



Towards a Low Carbon Energy Mix: Role of Nuclear Energy

Speaker: Dr. Nanda Kumar Janardhanan

Chair: Prof. Alka Acharya, Director, Institute of Chinese Studies

3 February, 2016

Institute of Chinese Studies Delhi

Dr. Janardhanan's presentation was an attempt to understand the role of nuclear energy in China's low carbon energy mix and its potential role in minimizing energy-related emissions. Introducing China's energy landscape, Dr. Janardhanan stated that as a developing country, China's energy consumption has increased over the past few years and it has emerged as the largest primary energy consumer in the world. China has the largest share in commercially traded primary energy consumption. During the end of the 1980's, China's economy started moving from centrally planned to market economy and as a result, its energy demands rose. As the production of oil within China declined over the years, it became a net importer of oil in 1993 and by 2003, it took over Japan as the second largest importer of oil. It is also one of the significant consumers of coal. According to the speaker, China has been trying to do the transition from the conventional fossil fuels base to a low carbon energy mix considering the climate and environmental impacts due to the use of fossil fuels to generate energy and the production of nuclear energy has been one of its plans.

Apart from understanding the role of nuclear energy in the low carbon energy mix that China has been planning, the presentation was also an effort to understand its implications.

Providing us with a picture of China's current energy mix, the speaker stated that 66 per cent of its total energy demand is met by coal, natural gas comprises 6 per cent and oil is the second largest consumed primary energy source. Comparing the situation with India, the speaker revealed that India depends more on fossil fuels for its energy needs than China but if one turns to climate related issues, China leads in primary energy consumption and carbon emissions.

According to the speaker, the existing literature suggests that considering China's huge geographical space, the growing population and the economic growth that it has been planning

would further increase its energy demand and the time is not far when China will eat up all the energy resource in the world.

While the initial years of the 2000s saw China growing as a consumer, the global energy sector faced crisis due to the 2003 US invasion of Iraq, collapse of Russian company Yukos, natural disasters like hurricane Katrina and workers strike on some of the largest oil fields in the world. China had started building, consuming more, expanding overseas and acquiring energy equity from countries like Africa, Latin America and Asian region.

Over reliance on oil and gas increased emissions and environmental pollution reached alarming levels. The 2007 Intergovernmental Panel on Climate Change (IPCC) report stated that it was scientifically proven that pollution was causing global warming. The 2007 Bali Action Plan asked all the developing countries that were part of the Kyoto Protocol, to make plans to reduce energy related emissions and greenhouse gas emissions. Therefore, China decided on the development of a mechanism to be built domestically to reduce impacts on environment, food and agriculture, and climate change. The measures for energy transition were also adopted.

From 2005 onwards, the 11th Five Year Plan gave more attention to energy transition where China had several programmes to increase energy efficiency and reduce use of conventional sources. Energy intensity reduction program was one of them and focused on household as well as industrial energy consumption. There were plans to retire inefficient energy generation plants and coal powered plants that were 20 years of age. The 12th Five Year Plan also addressed some of these energy related issues.

The speaker further revealed that during 2010-15, China made remarkable progress in energy intensity reduction. Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP. Therefore energy intensity reduction would mean that there was a decrease in the amount of energy used to produce a unit of GDP. During 2009, China communicated to UNFCCC that it would bring 40-45 per cent carbon emission intensity (emission generated per unit GDP) reduction by 2020. Thus, there was international pledge, domestic actions, national policies, etc. that targeted energy transition from fossil fuels to cleaner renewable energy mix.

Given the limits for emission set by the UNFCCC, among the other sources of energy, China started to consider production of nuclear energy for its energy transition plans. China, according to the speaker, has now become the largest renewable energy producer and largest renewable energy equipment manufacturer in the world, not only contributing to the sector's growth within China but also abroad. Looking at China's nuclear energy sector, it currently has 31 nuclear reactors with a capacity of 28,493 megawatts (MW), contributing to 1 per cent of the total energy mix. 24 new nuclear reactors are under construction and will be active by 2020, which would increase the share of nuclear energy to 6 per cent in the energy mix.

Within the Nuclear energy expansion plan, China targeted 80 gigawatts (GW) of nuclear energy by 2020 and 200 GW of nuclear energy by 2030. But it had to be reduced to 60 GW of nuclear energy by 2020 after the Fukushima nuclear disaster. Apart from the existing and under construction reactors, China is also planning 177 nuclear reactors in the coming years. Therefore according to the speaker, predominant questions regarding China's energy expansion plans are as follows:

1. Whether China will be able to make a remarkable change in the low carbon energy mix due to the expansion of nuclear energy?
2. What are China's plans on expanding nuclear energy as the statistics show that nuclear energy would contribute to only 15 per cent of total electricity generation by 2050?
3. Is China generating electricity for domestic use or does it also have some market plans outside its borders?

The speaker stated that at present China operates generation II and generation III reactors and although China is trying to develop its domestic energy sector, it is also trying to develop the environment in the energy sector similar to its trade and economic relations with other countries. China has already invested in Pakistan and a reactor is under construction there. China has also been planning the building of nuclear reactors in Romania, Argentina and UK which are in the initial stages. Even though these plans seem less definite, they show that China is not only interested in its domestic energy sector but also divesting upon the climate energy link to ensure that there is a possible market for Chinese nuclear energy and equipment in the future outside its borders. According to the speaker, the major challenge that China might face with regard to nuclear energy equipment is the quality of equipment technology. Nuclear energy is known as 'macho technology', i.e. technology that has the potential to create major disasters, therefore, an important question is how far would China ensure the quality of the technology that it would supply in future.

Discussing the future of China in the nuclear energy sector, the speaker stated that according to existing plan, China hopes that 15 per cent share of its total energy requirement would come from nuclear energy. However, the question that arises is will China be able to reduce fossil fuels from its energy mix? The speaker concluded by saying that fossil fuels would continue to hold a major share of China's energy mix but what China has been doing to expand its nuclear energy sector domestically would benefit the global nuclear sector and global nuclear industry players than China itself, in terms of energy. Therefore, though China cites domestic sector as a major factor for its nuclear industry expansion plans, the overseas market seems to be the main driver.

Discussion

The discussions that followed the presentation focused on various issues related to the nuclear energy sector, its relative economy and on other cleaner renewable sources of energy.

In response to a question on the relative economy of other sources of energy, the speaker argued that China has not only been focusing on generation of energy like solar energy etc., but has also been interested in the production of equipments like solar panels. Moreover, taking into account the planning of the reactor, its lifespan and decommissioning the reactor when the lifespan is over, the cost of nuclear energy is at par with solar energy. Moreover, statistics reveal that the number of deaths or casualties per kilowatt (KW) per hour is the least in the case of nuclear energy; rather, the highest number of deaths is being caused by emissions from the use of coal. He further argued that biomass, which is the primary source of energy in the rural areas of all developing countries causes a lot of emissions that pollute the environment, therefore, China focuses on the production of wood pellets which is more efficient in terms of heat generation and also emits less. Moreover it has also got a commercial value apart from residential urban usage. It is quite popular in the Western countries and is widely used for home heating purposes.

Further, the speaker informed that any civil society protest against nuclear energy in China has not been able to create any sort of deterrence. With regard to the question on nuclear waste and how China plans on managing it, the speaker replied that presently China does not have a permanent storage facility and nuclear waste is stored in the nuclear complex itself but since the waste fuel emits radiation and certain amount of heat which is sufficient to contaminate food, drinking water etc., they are placed in highly secure area. The Chinese have also been negotiating with a Taiwanese firm regarding the disposal of waste material.

The speaker seemed optimistic regarding the technology, which may not seem feasible now but in the coming years will play a better role in ensuring reduced emissions. Regarding data validity, the speaker thinks that it is not much of an issue as there are international bodies to estimate climate related issues. Replying to the politics behind China's interests in setting up reactors abroad, the speaker stated that though China highlights domestic factors for nuclear energy growth but they have a long term expansion plan with respect to not just setting up reactors but probably with the component equipment industry.

The speaker concluded by answering to the query if China and India were on the same page with regard to reduction of carbon emissions. According to the speaker, China and India are working closely in terms of climate negotiations as both of them are developing countries and thus on the same side of the table. There are many groups and forums where India and China have been working together and it would be beneficial for both the countries to remain together.

Report prepared by Jaya Kumari, Research Assistant, Institute of Chinese Studies.

About the Speaker

Dr. Nanda Kumar Janardhanan specializes on Energy and Climate Policy. His research interests include energy security, climate mitigation, low-carbon development, non-conventional energy and nuclear power. Nanda Kumar is an Adjunct Fellow with the Institute of Chinese Studies. Other institutions where Nanda Kumar has been involved in research, consulting and teaching

responsibilities include: Energy Studies Programme, School of International Studies (JNU); Institute for Global Environmental Strategies (Japan); Centre for Environmental Law and Governance, University of Strathclyde (Glasgow, UK); Climate CoLab, Massachusetts Institute of Technology (MIT, US); Nuclear Energy Division, GlobalData (India); Institute for Defence Studies and Analyses, (India); and Japan Institute of International Affairs (Japan).

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