Institutions and wind energy decisions in China and Norway

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1 Introduction

It is sometimes claimed that Chinese governance is more apt to implement climate change mitigation strategies, and that strong leadership is required in order to face current climate challenges (Eisen 2010; 2011). In Norway, this has been voiced actively by professor Jørgen Randers (e.g. Martiniussen 2012). But what does Chinese climate change governance consist of, and how does it distinguish from that of other countries? Looking at the wind industry this paper compares Chinese and Norwegian institutions and governance in terms of wind energy technology implementation and manufacturing. A particular emphasis is put on the institutional structure in both countries, studying discourses, debates and the legitimacy of wind energy technologies. Given the vast differences between Norway and China, in terms of size, population and culture, this comparison is strictly limited to wind energy policy, and the comparison does not seek to generalise findings to other areas. The information and analysis is based on 12 semi-structured interviews with Chinese wind industry stakeholders, conducted for my master thesis in 2011, and a broad literature review for Norway's wind energy development.

In order to analyse the field, I use the concepts of "socio-technical" or "technological regimes", commonly used in frameworks looking at industry growth and sustainability transitions. These frameworks assume that institutions, actors and networks are inert and change only slowly, so one can observe a certain "path dependency" with regard to which technologies are used in society. Given the fact that China has observed a rapid growth of new renewable energy technologies, whilst Norway still is dominated by older technologies, this comparative study is useful in detecting what factors have allowed such a change in China, whilst they have not been present in Norway. In terms of wind energy technologies, this is especially a puzzle since both countries have very good wind energy resource potentials.

The paper starts by laying out the theoretical field of choice. Then, the institutional structures are described in each country, limiting these structures to the energy systems, before the approaches to wind energy technologies are mapped. Thereafter follows a small discussion and conclusions section.

2 Institutions and regimes

The mere fact that China has managed to develop a wind industry relatively fast, implicates that substantial changes have taken place within China's energy governance. This creates a unique opportunity to study industry growth, regime change and transition processes. There is already a substantial literature on this field, commonly grouped under the heading "sustainability transitions", which draws from evolutionary economics and science and

technology studies (Carlsson & Stankiewicz 1991; Kemp 1994; Geels 2002). The most important notion that all the various approaches to sustainability transition studies share, is the role of institutions and socio-technical (or technological) regimes (Markard et al. 2012). This notion serves a theoretical point of departure for this paper. Institutions are here defined as "rules, enforcement characteristics of rules, and norms of behavior that structure repeated human interaction" (North 1989: 1321). They can regulate either directly or indirectly how actors relate to each other, and includes culture[1], norms and routines, as well as more tangible laws and regulations (Bergek et al. 2008). They are instrumental in transition processes, because they at the one and same time represent the old, and cater for the new.

In an influential work, Nelson and Winter (1982) developed a conceptualisation of evolutionary economics which explains how firms innovate incrementally, using knowledge accumulated over time. This leads to the expectation that firms "behave in the future according to the routines they have employed in the past" (Nelson & Winter 1982: 134). In essence, therefore, learning is cumulative and gradual, creating a reproduction of routines, skills learning and cognition (Nelson & Winter 2002). The notion of a *technological regime* emerges from this conceptualisation. In general, a technological regime encompasses all factors that influence, support and constrain the development of a technology—including production and thought processes, routines, knowledge and learning (Dosi & Nelson 1994). Innovation in this context is understood as a technological and a social process, where institutions, actors and networks all are shaping and being shaped by an existing regime (Smith 2011). By taking advantage of historical experience and interaction with institutions, actors and networks, established companies may manifest their position, even though new and better technologies exist. This is usually referred to as *path dependency* (ibid.). When a new technology emerges, it does so within the frames of an established regime. In fact, in all known transitions from one technological regime to another, the new technology has emerged and developed within the existing regime (Kemp 1994). In order for the new technology to grow, it is therefore dependent on making a new "path"—it needs to build a surrounding system which supports the technology when facing the incumbent technologies (Jacobsson 2011).

Nelson and Nelson (2002) argue that it is possible to unify the concepts of *technological regimes* and *institutions*. This is basically what (Geels 2002: 1260) has done by developing the concept of "sociotechnical regimes", defined as "the semi-coherent set of rules carried by different social groups". Both these authors argue that there is a connection between the institutions surrounding the development of technologies, and how these technologies also shape society. Hence, institutional frameworks are decisive to the success and legitimacy of a new technology (Jacobsson & Lauber 2006).

Based on this theoretical backdrop, it is interesting to see to what extent institutions and socio-technical regimes can highlight the difference in wind energy development in China and Norway.

3 China's energy governance and wind industry

China's energy sector is sometimes referred to as the last "fortress" of the planned economy (e.g. M. Wang 2007: 248), meaning that the sector is highly centralised and not very flexible or open to change. This picture is increasingly challenged, as a conception prevails that

[1] Because of limitations of space cultural aspects are not adequately accounted for in this paper.

marshalling resources to meet China's considerable energy needs is based on more than central planning (Cunningham 2010). Energy decisions are highly politicised in China because they involve many different actors with diverging interests and objectives. This has lead to a state of affairs where there is:

> a 'leadership vacuum' in China over energy policy and many decisions are driven by projects promoted by localities or industries rather than being guided by a coherent national energy policy (Kong 2009: 791).

Therefore, a change in energy policy amongst the top-level leadership does not necessarily equal smooth implementation throughout the system. This is because decisions face strong institutional constraints, ranging from "the vague and contradictory nature of the relevant laws and regulations; the nature of economic incentives for local government officials to prioritize economic growth at the expense of energy efficiency and the environment", to the expectations and beliefs amongst the Chinese people (Meidan et al. 2009: 615).

Two approaches to studying Chinese policy and governance that are interesting in this context. These are "Fragmented authoritarianism" and "Policy experimentation". The concept of *fragmented authoritarianism* was developed by Lieberthal and Oksenberg (1988) when studying China's energy sector. They concluded that the policy process was protracted, disjointed and incremental (p. 24), and that this fragmentation of authority created inter-ministerial competition and disjointed policy making, because the respective ministries had a similar level of authority, but separate goals. This means that any policy initiative or major project "needs to acquire the active cooperation of many bureaucratic units that are themselves nested in distinct chains of authority" (p. 22). The concept of *policy experimentation*, or *experimentation under hierarchy* alludes to how China the last 30 years has shown a remarkable to ability innovate and adapt its institutional structure to master the challenges faced large-scale economic change (Heilmann 2008b; 2008a; 2010). Heilmann (2008b:3) claims that this adaptability is due to a practise of policy experimentation in China, "that precedes the enactment of many national policies".

Chinese wind power

If we look at the government policies that enabled the development, it is convenient to divide the measures undertaken by the central- and local governments into two main areas:

Industry development: There are at least three important factors that promote China's wind industry development directly. First, the domestic content requirement on wind turbine manufacturing in China has lead to the development of its supply chain markets, second, speedy approval for wind power projects at a provincial level has resulted in the huge number of additions each year (Yadav 2011), and third, according to Bloomberg New Energy Finance, in 2010 China attracted $49,000 million in renewable energies investment, 78 per cent of which went to wind projects (BNEF 2011: 18, 20). This means that China attracted the most new financial investments for renewable energy in the world, far ahead on the US on second place, with around $25,000 million in 2010 (ibid.).

In 2002 the Chinese government decided to stimulate the development of wind energy through a national wind concession programme, which allocated selected sites for wind farm construction to the company bidding the lowest electricity tariff (CWPP 2010: 20). Some prerequisites were made in order for projects to be accepted, such as turbine size and local content restrictions. In effect, the price of electricity not only decided who won the bid, but also to what extent the turbines were manufactured locally (Q. Wang 2010: 705). According to a government statement in 2000, the domestic content requirements of wind turbines

became a policy because the dependence on imported turbines and lack of local manufacturing of key parts were hampering the development of wind power in China (Howell et al. 2010: 50). During the first concession round which started in 2003, the local content requirement of turbines was set at 50 per cent, a requirement which increased to 70 per cent in 2004, and was finally phased out in 2009 (Q. Wang 2010). In addition to the content requirements, import tariffs on preassembled wind turbines were at 17 per cent in 2007, whilst tariffs on their components were set to only 3 per cent (Martinot & Li 2007: 20). This policy, together with the removal of the local content requirements in 2009, is thought to have "allow[ed] domestic manufacturers to more easily access wind components from foreign suppliers as they build the prototypes for their larger turbines" (BNEF 2010: 9).

A central point made by Ruby and Lema (2007) is that the period until the concession-rounds was dominated by a considerable fragmentation of authority, for instance in the decision of establishing a domestic industry, or not. With the concession-strategy, however, cooperation between several ministries occurred, since both the import tariff and the content requirements needed consent. As the above description points out, there was a considerable cooperation between trade and industry policy, which sparked domestic wind turbine industry. In addition to this, China's concession strategy can be perceived as a way of policy experimentation, as it set the prices for the feed in-tariff, established in 2009 (Z. Wang et al. 2012).

Electricity generation: Most of the measures which are aimed at increasing the proportion of renewable electricity production in China are covered in the Renewable Energy Law (ReLaw) which was enacted in 2005, and brought into force on January 1, 2006, and with amendments effective from April 2010. The law was enacted with overwhelming support in the Central Committee, which implies that Chinese legislators recognise the need for renewable energy almost unanimously (M. Wang 2007). The measures include government installation goals, mandatory market shares, a tariff system, a cost sharing principle and a special fund (Jiang 2011: 105). The largest investors in wind farms in China are four state-owned power generation companies, all of which are part of the "big five" government power generation companies, Guodian, Datang, Huaneng, Huadian and China Power Investment Group (CPI) (CWPO 2010: 39).[2] The reason these power companies invest in wind energy to such a large extent is that they are mandated by the government through the 11th Five-Year Plan for Renewable Energy to install at least 3 per cent non-hydro renewable power as a portion of their total capacity in 2010, and 8 per cent in 2020 (ibid.). This applies to all utilities that have a capacity of more than 5 GW of thermal power electricity generation (ibid.). These mandated market shares undoubtedly lead to an increase in wind power investments, but a downside may be the fact that these large power utilities only care to fulfil their installed capacity criteria, and have less of an incentive to focus on the kWh produced (CWPP 2010)—something which demands more resources in terms of operation and maintenance. Also, in accordance with the ReLaw, electric utilities are obligated to purchase all wind power produced; an important change in this regulation appeared in the 2009 amendment of the ReLaw, when the utilities were obligated to purchase all the wind power even when there is not sufficient power demand on the grid (Martinot & Li 2010).

One way of aligning institutions, and thus increasing the legitimacy of a technology, is related to "conformance", which means to follow the rules of the already existing institutions (Bergek et al. 2008: 417). A clear example of this is when the government decided to introduce the mandated market share of non-hydro renewable energy for the established power producers in

[2] CPI was listed as the eighth-largest wind power developer in China in 2010—the four others were listed as the first four in the order with which they are listed above.

China. Another strategy of legitimation is to "manipulate" the rules of the game (ibid.). In a way, these two strategies are related, because the wind industry has gained legitimacy in China within established institutions, and also by using already existing legitimacy of energy incumbents to shape new outcomes. Many of the large, influential State Owned Enterprises (SOEs) have engaged in wind turbine manufacturing, and it is clear that their political influence in a region has facilitated their growth. According to an informant from the wind turbine manufacturer, XEMC Windpower, subsidiary of the large multi-industry conglomerate XEMC, the company "has a certain influence in Hunan province, because the head of the Hunan province came from XEMC". As a result of the political connections this company has, one can assume it also does its fair share to convince policy-makers of the benefits of wind turbines. Apparently this link between state-owned companies and political career is common (Rosen & Houser 2007). Moreover, large, central government owned companies take part in shaping government policy, and thereby closing the circle of influence (ibid.: 19). Thus, because of China's inherent characteristics we may say that state support oftentimes means more in terms of politics than in terms of economics.

The mandated market share for the electric power companies did not specify which source the electricity should come from, except that hydro-power was excluded. In the interview (08.11.2011) with a research associate from the Energy Research Institute, it was confirmed that the political power of the renewable energy industry has increased:

> The lobbying power is increased; they are taken more into account. One proof of this is how much more they are mentioned in the national media now. (...) Also, the National Energy Administration actually received increased status within the NDRC because of the promotion of renewable energy.

This is closely connected to increasing legitimacy. Also, the fact that renewable energies together have achieved a higher status within the National Energy Administration (NEA), testifies to the added value of "running in packs". [3]

The above shows that the processes behind the change from fragmented authority to alignment have been dominated by considerable policy-flexibility: there is a reflexive aspect to the development of wind power policy in China. The government induces policy experiments, which set in motion some of the large SOEs. These, in turn, have influence locally and nationally, and lobby towards increased policy-support for wind energy.

4 Norwegian energy system and wind

The Norwegian energy system is dominated by large actors within hydro power and petroleum. These actors are closely tied with the performance of the Norwegian economy, and they have considerable influence in terms of energy policy making (e.g. Hanson et al. 2011; Boasson 2011). Several scholars have pointed to the role of Norway's petroleum industry, and equated it with an established regime which benefits from a systemic lock-in. This to some extent affects the decisions around new renewable energy (NRE) technologies. For instance, according to (Christiansen 2002: 241) "the emergence of new sectoral interests, such as NRE, is affected through the selective institutional support that has been built up around petroleum activities [in Norway]". Also, an influential study by (Narula 2002: 813) characterises the Norwegian innovation system as "built up around" national champions such as Statoil and

[3] The NEA is an important organ under the NDRC which is "responsible for planning within the energy sector, industrial policies and standards (...)" (Delman & Chen 2008: 26)

Hydro, and further, that these firms receive a "certain amount of government patronage, and are highly embedded in Norway". (Haraldsen 1998: 203) follows a similar line of argument when she postulates that "the interactive learning which took place within the offshore-related national system of innovation laid the foundation for the development of a Norwegian 'style', or, more precisely, a Norwegian techno-economic trajectory". Within these institutional structures, wind energy has been attempted developed in Norway.

Norwegian wind

While China consistently has refined its renewable energy legislation the last 10 years, Norway has since the 1990s debated back and forth whether to establish "green certificates" or a Feed-in tariff, and finally ended up with a joint certificate system together with Sweden as of 2012 (Bergek & Jacobsson 2011; Wicken 2011). Until that policy was implemented, the general problem has been a complete lack of renewable energy policy and strategy. Though there has been a focus on wind energy as an environmentally friendly electricity source in Norway since the 1980s, little has happened in the field (Bye & Solli 2007). As Christiansen (2002: 240) points out: "one may subscribe poor development dynamics [in Norway] to the *absence* of measures that are conducive to creating viable commercial conditions for NRE technologies". How might this lack of initiative be explained?

Part of the story without doubt has to do with the incumbent energy regime in Norway (Buen 2006). Bye and Solli (2007) describe how wind power consistently lost the competition against gas power, because of the high price of wind. Statoil, for instance, first decided to invest in wind power in the end of the 1990s, but then, in 2000, decided to withdraw from wind power because of the high costs (ibid.). Indeed, for the same reason, few of the large energy companies were interested in wind power (ibid.). Solli (2004; 2007) has discussed the role of economic rhetoric in the development of wind energy in Norway, and found that the government's narrow focus on cost-effectiveness hampered the development. Because of cost-considerations, wind power was regarded an irrelevant power source in Norway (ibid.). There were spurts of government support and interest in wind power, for instance when it was decided against increasing the amount of hydro power (Solli 2004; Boasson 2011). Nevertheless, long-term policy engagement lacked in order to carry through wind power projects (Buen 2006). Wind power was measured against the incumbent energy providers, and the prospects for wind power were considerably downsized, since established energy-actors were not able to understand how wind power could compete on price (Solli 2004: 82, 100). In addition, wind power met local resistance, because of noise, cultural landscape, tourism and bird life-considerations (Bye and Solli 2007).

Interestingly, fragmentation of authority in Norway's energy system has impacted the wind power development. Boasson (2011) points to the important role of two large actors in the Norwegian energy system, the Ministry of Petroleum and Energy (MPE) and Statkraft. According to her, "[c]ontrasting logics and lack of coordination between the[se] two dominant actors obstructed the organisational change in renewable electricity from becoming more profound". This, Boasson claims, is true in particular for wind power technologies in Norway:

> Because Statkraft and MPE were structurally de-coupled and embedded in different institutional logics, stalemates kept emerging. All the same, Statkraft profoundly affected the diversification process by contributing to wishful thinking that led the companies to diversify. Further, by controlling the transformation of EU state-aid regulations, the MPE created major obstacles to diversification. Hence, both Statkraft and the MPE profoundly affected the outcome of the industrial change process (Boasson 2011: 27).

In general, there has been a short-sighted and unstable institutional setting in Norway, which has been very damaging for the prospects of both a domestic wind industry, as well as wind electricity generation (Buen 2006).

5 Discussion and conclusions

The completely different energy-realities in which Norway and China are found should not be underestimated: Norway's energy consumption has barely increased the last ten years, whilst China's has increased substantially. Likewise, the explanatory power of institutions should not be overrated. Yet, in terms of institutional set-up, it seems influential actors have been allowed to dominate the outcome of policy-approaches to wind power in the two countries. Whilst State Owned Enterprises (SOEs) in China have been compelled to develop renewable energy, Norway has let its energy decisions be dominated by these actors. To be sure, SOEs in China have a considerable influence on policy-making (Downs 2008; Meidan et al. 2009) yet, one may argue that the fragmented authority in China's policy-making system has been conducive to implement renewables.

As we have seen, in the energy field there are some characteristics shared between Norway and China: Both countries are dominated by large electricity utilities and energy companies that have a substantial influence (Narula 2002; Urban et al. 2012). Both countries have large SOEs—the "big five" in China, and the big two, Statoil and Statkraft, in Norway—which are influencing the scale and pace of wind power development. These companies are decisive for the outcome of a wind industry in both countries. Nevertheless, China's institutional structure has allowed for stable policies, aiming at both local manufacturing and domestic wind electricity generation. The policy *choice* has not been that innovative. In fact, wind policies that work tend to be very similar globally (Lewis & Wiser 2007). But the manner in which policy has been *implemented* through a combination of experimentation and mandating is exceptional. We might therefore conclude that China's fragmented authority on the one hand helps avoiding a lock-in, whilst experimentation, on the other hand, helps increasing the legitimacy and internal cooperation, sustaining the growth of the industry.

Another interesting point is the way goals have been set in the two countries. Whilst in China, there are clear goals referring to the amount of MW installed, Norway's goals have always been measured in terms of MWh generated. This difference reflects a disparity in the goals for wind farms in the two countries: In China, considerable effort was devoted to establishing a domestic wind industry, whilst in Norway, facing the cheap electricity generated by hydro power; wind was considered merely as an expensive and superfluous source of electricity.

In both countries we observe a system inclined to engage in new industries, and in both countries the success of a new industry is dependent on lobbying and legitimation. China has managed to lever space for wind energy, whilst Norway has not. In Norway, like in China, there is a low degree of consent amongst actors, yet the large industrial actors are not compelled, and certainly not interested in breaking out of the regime voluntarily. The difference may therefore be explained as a discrepancy in alignment of institutions: In China, industry, economy and climate-interests were aligned and propelled an industry. In Norway, competition between the same interests to some extent hindered wind energy technology.

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