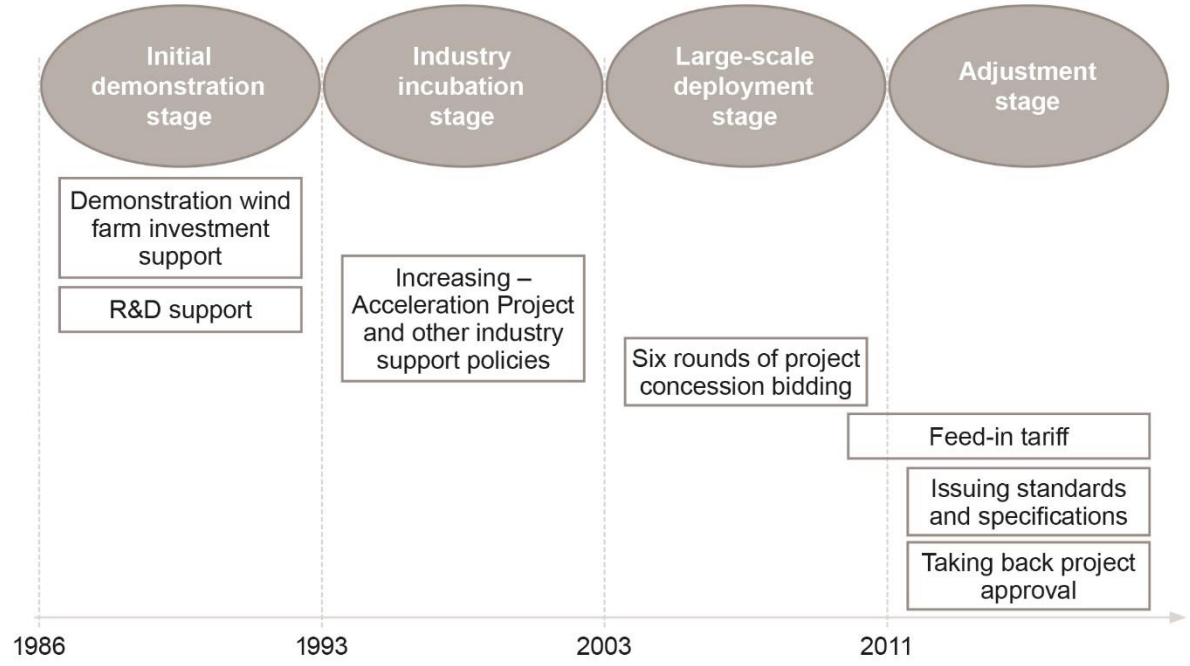
[7] The first six wind manufacturers were enterprises with strong manufacturing capabilities in related industries.

China's wind turbine manufacturing industry made substantial progress during this period. Before 2000, domestic brands were almost unknown, with a market share of less than ten per cent. By 2009, there were 43 Chinese wind turbine manufacturers and almost 200 enterprises manufacturing components including blades, gearboxes, generators, control systems, converters, spindles, hubs, bearings, and so on. Domestic manufacturers occupied 87 per cent of the incremental market in 2009 (Li, Shi and Gao 2010).[8]

2.2.4 Adjustment phase (2011–present)

Since 2011, underlying problems with grid connection and renewable generation integration have come to light. In terms of grid connection, the total installed capacity of wind power in 2011 was 62.4GW, while the grid-connected capacity was only 45.05GW, translating into an on-grid rate of only 72.2 per cent. The second problem is brownouts. National wind power lost more than 10bn kilowatt hours (kWh) in 2011 because of brownouts, and the total brownouts ratio was more than 12 per cent (Li Junfeng *et al.* 2012). As a result of these problems, the adjustment of wind power development became a policy priority. The central government took back the approval right for wind projects below 50MW and issued a series of grid connection standards. The wind power industry is transforming from extensive growth to qualitative growth. Wind power projects have been incorporated into integrated national planning.

Figure 2.3 Government policies in different stages of wind power development



Source: Adapted from Qi Ye (2013).

A review of the development of the Chinese wind power industry shows the vital role of central government in nurturing both wind turbine manufacturers and also the domestic wind power market. The government adopted a strategy of 'stimulating manufacturing industry through the domestic market' and implemented six rounds of tendering, which resulted in the rapid expansion of China's wind power manufacturing industry. The central government also learned from international experience and selected Germany's FIT model as its starting point for designing policy. Local government also played a significant role, however, with its

[8] The incremental market is the device market created by newly added wind power installations.

approval of numerous wind farms with a capacity below 50MW, driven by their desire to 'develop the local economy through wind resource' (Qi Ye 2013: 235–6).

2.3 Historical overview: solar photovoltaic (PV) power – the policies, manufacturers and the market

China is rich in solar energy; however, the government did not give much support to the domestic market for solar generation before 2009. The development of the solar power industry in China was largely driven by exports. For a long time the markets, both for the raw materials used to make PV cells and for the manufactured cells themselves, existed only overseas.

Compared to the state-dominated wind turbine industry, most solar manufacturing enterprises in China are privately owned. China's first solar cell manufacturer was incorporated in 1998, while the first production line of solar cells was put into operation in 2002, with a capacity of 15MW. However, because of the lack of domestic market demand, the solar industry remained small.

2.3.1 First period of expansion in PV manufacturing (1997–2008)

Once the Kyoto Protocol,[9] signed in 1997, had established targets for reducing greenhouse gas emissions, solar generation became the technology of choice for several European countries. Driven by their demand, the Chinese PV industry developed rapidly after 2004, when the targets came into force. By 2007, China had become the largest manufacturing country of PV cells and output reached 1,088MW (Figure 2.4).

From 2000, the central government began to increase access to electricity for residents in remote areas with PV systems, as well as other sources of renewable energy. It launched projects such as Brightness Pilot Project (in 2000) and Township Electrification Program (2001–03). These projects initiated the development of a domestic PV manufacturing industry. By 2003, new installations of PV in China reached 10MW and the annual output of PV cells reached 8MW (Li Junfeng *et al.* 2007).

The Township Electrification Programme promoted electricity supply to remote households by off-grid micro-hydro, wind and solar power systems in China. Investment in this programme totalled 4.7bn yuan (US$568m). Compared to micro-hydro and wind, solar technology faces higher costs and, depending on the type of installation, the challenge of replacing batteries later on. After this programme ended, the central government stopped its support for solar power projects. Most solar power systems built between 2004 and 2008 were financed by international donors or cooperation project funds.

2.3.2 Second period of expansion (2009–11)

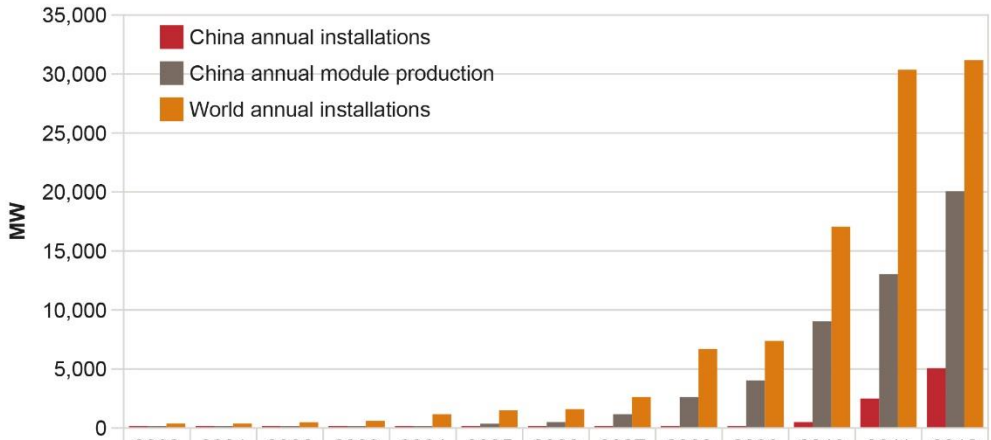
China's PV industry experienced its second rapid expansion period between 2009 and 2011. Many countries implemented new energy policies as part of their economic stimulus plans following the global economic crisis of 2008, and the global demand for PV technologies again soared. A prosperous international market obscured financial risk and PV manufacturers were all vying to expand their capacity. Technological development within the industry stalled at this time. By the end of 2010 there were between 20 and 30 polysilicon enterprises, more than 60 wafer enterprises, more than 60 cell enterprises, and more than

[9] The Kyoto Protocol is an international treaty that extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC), which commits state parties to reduce greenhouse gas emissions, based on the premise that (a) global warming exists and (b) man-made CO2 emissions have caused it. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997, and entered into force on 16 February 2005. There are currently 192 parties to the protocol.

330 module enterprises along the production line in China (Li Junfeng 2011). By the end of 2011, total production capacity was about 40GW, while new global installation was only 28GW (Fan 2012).

The Chinese government launched the first 10MW PV concession-bidding project in 2009, and the second round of 280MW projects was launched in 2010. In 2011, the central government established a FIT for solar generation. New installed domestic capacity reached 2.2GW, while 83 per cent of products were exported to overseas markets.

Figure 2.4 China's PV production, domestic market and European markets, 2000–12



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
China annual installations	19	5	19	10	10	8	10	20	40	160	500	2,500	5,000
China annual module production	2.8	4.3	15.3	8	50	200	438	1,088	2,623	4,011	9,000	13,018	20,000
World annual installations	303	365	471	584	1,133	1,411	1,582	2,576	6,708	7,376	17,064	30,391	31,095

Sources: Authors' own, based on: 2000–3 output data: Wang, Wang and Zhao (2004); 2004–9 output data: China Renewable Energy Society (2010); 2010 output data: SEMI/PVGroup/China Photovoltaic Industry Alliance (CPIA) (2011); 2011 output data: Photon International (2011); 2012 output data: SEMI/PVGroup/CPIA (2013); newly increased installation data of domestic market and European market 2000–12: European Photovoltaic Industry Association (EPIA) (2013).

2.3.3 Period of depression (2012–present)

Since Q4 2011, excessive competition in the export market and substantially reduced financial subsidies have resulted in a drop in the sale price of exported PV cells and modules to below their manufacturing costs. So far, Chinese PV manufacturers' profits have comprehensively fallen. Many have experienced financial difficulties, and even the prospect of bankruptcy (Labwu 2012).

Due to the United States (US) financial crisis and the European debt crisis, more and more countries have cut public subsidies for PV power generation, and this has greatly impacted the export of China's PV industry. Moreover, trade protectionism is rising. The US Department of Commerce announced a preliminary ruling to impose high anti-dumping duties on PV cells and modules imported from China in March 2012. In July 2012, German firm SolarWorld filed a complaint with the European Commission, asking for an anti-dumping investigation into PV products imported from China. Undoubtedly, the US and EU anti-dumping and countervailing tariffs were a serious blow for the Chinese PV industry. In 2013, the entire industry went into a phase of consolidation, featuring extensive mergers and acquisitions.

3 Financing landscape

This section provides an outline of where the investment for wind and solar power in China comes from and who the main investors are. This then provides a context for the case studies that follow.

3.1 Investment structure of wind and PV projects

There have been three main sources of finance for wind and solar projects: self capital invested by the developer, bank loans and subsidy from the central government. According to the 'State Council's Notice on Adjusting the Proportion of Equity in Fixed-assets Investment Projects', the minimum equity for power plant projects is 20 per cent of the total investment. As a result, wind and solar energy start-ups could borrow as much as 80 per cent of their investment. The *Annual Review of Low-Carbon Development in China 2013* shows in its analysis of nine representative developers that generally, wind generation projects have been financed with 20 per cent equity and 80 per cent loan (Qi Ye 2013).

The ratio is slightly different for building-mounted PV projects, where the 'Golden Sun demonstration' and building integrated PV subsidy programme (introduced in 2009 to encourage domestic uptake and manufacture of PV technology) pays 50 per cent of the required total capital for approved projects; the developer then invests 30 per cent and borrows 20 per cent from the bank.

Bank loans are the major source of finance for wind and PV projects. Of the total US$39.6bn invested in 2011, developers' equity investment accounted for 22.48 per cent, bank loans for 76.04 per cent and government subsidies for 1.47 per cent.

Table 3.1 Investment structure of wind and PV plants in 2011

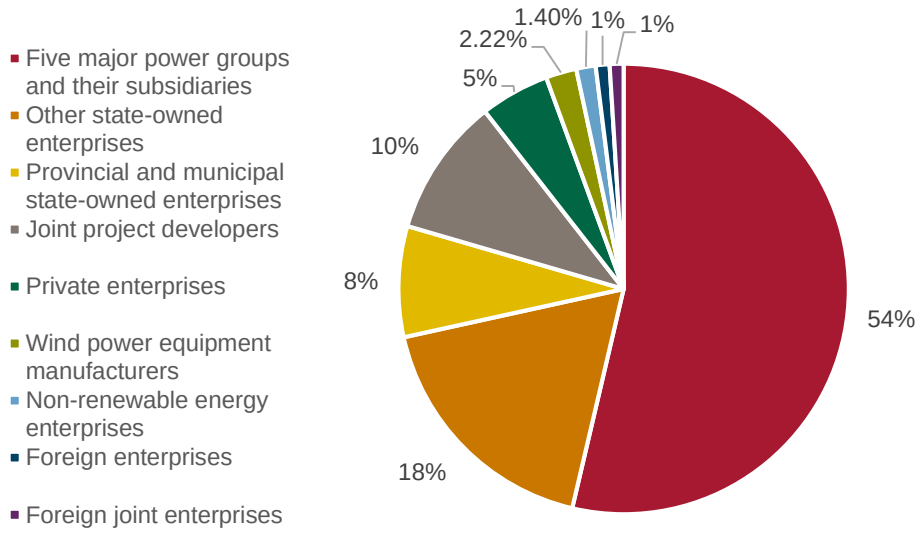
	New installation in 2011	Total investment	Own capital		Bank loan		Subsidy to distributed PV plants	
	GW	US$bn	US$bn	Ratio (%)	US$bn	Ratio (%)	US$bn	Ratio (%)
Wind power	17.6	28.2	5.64	20	22.56	80	0	0
PV power	2.331	11.4						
Ground-mounted PV systems	1.909	10.23	2.79	27.2	7.45	72.8		
Building-mounted PV systems	0.422	1.17	0.48	40.7	0.11	9.2	0.58	50
Total	19.93	39.6	8.91	22.5	30.12	76.06	0.58	1.46

Notes: (1) Total investment data is from the United Nations Environment Programme report (UNEP/BNEF 2012).
(2) PV power installation data is calculated by projects from the Bloomberg New Energy Finance (BNEF) database.
(3) The average exchange rate of yuan to US$ is 6.4588 (issued by the China Foreign Exchange Trading Center, which is authorised by the People's Bank of China).
(4) At the beginning of 2012, the China Development Bank (CDB), Agricultural Bank of China and Guangdong Development Bank issued documents to limit credit approval in PV manufacturing, wind power manufacturing and other overcapacity industries. In fact, according to our field survey, the PV manufacturers have not been able to get bank loans since 2011. Therefore, in our calculation, when the developer builds centralised PV plants, we assume 100 per cent of total investment comes from the developer. When the developer develops distributed PV plants, we assume that 50 per cent of total investment comes from the developer and the other half comes from government subsidy.
Source: Adapted from Qi Ye (2013).

3.2 Developers of wind and PV generation projects

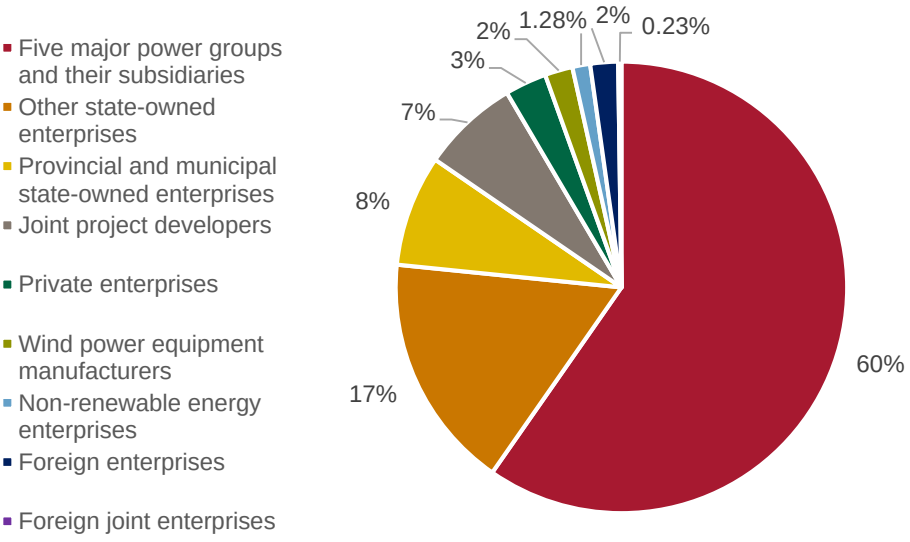
State-owned enterprises, including the five major power groups and their subsidiaries, and provincial and municipal state-owned enterprises, have been the main developers for both wind and PV projects. The state-owned enterprises invested 85 per cent of the total installed wind generation capacity in 2011 and 80 per cent of the total accumulated capacity. At the end of 2011, there were approximately 60 different state-owned enterprises (subsidiaries excluded) engaged in wind power projects (Li Junfeng *et al.* 2012). Joint venture project developers accounted for seven per cent of the domestic market in 2011; private enterprise, foreign enterprise and foreign joint enterprise accounted for three per cent, two per cent and 0.23 per cent of the domestic market respectively. Moreover, wind power equipment manufacturers also held two per cent of the market share of wind power generation (Figures 3.1 and 3.2).

Figure 3.1 Market share of accumulated installation – wind



Note: Period: 1 July 1996 – 11 June 2012.
Source: Adapted from Qi Ye (2013), based on data from BNEF (2014).

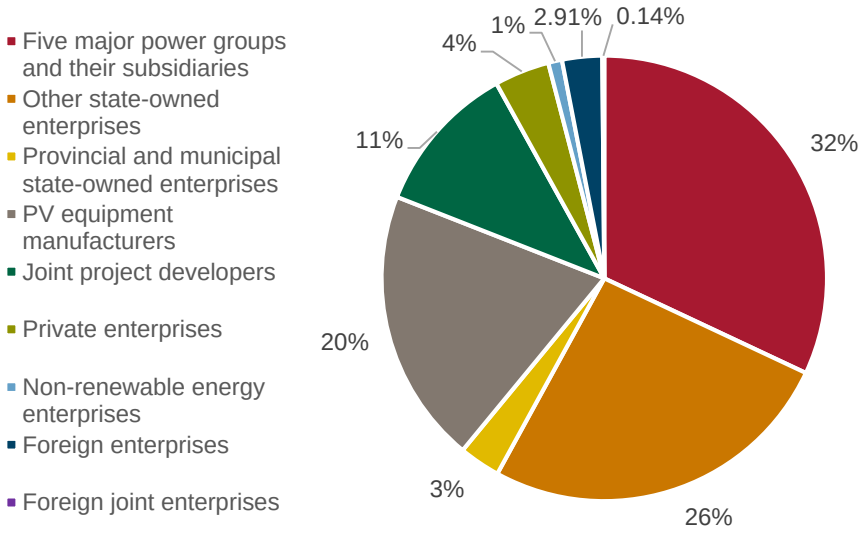
Figure 3.2 Market share of new installation in 2011 – wind



Source: Adapted from Qi Ye (2013), based on data from BNEF (2014).

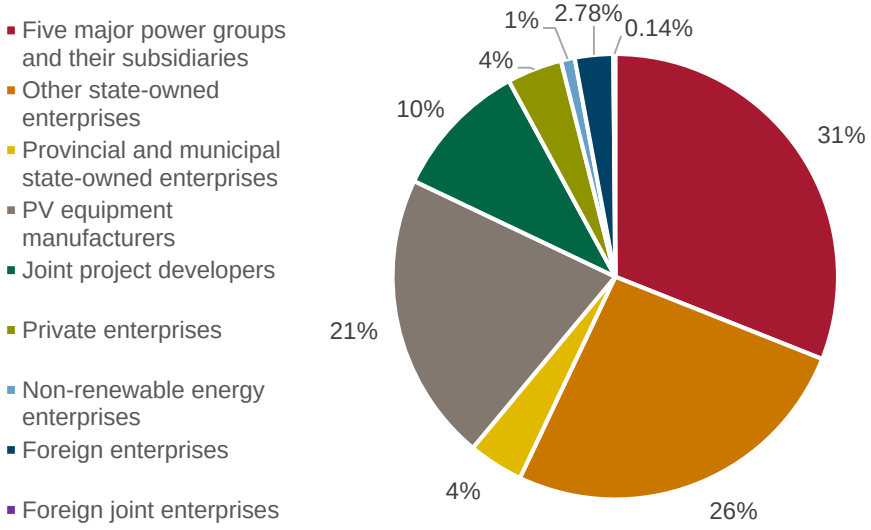
By comparison, developers have been relatively more diversified in the solar power market (Figures 3.3 and 3.4). In 2011, state-owned enterprises accounted for 61 per cent of both installed PV capacities and total accumulated PV capacity. PV equipment manufacturers' market share reached 21 per cent for new installed capacity, joint venture project developers accounted for ten per cent, while private enterprises and foreign enterprises accounted for four per cent and 2.78 per cent respectively.

Figure 3.3 Market share of accumulated installation – PV



Note: Period: 1 December 2003 – 11 June 2012.
Source: Adapted from Qi Ye (2013), based on data from BNEF (2014).

Figure 3.4 Market share of new installation in 2011 – PV



Source: Adapted from Qi Ye (2013), based on data from BNEF (2014).

The state-owned enterprises were easily able to get bank loans because of their long-established business relationships with state-owned banks, with their fixed assets and balance sheets to act as the loan guarantee. On the other hand, from the bank's perspective, finance for such projects is not an easy decision. One of the reasons for this is the unpredictability of government policy – for example, the value and duration of the FIT, which creates uncertainty about future returns.

3.3 Sources of finance

At the initial stage of wind and PV sector development, foreign governments provided grants for most of the projects. Such grants required the Chinese government to provide proportional match funding and to purchase the necessary units and equipment from the donor country. This is no longer the case now that domestic manufacturing capacity has grown. For example, in the Sino-German financial cooperation programme West Village Electrification (2001–10), from a total investment of €36.4m, the German government provided €26m, which the Chinese government matched with €10.4m. Most of the equipment was purchased from Germany (Qi Ye 2013).

The main finance channels for wind and PV power projects now are domestic bank loans, the stock market and bonds. Bank loans are the single most important source of funding for wind and PV power projects. Stock market financing has been popular among developers since 2009 and the issuance of bonds became an important financial channel after 2010.

3.3.1 Banks

Policy banks[10] and large state-owned commercial banks have been the main lenders to renewable energy project developers. At the moment, international loans, trust loans and other sources of capital are gradually entering renewable energy project development. The China Development Bank (CDB), as a policy-responsive bank, has the task of providing financial support for renewable energy projects. In 2005 it provided loans for seven wind power projects as a pilot demonstration. Subsequently, other state-owned commercial banks have opened up loan services to renewable energy projects.

Size of loans: It is estimated that approximately 300bn yuan in loans had been issued accumulatively by the end of 2011. By that time, CDB had issued 114.9bn yuan to the wind, PV and biomass industries, which helped to add 15GW of new installation in total (CDB 2012).

Length of maturity: Wind and PV project developers generally apply for long-term loans,[11] with loan maturity length typically between 10 and 15 years (including one year of wind/PV power system construction). Take Huaneng Renewables Corporation Ltd as an example: the long-term to short-term loan ratio for 2008, 2009 and 2010 was 66:34 per cent, 80:20 per cent and 78:22 per cent respectively.

Loan ratio: The loan ratio for centralised wind and PV projects is typically 80 per cent. Generally, 49.5MW is the typical capacity of a wind power project, which would need a bank loan of approximately 350m yuan. On the other hand, most of the centralised PV projects have a capacity of 10MW each, which would need a bank loan of about 170m yuan.

Type of loan: State-owned developers' credit loans account for a relatively high proportion. For example, Longyuan Power Group's credit loan ratio in 2011 was 69.1 per cent, of which the credit bank loan ratio stands at 73.5 per cent.

Parental company guarantee: When a subsidiary of a large state-owned enterprise requests a loan from the bank, its parent company will provide the guarantee. For instance, from 2008 to 2011, the guarantee ratio of Longyuan's parent company, China Guodian Corporation, has been 31.3 per cent, 1.8 per cent, 22 per cent and 35.2 per cent respectively.

[10] The Agricultural Development Bank of China, CDB and the Export-Import Bank of China were established as China's policy banks in 1994.

[11] A long-term loan refers to one with maturity above one year; a short-term loan refers to one with maturity equal to or less than one year.

Interest rate: In accordance with the promulgation of the 'Notification of People's Bank of China[12] regarding interest rate reduction' in 1996: 'a financial institute ought to adjust its loan interest rate in reference to the benchmark interest rate to industry (adjust downward, no adjustment, or adjust upward to a lesser extent), enterprises and products, and of those enterprises with higher credibility that are prioritised in the national policies'. Renewable energy generation is one of the priority industries according to national industrial policy and thus, in principle, enterprises are able to borrow at an interest rate ten per cent lower than the benchmark interest rate. Since June 2012, enterprises have been able to borrow with 20 per cent concession.

3.3.2 Stock market

Since bank loans account for almost 80 per cent of total investment in most renewable energy projects, the debt ratios of renewable energy developers are generally high, hence raising funds from the stock market is a common financial approach to improve their overall liability. Stock market finance has been an important source of finance for developers since 2009. By 16 August 2012, five enterprises had been listed on the stock market, raising a total of US$4.895bn. Longyuan Power Group listed on the Hong Kong Stock Exchange (HKEx) at the end of 2009, ranking the eighth-largest initial public offering (IPO) that year. However, the overall stock market outlook for the new energy sector has been pessimistic since 2010 and it has become difficult to raise a substantial amount of funds through this means. Launching after that time, Datang New Energy chose to be listed at a low issue price; Huaneng Renewables also lowered its issue price and increased the quantity of institutional investors.[13]

Table 3.2 Funds raised from the stock market by wind and PV project developers

Enterprise	Exchange	Date	Funds raised (US$bn)
Longyuan Power Group	HKEx	10 December 2009	2.594
Suntien Green Energy	HKEx	13 October 2010	0.4246
Datang New Energy	HKEx	17 December 2010	0.6812
Huaneng Renewables	HKEx	10 June 2011	0.8501
Huadian Fuxin Energy	HKEx	28 June 2012	0.3451

Note: Period: 1 July 1996 – 16 August 2012.
Source: Adapted from Qi Ye (2013), based on data from BNEF (2014).

3.3.3 Bonds[14]

In 2010, bonds became an important financial channel for project developers. In 2011, energy-related enterprises issued 100bn yuan bonds in China, with maturity between two and ten years, and interest rates between four per cent and six per cent accordingly. However, such financial tools are only available for state-owned enterprises. In 2001, the Hong Kong 'dim sum bond' market issued a total of 6.3bn yuan, with interest rates varying from 4.5 per cent to 6.4 per cent, although only 6 per cent of these bonds have been used for the wind and PV sectors (Bédin *et al.* 2012). Among the renewable energy developers,

[12] The People's Bank of China is the central bank of China with the power to control monetary policy and regulate financial institutions in China.
[13] Institutional investors are organisations which pool large sums of money and invest those sums in securities, real property and other investment assets. They can also include operating companies which decide to invest their profits to some degree in these types of assets. Typical investors include banks, insurance companies, retirement or pension funds, hedge funds, investment advisors and mutual funds.
[14] In finance, a bond is an instrument of indebtedness of the bond issuer to the holders. It is a debt security, under which the issuer owes the holders a debt and, depending on the terms of the bond, is obliged to pay them interest (the coupon) and/or to repay the principal at a later date, termed the maturity date. Offshore bonds are those issued abroad.

Longyuan Power Group issued 11.474bn yuan bonds in 2011, accounting for 19.4 per cent of its total investment finance that year. China Wind Power issued 750m yuan offshore bonds at an interest rate of 6.375 per cent in 2011.

To sum up: in China more than 80 per cent of wind developers and more than 60 per cent of solar developers are state-owned enterprises. Such institutions have long-term cooperative relations with the state-owned commercial banks and are their most important customers. (In the planned economy era (1949–78) the state-owned enterprises were the sole customers of state-owned banks.) Therefore, bank credit has always been the most important source of finance for China's renewable energy developers. The stock and bond markets are two important supplementary sources. The golden period for China's renewable energy developers and manufacturers to get finance on the stock market was 2006–09, as China enacted its Renewable Energy Law and promulgated the Medium and Long-Term Development Plan for Renewable Energy in China (2007–20) (National Development and Reform Commission 2007). These policies suggested long-term government support for renewable energy and gave confidence to interested investors. During this period, the venture capital/private equity institutions also played an important role as, full of optimism about the international renewable energy market at that time, they assisted renewable energy manufacturers and developers to get listed. After 2010, the stock market cooled down for renewable energy companies, and bond markets became an important alternative source of funds.

4 Case studies – the wind power sector

Based on Chinese wind energy investment data from the BNEF database, this research examined four case studies: three from the peak investment period (November–December 2007, April–October 2008, and September 2010–May 2011) and one from the lowest investment period (November 2011–present). The first case study is the public listing of China's largest wind turbine manufacturer, Goldwind Science & Technology, which occurred in the investment peak period November–December 2007. The second dates from another peak investment period, April–October 2008, when the market featured a significant increase in asset finance.[15] The third is from the peak investment period September 2010–May 2011, and the fourth is from a period of low investment in November 2011. We selected each case study based on its investment data, so that we can analyse the driving factors for its investors.

Figure 4.1 Investment in China's wind power industry, 2004–12

Source: Authors' own, based on data from BNEF (2014).

4.1 Wind power case study 1 – Goldwind Science & Technology listed on the public market

Goldwind – China's largest wind turbine manufacturer – is a typical case within China's wind turbine manufacturing industry and was one of the first turbine manufacturers to receive support from the Chinese government. On 26 December 2007 Goldwind was listed on the Shenzhen Stock Exchange, with 1.745bn yuan (US$238m) raised via IPO. It was China's first listed turbine manufacturing company. In this case study we analyse the development of Goldwind, focusing on each of its financing events, in order to identify the roles played by different stakeholders. Their roles and underlying motivations are further analysed in the light of the face-to-face interviews conducted, and by a review of the literature, in particular from the perspective of coalitions and alliances.

[15] Asset finance: all money invested in renewable energy generation projects, whether from internal company balance sheets, from debt finance, or from equity finance.

4.1.1 Goldwind's development

The Goldwind company was founded in 2001, evolving from its predecessor Xinjiang Wind Energy Company, affiliated with Xinjiang Department of Water Resources. Previously, Xinjiang Wind Energy Company had been responsible for the installation and operation of wind turbines donated by the Danish and German governments to Xinjiang. In 1997, the company imported technology from Jacobs, a German company, and started to manufacture 600kW wind turbines. This technology transfer was supported by research funds from China's Ministry of Science and Technology. In 1999, the first ten turbines were completed, of which six were installed in Goldwind's own wind farm, because there was hardly any market demand for wind turbines in China at that time. The Chinese government held its first round of concession tendering for wind power projects in 2003, when Goldwind won a large order to manufacture 100MW wind turbines. By the end of the sixth round of concession tendering in 2009, Goldwind was the supplier of 20 per cent of newly installed wind power capacity in China that year. Important events in the development of the company are recorded in Table 4.1.

4.1.2 Key actors, roles, priorities and challenges

The key actors in this case include: central government (including the State Council, Ministry of Finance, Ministry of Science and Technology and NDRC); a state-owned enterprise, Xinjiang Wind Energy Company Ltd; and a private company, Goldwind.

Central government

Central government played the role of policymaker. The priority of central government was to establish the manufacture of wind power equipment in China and nurture China's own companies. The support Goldwind received from the central government was twofold: stimulation of the domestic market, and funds for R&D.

Domestic market support

Before 2003, China's wind power development mainly depended on international grants. All wind equipment was imported because of China's lack of technology, equipment and professionals. In 2003 the NDRC initiated tendering for wind power concessions and required bidders to be consortia consisting of developers and wind turbine manufacturers. The required percentage of domestic equipment purchased was to be no lower than 70 per cent. The commission hoped to support the domestic manufacturing industry by expanding the domestic market.

R&D support

Goldwind undertook and accomplished the following national projects:

- the 9th Five-Year Plan key project 'R&D of 600kW Wind Turbine Manufacturing'
- the 10th Five-Year Plan project 'R&D of 750kW Wind Turbine'
- the National No. 863 research subjects 'R&D of 1.2MW Direct-Drive Wind Turbine' and 'R&D of MW-Class Wind Turbine and Key Components'.

In 2005 the NDRC approved a two-year grant of 220m yuan to support the development of the domestic industry for renewables. Establishing the manufacture of wind power equipment in China was one of the five key areas the grant supported. In 2008, Goldwind established the National Wind Power Engineering and Technology Research Centre.

Table 4.1 Goldwind – chronicle of events

Date	Event
1986	Xinjiang Wind Energy Company Ltd established. One of the earliest corporations in China with principal business in wind power plant construction and operation. Remains one of Goldwind's major stakeholders.
1989	Xinjiang Wind Energy bought 13.150MW turbines from Danish company Bonus with a US$3.2m grant from the Danish government, and set up Wind Power Plant No.1 in Daban City, connected to grid. Gained crucial experience of wind power plant operation and maintenance.
1994	Ministry of Electric Power Industry promulgated the 'Wind Power Plants Grid-Connected Operation Regulations' (trial): required grid companies to facilitate connection of wind power plants to the nearest grid and to buy their electricity.
1996	Through the German government's aid programme 'Gold Plan', the total installed capacity of wind power plants increased from 2.05MW to 6.1MW, including the two then largest turbines in China of 600kW. The introduction of different turbines enabled further Chinese R&D.
1997	Xinjiang Wind Energy imported 600kW wind turbine manufacturing technology from Jacobs in Germany.
1998	Xinjiang New Wind Science & Engineering Trade Corporation established. With the support of the Xinjiang Uyghur Autonomous Region's Department of Science and Technology, the Ministry of Science and Technology provided a 3m yuan research fund for Xinjiang New Wind, Xinjiang Wind Energy and Xinjiang Wind Power Research Institute to undertake the 9th Five-Year Plan scientific and technological project – R&D of 600kW Wind Turbine Manufacturing.
1999	Successful development of 600kW turbines: ten manufactured. The whole development process cost more than 40m yuan, of which 20m yuan was from loans, and 3m was a grant from the Ministry of Science and Technology.
26 March 2001	Xinjiang New Wind Science & Engineering Trade Company reorganised as Goldwind Corporation. Its registered capital was 32.3m yuan: 72% from state-owned shares,[a] 1.27% from public shares,[b] and 26.73% from 'natural person' shares.[c]
2002	Goldwind established assembling base of large-sized wind power turbines with annual production capacity of 200 sets of 600kW–750kW.
2003	In competition with the General Electric Company (GE) and Mitsubishi, Goldwind won the first wind power concession project in China and got a 100MW project from power company Yuedian in Guangdong province.
2005	Goldwind's first 1.2MW turbine put into operation in Daban City wind power plant.
2006	Goldwind achieved 33% of domestic market share. Its sales turnover ranked it as the number one wind turbine manufacturer in China and number ten in the world.
2007	The first five 1.5MW turbines put into operation in Daban City's wind power plant. Goldwind's capital increased to 450m yuan, among which the state-owned corporate shares accounted for 41.33%, the public corporate shares 23.64%, and the natural person shares 35.03%. Listed on the Shenzhen Stock Exchange in December, and general capital increased to 500m yuan.
2008	Goldwind won the concession tender with 810m kWh in Gansu Jiuquan city. It also purchased 70% equity of German company VENSYS and established R&D centres in Beijing, Xinjiang and Germany. First Chinese wind turbine manufacturer equipped with fully independent R&D capacity and intellectual property rights. Its products were also sold on the international market.
2010	Goldwind listed on Hong Kong Stock Exchange: 454,544,000 shares issued priced at HK$17.98 (US$2.32); HK$8bn (US$1.03bn) was raised.
2011	Goldwind signed 'strategic cooperation agreement' with Industrial and Commercial Bank of China, gaining 10bn yuan financing credit to support projects and operations.

Notes: [a]State-owned corporate share owners refer to state-owned enterprises; [b]public corporate share owners refer to private enterprises, including private equity funds; [c]'natural person' share owners refer to natural persons,[16] e.g. Mr Gang Wu, the company founder and legal representative.
Source: Goldwind (2014).

[16] Natural person: in jurisprudence, a natural person is a real human being, as opposed to a legal person which may be a private (i.e. business entity) or public (i.e. government) organisation. In many cases, fundamental human rights are implicitly granted only to natural persons.

The major challenge faced by central government for the development of renewable energy included a lack of relevant technology, talent, equipment and knowledge. By working with Goldwind the government began to meet this challenge. For example, Xinjiang Wind Energy spent eight years (1988–96) learning how to install and operate wind farms, learning about the technology and then training the first batch of wind power technicians. After the introduction of the German 600kW wind turbine in 1996, Xinjiang Wind Energy began to research and develop new models in cooperation with international research institutions (for example, VENSYS in Germany). In 2008, Goldwind acquired a 70 per cent stake in VENSYS and embarked on the road of independent research.

Local government – Xinjiang government

Xinjiang government also played the role of policymaker. Its priority was to support the manufacturing sector led by Goldwind. Local government faced the same challenges as the central government.

State-owned enterprises – Xinjiang Wind Energy Company and others

State-owned enterprises played the role of investors. When Goldwind was founded in 2001, the state-owned corporate share was 72 per cent. Xinjiang Wind Energy Company was a subordinate organisation of Xinjiang Department of Water Resources. Before 1997, the company conducted various activities including owning petrol stations, but after Goldwind won the 100MW project in the first concession tender in 2003, wind power became its primary business. The priority for state-owned enterprises is profit.

Goldwind

Goldwind played the role of policymaker and beneficiary. The company was invited to participate in designing the policy and process of concession tendering. Other participants included central government, local government and the grid companies (interview 1). Goldwind was also the beneficiary of this concession tendering policy (Table 4.2).

Table 4.2 Goldwind's share of onshore wind power concession tenders

	Year	Bid scale (MW)	Tender won by Goldwind (MW)
First tender	2003	200	100
Second tender	2004	300	N/A
Third tender	2005	450	N/A
Fourth tender	2006	700	200
Fifth tender	2007	950	300
Sixth tender	2009	5,250	1,300.5

Source: Goldwind (2014).

The priority for Goldwind was production. The challenges for the company included a lack of experience, technology, market and business model. In the early days, China had no wind turbine manufacturing enterprises and lacked experience. Compared to many better-developed regions in China, Xinjiang was remote, with a poor science and technology environment and substandard transport. At the time, China's wind turbines depended on international grants; therefore, the domestic market was quite small. As a company located in Xinjiang, Goldwind had to find ways to overcome such difficulties. Another issue confronted by Goldwind was its business model. The company focused on R&D and marketing, and its manufacturing business was limited to equipment assembly, which largely relied on suppliers of machine parts and components.

From a technological perspective, Goldwind learned from purchasing and studying foreign technologies. Then Goldwind began to cooperate on R&D with VENSYS, until it purchased

its 70 per cent stake in the company in 2008. All of these measures were taken to overcome the technological constraints step by step.

In terms of sales, Goldwind did not have a domestic market until 2003, and sold only several sets of its product before this date. R&D began in 1997. In 1999, Goldwind developed and produced ten sets of 600kW wind turbines, four of which were sold to Xinjiang Wind Energy and six of which were kept as Goldwind's own assets. An army troop in Xinjiang bought two sets in 2000 and Chengde Power Industry in Hebei province ordered six sets in 2001. However, in the first round of concession tendering held by the central government in 2003, Goldwind became the equipment supplier to the Guangdong Huilai Shipaishan 100MW wind power plant and sold 167 wind turbines. In the following years, the rapidly expanding domestic market provided many more opportunities for Goldwind's development.

4.1.3 Nature of engagement and relationship with other stakeholders

While developing policy and working out how to organise the tenders for wind plant concessions, the central government and the manufacturing industry developed an informal alliance (interview 1). China's central government decided to develop a domestic wind turbine manufacturing industry by stimulating the domestic market. The concession tender policy was developed jointly by the central government, local government, grid companies and wind turbine manufacturers. China's goal was not only to support a domestic manufacturing industry, but also to establish the country's own brand of wind turbine manufacturers. Therefore, the wind farm concession tender policy required consortia of manufacturers and developers, and stipulated that 70 per cent of the equipment had to be manufactured locally. These requirements blocked international manufacturers from China's wind power market. For this reason, in the first wind power concession tender, although Goldwind had only four years' experience of wind turbine manufacturing, it still won – beating foreign companies GE and Mitsubishi, which had far more experience.

Table 4.3 Goldwind – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Central government	Public	Central	Establishing manufacture of wind equipment in China	Technology, HR, equipment and experience of renewable energy development	Long-term/ strategic, informal	High
Xinjiang government	Public	Local	Supporting manufacturing sector led by Goldwind	Technology, HR, equipment and experience of renewable energy development	N/A	Low
State-owned enterprises	Public	Local	Profit	Experience, technology, market, business model	Formal	High
Goldwind	Private	Local	Production	Experience, technology, market, business model	Long-term/ strategic, informal	High

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

4.2 Wind power case study 2 – investment peak, April–October 2008

April to October 2008 was one of China's wind power investment peak periods (see Figure 4.1). It featured investment in asset financing – i.e. investment focused on the development of wind farms. During this period, China had not yet introduced its FIT for wind power generation. What motivated the investment in wind farms? This case study attempts to identify the main drivers of wind farm investment during this period, and how they were created.

4.2.1 Main drivers of wind farm investment, April–October 2008

Prior to April 2008 there were two events that had a major impact on Chinese wind power development. The first was the enactment of the Renewable Energy Law and its supporting policies. The law was a strategic policy which did not include implementation guidelines and further rules. Supporting policies were gradually introduced, including important ones on cost-sharing, establishing a renewable energy fund, grid access, and so on (see Section 2.2, and Table 4.4). These policies provided the legal basis for the grid connection of wind farms. Another key event was the change to the rules for the fifth concession tender which was conducted from August 2007–February 2008. The FIT set by the tender was high enough for developers to be sure of making a profit. The tariffs set by these projects were also to be used as a reference price for wind power projects in neighbouring areas. The increase in the tariff stimulated the construction of wind farms during this period.

Table 4.4 Investment peak April–October 2008 – chronicle of events

Date	Event
1 January 2006	Renewable Energy Law came into effect, with goals to increase energy supply, improve energy mix, ensure energy security and protect the environment.
4 January 2006	NDRC issued the 'Interim Measures on Renewable Generation Tariff and Cost Sharing Management' and directed its pricing department to set a nationwide renewables surcharge to be levied on electricity price at a uniform rate based on consumption.
30 May 2006	Ministry of Finance promulgated 'Interim Measures on the Renewable Energy Development Fund'. Central government fund for renewable energy established.
25 July 2007	State Electricity Regulatory Commission enacted 'Measures on Grid Company – Full Amount Purchase of Renewable Generation'. Required grid companies to connect wind farms to grid and buy the electricity they generated.
31 August 2007	The State Council released the 'Medium and Long-Term Development Plan for Renewable Energy in China'. Set a target of 10% of China's primary energy consumption to come from renewable energy sources, including hydropower, wind and solar by 2010; 15% by 2020. Allocated a quota for renewable energy development by large energy enterprises and grid companies.
August 2007–February 2008	Fifth concession tender of four wind power projects with a total scale of 700MW. NDRC changed rules: average value of FIT offered for constructing the wind farm would be calculated, and bidder with offer closest to the average would win (previously, went to lowest bidder). Wind farms could now be operated profitably.

4.2.2 Key actors, roles, priorities and challenges in the Renewable Energy Law's legislative process

The key actors in this case include central government (State Council, National People's Congress (NPC), NDRC, local government (provincial people's congress), state-owned enterprises (grid companies, energy enterprises, wind farm developers), and other institutions (universities, research institutes, enterprises, non-governmental organisations).

Central government

Central government was the legislator. The Renewable Energy Law was proposed by the Standing Committee of the NPC, while the congress's Environmental and Resources Protection Committee consigned the drafting work to the NDRC. The national congress played the most important role as the legislature. During the World Summit on Sustainable Development held in Johannesburg, South Africa, in 2002, China's delegation was headed by the prime minister whose delegation also consisted of national congress members. Renewable energy development was one of the focus topics of this conference, and the 'Action Plan of the World Leaders' Summit on Sustainable Development' presented at the meeting proposed to provide electricity access to three billion people worldwide with renewable generation. In 2003 the Standing Committee listed the development of the Renewable Energy Law in its agenda and asked its Environmental and Resources Protection Committee to organise the drafting (Table 4.5).

Table 4.5 Development and adoption of China's Renewable Energy Law

Date	Event
June 2003	NPC Standing Committee listed the development of the Renewable Energy Law in its agenda of the year, and asked its Environmental and Resources Protection Committee to organise the drafting.
August 2003	As requested by NPC's Environmental and Resources Protection Committee, NDRC developed and proposed the first draft.
August 2004	Environmental and Resources Protection Committee completed the second draft, and circulated it among over 100 institutions, including State Council departments, different ministries, people's congresses of provinces, autonomous regions, municipalities directly under the State Council, as well as universities, research organisations, businesses and community groups, for comments.
November 2004	Renewable Energy Law (draft) was submitted to NPC Standing Committee for approval.
December 2004	The 13th meeting of the NPC Standing Committee conducted its first evaluation of the Renewable Energy Law (draft).
February 2005	The 14th meeting of the NPC Standing Committee conducted its second evaluation of the Renewable Energy Law (draft), voted and passed it on 28 February 2005. President Hu Jintao signed Presidential Decree No.33, which enacted the law. The law came into effect on 1 January 2006.
April 2005	NPC Standing Committee sent an official letter to the State Council, requesting the latter to initiate and coordinate the development of 12 regulations and technical specifications in order to support the implementation of the Renewable Energy Law.

In formulating the Renewable Energy Law, the major barrier the NPC's Environmental and Resources Protection Committee encountered was lack of knowledge on the subject. As a result, the drafting work was delegated to the NDRC, then further to the commission's Energy Research Institute. It only took the institute a year to develop the first draft as it was already experienced in renewable research. The consultation on the first draft was wide: as well as being sent to all the government institutions (both national and local), universities, research organisations, etc., it was also put online for comments and suggestions from the public, including international organisations.

Local governments, state-owned enterprises, other institutions

These institutions provided comments, and hence contributed to the development of the Renewable Energy Law. They were mostly government institutions and state-owned enterprises, whose priority is to provide political support.

In the Renewable Energy Law formulation and review process, it was unusual that all stakeholders showed unanimous support. As a result, the law's development only took a year and a half, and the voting at the NPC Standing Committee also went very smoothly. Normally a law could not be passed until its third evaluation due to objections, yet this one was passed unanimously at its second evaluation. The whole process took less than two years, which is rare in China's legislative history.

Stakeholders supported the law for two reasons. Firstly, the scale of the renewable energy industry was too small at the time to threaten other stakeholders such as thermal power companies, grid companies, etc. Grid connection was discussed and grid companies had no objection, as the generation amount was hardly significant. Secondly, there was no administrative institution for renewable energy and no vested interests. This led to the efficient development and promulgation of the law (interview 1).

4.2.3 Key actors, roles, priorities and challenges in the fifth concession tender

The key actors in the concession tender process include central government (NDRC) and the private sector (wind developers and manufacturers).

Central government

The central government's priority during this period was to provide developers with a reasonable regional FIT for wind generation through tendering. For the first to fourth concession tenders, a lowest-price policy was adopted, where bidders who offered the lowest price for constructing and running the wind farm would win. This led to malicious competition, where some enterprises bid much lower than cost just to seize the opportunity to enter the sector. Prices paid in the first to fourth tenders were all much lower than needed for the project to be viable. Private companies who won the tender with a very low price seized the right for development yet did not actually start development for a long time.

The NDRC's change of the rules for the fifth concession tender was critical in that for the first time, it made it possible for the companies who built and operated wind farms to make a profit. It was the result of persistent lobbying by the developers, equipment manufacturers and research institutes. Instead of the lowest price winning, the bidder who offered the price closest to the average of all those offered won. This, with the help of carbon revenue via the Clean Development Mechanism,[17] resulted in a reasonable return for the developers/operators. As a result, China's domestic wind power market started to bloom.

Private sector – wind developers and manufacturers

The private sector's priority was to pursue financial rewards. Its challenge during this period was fierce competition.

China's wind industry developers and manufacturers had considerable lobbying power. Developers and manufacturers had a very strong network of relationships, as leaders of large enterprises usually had close relationships with government officials. They also built networks with research institutions and universities via research cooperation. In order to persuade the NDRC to change the concession tender rules, wind power developers and manufacturers lobbied together with research institutions and government officials from other institutions. The alliance succeeded. On the other hand, this also showed the lack of other

[17] Clean Development Mechanism: 'The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol… to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO2, which can be counted towards meeting Kyoto targets' (United Nations Framework Convention on Climate Change 2014).

political means to change government policy, so lobbying behind the scenes was their only option.

4.2.4 Nature of engagement and relationship with other stakeholders

In the Renewable Energy Law formulation and review process, no alliance was formed. Although the first draft was circulated extremely widely, those to whom it went were almost all dependent in some way upon government (not least, financially) and so usually offered it their political support. On the other hand, the scale of the renewable energy industry was too small at that time to threaten other stakeholders such as thermal power companies, grid companies, etc.

In the process of changing the rule for the fifth concession tender, wind developers, wind turbine manufacturers, research institutes, and government officials formed an informal alliance. As the 'lowest price wins' rule of the first four concession tenders resulted in malicious competition and made it impossible to make a profit, wind project developers and turbine manufacturers began to lobby the NDRC; in the process of lobbying, research institutions and some government officials joined the lobbying team. Objectively speaking, the purpose for these research institutions and government officials was not merely to protect the interests of developers and manufacturers; their concern was about how to make China's wind industry viable. Local government officials were more concerned about the impact of wind project development on local taxes, because if the wind plant failed, it was unable to contribute to local tax revenue. Although the motivation of the stakeholders varied, they all wanted to have a reasonable price for the wind farm developers and operators, and had reached a consensus in this regard. However, such an alliance is short term by nature, and no permanent institution was set up to express their interests and demands, so it remained an informal coalition of interests.

Table 4.6 Investment peak April–October 2008 – information matrix

Actor	**Nature of ownership**	**Location**	**Priority[a]**	**Drivers and challenges[b]**	**Engagement and relationship with other stakeholders[c]**	**Degree of influence[d]**
Central government	Public	Central	Energy supply, energy structure, energy security, environment protection, sustainable development	Information imbalance	Short-term/ strategic	High
Other institutions	Public	Local	Political support	N/A	Short-term/ strategic	Low
Developers, manufacturers	Private	Local	Market share	Financial rewards	Short-term/ strategic	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

4.3 Wind power case study 3 – investment peak, September 2010–May 2011

From September 2010 to May 2011, investment peaked again for wind project development (Figure 4.1). From the perspective of funding sources, this peak also featured asset finance. This was the highest peak of all between 2004 (when large-scale deployment began) and 2013, in what was the main period of investment in the wind industry. As Chinese wind farm developers acquired about 80 per cent of their investment capital from bank loans, so the peak in investment also indicates a peak in financing assets with bank loans. In addition, the nine months from September 2010 to May 2011 also featured the investment of extensive funds from the stock market. We selected this period for a case study in order to find out what the drivers of increased investment from both sources were, and whether alliances were formed for this.

4.3.1 Major drivers for the investment peak during September 2010–May 2011

Judging from the policies and major events listed in Table 4.7, increased investment in this period was driven by three main factors.

Table 4.7 Investment peak, September 2010–May 2011 – chronicle of events

Date	Event
1 August 2009	NDRC set differentiated tariffs per kWh for onshore wind generation based on four wind energy zones: 0.51 yuan (US$0.075, £0.05), 0.54 yuan, 0.58 yuan and 0.61 yuan (significantly higher than the average rate of 0.34 yuan/kWh paid for coal-generated electricity).
22 January 2010	NEA and the State Oceanic Administration (SOA) jointly issued 'Tentative Measures for the Implementation and Management of Offshore Wind Power Development and Construction', marking the start of China's offshore wind power development.
April–September 2010	NEA held the first concession tender for offshore wind projects; total capacity of 1,000MW. The winners were: Sinovel Wind Group (Binhai and Sheyang), Shanghai Electric and Shandong Luneng Group (Dongtai), and Goldwind (Dafeng).
28 May 2010	The State Grid Company announced plans for grid connection and electricity transmission for seven major wind farms: Hami, Jiuquan, Hebei, Jilin, Jiangsu, Mengdong and Mengxi (in total, 60% of installed capacity nationwide).
1 October 2010	Ming Yang Wind Power Group listed on the New York Stock Exchange; raised US$0.35bn.
8 October 2010	Goldwind listed on the Hong Kong Stock Exchange; valued at US$7.8bn.
10 October 2010	State Council promulgated 'Decision of Accelerating the Cultivating and Developing of Strategically Important Emerging Industries', and encouraged banks to lend to them, including for renewable energy generation.
2010	CDB offered credit lines worth US$43.6bn to renewable energy manufacturing companies, including solar panel producers (LDK Solar, Suntech, Yingli Solar and Trina Solar) and wind turbine makers (Sinovel and Goldwind), each borrowing US$6.5bn on average.
13 January 2011	Sinovel Wind Group listed on Shanghai Stock Exchange; raised 9.459bn yuan.

Sources: NetEase Finance (2010); Financial Community (2011).

Firstly, strong positive signals were given by various wind sector-specific government policies, including setting a tariff for onshore wind generation, plans made for developing seven wind generation bases, and the holding of a concession tender for offshore wind

projects, among others. The set tariff made the revenue to be earned from wind farms predictable.

Secondly, central government introduced its policy of developing seven 'strategically important and emerging industries', naming the renewable energy industry as one of them. The government encouraged financial institutions to provide support for these industries, with the CDB – as a policy bank tasked with helping to implement government strategy – taking the first move in providing loans.

Thirdly, international capital flows increased, with a notable increase in the open market. In the context of the international financial crisis of 2008, a large amount of international investment was attracted to China's wind industry because, as explained above, the Chinese government had provided very clear support for the industry, and the industry itself looked very promising (interview 2).

4.3.2 Key actors, roles, priorities and challenges

The key actors in this case include central government (NDRC, NEA, SOA), local government, the CDB and other state-owned banks, and the private sector (wind turbine manufacturers, wind power developers).

Central government

Central government was the policymaker. During this period, the priorities of the central government were to increase energy supply, upgrade the energy mix, and address climate change; sustain economic growth and find new opportunities for growth. The introduction of a wind generation tariff and inception of an offshore wind power market were expected to serve the first three goals, while the economic goals were addressed through the 'Decision of Accelerating the Cultivating and Developing of Strategically Important Emerging Industries', developed in 2009 and launched in 2010, during the continuing international financial crisis.

The major problem for wind farm development during this period was cross-management. Onshore wind farm management was hampered by conflicts between central and local government. The latter approved a vast number of projects which resulted in uncontrolled expansion of installed capacity. Central government developed its renewable energy development plan based on grid connection capacity, but the number of wind farms far exceeded this. According to the 'Medium and Long-Term Development Plan for Renewable Energy in China', installed capacity of wind power would reach 5GW in 2010, yet in fact this goal had already been achieved in 2007. In 2010 the cumulative installed capacity of wind generation surged to 44.7GW. Local government approved too many wind power projects: although it encouraged the rapid development of the wind power market in terms of manufacturing, it also created a bottleneck for grid access.

For offshore wind development, the problem was conflicts between different authorities. The 'Medium and Long-Term Development Plan for Renewable Energy in China' was implemented by the NEA, while the oceans were managed by the SOA. In addition, a large area of the ocean was also managed by the military. Such bureaucratic divisions made construction of offshore wind farms very difficult. For instance, after the first round of tendering for offshore wind projects, the winning bidders did not start to construct offshore wind farms as planned, because the NEA had not yet reached an agreement with the SOA. Therefore, the latter did not approve the construction of offshore farms. This inevitably led to increased construction costs.

The main challenge for the central government in this period, however, was the economic slowdown. From 2008 the international financial crisis curbed China's heavily export-dependent economy. To recover, China enacted its stimulus package of 4tn yuan in

November 2008, and began its support of 'strategically important and emerging new industries' in 2009.

Local government

The priority for local governments was to pursue economic development in their area, largely because economic growth is a significant element in the performance evaluation of their officials. Wind farm construction involves a large amount of fixed asset investment, which significantly increases the total investment within a region – a key factor for the measurement of economic growth. So local governments had strong incentives to support the wind power industry, whose developers were mostly large state-owned enterprises with strong capital capacity. As a result, the various local governments vied with each other to build wind farms and approved a large number of projects, which led to excess capacity and considerable resource waste. Local government officials' concerns about their own prospects for promotion were therefore a key factor in the overcapacity of China's wind power industry.

China Development Bank and other state-owned banks

The China Development Bank was both policymaker and implementer. Its mission is to provide medium- and long-term credit and finance to implement the country's medium- and long-term national economic development strategies (CDB 2005). In this case, the bank's priority was to provide financial support to recently identified strategically important and emerging industries. At the end of 2009, bank officials met with representatives from the NEA, NDRC and the Ministry of Industry and Information Technology (MIIT), and signed cooperation memos with them. The bank was also invited to draft the State Council's 'Decision of Accelerating the Cultivating and Developing of Strategically Important and Emerging Industries' (Zhao 2012). In 2010, CDB lent substantial sums of money to companies in both the solar and wind power sectors (Jackson 2011).

In supporting the wind industry, the major challenge for the bank and other large state-owned commercial banks was their lack of knowledge about it. In fact, when CDB was offering large-scale loans to renewable energy industries, China's wind turbine manufacturing industry was already experiencing overcapacity (as was the PV). The MIIT pointed this out as early as 2009. However, its analysis was questioned by the Ministry of Science and Technology and did not receive any serious attention. The extensive loans offered by the bank in 2010 resulted in even further overcapacity of the two industries.

Private sector – turbine manufacturers and wind farm developers

The priority of turbine manufacturers and wind farm developers was to expand their market share. From 2010 to 2011, turbine manufacturers were busy with this. The biggest ones, such as Sinovel, Goldwind and Ming Yang, conducted two forms of attention-attracting activities: getting listed on the stock market, and bidding for the first round of concessions for developing offshore wind farms.

The challenge for turbine manufacturers was the serious oversupply of the whole industry, which induced fierce competition in the domestic market. In the light of such a highly competitive market in China, they all strove for capital expansion both at home and abroad.

4.3.3 Nature of engagement and relationship with other stakeholders

No coalition between stakeholders was found in this case study. The substantial loans offered to wind manufacturers were largely driven by central government policies. The CDB is a state-owned bank tasked to provide financial support to implement national strategy. From a political perspective, CDB is actually part of the central government and has obligations to function as a financial institution for the central government. In addition, large turbine manufacturers were also considered as borrowers promising a good return by state-owned commercial banks. The case study of Goldwind showed that the cooperation between banks and turbine manufacturers started as early as 1999.

In terms of the listing of wind turbine manufacturers and wind farm construction by overseas developers, it is a result of the free choice of international capital. No coalition was found for the companies' stock market listings either.

Table 4.8 Investment peak, September 2010–May 2011 – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Central government	Public	Central	Energy security, energy structure, climate change	Cross-management	Long-term/ strategic	High
China Development Bank	Public	Central	Political support	Lacking knowledge of wind manufacturing industry	Long-term/ strategic	High
Local government	Public	Local	Investment attraction, economic performance	Economic growth-dependent performance evaluation	Short-term/ tactical	High
Wind farm developers, turbine manufacturers	Private	Local	Market share	Fierce competition and red tape	Short-term/ tactical	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

4.4 Wind power case study 4 – investment trough, November 2011–present

Between 2004 and 2010, China's annual installed wind generation capacity growth rate was 117 per cent on average; however, negative growth began in 2011. Compared with the previous rapid growth in China's wind power industry, investments for the first time went into a trough, where they have remained since November 2011. What were the reasons for this falling off? This case study looks into the important events of this period to find out.

4.4.1 Reasons for the investment trough since November 2011

From July to August 2011, the NEA enacted three major policies for wind power development in the country. These policies required all onshore wind power projects to be subject to its approval, and it would implement an annual wind power development plan in order to bring development under its control. In addition, policies and norms were also adopted for wind power equipment manufacturers and wind farm development, construction and grid connections. These measures effectively cooled down the growth rate and kept the number of projects for that year under control. The NEA also raised the technical thresholds for grid connection of wind farms. In terms of offshore wind power development, it issued the 'Interim Measures for Development and Construction of Offshore Wind Farms', which made developing offshore wind power more difficult.

Table 4.9 Investment trough since November 2011 – chronicle of major events

Date	Event
July 2011	NEA began 'annual approval management' nationwide. It issued the 'Notice on Enacting the Schedule of First Batch of Wind Farms for the "12th Five-Year Plan" Period', which planned a total capacity of 26.83GW for the country, with 12.75GW that could be approved by central government and 14.08GW by local government. No additional projects outside the proposed list could be approved. NEA and SOA jointly released 'Interim Measures for Development and Construction of Offshore Wind Farms'. These measures: specified requirements for offshore wind farm planning, pre-feasibility and feasibility studies; allocated responsibilities to related institutions; set requirements for offshore wind farm construction and operation; and established the principle that offshore wind farms should be no less than 10km offshore, and no less than 10 metres deep with the beach being over 10km wide. Four offshore wind power projects had to relocate.
25 August 2011	NEA issued 'Tentative Method of Wind Power Development, Exploitation and Construction': local governments should examine and approve wind power plant projects following the construction and yearly development plan; any project that had not undergone this approval was ineligible for electricity price subsidies from the National Renewable Energy Development Fund; wind power licensing would be integrated into national unified planning; local governments could no longer license wind power plants below 50MW.
2011	Release of 18 technical standards for wind power projects, covering wind farm development cost calculation, wind power equipment manufacturing, grid connection design, wind generation quality tests, etc.

Source: Adapted from Li Junfeng *et al.* (2012).

4.4.2 Key actors, roles, priorities and challenges

Key actors in this case include central government (NEA and SOA), local government, and wind project developers.

Central government

Central government played the role of policymaker and regulator. The priority of central government was to control the rate of wind power development. Grid connection conflicts were becoming prominent in 2010, with 30 per cent of installed plants unconnected in that year. Moreover, the public started to question the quality of wind farm projects – the media reported the collapse of more than ten wind turbines (Li Junfeng *et al.* 2012). Therefore, in the 'Tentative Method of Wind Power Development, Exploitation and Construction', the NEA withdrew the authority for approval from local governments and made it part of national planning.

The major challenge at the central government level was cross-sectoral management of renewable energy. Offshore wind power development was particularly affected. The planning and approval process for offshore wind farms lay with multiple administrative agencies in charge of the ocean: fishing, shipping, military and environmental protection. The difficulties of coordination between them severely undermined offshore wind power development.

The division of approval rights for onshore wind farms was also a big problem. According to existing policy, provincial Development and Reform Commissions were entitled to examine and approve projects with a capacity of less than 50MW. As a result, many wind power plants with a capacity of 49.5MW had been constructed in order to avoid the national-level approval process. This contributed significantly to the disorderly development of wind power plants.

Local government
Local governments' interests were restricted. The central government enacted the annual schedule management of the country's wind power development, which deprived local government of its previous approval rights for wind farms with a capacity of less than 50MW, so reducing investment in, and the growth of, the local economy. Wind farm construction not only brought local government fixed assets and tax revenue, but its strong, heavily capitalised state-owned enterprise developers also tended to bring in associated investment for other projects.

The challenge for local governments was economic performance, which (as already stated) was a crucial measure of their officials' performance. Although local governments' behaviours are subject to various influences, the central government's evaluation of their performance is the most significant, and its methods of evaluation were drawn up during the period of transformation from a planned to a market economy – hence the emphasis on economic growth as a measure. In recent years, the central government has reduced the importance of economic indicators in their evaluation, but, in practice, they are still the most salient (interview 3).

Wind developers
Wind farm developers' interests also suffered. Access to the grid and selling the power they generated had been a problem; conflicts between developers and grid companies were on the rise. Although the NEA implemented the schedule for national wind power development, no guarantee was provided for grid connection and power sales. Because of such risks, the construction of some approved projects – for example, one in Gansu province by Longyuan Power Group – was delayed (interview 4).

For wind power developers, the most important consideration is, of course, profitability. They stop developing new projects when grid connection and power sales cannot be arranged.

There are two big risks for developing wind farms. Firstly, payment of the FIT is usually delayed by one year, which poses challenges for the developers' cash flow. It also makes banks hesitant to provide loans with tariff revenue as security. Secondly, policy changes made offshore wind projects particularly risky. The 'Interim Measures for Development and Construction of Offshore Wind Farms', released in 2011, introduced more detailed specifications. This necessitated the relocation of four offshore projects with a total capacity of 1GW approved in 2010 by tender concession. Construction of these four projects has still not started.

4.4.3 Nature of engagement and relationship with other stakeholders
In this case study, no alignments were found. Recession in onshore wind development investment was caused by central government control through the NEA's schedule. Offshore wind development investment slowed down because of specific policy changes.

In the wind power development process, the main stakeholders involved are central government, wind farm developers, wind turbine manufacturers, local governments, banks and capital markets. The central government acts as the guide for wind power financing, leveraging the involvement of various stakeholders through policy tools. In the four case studies in this chapter, the central government, in order to stimulate the manufacturing industry through the domestic market, conducted a series of concession tenders. An informal coalition was established between the central government, wind farm developers, wind turbine manufacturers and local government.

In addition, when local governments were approving wind farm constructions, they formed a coalition with wind power developers. Although the two had different sets of interests, both could be realised through the same project. As a result, interest exchange appeared between

the two. Local governments would generally provide wind developers with infrastructure, project approval, and assistance in grid access negotiation, while developers would make a commitment to make other investments unrelated to wind power. For local government, this is a very typical practice of 'exchange for local economic development through offering resource'. Such alliances were usually informal and short term, usually established in the course of project negotiation.

Table 4.10 Investment trough, November 2011–present – information matrix

Actor	**Nature of ownership**	**Location**	**Priority[a]**	**Drivers and challenges[b]**	**Engagement and relationship with other stakeholders[c]**	**Degree of influence[d]**
Central government	Public	Central	Control speed and scope of wind power development	Cross-sectoral management of renewable energy	N/A	High
Local government	Public	Local	Economic performance	Economic performance is critical in evaluation of government officials	N/A	Low
Wind developers	Private	Local	Market share, profit	Production cost and procedural cost	N/A	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

5 Case studies – the solar power sector

China's photovoltaic (PV) industry experienced a rather unconventional development pattern. In just ten years it achieved what other industries had taken 20–30 years to accomplish. Its first PV cell production line was established in 2002 with a capacity of 15MW. PV cells were exported to Germany and other European countries, driven by the targets for renewable energy supply agreed in the Kyoto Protocol of 1997, which came into force in 2004. A Chinese solar company was listed overseas for the first time in 2005, and by 2012 China had been the top PV producer in the world for six consecutive years, with production capacity reaching 40GW, while global new installed capacity was only 31GW (EPIA 2013). The overcapacity in the industry was clear, resulting in financing distress within the sector. In 2013 the entire industry went into a phase of consolidation, featuring extensive mergers and acquisitions.

According to the *Annual Review of Low-Carbon Development in China 2013* (Qi Ye 2013), there were three critical factors in the development of the PV manufacturing industry: technology, market and financing. The technology for solar power was, similarly to the development of the wind power industry, brought in from Germany, the US and other developed countries. The market was promising, driven by European and American demand, while once more local governments played an important role in financing the enterprises.

We have selected six case studies to examine the development of China's PV manufacturing industry and its domestic market, trying to find out the driving factors for the rapid development of the industry, its development models and the investment that made it possible, again drawing on the perspective of coalitions and alliances formed between government and the industry.

5.1 Solar power case study 1 – early stages of Suntech

Suntech was founded in 2001. It was China's first company to produce solar cells commercially. In 2005 it was listed on the New York Stock Exchange (NYSE), and its IPO brought in US$400m. It was China's first PV manufacturer to be listed overseas. But from 2011, Suntech's fortunes declined, resulting in a debt ratio of 79 per cent by the end of that year (Suntech Power Holdings Co Ltd 2012).[18] In March 2013, Suntech's creditor banks jointly submitted an application to the Wuxi Intermediate People's Court for the company's bankruptcy, as its bank loan debt had reached 7.1bn yuan. Suntech became China's first bankrupt PV manufacturer. In this case study, we focus on the role played by local government during the early stages of Suntech and analyse the drivers of Suntech's rapid development.

5.1.1 Major factors affecting Suntech's initial rise

The main stakeholders at the beginning included the company founders, the Wuxi municipality and seven state-owned enterprise shareholders. The role of the Wuxi municipality was to approach investors and convince them to invest in Suntech, and to coordinate the withdrawal of state capital prior to the company's NYSE listing. The role of the state-owned enterprises was to commit initial investment as shareholders and provide guarantees for bank loans.

[18] The debt ratio is defined as the ratio of total debt to total assets, expressed as a percentage, and can be interpreted as the proportion of a company's assets that are financed by debt.

Table 5.1 Suntech's early stages – chronicle of financial events

Date	Event
2001	Suntech established with initial registered capital of US$7.2m, of which the founder Shi Zhengrong[a] contributed US$0.4m, and held technology shares[b] of US$1.6m. Coordinated by the Wuxi municipality, seven state-owned enterprises invested US$5.2m; three of these were professional investment companies established by the Wuxi municipality.
2003	State-owned shareholders provided guarantees for Suntech's external loans. The chairman of the board, Li Yanren, took advantage of his political network and gained a low-interest loan of more than 50m yuan through the Wuxi Labor Bureau.
2001–05	Wuxi municipality received over 11 national, provincial and city-level research programmes for Suntech totalling 39.2m yuan. From 2003 to 2004, Suntech obtained funds from nine research programmes with the help of the Wuxi municipal government.
2005	Before Suntech was listed on the NYSE, state-owned shareholders withdrew their shares from Suntech with coordination from the Wuxi municipality. This was a crucial move for Suntech to become listed.

Notes: [a] Shi was born in Yangzhong, Jiangsu province, China. After completing his undergraduate degree at Changchun University of Science and Technology, he gained a Master's degree from the Shanghai Institute of Optics and Fine Mechanics, at the Chinese Academy of Sciences. He then gained a doctorate degree in solar power technology at the School of Photovoltaic and Renewable Energy Engineering at the University of New South Wales, Australia, and acquired Australian citizenship. In 2001 he returned to China and set up Suntech; [b]technology shares refer to contributing one's technology as capital investment.
Source: Adapted from He Yifan (2006).

5.1.2 Key actors, roles, priorities and challenges

The key actors in this case were Suntech, the Wuxi municipal government and seven shareholders with a government background.

Wuxi municipal government

Wuxi municipal government played the role of venture capital investor, coordinator and director of the board. In 2001 the Wuxi municipality persuaded three government-controlled companies and six state-owned enterprises to commit to invest in Suntech. Eventually, seven out of the eight companies contributed US$5.2m in total, accounting for 72.2 per cent of the shares. The founder invested US$0.4m and held technology shares equivalent to US$1.6m, accounting for 27.8 per cent of the shares. Suntech's state-owned shareholders included Wuxi Venture Capital Group, Wuxi High-tech Venture Capital Fund Managers, and Wuxi High-tech Venture Capital Company; all three of these were investment companies set up by the Wuxi municipality.

Starting in 2004, Suntech's founder began to plan for the withdrawal of the state-owned shares. He submitted a proposal to the Wuxi municipality suggesting the withdrawal of state-owned shares from Suntech, which was supported by the party-secretary of the Wuxi Municipal People's Congress Committee. The Wuxi municipality gave two principal provisos: firstly, in order to meet the listing requirements, state-owned shares should be withdrawn; secondly, the interests of all investing parties should also be met. As for the details of reaching a balance between these two provisos – i.e. when and how the company should compensate the shareholders – this was subject to agreement between the individuals involved. The founder began to negotiate with the shareholders and finally reached agreement with all of them in March 2005. Wuxi Venture Capital received the lowest return – still ten times as much as its initial investment (He Yifan 2006).

Li Yanren, former director of the Economic and Trade Commission in Wuxi city, served as chairman of the board at Suntech from 2001 as a representative of the state-owned shareholders. With the withdrawal of state-owned shares, Li Yanren left Suntech in 2004.

The Wuxi municipal government's priority was to develop a government investment model to foster high-tech enterprises. At the beginning of 2000, both central and local governments in China were trying to figure out how best to support high-tech companies. The Wuxi government was one of them. The municipality tried to create an innovative and entrepreneurial atmosphere for small- and medium-sized high-tech start-ups.

Wuxi city is located in Jiangsu province, very close to Shanghai, Nanjing and Suzhou. Surrounded by these megacities, the Wuxi government must find a way to make its local economy competitive. In 2000, its government established a venture capital investment company, Wuxi Venture Capital Group, to invest in high-tech start-ups. At that time, Wuxi's local government lacked knowledge of how to run such a company. Suntech was the first project that this venture capital company invested in. After Suntech, Wuxi government established a '530 Program' in which it promised to support 30 group start-ups within five years. Small- and medium-sized high-tech companies could apply for support under this scheme.

The Wuxi government was confronted with some major barriers when investing in Suntech:

Difficulties in market prediction
In 2000, China was generating too much electric power. Domestic demand was limited, so there was a problem of oversupply. Meanwhile, the international market was a mystery to Wuxi. Under such circumstances, the government sought advice from the senior technicians of the largest integrated-circuit chip manufacturer, China Huajing Electronics Group Co. It also organised a five-member team to study solar battery technologies and their production in Australia.

Difficulties in fundraising
Li Yanren, former director of the Wuxi Economic and Trade Commission, was now in charge of raising funds for Suntech. At first he approached private companies, but they were not interested. Then he went to state-owned companies. Eventually, Wuxi Venture Capital Group and Wuxi High-tech Venture Capital Company invested, followed by five other state-owned companies. US$6m was raised in total.

Seven shareholders with state-owned background
Seven state-owned enterprises became Suntech's investors. In addition to Wuxi's three investment companies, these were: Wuxi United Trust Company, Little Swan Group (manufacturer of washing machines), Mercury Group (a textile industry) and Wuxi Wo Group. These seven companies committed to invest with Li Yanren's coordination. Of course, Li's support for Suntech largely represented the support of the Wuxi municipal government.

The investors' priority in putting their money in Suntech was to provide political support for the government. The biggest challenge they faced was their very limited knowledge of solar technologies and the market.

Suntech
Suntech was the beneficiary and its priority was to attract investment. In October 2000, Shi Zhengrong, the founder of Suntech, had just arrived in Wuxi city. He presented his business plan to some government officials at Wuxi's Municipal Bureau on Science and Technology, hoping to get investment from the municipal government. Before this time, he went through negotiations on cooperation with the governments of Qinhuangdao, Dalian and Shanghai. His proposal was rejected by Qinhuangdao and Dalian. In Shanghai, Shi Zhengrong signed an agreement of intent.

In January 2001 Wuxi's municipal government decided to support his project. The company's registered capital was US$7.2m. The Wuxi government insisted on two conditions: firstly, Shi Zhengrong had to invest a proportion of cash; secondly, his technology and achievements would all belong to the joint-venture company – he could not cooperate with anyone else for the same project. The result of the negotiation was that Shi Zhengrong had a 25 per cent shareholding, of which technology shares constituted 20 per cent, equivalent to US$1.6m, and cash shares were five per cent, worth US$0.4m. The seven companies with state-owned capital invested US$5.2m and they became the major shareholders.

Throughout its development, Suntech encountered many challenges including lack of capital, market unpredictability, management barriers, etc. During its start-up phase, however, capital was the major constraint. Li Yanren became the chairman of the board as the representative of Wuxi Venture Capital Group and Shi Zhengrong was the Chief Executive Officer. During the start-up period, Shi Zhengrong was responsible for marketing and management while Li Yanren was in charge of raising the necessary capital. In early 2003 the company began to seek loans. Li persuaded the shareholders of four of the state-owned enterprises to provide the guarantee for a loan of approximately 50m yuan. After that, Li took advantage of his political network and gained a low-interest loan of more than 50m yuan through the Wuxi Labor Bureau (He Yifan 2006).

5.1.3 Nature of engagement and relationship with other stakeholders

Wuxi's municipal government had informal relationships with Suntech. It secured investment for Suntech from seven state-owned enterprises. In terms of corporate management and decision-making, it participated by sending its former director of the Economic and Trade Commission to serve as Suntech's chairman of the board between 2002 and 2004 after he retired from the government. As a retired government official, Li Yanren represented the interests of state-owned company shareholders. Before Suntech sought to be listed on the public stock market, Wuxi's government coordinated the withdrawal of state-owned shareholders, and Li Yanren left Suntech.

Table 5.2 Suntech's early stages – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Wuxi government	Public	Local	Competitiveness	Market demand, technology potential, capital source	Short-term/tactical, informal	High
State-owned enterprises	Public	Local	Government influence	Political support	Short-term, informal	Low
Suntech	Private	Local	Investment	Capital, market, management, etc.	Short-term/tactical, informal	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

In this case, the local government's support for Suntech was predominantly informal except for the funds from research projects. Wuxi municipality did not directly invest in Suntech and was not one of the angel investors. Although the chairman was a retired government official who mobilised finance through government resources, he was not a formal representative of the Wuxi municipality itself. While the municipal government was coordinating the withdrawal of state-owned shares before the company was listed on the stock market, it only proposed

two guiding principles and left the negotiation to the shareholders. Nonetheless, the impact of the municipal government was profound. It played a very important role in the development of Suntech.

5.2 Solar power case study 2 – Suntech's foundation model copied by another company

After Suntech was listed in 2005, the Wuxi government's innovative support model became a hot topic in media reports. The model was copied by many municipalities in China to support solar companies, resulting in a rapid expansion of the industry. We selected another company, Canadian Solar, to analyse how the Suntech model was copied, and what the relationship between businesses and local government was.

Table 5.3 Canadian Solar – chronicle of financial events

Date	Event
November 2001	Incorporation of Canadian Solar in Canada. Factory established in Changshou, China. 2001–04, Canadian Solar focused on small PV products, e.g. vehicle-based solar battery chargers. Incorporation of Canadian Solar Inc. in Canada.
2004	Canadian Solar set up a branch in Suzhou for the production of PV cells and modules.
1 November 2005	Finance secured from a private equity investor, totalling US$8.1m (HOWbuy Private Equity 2005).
June 2006	Canadian Solar set up in Suzhou High-tech Zone.
November 2006	Listed on NASDAQ stock exchange, becoming the second PV manufacturer listed on an American stock market after Suntech, and first Chinese PV manufacturer listed on NASDAQ.
28 April 2009	Suzhou High-tech Zone Administration and Canadian Solar signed strategic cooperation agreement: Canadian Solar to increase capital and expand production, set up Chinese headquarters and R&D centre in Suzhou. Suzhou High-tech Zone Administration to support Canadian Solar to build solar power plants in its jurisdictions. First cooperation project was rooftop solar panels for two middle schools. Suzhou High-tech Zone Administrative Committee to help Canadian Solar to apply for subsidies from governments at all levels. The Bank of Communications, Industrial and Commercial Bank of China, and Bank of China signed a 15bn yuan credit support agreement with Canadian Solar (Zhan and Xu 2009).
9 September 2009	Suzhou government issued a circular on Leap Development Program for the new energy industry (wind, solar PV) and three other industries. In this circular, the Suzhou government publicised its support for the development of the new energy industries. Total industrial output of solar PV industry was worth 10.6bn yuan in 2008; Suzhou government's target for 2012 was 30bn yuan (i.e. roughly three times as much).
27 May 2011	Canadian Solar signed joint-venture agreement with Suzhou High-tech Zone Economic Development Group Corporation and Suzhou Science and Technology Development City Company Limited (both wholly owned by Suzhou High-tech Zone Administration and Suzhou Science and Technology Town Administration). The three companies jointly invested US$290m to build a 600MW solar cell factory in Suzhou Science and Technology Town.

5.2.1 The growth of Canadian Solar

Prior to 2004, Canadian Solar specialised in the production of small solar products such as vehicle-based solar battery chargers. It built a factory in Suzhou in 2004 and began to produce solar cells. Its listing on the NASDAQ stock exchange was primarily driven by its private equity company. Suzhou High-tech Zone Administration and Canadian Solar signed a strategic cooperation agreement in 2009. In 2011 Suzhou High-tech Zone Administration and Suzhou Science and Technology Town Administration invested to help Canadian Solar

expand its production capacity. Suzhou High-tech Zone Administration mainly provided support for Canadian Solar in terms of product applications and funding.

5.2.2 Key actors, roles, priorities and challenges

The key actors in this case included local government (Suzhou's municipal government, Suzhou High-tech Zone Administration, Suzhou Science and Technology Town Administration) and Canadian Solar.

Local government

Suzhou municipality was the policymaker – crucially, in its decision to support new energy industries, as stated in its 2009 Leap Development Program circular, aiming in particular to triple the output of the PV industry within four years. Suzhou municipality had strong control over its subordinate units, Suzhou High-tech Zone Administration and Suzhou Science and Technology Town Administration, which had to find a way to achieve the target set. The biggest challenge for the municipality was its lack of any rational analysis of market demand, which meant that the target had been plucked out of the air rather than based on solid research.

Suzhou High-tech Zone Administration was Canadian Solar's strategic partner and investor, while Suzhou Science and Technology Town Administration was a straightforward investor. Suzhou High-tech Zone Administration's priorities included supporting the development of high-tech enterprises and driving economic growth and local employment.

The challenge for Suzhou High-tech Zone Administration included competition from other high-tech zones and towns. Suzhou is located in the Yangtze River Delta area, which covers Shanghai, eight cities from south-east Jiangsu province and seven cities from north-east Zhejiang province. The Yangtze River Delta is the region with the fastest economic growth and largest economic output in China. To stimulate economic growth, many cities provide very favourable terms to attract investors. The Suzhou municipality had to compete with its peers. In addition, the administration's knowledge of the PV market was extremely limited.

Canadian Solar

Canadian Solar was the beneficiary. Its priorities were investment and becoming competitive. Affected by the continuing international financial crisis, by the beginning of 2009 China's export market for solar PV products had shrunk and the cash flow of many companies was tight, including Canadian Solar (interview 5). In April 2009, Suzhou High-tech Zone Administration signed a strategic cooperation agreement with Canadian Solar, with the commitment to build rooftop solar power plants using Canadian Solar's products, and to provide loan credit of 15bn yuan. This helped Canadian Solar to survive through a difficult period.

In 2011, Canadian Solar invested more capital to expand production when itself, Suzhou High-tech Zone Economic Development Group Corporation and Suzhou Science and Technology Town Development City Company jointly invested US$290m. The biggest risk for Canadian Solar was its blind confidence in the international market. The company was still expanding in 2011, and in 2012 it experienced financial difficulties.

5.2.3 Nature of engagement and relationship with other stakeholders

There was a long-term, formal relationship between Suzhou High-tech Zone Administration and Canadian Solar as they signed their strategic cooperation agreement in April 2009. In this agreement, Suzhou High-tech Zone Administration promised to support Canadian Solar, while Canadian Solar promised to increase capital investment and expand production, and set up headquarters in China and an R&D centre in Suzhou. A strategic partnership like this is reciprocal. The local government helped Canadian Solar to gain finance from banks and

itself became an investor, while Canadian Solar's expansion was expected to increase employment and tax revenue. The R&D centre was expected to enhance R&D capacity overall in Suzhou. These were priorities for the local government. This strategic cooperation is a long-term and formal partnership.

Table 5.4 Canadian Solar – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Suzhou High-tech Zone Administration	Public	Local	Competitiveness, job creation	Market demand, technology potential	Long-term/ strategic, formal	High/direct
Suzhou Science and Technology Town Administration	Public	Local	Competitiveness	Market demand, technology potential	N/A	Medium/ direct
Suzhou government	Public	Local	Competitiveness, job creation	Market demand, technology potential	N/A	Low/ indirect
Canadian Solar	Private	Local	Investment	Capital, political support	Long-term/ strategic formal	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

5.3 Solar power case study 3 – sharp investment growth before financial crisis

Between December 2005 and August 2007, ten Chinese PV manufacturers were listed on overseas stock exchanges, raising a total of US$2.082bn. How did this financing peak happen? What mechanism drove such a huge amount of investment?

5.3.1 Major driving factors of the investment peak

The primary capital that drove Chinese PV manufacturers' listings came from internationally renowned venture companies. During this period, a large amount of international venture capital rushed into China, and the PV industry became a hotspot for investment. Most of these venture companies were listed overseas (interview 1). At the same time, Chinese local governments also played a role.

Table 5.5 PV manufacturer stock market listings, December 2005–August 2007

Date	PV manufacturer	Exchange market	Capital raised (US$m)
14 December 2005	Suntech (STP)	NYSE	342.3
8 August 2006	ReneSola Ltd. (SOL)	LSE (AIM)	50
9 November 2006	Canadian Solar (CSIQ)	NASDAQ	107.8
18 December 2006	Trina Solar (TSL)	NASDAQ	150
19 December 2006	Trina Solar (TSL)	NYSE	98
21 December 2006	Solarfun Power (SOLF)	NASDAQ	150
7 February 2007	JA Solar (JASO)	NASDAQ	240
17 May 2007	China Sunergy (CSUN)	NASDAQ	93.5
1 June 2007	LDK Solar (LDK)	NYSE	469.368
8 June 2007	Yingli Solar (YGE)	NYSE	319
6 July 2007	Jetion Solar (JHL)	LSE (AIM)	62.13

Notes: LSE: London Stock Exchange; NASDAQ – based in US and Europe.
Source: Adapted from Chinaventure (2007).

5.3.2 Key actors, roles, priorities and challenges

The key actors in this case included venture capital/private equity (VC/PE) agents, local governments and PV manufacturers.

Venture capital/private equity agents

In this case, VC/PE agents played the role of investor. Their priority was financial rewards. Investing in a PV manufacturer and helping it to get listed on the overseas stock market during this period (December 2005–August 2007) normally brought a profit more than five times its initial investment – at least. For example, Goldman Sachs invested US$25m in Suntech in 2005 (China Business Herald Net 2007). When Suntech was listed on the NYSE, the opening price surged to US$20.35 per share, so Goldman Sachs' investment became US$400m, translating into a profit of 16 times its initial investment.

Local governments

Local governments have played the roles of coordinator and lender. The priority of local governments is economic growth and local employment. Overseas listings benefited local governments in three ways (interview 6):

Most companies seeking to be listed would begin by registering a new company in the Virgin Islands or the Cayman Islands, serving as the institution to be listed. This meant that the financing of these companies could be categorised as 'foreign investment' and so be accounted by the local government as 'attracting foreign investment work' in that year.

After gaining funding, the listed companies would generally use most of the money to expand production capacity, which could be accounted as an achievement of 'fixed asset investment' by the local government.

When companies received funding through public financing for the needed production capacity expansion, local governments no longer had to seek out funds for the companies (Yingli Solar 2007). With such incentives, the local government fully supported the listing.

In the case of Suntech, in order to ensure listing, the local government coordinated the withdrawal of the state-owned shareholders prior to it taking place. For the listing of Yingli Solar, local government played the role of coordinator and borrower. Before Yingli was listed

in 2007, state-owned shareholders held 51 per cent of the shares, while the founder held 49 per cent. Under the coordination of the local government, state-owned shareholders agreed to sell two per cent of the shares, and their share fell from 51 per cent to 49 per cent. This was necessary for Yingli to register a company overseas and become listed. In addition, Yingli's capital was very tight prior to listing, when the Baoding High-tech Zone government secured two loans of US$30m and US$42m respectively (interview 6).

The constraints for local government were its officials' knowledge that their performance would be judged according to how much the local economy had grown, and their ignorance of the PV industry and market. Economic growth was a crucial factor when the performance of local officials was evaluated, and investment was in turn a key measure of economic growth. Driven by a desire to excel in economic growth-based performance evaluation, the listing of PV manufacturers received full support from local governments.

PV manufacturers

PV manufacturers were the beneficiaries. Their priorities were finding new sources of finance and becoming established producers and brands. Their main constraint was ignorance of the risks of being publicly listed on the stock market. In 2007, LDK Solar's stock price tumbled because its financial problems were exposed after it listed. In 2012, many listed companies received delisting warnings from the NYSE and suffered a crisis of credibility.

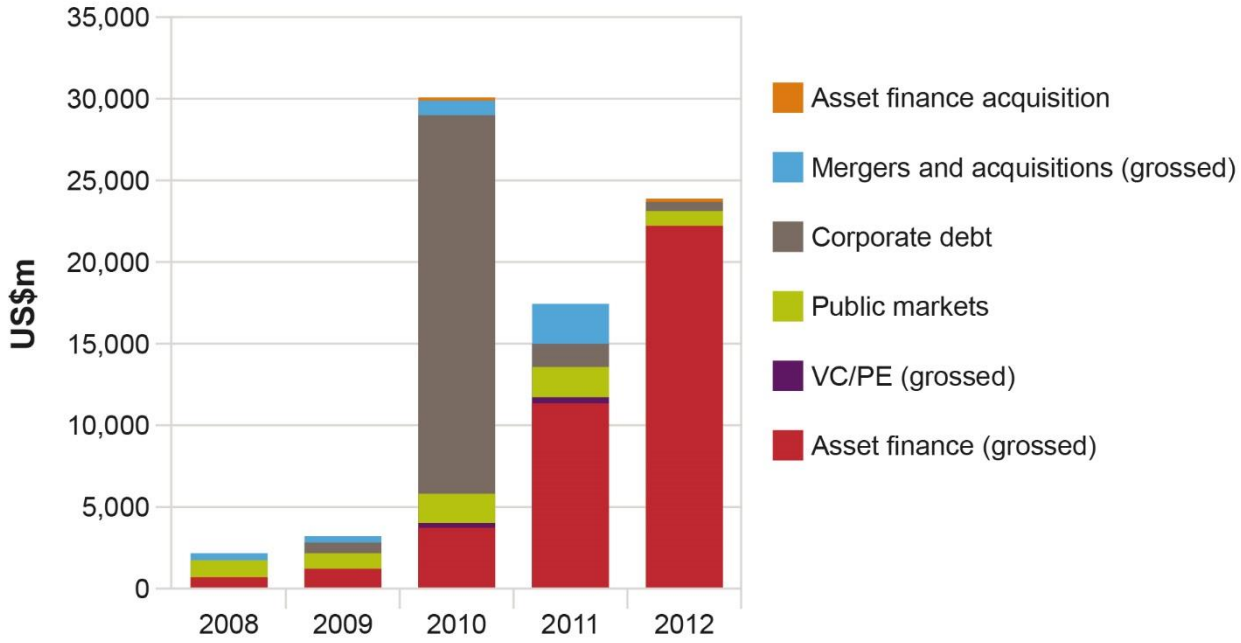
5.3.3 Nature of engagement and relationship with other stakeholders

There was an informal partnership between local governments and PV manufacturers. For the listing of a number of companies, local government played the role of coordinator and lender. In the withdrawal of state capital, public statements by top officials of the local government empowered the founder's negotiation, or negotiation was directly assisted by local officials. Local government officials took advantage of their influence on state-owned enterprises. In Yingli's case, the local government secured loans by lending money to Yingli from its subsidiary companies. These are all examples of informal cooperation and voluntary support from local governments to help the enterprise to be listed on the stock market; such support played a very important role.

5.4 Solar power case study 4 – sharp investment growth during financial crisis

In 2010 there was a sharp peak in investment in the PV industry. As shown in Figure 5.1, the largest part was from corporate debt. In 2009, 2010 and 2011, the total amount of corporate debt was US$772m, US$23,248m and US$1,443m respectively, and the ratio of corporate debt to total financing was 24.2 per cent, 77.6 per cent, and 8.2 per cent (BNEF 2014). In 2009 and 2010, the proportion of debt financing for PV companies increased significantly, reaching 77.6 per cent of total financing in 2010. In this period, there was also an investment peak in the wind power industry (see wind power case study 4.3). What was the main source of corporate debt? And what were the drivers for this sharp investment growth during the financial crisis?

Figure 5.1 Solar PV financing 2008–12



Notes: Mergers and acquisitions: the value of existing equity purchased by new corporate buyers in companies developing renewable technology or operating renewable energy projects; public markets: all money investment in the equity of publicly quoted companies developing renewable energy technology and clean power generation.
Source: Based on data from BNEF (2014).

5.4.1 Major drivers for the investment peak in 2010

The main source of funding for the investment peak in 2010 was bank loans, which had been the main financing channel for Chinese PV companies since 2008. The stimulus package planned in 2009 and launched in 2010 by the Chinese central government listed the new energy industry, including PV manufacturing, as one of the 'seven strategically important and emerging industries'. Banks were encouraged to give financial support to these industries from 2009. The CDB played an important role.

5.4.2 Key actors, roles, priorities and challenges

The key actors in this case included central government (State Council, NDRC, NEA, MIIT), the CDB and other state-owned banks, local government and PV manufacturers.

Central government

Central government played the role of policymaker. The priorities of central government included seeking new economic growth, creating jobs, industrial restructuring and upgrading, speeding up the transformation of China's model of economic growth, and building international competitive advantage (State Council 2010).

At this time the central government also faced many challenges including the financial crisis, economic stagnation, unemployment, etc. However, the most important one for this case study was the government's lack of knowledge about the PV industry and market risks. By 2010, PV factories were established in many places in China and the PV industry already had overcapacity, yet the central government encouraged the banks to lend PV manufacturers more money to expand further.

Table 5.6 Investment peak in PV industry, 2010 – chronicle of events

Date	Event
September 2009	Premier Wen Jiabao held three symposiums on the development of 'strategically important and emerging industries'.
3 November 2009	Premier Wen Jiabao gave a speech on 'let science and technology lead China's sustainable development' at the Chinese Academy of Sciences, mentioning that China had a comparative advantage and broad space for developing strategically important and emerging industries.
2009	At the end of 2009, CDB met with top officials of NEA, NDRC and MIIT, and signed cooperation memos with each of them. The bank was also invited to draft the State Council's 'Decision on Cultivating and Developing Strategically Important and Emerging Industries' and it introduced the 'Guidelines of Solar Power Development Project Evaluation'.
10 October 2010	State Council promulgated its 'Decision on Cultivating and Developing Strategically Important and Emerging Industries'. The industries were: energy conservation and environment protection, new energy, new generation information technology, biotechnology, high-end equipment manufacturing, new materials, and new-energy vehicles. The target for each industry was to reach global level within 20 years. A special fund was set up to support their development. The government encouraged financial institutions to lend more money to these industries.
2010	CDB offered credit lines worth US$43.6bn to Chinese renewable energy manufacturing companies. Loan guarantees worth US$32.5bn were extended to the solar industry alone (Jackson 2011).

China Development Bank and other state-owned commercial banks

The China Development Bank was both policymaker and implementer in China's support for strategically important and emerging industries. As discussed in Section 4, the CDB's mission is to provide medium and long-term credit in order to implement the country's medium and long-term national economic development strategies. In this particular case, the bank's priority was to help implement national strategies for the strategically important and emerging industries as defined by the central government. To this end, it worked with the NEA, NDRC and MIIT, helped to write the State Council's 'Decision on Cultivating and Developing Strategically Important and Emerging Industries' (interview 7), produced its own guidelines for evaluating solar power development projects, and started to provide loans for the PV industry. CDB's strong support for the industry also encouraged other state-owned banks to offer loans for solar projects.

The priority for other major state-owned commercial banks was to pursue financial rewards. During 2008/09, many countries implemented economic stimulus plans in response to the global recession, leading to a boom in overseas markets for PV products. Companies' net profits exceeded 20 per cent during that time. Driven by expectations of high profits, the banks provided much financial support to the industry. Suntech, for example, was pursued by sales staff from many banks and substantial loans were offered (interview 8).

The constraints faced by the CDB and the other state-owned commercial banks included their lack of knowledge about the risks, market variation, technology, and production capacity of investing in the PV industry.

Local governments

When applying for loans from the CDB, local governments were partners with PV companies. Before 2002 the CDB only lent to state-owned companies. In 1998 Yingli wanted to apply for a 20m yuan loan, but as a private company it was not eligible to obtain loans from the CDB. The government of Baoding High-tech Zone arranged for one of its subsidiary state-owned enterprises to invest and bought 60 per cent of Yingli's shares. Then the government

succeeded in applying for a loan for Yingli from the CDB. After 2002, although the bank's loans were accessible to the private sector, they still required a lot of evidence from the local governments. When companies were applying for CDB loans, there was an alliance between local governments and the solar power industry.

PV manufacturers

PV manufacturers were the beneficiaries. Their priorities were gaining finance and competitiveness. The challenge for them was that financing resources were not equally distributed. It was much easier for big, well-known enterprises to gain bank loans, while small- and medium-sized enterprises usually encountered difficulties in borrowing money from the banks.

5.4.3 Nature of engagement and relationship with other stakeholders

There was no established coalition between the central government, and the CDB and the other state-owned commercial banks. CDB is one of China's policy banks and is a subsidiary of the central government. State-owned commercial banks are usually also influenced by central government's decisions. By nature, they are not fully 'commercial' banks. The presidents of these banks are appointed by central government, and they are sometimes government officials themselves. However, these state-owned commercial banks are also listing enterprises; their priority is pursuing profit.

Table 5.7 Sharp investment growth during financial crisis, 2010 – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Central government	Public	Central	Economic growth, job creation, transformation of economic growth pattern	Lack of knowledge of PV industry development and market risks	N/A	High
China Development Bank	Public	Central	Political support	Lack of knowledge of PV industry development and market risks	N/A	High
State-owned commercial banks	Public	Central	Financial rewards	Lack of knowledge of PV industry development and market risks	Informal	High
Local government	Public	Local	Economic growth	N/A	Short-term, informal	High
PV industry	Private	Local	Finance	Capital, political support	Short-term, informal	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

When a PV manufacturer was applying for a loan from the CDB, short-term, informal cooperation was established between the manufacturer and its local government. Enterprises could not gain CDB loans by themselves, so local government stepped in and

provided assistance. This coalition remained short term and informal, as agreements were mostly made on a personal level between managers and government officials.

5.5 Solar power case study 5 – introduction of PV feed-in tariff (FIT) in 2011

China's domestic PV market was inactive for a long time. In 2010, new installed capacity was only 0.5GW, while PV production reached 9GW in that year. The NEA conducted the first concession tender for solar generation projects in 2009 and the second tender in 2010; the third was planned for 2011. Then in 2011 the NDRC introduced the FIT for solar-generated electricity. What were the major drivers of introducing this? This study examines them from the perspective of coalitions and alliances.

5.5.1 Major drivers of enacting the FIT

Local government played a very important role in the introduction of the FIT. As a result of the 2008 international financial crisis, China's PV sales overseas were falling and solar companies were in trouble. In order to help their local PV manufacturers, Jiangsu and Zhejiang provinces both introduced their own FITs. Ningxia also secured FIT rates for its four solar power plants approved by the NDRC in 2010. In 2011, Qinghai approved many solar power plants in its jurisdiction and started to lobby the commission to set a national FIT.

Table 5.8 Actions of local government concerning FIT, 2009–11

Date	Actions of local government
19 June 2009	Provincial FIT in Jiangsu province issued by Jiangsu provincial DRC.[a]
July 2009	Qinghai provincial governor lobbied NDRC for approval of FIT to kick-start province's PV industry, but it cost local government 1bn per year to subsidise.
2 April 2010	Four PV plants in Ningxia Hui Autonomous Region approved with temporary FIT by NDRC, which meant the cost of subsidy would be shared by electricity consumers in China. This activity was seen as the result of successful lobbying of NDRC by the provincial government.
21 June 2010	Provincial FIT in Shandong province issued by Shandong provincial DRC.
July 2011	Qinghai provincial governor lobbied NDRC for unified FIT so cost of subsidy would be shared by electricity consumers across China.

Notes: [a] DRC: Development and Reform Commission, Department for Economy and Development Policymaking.

5.5.2 Key actors, roles, priorities and challenges

In this case study, the key actors included central government (NDRC), local government (Qinghai province, Ningxia Hui Autonomous Region, Shandong province, Jiangsu province) and PV manufacturers.

Central government

The price department of the NDRC was responsible for setting the price of electricity, including FITs for solar power. Provincial governments did not have the power to set prices; they could propose a provincial FIT, which was subject to approval by the commission.

The NDRC's priority was to develop wind power. It costs more to generate electricity from solar energy than wind, so since 2000 the government had focused on the latter. Although PV manufacturers had called for support for the domestic market for many years, their influence on central government's policymaking was limited.

The challenge for the commission was the higher cost of PV generation compared to wind and biomass. The total amount of the renewable energy fund was approximately 20bn yuan

in 2012. In that year the FIT for wind power ranged from 0.51 to 0.61 yuan/kWh, about 0.75 yuan/kWh for biomass, and 1 yuan/kWh for solar. With a limited sum available as subsidy, the commission preferred to support wind as that way it got more power for each yuan spent.

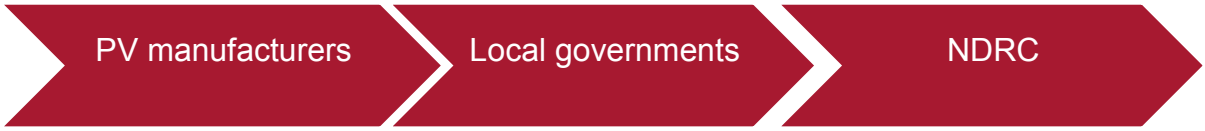
Local government

Local government was the lobbyist and also the manufacturers' partner. Its priority here was to provide political support for its local manufacturers.

Through supporting its PV manufacturers, local government became a partner that they could rely on. When overseas markets shrank after the 2008 financial crisis, local government protected its PV industry by lobbying central government and setting local FIT policies – e.g. Jiangsu and Shandong introduced a local FIT. However, economic stimulus plans across the world soon restored international market demand (by the second half of 2009). While pursuing a high profit margin in international markets, China's PV industry was not very interested in developing solar plants domestically, so the local FIT policy did not really benefit the PV industry.

In the introduction of a national FIT for solar generation, local governments were the lobbyists. PV sales experienced a major decrease because of overproduction in China and the decreasing market overseas because many countries had cut their subsidies for solar energy. This drove the solar industry to push for an expansion of the Chinese domestic market. Qinghai province in western China, which is rich in solar resource, approved more than 800MW of solar power projects. In May 2011, Qinghai's party-secretary and governor travelled to Beijing to meet the director of the NDRC to discuss the FIT. According to 'Geermu City People's Government Meeting Minutes – PV Projects Symposia' dated 27 May 2011, the director agreed to give Qinghai special support for its tariff, namely 1.15 yuan/kWh for all solar plants that were constructed and connected to the grid by 30 September 2011 (Xie Dan 2011). On 24 July 2011, the NDRC formally issued its 'Notice on Improving Solar Feed-in Tariff Policies'.

Figure 5.2 How pressure was transferred to the NDRC



Source: Authors' own.

The challenge for local government included the fact that it did not have the power to set the price of electricity and its inability to subsidise large-scale solar projects. On prices, it had to gain approval from the NDRC, so it was powerless to stimulate the local market for solar energy. This meant that local government was not able to help PV manufacturers directly. Moreover, local government in western China was comparatively underdeveloped and did not have enough revenue by itself to subsidise large-scale deployment. For example, the subsidy Qinghai needed in 2009 for PV power was approximately 1bn yuan, while its total revenue was only about 16.6bn yuan (Qi Ye 2013).

PV manufacturers

PV manufacturers were the beneficiaries and their priority was to win support for sales in the domestic market. Their challenge was over-dependency on the overseas market. Overseas sales accounted for about 90 per cent of all sales of China's solar industry until 2011 (Fan 2012). Every time that global market demand decreased, PV manufacturers had to deal with the excess products left in stock. This time, they turned to local government for support.

When the financial crisis affected PV policies in European countries in 2009, PV manufacturers in Jiangsu province sought protection from the local government. The governor of Jiangsu negotiated with the NDRC and finally issued the first local FIT for solar generation in China.

5.5.3 Nature of engagement and relationship with other stakeholders

Provincial governments and PV manufacturers had a long-term informal relationship. Supported by local government, several PV manufacturers became leading enterprises in their city or province, and their presidents usually had good personal relationships with government officials so they could lobby local government effectively. On the other hand, local government was enthusiastic to support solar enterprises as they could greatly contribute to revenue, employment, etc. During the expansion of the PV industry, local government became the spokesperson for their interests. The relationship between manufacturers and government officials was personal, while the relationship between local and central government was defined by political hierarchy.

Table 5.9 Introduction of PV FIT in 2011 – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
NDRC	Public	Central	Wind power	Higher cost of solar generation compared to wind	N/A	High
Jiangsu and Shandong provincial governments	Public	Local	Political support for local manufacturers	No pricing power, unable to provide subsidy for large-scale PV deployment	Long-term/ informal	Low
Ningxia Hui Autonomous Region	Public	Local	Support PV industry through developing power plant	No pricing power, unable to provide subsidy for large-scale PV deployment	N/A	Low
Qinghai provincial government	Public	Local	Support PV industry through developing power plant	No pricing power, unable to provide subsidy for large-scale PV deployment	Long-term/ informal	High
PV manufacturers	Private	Local	Domestic market support	Overly dependent on overseas market	Long-term/ informal	Low

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

5.6 Solar power case study 6 – rescue of LDK Solar

A media report in July 2012 about Xinyu municipality's plans to help pay off LDK Solar's debts with public money attracted widespread attention. The legality of such a plan was heatedly discussed. This was a typical case of local government trying to help PV manufacturers at all costs. The intensive and unprecedented public attention and controversy finally compelled the municipality to give up its plan. This case study analyses the factors that influence local government behaviour when it decides to invest public money in a private solar energy company.

5.6.1 Major influencing factors in the case of LDK Solar

The major stakeholders were Xinyu municipality, Jiangxi provincial government, the public and LDK Solar. Beginning in January 2012, Jiangxi provincial government and Xinyu municipality had been busy making plans to help LDK survive its financial crisis. Media reports sparked public concern and the public started to act as watchdogs of the local government.

Table 5.10 Local governments' rescue activities

Date	Financing activities by local government
January 2012	Xinyu government lent 200m yuan to LDK Solar.
2 May 2012	Jiangxi provincial government established 'LDK Solar Stable Development Fund' and provided a loan of 2bn yuan to LDK from this.
12 July 2012	Xinyu government planned to allocate 755m yuan from public revenue to pay back LDK's debt (abandoned due to intense public concern).
22 October 2012	Jiangxi Hengrui New Energy Company (a new company established to save LDK, with 40% of its shares owned by Xinyu government) purchased 19.9% of LDK's global share at a price of US$0.86 per share, investing US$23m in total.

Sources: Adapted from Guo Lifang (2012) and Jiang Zhuoying (2012).

5.6.2 Key actors, roles, priorities and challenges

Key actors in this case included local government (Jiangxi provincial government, Xinyu municipality), LDK Solar, the mass media and the public.

Local government

Local government played the roles of lender and investor. When LDK Solar could not gain any funding from the market, local government transferred funds directly to LDK to clear its debts. The continuous decline of its stock price meant the company was at risk of being delisted, so the local government tried to buy LDK shares through its holding company in order to prevent this.

The priority of local government changed from economic growth to simply maintaining employment and social stability. Their top concern was that LDK Solar employed more than 24,000 people. If it went bankrupt, many people would lose their jobs, with the potential of social turmoil. Secondly, LDK was a giant enterprise which made a significant contribution to local development. For example, the net income of LDK Solar was US$609m in 2011 – a slump year – yet it still paid 1.36bn yuan (US$210m) tax to the municipal government.

The challenges for local government were its limited sources of finance and being open to public questioning. By 31 December 2012, LDK Solar's total liabilities were US$5.4bn, while the total revenue of Xinyu city in 2011 was only US$1.72bn (11.1bn yuan) (Xinyu Municipal Finance Bureau 2012). Xinyu municipality obviously did not have the financial capacity to save LDK from its enormous debts.

Nowadays, the internet has become a means for the public to express their opinions, question and criticise, with the power to change the behaviour of central and local governments. In China, local government officials are appointed by central government, while public criticism is a very important factor by which to evaluate their performance. So when their offer to LDK Solar was greeted by public outrage, this was a major challenge for them.

LDK Solar
LDK Solar was the beneficiary. The priority of LDK Solar was to pay back its debts and survive. In 2012, LDK Solar trimmed its staff, reduced production, sold assets (including three large rooftop plants, and 100 per cent of its shares in two subsidiaries: LDK Nanchang and LDK Anhui), and found two large strategic investors to pay its debts.

The main challenge for LDK Solar was limited sources of finance. Bank loans, the stock market and bonds were the most important financing channels for LDK Solar from 2007 to 2011, but these were all blocked in 2012. In the third quarter of 2012, LDK Solar received a delisting warning from the NYSE because the share price had fallen below US$1 for 30 consecutive days. Subsequently, LDK's share price lingered below US$2. There was no new bank loan on offer. In April 2013, LDK announced partial non-payment of its convertible senior notes due in 2013 (LDK Solar Company Limited 2013).[19]

The only sources of finance left for LDK Solar were equity financing or to borrow from the government. In 2012, LDK borrowed 2bn yuan from Jiangxi provincial government and 0.2bn yuan from Xinyu municipality. In 2012 and 2013, LDK Solar gained two big investors with government background and secured US$47.5m from them. However, compared with its US$5.4bn debts, the investment was far from sufficient.

Mass media and the public
The mass media and the public played the role of watchdogs. Their priority was to keep a watch on the local government. Media watchdogs have become increasingly important in China, while the public are also paying closer attention to government behaviour. Xinyu government's decision to use 755m yuan of public money to pay LDK's debts was all over the media in the following days and evoked high concerns and debates among the public. They questioned the legality of using public revenue to pay the debts of a private enterprise (Dong and Guo 2012). Due to the intense public concern, notice of the decision was removed from the government website and eventually the decision itself was revoked. The main challenge for the media and the public was that China still lacked legal and diversified channels for them to participate in the policymaking process.

5.6.3 Nature of engagement and relationship with other stakeholders
LDK Solar and Xinyu city government had a long-term informal relationship. For example, the mayor of Xinyu used to work onsite at LDK Solar one day per month during its set-up phase. LDK's founder, Peng Xiaofeng, was also vice president of the Commercial and Industrial Association of Jiangxi province, and a member of the standing committee of the Xinyu People's Political Consultative Conference. These positions gave him the right to submit proposals to the government and to negotiate with the government locally. Its support was crucial to LDK Solar: in 2012 all the capital LDK received from financing activities was guaranteed by the local government.

[19] Convertible senior notes: a debt security that contains an option where the note will be converted into a predefined amount of the issuer's shares. A convertible senior note has priority over all other debt securities issued by the same organisation.

Table 5.11 Rescue of LDK solar – information matrix

Actor	Nature of ownership	Location	Priority[a]	Drivers and challenges[b]	Engagement and relationship with other stakeholders[c]	Degree of influence[d]
Jiangxi provincial government	Public	Local	Employment, social stability, local tax revenue	Limited financing ability, public criticism	Long-term/ informal	High
Xinyu municipality	Public	Local	Employment, social stability, local tax revenue	Limited financing ability, public criticism	Long-term/ informal	High
LDK Solar	Private	Local	Pay back debts and survive	Limited financing channels	Long-term/ informal	Low
Media and public	Public	National	Supervision on decision-making of local government	Limited channels to participate in policymaking	Independent supervisor	High

Notes: [a] e.g. climate change, energy security, competitiveness, job creation; [b] e.g. financial rewards, political support, career/status advancement; [c] e.g. long-term/strategic vs. short-term/tactical; [d] high/medium/low.

5.7 Summary of PV case studies

From these PV case studies we can conclude the following:

There was a long-term coalition, informal or formal (usually the former) between local government and PV manufacturers. The alliance was formed during long-term support for its PV manufacturing industry by local government. Presidents of such enterprises and local government officials usually had very good personal relationships, which helped enterprises lobby local government successfully. The senior executives usually also held positions in industrial associations and the People's Political Consultative Conference, which enabled them to appeal to local government through formal, legal channels as well.

Local government officials could be judged as performing well in their jobs if they helped to develop strong PV companies in their area, hence they had consistent interests with solar companies. That was a key reason why local government would help solar companies to secure finance or lobby central government for policies favourable to them.

Local governments played multiple roles in the financing activities for PV manufacturing enterprises. They acted as the coordinator for getting loans from banks, as direct lenders themselves, as coordinators to support the listing of these companies, as venture capital investors, and as lenders and investors to help companies weather their financial crises.

Public opinion began to play an important role as a watchdog in local government's decision-making processes.

6 Key findings

6.1 Primary drivers

The primary drivers of investment for wind and solar energy in China were different. In the development of both the wind turbine and PV industries, the Chinese central government played the most vital role. However, there was still a difference. For wind, the turbine manufacturing industry was primarily driven by the surging domestic market demand stimulated by central government's policies, while wind farms were driven both by central government's policies and local government support. For the solar power sector, PV manufacturing industry expansion was primarily driven by local government, while solar plants or farms were driven by central government (Table 6.1).

Table 6.1 Primary drivers of investment in wind and solar energy in China

	Primary drivers
Wind manufacture industry	Domestic market demand stimulated by central government's policies.
Wind farm development	Central government's policies and local governments' support.
PV manufacture industry	Overseas market demand and local governments' support.
PV deployment within China	Central government's support for PV manufacturing industry.

For the wind turbine industry, surging domestic market demand was the main driver of its development. Chinese wind turbine manufacturers mostly evolved from state-owned institutions or state-owned manufacturing enterprises, whose initial impetus for the transformation was to seek profit and growth (see Section 4.1, Goldwind Science & Technology). From 2003, China's central government enacted a series of policies to boost domestic demand for wind generation, which provided incentives for many state-owned manufacturing enterprises to transform into wind turbine manufacturers.

The development of wind farms was driven by two factors: firstly, the series of policies conducted by the central government to expand domestic market demand, such as the 'concession tenders'; then secondly, the approval rights held by local government for wind farms between 2005 and 2011 when a large number of projects were set up (see Sections 4.1 and 4.2). In 2007, for example, all 72 wind farms constructed had an installed capacity of less than 50MW, a capacity threshold that only needed the approval of local government (Qi Ye 2011).

Investment for the PV manufacturing industry was also mainly driven by just two factors: firstly, the growing international market demand. It was evident that investment rushed into the PV manufacturing industry in China after the German-based European market demand took off in 2004. The second factor was the financial support of local government (see Sections 5.1, 5.2 and 5.6). Around 2007, more than 100 cities in China built a PV industrial park, accounting for about one-sixth of all cities in the country (He Yong 2011).

The main driver of China's support for the domestic PV market was a desire to support the manufacturing industry and manage its overcapacity. Affected by overcapacity and trade wars, PV manufacturers encountered a difficult time after 2011. To save the industry, the central government enacted a feed-in tariff (FIT) to stimulate the domestic market in response to the lobbying of local governments and PV manufacturers (see Section 5.5). During 2012 and 2013 the US and Europe launched anti-dumping and anti-subsidy policies against China's PV products, which was a devastating blow to China's PV industry.

In response, the central government introduced a number of policies to encourage the rapid expansion of PV generation within China itself. For example, the central government set the target of installing 10GW in 2013 (actual installed capacity reached 13GW) and 14GW in 2014.

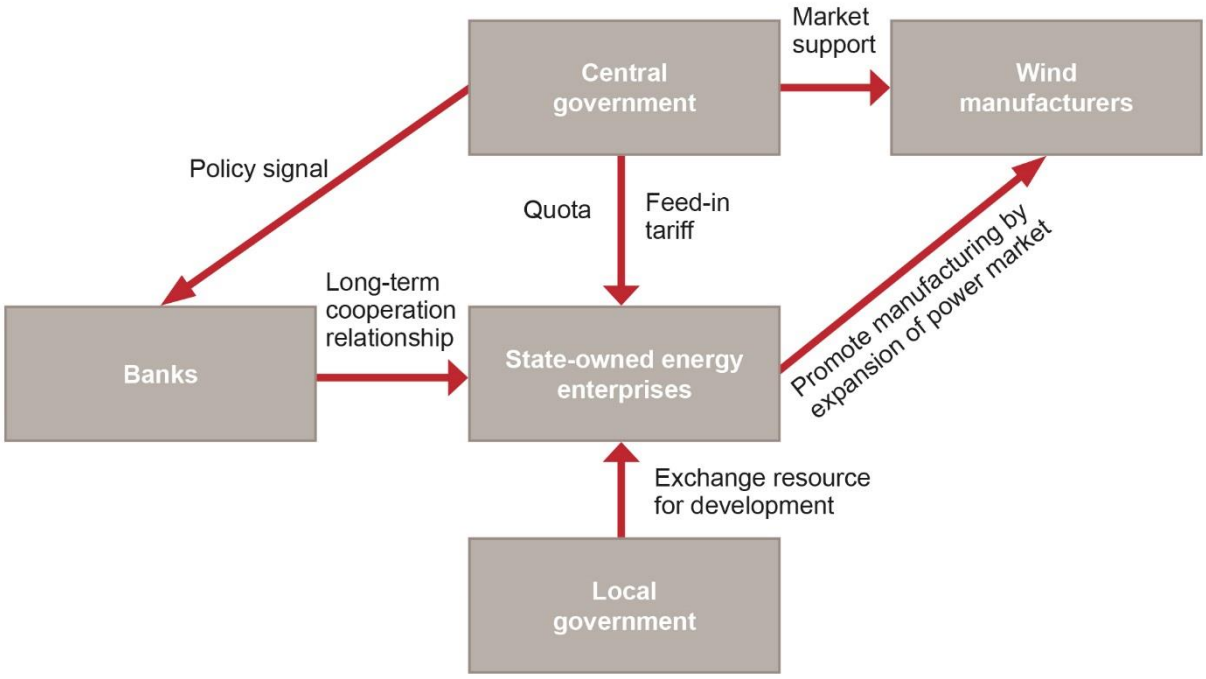
Wind investment was conducted in a typical government-led approach, characterised as follows:

Central government played the most vital role in promoting both manufacturing and deployment in China. It adopted two policy instruments – renewable energy quotas and the FIT – which equipped large energy corporations with both obligation and motivation to expand wind generation. The central government also encouraged banks to provide loans to enterprises engaged in wind and other renewable energy development.

Main players in the wind power sector were either state-owned enterprises or corporations with governmental backgrounds. For example, state-owned enterprises were the major developers, and state-owned banks were the major lenders. At the early stage of development, state-owned policy banks provided funds for wind manufacturers and developers; other state-owned commercial banks also increased their level of support towards the wind industry as the national policy signal was very clear.

Local governments adopted the 'exchange local resources for development' strategy, supporting wind farm projects for the purpose of developing the local wind manufacture industry or using local products (Figure 6.1).

Figure 6.1 Dynamics in the wind sector

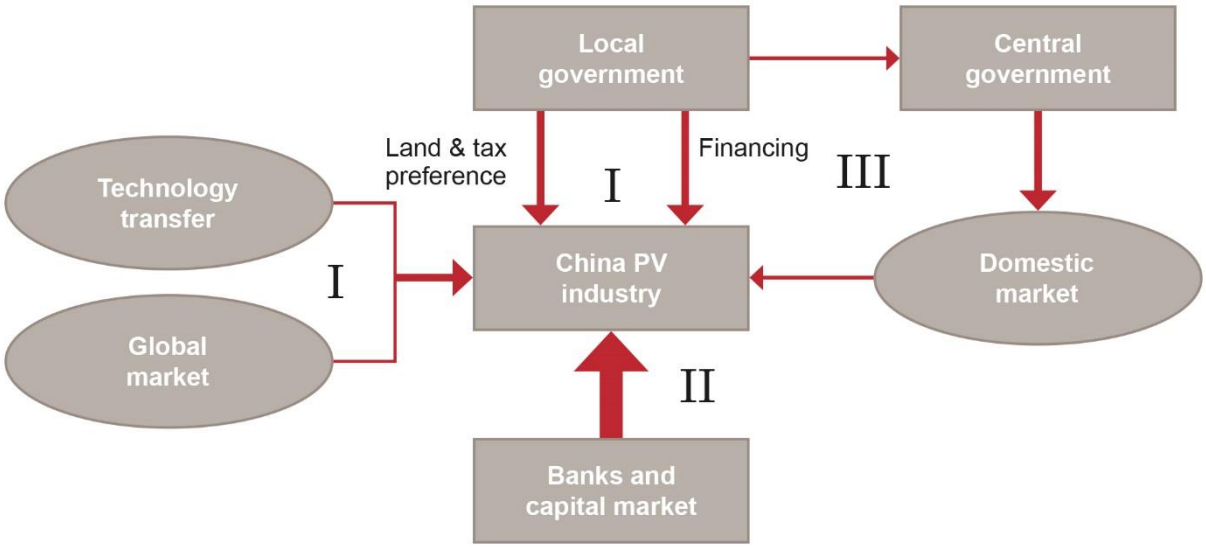


Source: Adapted from Qi Ye (2013).

The development of the PV industry in China can be divided into three phases according to its financing characteristics (Figure 6.2). During the initial cultivating phase from 1998 to 2004, local governments played the most vital role in helping PV manufacturers get financed. In the second phase, 2005–11, capital from banks, stock markets, VC/PE and the bond market flooded into the PV industry, attracted by expectations of high profits, and the industry absorbed a large amount of investment in a relatively short time. The third phase started in

2012, when capital left the industry and it experienced decreasing profits and trade wars. In this phase, local government reached out to help manufacturers solve their financing problems, while the central government started to stimulate the domestic PV market by encouraging solar generation within China itself.

Figure 6.2 Dynamics in the PV sector



Source: Adapted from Qi Ye (2013).

6.2 Key characteristics of coalitions

Close coalitions were found in investment for both wind and solar energy in China. In the development of the wind turbine industry, wind turbine manufacturers, the government, grid companies and wind farm developers (large state-owned energy companies) together constituted the developers, implementers and beneficiaries of the wind farm concession tender policies (see Sections 4.1 and 4.2). For wind farms, developers not only participated in concession tender policymaking and implementation, but also formed a close alliance with local government during the actual development process (see Section 4.2). In the development of the PV manufacturing industry, PV companies and local governments formed long-term and stable cooperative relationships (see Sections 5.1, 5.2 and 5.6). For the use of PV products within China, the industry worked together with local government in lobbying for FITs (see Section 5.5).

The development of wind and solar farms in China far exceeded the country's planning objectives – policy alone could not have resulted in such rapid development of wind and solar energy. This also indicates the existence of a coalition mechanism. The targets for 2010 set by the 2007 'Medium and Long-Term Development Plan for Renewable Energy in China' were for cumulative installed capacity of 5GW for wind and 300MW for solar, yet the actual installed capacity reached 44.7GW and 900MW respectively.

Such coalitions were formed by mutual interest and actions. For the wind concession tender policy, governments, manufacturers, developers and grid companies jointly developed and revised the policy (see Section 4.2). In wind and solar energy resource development, local government pursued developers for its purposes. In supporting the development of PV enterprises, local government adopted various instruments in their support, while enterprises actively went to local government for help (see Sections 5.1, 5.2 and 5.5). In stimulating the use of PV within China, both manufacturers and local governments actively lobbied for the introduction of the FIT (see Section 5.5).

Another feature of these coalitions was the bond formed through/despite different interests. Each party had their own interests, yet they could be achieved through the same action. For example, in solar energy case study 5.2, the expansion plan proposed by Canadian Solar was supported by Suzhou High-tech Zone Administration and Suzhou Science and Technology Town Administration, which provided investment through a government-affiliated investment company. The expansion was expected to serve the company's goals of reducing production costs, as well as the local government's goal of increasing the value of its 2012 PV industry output to 30bn yuan. In this case, the interests of Canadian Solar and the Suzhou government were not the same, but the expansion was expected to enable them both to achieve their different goals.

The coalition relationships lasted different periods of time for wind and solar. For wind energy investment, the coalition was a short-term relationship. In the development and implementation of wind concession tender policy, the validity period of the coalition relationship was the same as the policy cycle. In local wind resource development, the relationship lasted as long as the development and construction phase of wind farms – once they were built and in operation, the relationship between developers and local government also came to an end. For investment in solar energy, local government and PV companies formed longer-standing coalitions. Solar energy case studies 5.1 and 5.6 showed that these coalitions were established with the foundation of the company and lasted until the present. They relied heavily on personal relationships between government officials and business leaders, yet even when government officials were replaced, the new officer would generally seek to maintain such relationships for the consideration of both public and personal interests (interview 6).

The alliances formed in the wind and solar industries were both formal and informal. In the development and implementation of wind concession tender policy, the relationship was informal. During the development of local wind power resources, alliances between local government and the wind farm developers were formalised by a series of signed contracts, including wind resource development agreements. In the local government's support for PV companies, there were both formal and informal coalitions. In solar case studies 5.1 and 5.6, although support from local government was significant for PV enterprises, the coalition was informal as no agreement was signed. In these cases its strength depended on personal relationships between government officials and business leaders. In PV case study 5.2, Suzhou High-tech Zone Administration and Canadian Solar signed a strategic cooperation agreement, formalising their alliance. In PV product applications, the coalition between manufacturers and the central government was informal, as the latter did not directly support the industry but stimulated the market while leaving competition to the PV companies.

The coalition relationships described here were also generally local and only within China. Coalition relationships based on an alignment of interests existed within national boundaries for wind energy investment, and remained more narrowly local for solar industry development. In recent years, as China's turbine manufacturing industry is expanding its exports and the China Export-Import Bank and other banks are providing financial assistance, the formation of coalitions and alliances has tended to expand to the international arena.

6.3 Coalition forms and bundling tactics

Factors influencing investment behaviour in China's wind and solar energy sectors were different (Table 6.2). Most turbine manufacturers evolved from state-owned manufacturing enterprises which faced the challenge of surviving by developing new products. Hence, for them, the decisive factor for investment was market demand and expected profit. Wind and solar farm developers were mostly large state-owned energy enterprises, who had quasi-monopoly resource access and did not need to worry about survival as much as those state-owned manufacturing enterprises. As a result, for them, the decisive factor for investment

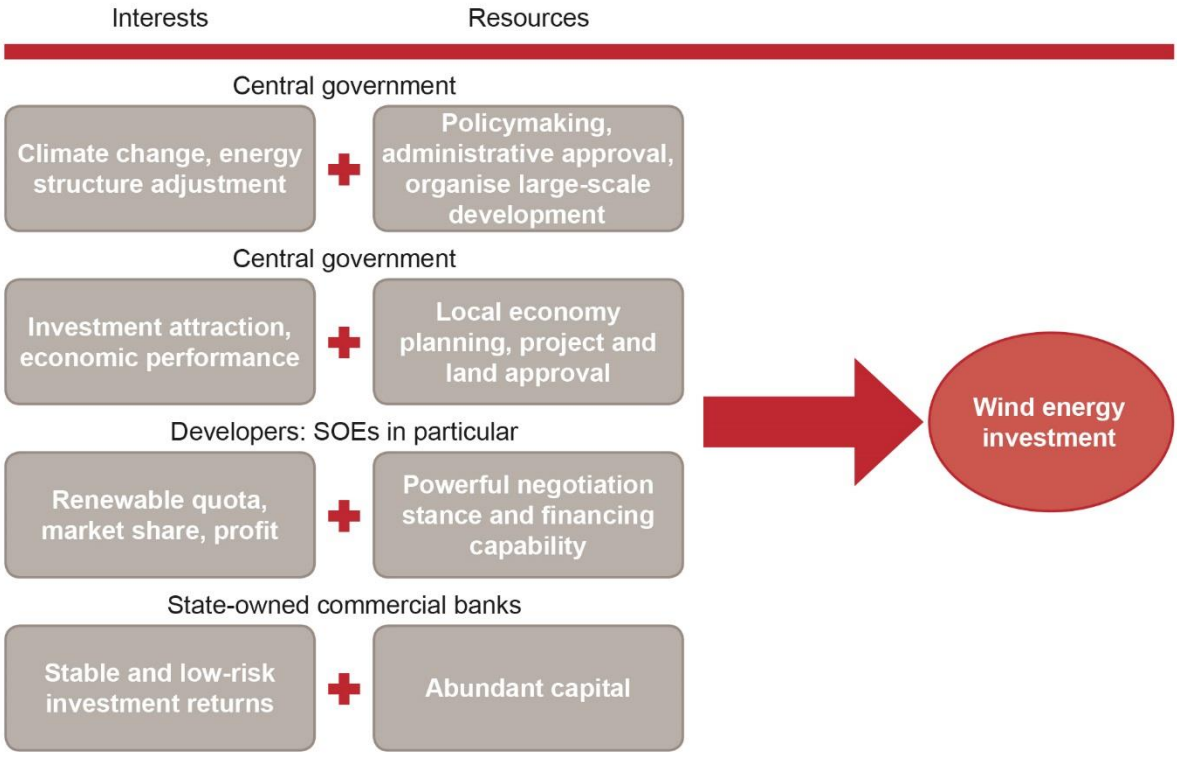
was the renewable energy quota imposed on them around 2007. In addition, these energy companies competed for market share and drove the rush for seizing wind resources after 2007. For them, profit was an important factor, but not the most important one. As for PV manufacturers, who were mostly private enterprises, their top concerns were firstly profit, then support from local governments. In conclusion, investors in different sectors had different backgrounds and mentalities, and factors that influenced their investment decisions also differed.

Table 6.2 Key determinants of investors' decisions

Investors	Key determinants of investment decisions
Wind manufacturers	Domestic market demand, profit
Wind power developers	Renewable quota, market share, profit
PV manufacturers	Profit, local government's support
PV developers	State-owned enterprises: market share, profit; PV manufacturers: absorption of production

A coalition was formed between stakeholders with different yet related interests. This was the most important rationale to forming a coalition or alliance – the stakeholders had different interests, but ones that they expected to further through the same action. It is also worth noticing that each stakeholder in a coalition had significant resources and the capacity to allocate them so that such relationships could be formed. For example, for wind energy development, the central government successfully involved different stakeholders. Each player had their interests and resources that motivated and enabled them to participate and each played a role. With the aligned participation of different players, a coalition was formed to promote investment in wind energy development (Figure 6.3).

Figure 6.3 Interests and resources of major players for wind energy investment



Source: Authors' own.

Project developers with a state-owned background were motivated by three factors: the renewable energy quota, market share and profit. In addition, state-owned energy companies also had a strong negotiating position and sufficient financial capacity to empower them to seize huge market share. These companies were already high-profile enterprises that local governments wanted to attract, and credible borrowers that banks were happy to pursue. They had unparalleled advantages in the competition for the wind power market.

State-owned commercial banks were the major lenders for investment in wind energy. The central government sent out clear signals about its long-term support for renewable energy development through its Renewable Energy Law and other matching policies, and banks were encouraged to provide preferential bank loans to enterprises engaged in wind energy development. On the one hand, state-owned energy companies had strong guarantee capacities and a high credit rating, plus (behind the scenes) government back-up to meet the banks' preference for low-risk and long-term loans. On the other hand, state-owned energy companies have long-term cooperation with state-owned commercial banks. In terms of resources, the banks had abundant capital in state-owned commercial banks during the period of the 11th Five-Year Plan that could be used to support renewable energy developments.

Local governments were active participants in and promoters of the wind energy market. They had a strong incentive to exchange resources for economic development. Their goal was to cultivate the local manufacturing industry and/or use local products by bringing in wind farm projects. In terms of resources, they had the power to make decisions about economic development, land use and project initiation, and the capacity to build a local financing platform. Therefore, local governments had both the interests and resources to participate actively in the development of the wind energy industry.

Local governments also played a variety of roles in financing the PV industry. In the start-up period of PV enterprises, they allocated considerable resources to these enterprises and lowered their cost through preferential land prices and electricity rates; they were the venture capitalists in the PV manufacturers' start-up period, the creditors when the enterprises were in urgent need of capital, the board members of the enterprises when they were founded or encountered financial difficulties (see Sections 5.1 and 5.2), and coordinators in helping enterprises secure capital from the stock market or bank loans (see Sections 5.1 and 5.6).

The central government's role was mainly reflected in 2009 and 2010 as it urged domestic commercial banks, led by the China Development Bank, to offer loans to the PV industry. Because of the participation of local governments in raising capital, the production capacities of the PV industry expanded exceptionally fast. It only took the Chinese PV industry ten years to become world-class. Although this development model – a rapid initial expansion of production capacity based on government financial support – seemed efficient in the short term, the industry was quickly hamstrung by its excess production capacity, which rendered this model problematic in the long run.

For China's wind energy investments, market demand played the most important role in the formation of coalitions. Central government drew up its policies based on a strategy of developing turbine manufacturing industry through domestic market demand, and indeed the expanding market demand bonded manufacturers, developers and local governments together. For the solar sector, the economic growth-based evaluation of local officials' performance was the most important factor in the formation of coalitions. Driven by a desire for economic growth, local government and PV manufacturing companies formed alliances where the former became the spokesperson for the interests of the latter. Such relationships were so strong and firm that when one local official left his office, the successor still had the motivation to maintain it, even to the point where the local government would commit significant resources to save the PV manufacturing business when it encountered financial crisis. Driven by their pursuit of economic growth, a large number of municipalities developed

ambitious plans to build a local PV production base and made every effort to provide funding and other resources to encourage enterprises to expand their production capacity. But for some, overcapacity was a trap out of which they were unable to escape.[20]

Coalitions in China's wind and solar energy sector evolved with the development of the industries. For investment in wind energy, the geographical scope of the alliances continues to widen. With the expanding exports of wind turbines, banks provide strong financial support to wind turbine manufacturers. In terms of investment in solar PV companies, when they are hit by export recession, local government holds out its hands to assist them through bankruptcy and reorganisation, to inject capital, to coordinate with mergers and so on. As public criticism and oversight is getting stronger, the role of local government is also changing. These are topics worth paying attention to in future research on this type of coalition or alliance.

[20] Suntech went into a bankruptcy restructuring process in March 2013, and finished the re-organisation in late 2013.

Annex

Table A.1 List of interviews

No.	Interviewee(s)	Date
1	Director of the National Centre for Climate Change Strategy and International Cooperation	29 November 2013
2	Wind turbine manufacturers	26 November 2013
3	Local government officials from both Hebei province and Jiangsu province	January 2012, July 2012
4	Manager of Longyuan Power Group Corporation Limited	12 August 2013
5	Officials from Energy Bureau in Jiangsu province	11 July 2012
6	Local government officials from Baoding city, Hebei province	23 November 2013
7	Official from Ministry of Commerce	10 December 2013
8	Official from Suntech	8 July 2012

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