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Global Energy Reforms Call for Innovations in Energy Economics

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In the context of global fight against the climate change and reductions in carbon emissions, a worldwide wave of energy system innovation has surged up. The traditional energy system dominated by fossil fuels will be replaced gradually by a new low-carbon energy system mainly supported by new and renewable sources of energy. The economic development of human society will not depend on the limited mineral resources on the earth and the environmental space will not be exploited and breached, hence will allow human civilization to transit from the current unsustainable industrial civilization to an sustainable ecological civilization featuring harmony between human and nature, and balance between social and economic development and resources and the environment.

The transition of human civilization is associated with transformation of the concepts of development and consumption. With the global environmental space becoming an increasingly important scarce public resource, the carbon emission space is becoming a more precious resource and factor of production than labor and capital. The carbon tax widely adopted and the "carbon pricing" under the carbon market mechanism have triggered externalization of the value of environment capacity and internalization of the social cost of occupying the environmental space. A signal of "carbon pricing" will guide the social investment into energy-saving and advanced energy technology, and promote energy system reform and transition towards a low-carbon society and economy. New energy economics shall focus on the research of "carbon productivity" in order to improve the output efficiency per unit carbon emission, or per unit of environmental space, under the 2°C climate target. By 2050 there will be a three-fold increase of world GDP with the carbon emission decreasing by around 50% than in 2010, which means, at the same time, the carbon productivity has to increase by six-folds with an annual increase of over 4.5%. The figure is a lot higher than the labor productivity and capital-output ratio since the industrial revolution. To realize it we must rely on theoretical innovations in energy economics.

As a new international trend in recent years, the research on new climate economy not only focuses on traditional notions such as impact of and damage done by the climate change and abasement cost, but rather on achieving sustained economic growth while controlling the climate risk. At institutional level of international governance, it not only focuses on the responsibilities of different countries, but rather on sharing the global development opportunity for a mutual success within the global community. The innovations in energy economics shall serve as a prop for the development of new climate economy. At a micro project level, the research focuses will be extended from the simple analysis of technological economics to the life cycle analysis and environmental cobenefits. At a macro strategy level, it focuses on developing a technology roadmap for an efficient, secure, clean and low-carbon energy system and its corresponding model system and evaluation methods, as well as finding out how to expand the win-win mechanism and analysis methodology of advanced energy technology cooperation and technology transfer mechanism under an international "carbon pricing" mechanism. The compelling situation of the fight against the climate change will also accelerate the theoretical and methodological development and innovation in energy economics.