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Editorial

Facing Challenges Together

Zhihua Zhong^a, Raj Reddy^b^a Secretary-General of the Chinese Academy of Engineering, China^b Mozah Bint Nasser University Professor at Carnegie Mellon University, USA

From a wide view of human history, it is clear that engineering has continuously advanced the development of human civilization and society. At different developmental stages, humans are confronted with different problems that must be addressed with different key technologies. In the 21st century, humans have been confronted with critical problems such as starvation, resource scarcity, energy shortages, environmental pollution, climatic anomalies, population expansion, regional poverty, disease outbreaks, and economic crises, one after another.

In 2008, the National Academy of Engineering (NAE) put forward the 14 Grand Challenges to be addressed in the 21st century. In 2013 and 2015, the NAE, the Royal Academy of Engineering (RAE), and the Chinese Academy of Engineering (CAE) jointly held two Global Grand Challenges Summits in London and Beijing, respectively, to carry out exchanges on how to use engineering technology to address the most pressing global grand challenges, and to discuss inter-disciplinary solutions. This issue contains valuable reflections from and solutions proposed by some of the speakers at the 2015 Global Grand Challenges Summit on major challenges relating to sustainability, infrastructure, energy, health, the joy of living, education, and security/resilience. We hope that these articles will exert a beneficial influence on forward-looking studies in the field of engineering technology.

Climate change is a major challenge that has been facing the entire world in recent years. Global temperature increases have led to a series of problems including glacial ablation; sea level rise; frequent occurrences of typhoons, storms, and drought; and the destruction of coral reefs, wetlands, and other natural ecosystems. We were glad to hear that the Paris Conference on Climate Change agreed on the historical goal of keeping the increase in global average temperature to well below 2 °C above pre-industrial levels, and pursuing efforts to limit the increase to 1.5 °C. This

is a major breakthrough in the challenge of climate change.

Energy consumption is closely connected to climate change, and is currently climbing continuously, in tandem with economic and social development. The questions of how to meet growth in energy demands, how to ensure energy security, and how to reduce or avoid negative impacts on climate have become serious challenges facing countries worldwide. In spite of the difficulties in waste treatment and the potential for environmental disaster from accidents, nuclear power remains an appealing energy source. Increasingly sophisticated nuclear power and the supporting nuclear fuel technology have become the third top energy source for reducing carbon dioxide and pollutant emissions, next only to thermal power and hydropower. Capable of improving energy structure, satisfying energy demands, and addressing climate change, nuclear power is the core element of an energy revolution. Nuclear fission technology has now reached its fourth generation. The third generation nuclear power plants already built in various countries are regarded as modern and popular reactors, and the more advanced fourth generation reactors are yet to come. In the field of nuclear energy applications, however, nuclear fusion technology is king. Let us consider it for a moment: Once the technology for controlled nuclear fusion is ripe, what will its impact be on humanity? With inexhaustible, clean, and cheap energy, we will be able to tackle other challenges on a solid physical basis.

The many challenges we face cannot be avoided; we must deal with them. No matter how difficult these challenges may be, we can conquer them with our combined efforts. It is now time for us to jointly respond to global challenges and build a brighter tomorrow. Our future requires innovation from and cooperation between engineers, policy-makers, economists, and sociologists. Let's do this together!

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