Asian Energy Challenges in the Asian Century

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Abstract

In this first article in the inaugural issue of the Journal of Asian Energy Studies (JAES), the scene is set for further discussions and debates on the energy challenges in Asia. Energy is fundamental to economic development. Thus far, Asia has been largely meeting its skyrocketing energy demand through conventional technologies based on fossil fuels. However, challenges relating to energy security, local pollution, and global climate change mean that such a path is no longer feasible and Asian countries must meet their growing energy demands in a more sustainable manner. Addressing these challenges is not only critical to the realization of the Asian century, but also to global sustainable development. Multidisciplinary and interdisciplinary energy studies have much to offer in addressing these pressing issues. The mission of JAES is to provide a free and international forum for scholars and professionals working in this exciting and important field of study.

Keywords: energy challenges, energy revolution, Asia, Journal of Asian Energy Studies

1. Introduction

The twenty-first century has often been declared as the Asian century due to the region's rapid transformation into an economic powerhouse. While it is far from certain if or when Asia will overtake North America and Europe to become the dominant economic region of the world, there is no doubt that the importance of China, India, Japan, South Korea, and the Association of Southeast Asian Nations (ASEAN) in the global economic system is on the rise. Such economic successes have been driven by an equally unprecedented energy revolution in the region. In 1990, Asia accounted for only 27% of total energy consumed globally, whereas Europe and North America accounted for 64%. Fast forward to 2013 and the former's share increased to 49%, whereas the latter's decreased to 41%. This energy revolution is not only important to Asia, but has global implications. For example, fluctuations in the energy market have been linked to the varying demand of China. Climate change is another pressing global challenge and many Asian countries, including China, India, Japan, South Korea, and Indonesia, are among the largest greenhouse gas polluters. Not only does Asia have to find sufficient energy to power its economic growth, it must do so against the challenging backdrop of resource depletion and climate change. There is no question that a sustainable energy transition is urgently needed in Asia, but its meaning and the mechanisms to achieve such an objective remain clouded by its great complexity as well as the paucity of research on the topic.

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In this very first article in the Journal of Asian Energy Studies (JAES), I set the scene for critical discussions and debates on Asian energy challenges associated with the economic rise of the region. Following a sketch of Asia's rising energy demand, I focus on the challenges associated with the reliance on fossil fuels and the pressing need for a sustainable energy transition. By highlighting the ultimate goal of energy studies in realizing the Asian century—making sustainable energy revolution a reality—I demonstrate the potential contribution of JAES and look forward to many significant inputs in the future.

2. Asian energy challenges

Asia is experiencing an energy revolution that is defined by an unprecedented increase in energy demand in terms of both scale and speed. In contrast to the rest of the world where energy consumption has been stagnating or even declining, there has been a rapid rise in energy consumption in Asia. Much of Asia's rising energy demand is driven by China and India [1]: China is now the world's largest energy consumer, and its rapidly growing energy demand has been primarily driven by the burgeoning heavy industries [2] and to a lesser extent by households [3]. India's primary energy demand has grown from 450 million tons of oil equivalent (toe) in 2000 to 770 million toe in 2015 due to the growth of industry, rising living standards in urban areas, and enhanced access to electricity in rural areas [4]. Rising energy consumption can also be witnessed in South Korea [5], Southeast Asian countries such as Indonesia [6], Vietnam [7], and Malaysia [8], and Central Asian countries such as Kazakhstan [9]. Energy consumption in Japan, in contrast, has been decreasing due to the country's stagnant economy and improved energy efficiency. Forecasts by various agencies have universally projected that Asia's energy growth rate will remain high at least until 2035: a rate of 2.82% annually according to the Asian Development Bank, 2.20% according to the International Energy Agency, and 2.9% according to the Energy Information Administration [10]. All of these figures predict that, by 2035, Asia will consume over half of global energy. A strong indicator of the potential for growth is that, while Asia's total energy consumption is high, the per-capita energy consumption in most Asian countries remains low compared to that of North America and Europe. Therefore, there is significant 'dormant demand' for energy services.

How to meet such a rapid rise in energy demand is a profound challenge not only in terms of energy security but also environmental problems. So far, such demand has mainly been met by traditional fossil fuel-based technologies such as coal, oil, and natural gas. This is reflected in the proportion of fossil fuels consumed in Asia. According to the United Nations Statistics Division, in 2013, Asia was responsible for 73% of the world's consumption of coal, 44% of oil, and 35% of natural gas. Again, much of this consumption of fossil fuels–especially that of coal–comes from China and India which have abundant reserves. China has the third largest coal reserves in the world behind the US and Russia and is the world's largest coal producer and consumer [11]. India has the fourth largest coal reserves and is the fourth largest coal producer and consumer [12]. Some forecasts have suggested that much of the future energy demand in Asia will be met by fossil fuels, especially coal [10]. Such projections are increasingly improbably, particularly as the negative environmental impacts associated with burning fossil fuels become more severe. At the local scale, toxic emissions such as ozone, PM, CO, SO_2, and NO_x from the combustion of fossil fuels are causing serious health and environmental problems in many Asian countries [13–16]. At the global scale, the CO_2 emissions from fossil fuels consumption from Asia is now the primary cause of climate change. China and India are now the world's largest CO_2 emitters. If the issue of climate change is neglected, this will have very serious consequences for Asian countries who are highly vulnerable to the impacts of climate change.

Table 1: *INDC targets of selected Asian countries*

Country	Targets
Bangladesh	Emissions in 2030 will be 5% below BAU (business-as-usual), 15% with international support.
Bhutan	To remain carbon neutral.
Brunei	Total energy consumption in 2035 will be 63% below BAU and the share of renewable energy in power generation will reach 10% by 2035.
Cambodia	Emissions in 2030 will be 27% below BAU.
China	Stabilization of emissions around 2030.
India	Emission intensity in 2030 will be 33-35% below 2005.
Indonesia	Emissions in 2030 will be 29% below BAU.
Iran	Emissions in 2030 will be 12% below BAU.
Japan	Emissions in 2030 will be by 26% below 2013.
Kazakhstan	Emissions in 2030 will be 15% below 1990 (25% with international support).
Kyrgyzstan	Emissions in 2030 will be 11.49-13.45% below BAU (29.00-30.89% with international support).
Malaysia	Emission intensity in 2030 will be 45% below 2005.
North Korea	Emissions in 2030 will be 8% below BAU (40.25% with international support).
Papua New Guinea	The share of renewable energy in power generation will reach 100% by 2030, contingent on international support.
Philippines	Emissions in 2030 will be 70% below BAU.
Singapore	Peaking of emissions around 2030.
South Korea	Emissions in 2030 will be 37% below BAU.
Thailand	Emissions in 2030 will be 20% below BAU.
Turkmenistan	Stabilization of emissions by 2030.
Vietnam	Emissions in 2030 will be 8% below BAU (25% with international support).

Because of the global impact of climate change, there has been increasing international pressure on Asia to shift away from a reliance on fossil fuels, and the Paris Agreement is the latest and most comprehensive international treaty on climate change [17]. The overall objective of the Paris Agreement to limit global warming to 2°C above pre-industrial levels simply does not leave much rooms for Asia to further increase its carbon emissions [18]. Whereas its predecessor, the Kyoto Protocol, exempted Asia's developing countries from climate change mitigation responsibilities, under the Paris Agreement, most Asian countries have committed to various low-carbon targets [19]. Table 1 lists the targets of selected Asian countries under their Intended Nationally Determined Contributions (INDCs). When the Paris Agreement comes into effect in 2020, these targets would become legally binding which means that Asia must look for ways to limit their fossil fuel consumption. The implication here is that Asia must embrace a more sustainable energy future. Fortunately, such a transition is achievable as changes have taken place already and Asia is now entering into a new phase of sustainable energy revolution.

Asian countries have become the leaders of many forms of renewable energy technology, with China being the most notable success story. China has led the world in installing wind turbines since 2009, and reached a new record of 30.8 GW of newly installed capacity in 2015, with a

total installed wind capacity (145 GW) that equals all of Europe and approximately twice that of the US [20]. In 2015, China also overtook long-time leader Germany to become the world's forerunner in photovoltaics (PV) capacity. China's success in developing renewable energy is largely due to aggressive government measures such as generous feed-in tariffs [21]. Elsewhere in Asia, India's renewable energy sector is blossoming under the National Action Plan on Climate Change initiative [22]. Japan has doubled its renewable energy capacity since 2012 mainly because of a renewed interest in PV following the introduction of a national feed-in tariff scheme [23]. However, successes in renewable energy are not universal in Asia. Hong Kong, one of Asia's leading international cities, uses very little renewable energy because of a lack of government action and limited land and renewable energy resources [24]. In Southeast Asia, despite the abundance of a variety of renewable energy resources, the share of renewable energy is declining as reliance is placed on fossil fuels [25,26]. However, a number of favorable policies, such as Malaysia's National Renewable Energy Policy and Action Plan [27] and Vietnam's National Green Growth Strategy [28], have been put in place recently to address this deficiency.

Energy efficiency is another crucial part of Asia's sustainable energy revolution. Energy efficiency improvements, such as efficient boilers and motors in the industrial sector, efficient lighting and air conditioning for buildings, and efficient transportation, are among the most cost-effective ways of reducing carbon emissions from energy use [29,30]. China's energy intensity has improved significantly since the 11th Five-Year Plan (2006-2010), driven by a series of highly ambitious command-and-control programs and institutional reforms [21,31]. India enacted the Energy Conservation Act in 2001 with the goal of reducing the energy intensity of the economy [4]. In Japan and Taiwan, structural changes to the countries' industrial composition have been the key driver behind the improvements achieved in energy intensity [32]. In the wake of the Fukushima nuclear accident, a grassroots movement called the 'setsuden' has emerged in Japan where households and companies voluntarily adopt measures to conserve electricity [33].

3. The mission of JAES

To make the twenty-first century truly the Asian century, we must meet the challenges of the Asian energy revolution. Part of the solution will be based on technological development, especially in the areas of renewable energy, smart grids, carbon capture and storage, and energy efficiency. Part of the solution will stem from a better understanding of the relationship between energy systems and human societies. There is no doubt that the energy revolution is better conceptualized as complex socio-technical transitions, where technical, economic, social, cultural, and political forces function collectively in shaping the continuous changes in energy systems [34–36]. Insights from the social sciences are particularly useful in this regard. Therefore, energy studies are inherently multidisciplinary and interdisciplinary; success depends on bringing together researchers from diverse backgrounds.

JAES aims to contribute to finding solutions to the challenges associated with the Asian energy revolution by promoting the sharing of new knowledge and facilitating stakeholder engagement. To achieve these objectives, and to encourage multi/interdisciplinary research, the coverage of the journal is broadly defined. We welcome submissions from all fields of inquiry that focus on energy issues in Asia. We also consider studies from outside Asia but that have explicit aims to help understand Asian energy problems. Empirical analysis, theoretical critique, comparative analysis, case studies, review essays, policy debate, and book reviews will be considered for publication.

To provide a truly open and inclusive forum for academics and practitioners, JAES adopts the platinum open access (OA) model and is therefore completely free for authors and readers. Not only are all publications freely available to readers, there is no charge to authors. The costs

of publication are provided through volunteer work and institutional grants. JAES also has one of the simplest and most streamlined online submission processes. This is to allow authors to focus on the most important part of their work: the content. Last but definitely not least, JAES adopts a rigorous double-blinded peer review system where both the authors and the referees are kept anonymous. Manuscripts submitted are first screened by the editors for suitability before they are reviewed by at least two experts. We believe in the importance of timely publication and strive to expedite the process as much as possible without compromising the quality of the journal. Accepted manuscripts are published on a rolling basis in a timely manner. Finally, on behalf of the editorial board, it is my great pleasure to extend my sincere welcome to you both as a regular reader and as a future contributor.

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