



Development of renewable energy in Australia and China: A comparison of policies and status



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ABSTRACT

Both developed and developing countries have committed to reduce their emissions through the increased use of renewable energy. This paper aims to compare renewable energy deployment in developed and developing countries represented by Australia and China. The paper firstly argues the validity of comparison of renewable energy deployment in Australia and China. Then, the governance structures in both countries are compared; the paper also compares management mechanisms in terms of funding and incentive support, renewable energy grid-connection and coordination between different levels of governments in both countries. Moreover, the current status of renewable energy development in two countries is summarized. From the study, it can be concluded both countries have set a Renewable Energy Target and promulgated legislation and regulations to enlarge the scale of renewable energy; China shows a stronger commitment to renewable energy than Australia. However, Renewable Energy Certificate mechanism is implemented more effectively in Australia than in China. The paper suggests: augmenting and rebuilding the electricity network and strengthening coordination between different levels of governments for both countries; enhancing manufacturing facilities and incentives for the solar and wind industry for Australia, while developing more-detailed implementation legislation and renewable power quota system for China.

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1. Introduction

Increasing energy demand, security of energy supply and reduction of emissions are the essential challenges for the world [1]. Energy consumption which accounts for 60% global greenhouse gas emissions has mainly contributed to climate change [2]. How best to combat climate change and global warming while satisfying the world's energy consumption, without impairing the global economy is an urgent problem for every country.

Reduction of carbon intensity of energy is important for dealing with climate change in the future [2]. Renewable energy is an appropriate way to satisfy energy consumption without environmental degradation. Many countries' governments have committed to decreasing their emissions and respond actively through promoting renewable energy.

Therefore, in recent years, there are different levels of legislation

and policies promulgated to encourage renewable energy development not only in developed countries, but also in developing countries. By the year of 2013, there were at least 144 countries which had made different renewable energy targets and policies to support renewable energy development at the national level compared with only 55 countries in 2005. There are also a large number of state/provincial level and local level policies in different countries [3].

In 2012, there was \$244 billion of total investment in renewable energy which increased by 8% compared to the 2010 level globally. Renewable energy supplied approximately 19% of the world's energy consumption in 2012 [3]. In recent years, renewable energy has increased strongly in both developed countries and developing countries.

2. Validity of comparison of renewable energy deployment in Australia and China

Firstly, comparison can be used as a legitimate and significant method to scientifically explain and explore how political processes

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work [4]. Hill [5] argues it is essential to compare policies for development of policy theory since comparative analysis could look at more than one situation which are separated by policy issues, time and space rather than a particular case occurring at the same time even in the same place. In a comparative study, it is important to observe the extent of policy learning between different countries and over time. Therefore, comparison of renewable energy policies between different countries would contribute to the worldwide renewable energy policy study.

Furthermore, considering the Human Development Index (HDI) that is a composite index reflecting average national human development achievement from three basic dimensions—knowledge, a decent standard of living and a healthy and long life. Australia belongs to the group of Very High Human Development countries with an HDI of 0.933 and China belongs to the High Human Development group of countries with an HDI of 0.719. Australia and China rank at 2 and 91 across the world respectively [6]. HDI sometimes is used to distinguish whether a country is a developed or a developing country [7]. Thus, Australia is a developed country which is in the Very High Human Development ranking and China is a developing country. Comparative analysis of renewable energy policy in Australia and China could be the typical example of renewable energy policy between developed and developing countries.

Australia is endowed with abundant fossil fuel resources, which gives Australia a comparative advantage in relatively cheap electricity. However, high reliance on coal-fired electricity generation has caused Australia to become the highest per capital emitter globally [8]. The GHG emissions from fossil fuel production and combustion sectors account for 78% of total Australia's GHG emissions [9]. The electricity generated from fossil fuel, such as coal, oil and gas accounts for 90% of the total Australian electricity of which coal provides 68% of total Australian electricity [10]. The Australia Government pledged it will reduce its emissions by 5% with unconditional commitment and by 15% or 25% with conditional commitment based on 2000 level by 2020 [11].

On the other hand, Australia is also abundant in renewable energy resources and it is the sunniest country in the world [12]. Therefore, Australia has potential to develop its renewable energy to meet increasing energy demand meanwhile reducing the GHG emissions to respond to climate change proactively.

Compared with Australia, China is a manufacturing and developing country and therefore the energy demand has risen rapidly in recent years due to its speedy economic growth and modernization. On the other hand, China has become not only the largest energy consumer but also the largest CO₂ emitter in the world [13]. Likewise, the Chinese Government pledged to reduce the amount of carbon dioxide emissions (CO₂) by 40%–45% by 2020 based on 2005 level.

Fortunately, China is also rich in renewable resources, such as solar, wind, hydro, which supplies an opportunity for China to integrate renewable energy into Chinese energy mix to meet the energy demand and emission reduction goals.

As discussed above, renewable energy has become a viable option for both developed and developing countries. Investigating the governance and management of renewable energy development in Australia and China is a meaningful task so that they may learn from each other and seek co-operation to contribute to global emission reduction together. There are some similarities and also differences in the process of development of renewable energy in both countries. This article will firstly compare the governance and management mechanisms in both countries and then illustrate the status of renewable energy development in Australia and China.

3. Governance structures and their influences on renewable energy development

There are several similarities of renewable energy governance between Australia and China. Firstly, in order to meet the increasing energy demand and respond to climate change actively, both Australia and China have set renewable energy targets at national level and promulgated national legislation and regulations to promote renewable energy. Secondly, the state/provincial governments in both countries set their own renewable energy targets and released the state/provincial renewable energy legislation and regulations considering their regional renewable resources. However, they must comply with pertinent national legislation and regulations to ensure their own targets can be reached within the required time. In the light of different political systems in Australia and China, the following sections discuss the detailed governance structure in both countries respectively.

3.1. Governance structure of renewable energy development in Australia

In 2000, the Australian Government issued the Mandatory Renewable Energy Target (MRET) which set 9500 GWh by 2010 to encourage renewable energy investment through tradable renewable energy certificates (RECs, 1 REC = 1 MWh of electricity). This legislative target was met ahead in 2007. In 2009, the Australian Government implemented the Renewable Energy Target (RET) which was expanded from MRET. This target was designed to guarantee renewable resources will supply 20% of total Australian electricity by 2020 including meeting the 45,000 GWh renewable energy target. In January 2011, the RET was divided into two parts: the Large-scale Renewable Energy Target (LRET) and Small-scale Renewable Energy Target (SRET). This change aims to create separate incentives for large-scale renewable energy projects and small-scale technology which can decrease the competition with each other in the RET scheme [14].

In order to facilitate the implementation of RET scheme, the Australian Government promulgated national acts to ensure the target can be met in future. There are some legislations, such as Renewable Energy (electricity) Act 2000, Renewable Energy (Electricity) (Small-scale Technology shortfall Charge) Act 2010, Renewable Energy (Electricity) (Large-scale Generation Shortfall charge) Act 2000 and Renewable Energy (Electricity) Regulation 2001. This legislation establishes the liability framework, identifies the means of creating certificates and administration of arrangement and imposes the large-scale generation and small-scale technology shortfall charge at \$65 per MWh. These Acts place a legal obligation onto the liable entities. This means the electricity retailers and other large buyers are required to purchase renewable energy certificates (RECs) from accredited renewable energy providers [14]. If these entities cannot meet the required quotas, they would get fined at \$65 per MWh for shortfalls. The RECs can be used to demonstrate the liable entities' compliance with requirement of RET as a 'currency' form [15].

The Carbon Price commenced from 1 July 2012. To some extent, it has enhanced the competition of renewable energy with fossil fuel through increasing the cost of fossil fuel generation and make renewable energy more viable. This is because cost is the major barrier for renewable energy development which requires much higher up-front capital cost compared with fossil fuel generators. Another reason is that cost and risk of fossil fuel electricity are historically externalized, which leads to the lower private costs but higher social cost compared with renewable energy, and further decreases the competitiveness of renewable energy [16]. Carbon Price in Australia aimed to internalize environmental costs of fossil

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