Solutions for Energy Conservation and Emission Reduction in China

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Abstract

The purpose of this paper is to help people understand the contradiction of economic growth and environmental protection in China. Although there are problems with China's current energy structure and emission control, the Chinese government has taken significant efforts to solve energy and environmental problems, and achievements have been obtained. Without a reduction in energy intensity since 1978, China would consume three times the energy it does today to sustain its economic growth. For the control of smog, China should optimize energy structure in the long term, and increase the use of high-quality energy in the short term. In other words, China should find a sustainable way to protect the environment while developing its economy. A country which is driven by energy can have a clean environment and protect its resources.

1. Introduction

Along with a rapid growth in economy, China has been facing with serious environmental issues. Coal has been used as a major source of energy, which leads to several environmental and health effects. One of the environmental problems is significant emissions of carbon dioxide (CO_2). In 2014, China National Information Center estimated that 70% of the total carbon (C) emissions in the atmosphere is from fossil fuel energy production and consumption. Zheng, Deng, Yan, and Zhao (2005) conducted a research in which future energy consumption and its environmental impacts were studied. They concluded that due to the energy consumption in the future, SO_2, NOx, CO_2 and soot emissions will remain high. It was further stated that energy consumption and environmental problems can be solved by improving energy efficiency and strengthening the development and utilization of clean energy. NOx emissions inventory in China during the years of 2000 – 2014 was established by Zhang, Wang, Xing, Zhao, and Hao (2008) and Shi, et al. (2014).

The inventory analysis showed that NOx emissions continued to rise with the increase of energy consumption. Similarly, CO_2 emission rises with the increase of energy consumption. Lin, Yao, and Liu (2010) established optimization models that reflected the optimal energy structure under the restriction of energy conservation and emissions, leading to the computable general equilibrium model. The results showed that the government's renewable energy plan had significant positive effects on CO_2 emissions. Zhang, Yang, and Wang (2014) utilized the system dynamic theory and method to predict the demand of energy and CO_2 emissions in China by applying the situation analysis. The results showed that there was a 58% reduction in the carbon intensity (the carbon emission per unit GDP, the unit is ton/10,000 RMB) compared with the carbon intensity in 2005 under the low carbon scenario, which means that low carbon is the best option for the future development of China's energy structure. It is in accordance with the requirement of future development.

2. Energy consumption and environmental protection present a good trend

China has been trying to solve its environmental problems. According to the environmental effect of pollutants, relevant international experience, and availability of data, an air pollution research team in China has determined the research scope and emission trends of the six main atmospheric pollutants, which are sulfur dioxide (SO_2), nitrogen oxide (NOx), particulate matter (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOCs), ammonia (NH_3), and heavy metals. The team established the analysis framework that includes trends of economic growth and pollutant emission, the Environmental Kuznets Curve (EKC) and international experience of emission reduction, development trends of high energy intensive industry, trends with the total energy consumption and energy structure change, and trends of the effectiveness of environmental regulation and emission reduction policy. Research showed that from now to 2020, emissions will peak and start to decrease. Emissions of the main pollutants will begin to decline in five to ten years. From 2016 to 2020, China's 13th five-year-plan (13th FYP) period, the total emission amount of major pollutants will reach their peak. Most of the pollutants emission will drop the stable levels after reaching the peak (Chen, Gao, & Li, 2015).

Most Chinese people think that it is most likely the worst time for air quality will be during 13th FYP in China. But this is the critical achievement period of positive transformation of environment quality. According to the calculations, to significantly improve environmental air quality, the amount of air pollutants have to be cut by more than 60% from present levels. This process would need at least 20 years.

3. The Measures, Actions and Achievements of Energy Conservation and Emissions Reduction in China

It is hard to achieve the environmental protection goal if it only controls the total amount of energy consumption or intensity of energy consumption. In order to implement the goal, the Chinese government should control both of them simultaneously.

3.1. Chinese government's significant efforts to solve energy and environmental problems

For a long time, the Chinese government has been paying attention to the problems of resources and environment and put them into an important strategic position. Especially in the period of the 11th FYP, the Chinese government established an obligatory index of energy conservation and emissions reduction and developed a series of action policies and regulations. In the 12th FYP period, Chinahada seven obligatory indices of resources and environment, including the carbon emissions per unit GDP drop by 17%, energy consumption per unit GDP drop by 16%, non-fossil energy proportion increase to 11.4%, $SO_2$and CO_2emissions drop by 8%, and NH_x and NO_x emissions drop by 10%. Along with the people's understanding of smog, $PM_{2.5}$ became an important control index in 2012. In recent years, in order to develop an ecological civilization, the Chinese government called for the new requirements of green development, circulation development, and low carbon development. In October 2007, the China National Congress pointed out several strategies which included "harmonious development of mankind and nature,""put resource-conservation and environment-friendly society in the prominent position of industrialization and modernization development strategy,""implement the responsibility system for energy conservation and emissions reduction,"“develop clean and renewable energy, "and "strengthen the ability to cope with global climate change and contribute to the global climate protection."

In December 2012, Greenpeace, together with Beijing University, released a research report, *Dangerous Breath - Evaluation Research of a Health Hazard and Economic Loss of $PM_{2.5}$.* The report mentioned that there were 8,600 people who prematurely died and one billion dollars in economic losses in Beijing, Shanghai, Guangzhou, Xi'an, and other cities in 2012because of the $PM_{2.5}$ pollution. Subsequently, the $PM_{2.5}$ index was included in the new *Norms of Ambient Air Quality (GB3095-2012)* authorized by China's State Council in 2012. Compared to the old norms (GB3095-1996), the new one added the concentration limitation of $PM_{2.5}$ annual average and daily average, as well as an ozone (O_3) concentration limitation for eight hours. At the same time, the PM_{10} and NO_2 index were stricter than before. From 2013, the new *Norms of Ambient Air Quality* was extended to 74 cities in China. Those cities would monitor and report real-time data of $PM_{2.5}$ pollution. The new *Norms of Ambient Air* will be implemented nationwide in 2016. In September 2013, China State Council issued the *Action Plan for Air Pollution Prevention and Control (Action Plan)*. The purpose of the *Action Plan* is to drop the PM_{10} concentration by 10% in 2017 in the main cities compared with 2012 and increase air quality year by year. At the same time, to implement the *Action Plan*, the China Environmental Protection Agency established six norms of national air pollutants emission in the main industries.

They were *Norms of Oil Refining Industrial Pollutant Emission(GB31570-2015)*, *Norms of Petroleum Chemical Industry Pollutant Emission(GB31571-2015),Norms of Synthetic Resin Industry Pollutant Emission (GB31572-2015), Norms of Inorganic Chemistry Industrial Pollutant Emission(GB 31573-2015), Norms of Regeneration of Copper, Aluminum, Lead, Zinc Industrial Pollutant Emission (GB31573-2015),*and *Norm of Crematorium Air Pollutants Emission (GB13801-2015).*By implementing these norms, China forced industries to adjust energy structure, reduce emissions, and improve the environment quality. It will greatly decrease the emission of $PM_{2.5,}$ PM_{10}, NOx, SO_2, VOCs, heavy metals, and other pollutants. It also promotes industrial technology progress, improves air quality, and effectively prevents and controls environmental risk. On September 17, 2013, China Environmental Protection Agency, National Development, and Reform Committee issued the *Implementation Details of Action Plan for Air Pollution Prevention and Control in Beijing, Tianjin, Hebei and Surrounding Areas*, accelerating the implementation of China's energy structure adjustment.

In early 2014, the Chinese National Development and Reform Committee launched the *Action Plan for Energy Conservation and Emissions Reduction in 2014-20*15.Ministry of Science and Technology and Ministry of Industry Information also jointly issued *Action Plan for Energy Conservation and Emissions Reduction in Technology in 2014-20*15. Then, *Performance Assessment Measures for* the *Action Pla*n *for Air Pollution Prevention and Control* and other series policies and measures were issued. All of them propelled energy conservation and emissions reduction in 12th FYP. On January 1, 2015, the new *Environmental Protection Law*, which is called the strictest law in China's history, was implemented. This law instituted a penalty for illegal pollutants discharged, and there is no upper limit. For those who refuse to correct the illegal discharge, administrative authorities may successively punish them on a daily basis, which significantly increases the cost of illegal discharge. In addition, the *Law for Air Pollution Prevention and Control* has been completely revised and will take effect on January 1, 2016. On September 25, 2015, Chinese President Xi Jinping met U.S. President Barack Obama in Washington. They jointly declared that in order to cope with global warming, China's CO_2 emissions intensity must drop 60% to 65% by 2030 compared to 2005. China also plans to start a national carbon emissions trading system in 2017, which will cover such key industries as iron and steel, electricity, chemical production, building materials, paper, and non-ferrous metals (Wanqilong Energy Conservation and Low Carbon Research Institute, 2015).

3.2. The goal and achievement in 11th FYP

The 11th FYP (2006-2010) is the accelerating development period of China's urbanization and industrialization. It is also the important period in China's energy development history. Along with the development of China's national economy, China has rapidly become the world's number one energy producing country and second in energy consumption. A total primary energy production of 2.16 billion tce in 2005 rose to 2.97 billion tce in 2010, an average annual growth of 6.6%, and a primary energy consumption of 2.36 billion tce rose to 3.25 billion tce, an annual growth of 6.6%.

These consumption amounts ensured the demand of energy for the rapid national economy development (China Statistic Bureau, 2011).China's energy intensity had been decreasing for several decades, but it presented increases between 2002 and 2005 for unknown reasons. So, the Chinese government set a goal in the 11thFYP of decreasing energy intensity by 20% by 2010. To reach that goal, the government launched a range of new programs and policies, such as the Top 1000 Energy–Consuming Enterprises Program and Small Plant Closures Program. In the period of the 11th FYP, China achieved a big transition on reducing major pollutants discharge. The main contributors were the large scale projects of thermal power desulfurization and wastewater treatment, which supported the pollutant emissions reduction and the total amount control policy. Because of the policies of emission reduction and adjusting of the economic structure, the discharge of major pollutants appeared as a new trend of decline in the 11thFYP in China. By the end of the 11th FYP in 2010, China achieved a 19.1% energy consumption reduction, narrowly missing the 20% target (Joanna, 2011). SO_2 emissions dropped from 25.50 Mt in 2005 to 21.85 Mt in 2010. C emissions intensity dropped from 1.84 in 2005 to 1.45 in 2010. Most of the Ten Key Projects, the Top – 1000 Program, and the Small Plant Closure Program will meet or surpass the 11thFYP savings goals, and Appliance Standards and Labeling Programs will become very robust (Price, 2011).

3.3. The goal and achievement in 12th FYP

The 12th FYP (2011-2015) is a major transformation period in China's economic and social structures, focusing on energy conservation and emissions reduction. In the 2009 Copenhagen Conference, the Chinese government pledged a 40% -45% reductions in national carbon intensity from 2005 levels by 2020.

The 12thFYP devotes considerable attention to energy and climate change. Some of the targets represented more dramatic moves to reduce fossil energy consumption and promote low-carbon energy sources. To achieve this target, the 12thFYP set an interim target of reducing carbon intensity 17% from 2010 levels by 2015. Also, the 12thFYP set a new target to reduce energy intensity by an additional 16% by 2015. Although it is lower than the 11thFYP of 20%, it is more challenging because the largest and least efficient enterprises have already undertaken efficiency improvements, leaving smaller and more efficient plants to be targeted in this second round. In addition, the 12thFYP includes a target to increase non-fossil energy to 11.4% of the total energy use (up from 8.3% in 2010) (Joanna, 2011). After the success of the Top 1000 Energy Consuming Enterprises Program in 11th FYP, the government molded the Top 10,000 Energy-Consuming Enterprises program in 12th FYP. This program includes 15,000 enterprises that use more than 10,000 tce per year, in addition to around 160 large transportation enterprises and public buildings that use more than 5,000 tce per year. According to *BP Statistical Review of World Energy*, the energy conservation and emissions reduction are on track to meet the 12 FYP's goal, and they are expected to exceed it. In the energy structure, the consumption of coal, the dominant energy, was reduced to a proportion of 67.5% in 2013, breaking the low record. In 2014, China's energy structure was continuing to improve. Coal consumption proportion continued dropping, falling to 66% in 2014, which set a new low record. Oil proportion fell to 17.8% in 2013, which was the lowest since 1991, and dropped even more in 2014. Among the three main energies in 2013, China's oil production growth was 0.6%, far below the average of 2.1% over the previous ten years. Coal production growth was 1.2%, the slowest growth since 2001.

Table 1 show that China's energy consumption growth has sharply declined in recent years. In 2013, energy consumption growth dropped to 4.7% from the previous year of 7.0%, which was far less than the average of 8.6% of the previous decade. Then the energy consumption growth kept dropping to 2.6% in 2014, which was the lowest level since 1998 and less than half of previous decade average of 6.6%. Other than that, CO_2 emissions grew by 4.2% (358 million tons) in 2013, the slowest in five years. Then CO_2 emissions rose only 0.9% in 2014, far below the 5.9% average of the previous ten years. Table 2 shows that coal consumption grew by only 4% in 2013, less than half of the previous ten-year average of 8.3%, and only 0.1% growth in 2014. Natural gas consumption increased 10.8% in 2013, which doubled the average growth of 5.1% of the last decade and was the worldwide highest growth in that year. In 2014, natural gas continued to grow by 8.6%. Also in 2014, China's renewable energy consumption growth was 15.1%, which accounted for 16.7% of the world's renewable energy, far more than 1.2% of a decade ago. Nuclear energy rose 13.2%, which doubled the average of the past seven years.

Table 1

2013 and 2014 Energy Consumption and CO_2 Emission

	China's Share of Global Energy Consumption（%）	Energy Consumption Growth（%）	CO2 Emissions Growth （%）
2013	22.4	4.7	4.2
2014	23.0	2.6	0.9

Date source: BP Statistical Review of World Energy, 2014, 2015

Table 2

2013 and 2014 Energy Consumption Increase Rate (%)

Year	Coal	Gas	Oil	Renewable Energy	Nuclear Energy	Hydroelectric
2013	4.0	10.8	3.8	28.3	13.9	4.8
2014	0.1	8.6	3.3	15.1	13.2	15.7

Date source: BP Statistical Review of World Energy, 2014, 2015

As a result of forcing energy conservation and emissions reduction, the average annual energy consumption growth was 4.3% during the 12thFYP, less than half of 9.4% of 11thFYP. In October 2013, the General Office of the State Council required implementation of the safety of coal mining, which forced the shutdown of more than 2,000 small coal mines by the end of 2015. In 2013, 711 small coal mines closed, and 800 closed in 2014. The rest would be completely closed in 2015.

In 2014, natural gas consumption was 183 billion m^3, which led to reductions in 1.02 billion tons of CO_2, 9.43 million tons of SO_2, and 9.43 million tons of fuel dust compared to coal consumption. It made a great contribution to reducing environmental pollution and CO_2 emissions. BP's chief economist Christ of Ruhlsaid, "China's economic restructuring has affected the demand for energy, but did not affect 7.7% of GDP, this cannot be explained by economics."

3.4. The goals 13th FYP

The 13th FYP (2016-2020) will focus on developing safe, clean, efficient, and sustainable energy systems. In addition to achieving carbon emissions intensity of 40% - 45%, which China promised in 2009 in Copenhagen, and achieving the goal of the carbon emissions peak in 2030, which is the joint statement by China and the US on climate change in 2015, the goal of energy consumption growth in the 13th FYP is to drop to 3% (China Energy Bureau, n.d.). According to the *Action Plan* issued in 2013, by 2020 the coal consumption proportion will be controlled within 62% and then drop to 50% in 2030. In 2020, the gas consumption proportion will rise up to 10%. Also in 2020, China's energy consumption intensity will be 35% lower than in 2005. (Xu, Wang, Chen, & Du, 2010).

Compared with the 12th FYP, the biggest difference in the 13th FYP is the reformation of the energy price formation mechanism, which is pricing by market. The government's subsidies to the renewable energy industry will be capped. The new-energy power generation companies should improve their technology and gain market share by cutting costs, instead of depending on government subsidies. At the same time, the renewable energy proportion being consumed will be improved. Total wind power installed capacity will reach 200 million kilowatts by 2020, which is doubling the 12th FYP period's level. Solar power will generate more than 100 million kilowatts, which will quintuple the target during the 12th FYP period. In addition, China's national carbon emissions trading system will start in 2017 and will cover the key industries such as steel, electricity, c hemical production, building materials, paper making, and non-ferrous metals (Wanqilong Energy Conservation and Low Carbon Research Institute, 2015).

3.5. Future outlook

With the energy efficiency improved, China's energy consumption intensity presents the declining trend. Energy consumption intensity is regarded as one of the most important core indicators of energy efficiency. In general, the more the energy efficiency is improved, the lower the energy consumption intensity will be. From now until 2035, China will enter a critical period of increasing industrialization and urbanization. Combining with China's energy efficiency situation, Li, Wang and Yu (2010) analyzed the track of CO_2 emissions intensity index of developed countries and predicted that, in 2030, China will be at the same development level as the United States was in 1994, but China's emissions intensity index would be less than half of the United States' in 1994. From the international experience, energy consumption's peak lags behind air pollutant emissions peak of 20 years. Europe, for example, had air pollutant emissions peak in the 1970s, and energy consumption peaked in the 1990s (Zhu, Wang, & Shi, 2014). Predictions show that China's emissions will peak in 2016-2020 (Chen, Gao, & Li, 2015); then China's energy consumption peak will be in 2030-2040. Similarly, another study analyzed the energy consumption in developed countries and concluded that China's zero growth of energy consumption will be in 2030 to 2035 (Yu, Wang, & Wang, 2010).

4. Recommendations

4.1. Long Term and Sort Term Energy Strategies

In the long term, changing the energy consumption structure is the key to controlling the smog in China. It is an inevitable choice. Although the *Kyoto Protocol* did not set specific emissions reduction targets for developing countries, including China, it seriously impacted China's future. China's energy consumption reliesheavily on coal; and results in high pollution. In order not to repeat the 1952 London Great Smog scenario, China must reform the energy structure for long-term sustainable development by taking actions on energy conservation, emissions reduction, energy efficiency, and clean energy development. In 20 years after the Great Smog incident in Britain, more than 20% of the coal usage was replaced by oil, and more than 30% of coal usage was replaced by natural gas. Coal proportion in the energy structure fell from 90% to 30% (Zhang, Liu, & Li, 2014). The British used cleaner energy, like oil and gas, especially gas, instead of coal, improving the environment and restoring a blue sky. At the same time, the British economy did not regress. From 1960 to 1970, the first decade of the pollution treatment, the British GDP doubled.

The following decade, when Britain entered into the era of oil and gas, the economy quadrupled (Chai,2015). By specifically adjusting the proportion of coal in the energy structure, China will be able to reduce emissions effectively and to solve the root of environmental problems such as smog. Although the fossil fuel proportion will gradually be reduced, the energy structure will not be totally changed from fossil fuel to clean energy rapidly. At present, China's coal consumption accounts for 67% of its total energy consumption. Energy saving technology and renewable energy has not been well developed yet. Fossil fuel will still take the biggest share in the energy structure for a short time. In the short term, increasing the use of high-quality energy, especially the use of high-quality coal, is an effective way to reduce the emission of energy consumption, helping to reduce the smog.

4.2. Strengthen the Concept of Low Carbon, Develop Renewable Energy and New Energy

Low carbon means minimal energy consumption and minimal output of emissions. The core of the low-carbon development is clean, efficient energy production. Low-carbon refers not only to reducing greenhouse gas emissions, but it also focuses more on pollutant emissions reduction. China's rapid economic growth depends heavily on energy. A high demand of energy and low percentage of reuse results in a large amount of industrial emissions and does not conform to the requirements of environmental protection.

Energy conservation and emissions reduction can solve the problems of economic growth, energy consumption, and ecological deterioration. Due to more than 90% of the carbon emissions from fossil fuels in China, the low carbon development index can promote energy savings and optimization of the energy structure problem, which at the same time solves the problem of atmospheric pollution (Kang, 2015). Methanol gasoline, for example, is the latest low-carbon energy in China. Adding methanol into gasoline greatly increases its oxygen content. The harmful exhaust emissions from vehicles will be reduced more than 50%, of which the CO emissions will be reduced by 90%. NC compounds and HC compounds will also be reduced by 90%. This meets the demand of China's energy conservation and emissions in environmental protection. The cost of methanol gasoline is 30% lower than traditional gasoline (Wu, 2014). With global warming becoming a serious problem, the development of low-carbon economies has achieved a global consensus. Historically, the human energy consumption structure is first stage: fire wood, second stage: coal, third stage: oil and gas, and an eventual in to the final stage: new energy.

After years of development, China has made great progress on its development and utilization of renewable energy and new energy. Although China invested $34.6 billion in renewable energy and new energy, becoming the most heavily invested country in 2009, advanced technologies and experience from developed countries are still needed. China also needs to develop and utilize renewable energy and new energy as an important part of the energy security strategy. In recent years, China's wind power development is progressing quickly with a cumulative installed capacity of 25.1 billion watts in 2009, which was ranked the third in the world. China hopes wind power costs will be reduced to the same level as conventional energy production in a few years. China has lagged in solar power. Photovoltaic power generation capacity was only 145 million watts in 2008, which was 1% of the world photovoltaic power (Yan& Chen, 2010). Nuclear energy was less than 1%, which means there is huge potential for development.

New energy are clean and environmentally friendly, resulting in lower emissions or even zero emissions, but most of them are undeveloped. Compared with conventional energy, the initial cost of investment in new energies is high, and the technology is complex. China's new energy technology is in the lower level and is used in the low-tech heating field. In November 2001, the *Kyoto Protocol* introduced the flexible implementation mechanism - the Clean Development Mechanism (CDM). According to the CDM, it allows the offset transfer of emission reductions between developed countries and developing countries and implements the greenhouse gas emission reduction project in developing countries. In other words, CDM allows developed countries to help developing countries create projects of emissions and greenhouse gases absorption as a part of their own achievement. This mechanism provides great opportunity for developing countries who want to develop new energy. China became one of the biggest beneficiaries of the Clean Development Mechanism. Under this framework, developing new low-carbon energy in China will have a very significant economic, environmental, and social benefit.

4.3. Energy Prices Should Include the Environmental Costs

At present, China's energy policies do not fully reflect the environmental costs. The process of mining coal, for example, causes harm to the ecological environment, such as surface subsidence, destruction of water resources, water pollution, and soil erosion. Only a few of those damage costs are included in the price of coal.

In addition, the process of using coal causes serious air pollution and damage to health, but they are not included in the coal price. In recent years, due to China's inferior natural gas reserves, production costs increased. Combined with the high price of natural gas imports, the price of gas rose gradually. As a result, the price of natural gas went higher than the price of coal. In some areas, natural gas prices are equivalent to 3 - 4 times the price the calorific value of coal (Hou, Zhu, & Wang, 2015).Therefore, it is difficult for natural gas to compete with coal. As a result, China's natural gas consumption growth declined from 10.8% to 8.6% in 2014, which was the lowest in the decade. In order to protect the ecological environment and optimize the energy structure, China should optimize the policies on energy, environmental protection, taxation, and supervision. In the process of energy production, transportation, and use, environmental costs should be fully embodied in energy prices, such as increasing discharge fees or levying environment taxes and raising the cost of polluting energy exploitation and use. At the same time, China should optimize the fiscal and taxation policy to reduce the cost of natural gas production and supply. In this case, natural gas would be competitive with coal, and coal to gas production in China. With the development of the ecological environment, the Chinese government promised that CO_2 emissions would peak around 2030. Coal to gas generation is the most realistic measure for large-scale carbon reduction. Therefore, the contribution of the coal to gas generation in carbon reduction should be monetized.

4.4. Cultivating the Consciousness of Resources and Energy Conservation, Improving the Environmental Justice System

The organizations should improve employee consciousness with regard to energy conservation in the process of consumption and production by training. Communities should strengthen the publicity of environmental rules by popular science to help the public understand the energy resources and protection, enhance the public awareness of long-term energy protection and emissions reduction, and actively participate in environmental protection and pollution control. At the same time, the government should develop the environmental judicial specialization system to make the environmental pollution incidents enter the judicial process and improve the environmental legality.

5. Conclusions

Economies cannot develop without consuming energy, and emissions are inevitable. Since reforming and opening in 1978, China's economy has experienced rapid growth. In 30 years, China has gone through the industrialization stage, which took developed countries a hundred years to go through. The energy consumption structure has long been heavily relying on fossil fuels, and lacks the experience of emission controls. Coal consumption is the main cause of smog. Economic development cannot skip the pollution stage. Developing the economy and reducing the energy consumption and emissions at the same time is the way to solve this controversy.

It is good that the controversy caused by the documentary *Under the Dome* aro used people's attention to the environment. After the debate and complaints, people should start thinking more about how to continue to adjust the energy structure, improve technology, and strengthen policies to cut down on energy consumption and emissions. The next step is to seek a feasible path for a harmonious development of economy, energy, and society that is a sustainable solution. Twenty years after the Great Smog, Britain used cleaner energy instead of coal and got a blue sky, and GDP significantly increased. This shows that by adjusting and optimizing energy structure, improving technology, and developing renewable energy and low carbon energy, pollution emissions and smog can be reduced. Finally, the contradiction between economic development and environmental protection can be resolved. A country which is driven by energy can have a clean environment and protected resources.

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