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The impact of cooling energy consumption has been underestimated for a long time

— Interview with Iain Campbell, Managing Director of the Rocky Mountain Institute

Our reporter Zhu Yan

China Energy News (March 04, 2019, 05th edition)

As urbanization, population and income continue to rise, global cooling demand is also increasing. However, there is data showing that cooling is one of the largest end-use behaviors affecting climate change. If it is not controlled, by 2050, only the cooling of residential buildings will bring at least 0.5 degrees Celsius temperature rise. In this regard, Iain Campbell, managing director of the Rocky Mountain Institute, an international energy think tank, explained his views to reporters.

China Energy News: As one of the important needs of life, what is the energy use in the cooling sector?

Iain Campbell: Cooling is an important life "comfort" in today's world, and the energy consumption is increasing. From 1990 to 2016, global building cooling energy consumption more than doubled, with nearly 70% of growth coming from residential buildings.

From the point of view of usage, the air conditioning system is currently the leading technology to meet the cooling needs, especially room air conditioners. According to the current conventional cooling development needs, we estimate that in 2016-2050, the number of room air conditioners in the world will increase from 1.2 billion units to 4.5 billion units, an increase of nearly 3.7 times.

China Energy News: What impact will these growths have?

Iain Campbell: The increase in the number of room air conditioners will inevitably drive further increases in electricity demand. It is estimated that by 2050, its electricity consumption will account for about 16% of the total electricity demand in the world. By then, the world needs to build about 2,000 GW of power generation capacity to supply 5,400 TWh/year of electricity for new room air conditioners, which is equivalent to the current annual electricity consumption in the United States, Japan and Germany. Increased demand for electricity has forced governments to increase investment in power infrastructure. According to a report released by the International Energy Agency, as of 2050, the global capital expenditure for new generations will reach 1.2 trillion US dollars.

At the same time, the impact of cooling on global greenhouse gas emissions is also increasing. Although many countries around the world have signed the Paris Agreement, the total amount of carbon emissions due to cooling energy consumption is still increasing substantially. It is estimated that by 2100, the demand for cooling energy will reach more than 50 times the level of the beginning of this century. The growth of room air conditioners alone will cause the surface temperature to rise above 0.5 degrees Celsius. The future growth of cooling energy consumption is actually more serious than the one predicted by the Paris Agreement.

China Energy News: In the face of the crisis of warming, what response work has been done? What are the challenges?

Iain Campbell: In order to improve energy efficiency, we started to conduct a lot of research after the pass of the Kigali Amendment to the Montreal Protocol in 2016, in terms of cooling technologies. We started from energy efficiency to understand the current energy consumption level of existing and explore their maximum energy efficiency value.

However, these studies are far from enough. For example, until now, mainstream cooling technology has been the vapor compression cooling technology that has appeared more than 100 years ago. The improvement of system energy efficiency in the air-conditioning industry is still limited, and there is a lack of innovative technologies. Compared with solar energy and other technological updates, its progress is too slow and the industry threshold is relatively low.

At the same time, when consumers purchase air-conditioning equipment, they pay more attention to the "first-cost" such as brand and price, and often ignore the hidden energy efficiency and power consumption. The market failure has caused manufacturers to pay less attention to energy efficiency and to fully promote technological innovation.

China Energy News: What good suggestions do you have around the above challenges? Iain Campbell: First of all, we should fully realize that although air conditioning brings comfortable cooling services, it also causes the global temperature to rise. There is an urgent need to find an alternative solution to reduce cooling emissions faster, eliminating the overall climate impact of increased cooling energy consumption. In addition, developing and ensuring the implementation of effective policies is a key lever to drive the market toward efficient cooling. For example, a set of efficient policy combinations can be formed by adopting minimum energy efficiency performance standards, building energy efficiency codes, setting equipment energy efficiency labels, taxes and subsidies.

At the technical level, we have found that the improved technology of the traditional vapor compression cooling system can achieve 2.5 times energy efficiency improvement, and the natural cooling and advanced dehumidification technology can increase the system energy efficiency by 3.5 times. The outdoor unit of the air conditioner can also integrate photovoltaic power generation equipment, resulting in significant energy saving effects.