Nuclear energy for the future

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The IAEA's work relates to many of the Sustainable Development Goals (SDGs) adopted last year by the United Nations General Assembly, but three SDGs, in particular, underscore the contribution of nuclear power towards energy for the future: Goal 7 — access to affordable and clean energy — will concentrate our efforts towards realizing sustainable development as the global population grows and energy demand increases; Goal 9 — industry, innovation and infrastructure — is not possible to achieve without ample access to energy; and Goal 13 — climate action — sets out targets for clean, environmentally friendly energy.

Nuclear power produces about 11% of global electricity with 450 nuclear reactors in operation in 30 countries. Our projections show that nuclear energy will continue to play a key role in the global energy mix for decades to come. While the use of nuclear power is increasing, its share in the world's energy mix is decreasing and its economic competitiveness is being challenged. Nuclear power plants have a high upfront cost but can be competitive when one considers the cost to produce electricity over the entire lifetime of the plant. The competitiveness of any energy option is very country-specific and depends on many factors, such as available natural resources.

A growing number of IAEA Member States, several of which are concerned about climate change and about strengthening their supply of energy, are considering introducing nuclear power into their national energy mix or expanding its use (see article, page 15).

The IAEA fosters sustainable nuclear energy development by supporting existing and new nuclear programmes around the world and by providing support for new nuclear technology development. We also help Member States build local capability in energy planning and analysis as well as in nuclear information and knowledge management, while setting the foundations for nuclear safety and security.

Innovation, technological advances and new economic models can help increase nuclear power's contribution to the world energy mix and to sustainable development. New nuclear reactor designs feature enhanced safety features and can run more efficiently and produce less waste, or even consume it. Advances in the nuclear fuel cycle can further cut down on waste, making nuclear power more sustainable. Creative funding and financing arrangements between governments and the private sector contribute to technology development and help to better handle the large investment cost needed for nuclear energy infrastructure and the construction of power plants.

When considering emissions over the entire life cycle of electricity generation using different energy options, nuclear power, along with hydro and wind power, does not lead to carbon dioxide (CO_2) emissions while producing electricity and is among the lowest greenhouse gas contributors. Taking into account the whole life cycle, nuclear power among the lowest emissions comparable to those from renewable energy sources.

Renewable energy has many advantages and is clean, but one of the disadvantages is that it relies on the availability of wind or sunlight. Nuclear power is a useful complement: it can produce energy consistently and efficiently most of the year (rates exceeding 90% have been regularly achieved in several countries), day and night. Also, it can be deployed on a large scale, making it better suited to meet electricity demands of cities and industry. Looking to the future, innovative hybrid energy systems are in development to bring nuclear power together with renewables to produce electricity, or to use the heat from nuclear reactors for other applications, such as desalination of seawater.

Climate AND energy

As a low-carbon technology available today, nuclear power can help countries meet the dual energy–climate challenge, as laid out in the Paris Agreement (see Box, page 16).

The Paris Agreement, agreed under the United Nations Framework Convention on

Quick Facts

Ten new nuclear reactors were connected to the grid in 2015, the highest number since 1990.

Climate Change in 2015 by 195 countries, calls upon governments to limit the increase in the global average temperature to well below two degrees Celsius above pre-industrial levels. About a third of greenhouse gas emissions come from energy production; therefore we must decarbonize the energy sector in order to control the catastrophic effects of global warming.

The IAEA has a comprehensive set of tools to help Member States better understand and respond to the energy–climate challenge and to launch a nuclear power programme. Our efforts focus on providing a factual assessment of nuclear power. We help decision-makers consider all energy production technology options. If and when a Member State so requests, we provide assistance for the safe, secure and sustainable implementation of its nuclear power programme.

Nuclear power can continue to promote sustainable development by providing the energy needed to support a growing population and a society that continues to industrialize. It can do this while having a smaller impact on the climate and the environment when compared to most other forms of energy.