

Aplicações pacíficas da energia e tecnologia nucleares

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Nuclear technology is everywhere, contributing quietly and efficiently to improvements in human wellbeing. Governments and citizens around the world are reaping the benefits of nuclear science and technology, not only in the realm of energy production, but also in fields as diverse as agriculture, health, industry, water management and environmental monitoring. Nuclear science and technology is present everywhere in our daily lives and many still may not recognise the widespread application of the peaceful uses of nuclear technology

Clean Energy

Nuclear power is one of the best known peaceful applications of nuclear technology. At present, 30 countries use nuclear power whilst many more countries, especially in the developing world, are exploring the possibility of introducing it. Nuclear power makes a significant contribution to reducing greenhouse gas emissions and improving energy security, while delivering energy in the growing quantities needed for development.

More than a billion people woke up today having NO access to electricity. That is 1 out of 7 of the world population. More than 600 million of those are in sub-Saharan Africa,, and more than 300 million are in India alone. That means no health care, no education, no running water.

So our current challenge today is to meet the ever-increasing energy demand while handling the consequences to the environment and need for energy security. Indeed, hydropower, nuclear power and wind based electricity are the lowest CO₂ emitters, when emissions over the entire life cycle are considered. Direct GHG emissions from nuclear power plants are negligible. Nuclear power currently produces 11% of the world's electricity but this corresponds to more than 30% of the world's low carbon electricity production. Nuclear energy currently avoids the release of nearly 2 Gigatons of CO₂ per year. That is the equivalent of taking more than 400 million cars off the road per year.

As early 2019, there are 449 operational reactors in 30 countries, with over 392 GW(e) installed generating capacity globally. There are 60 reactors under construction, 2/3 of them in Asia. This region, Latin America, has modest prospects for growth.

There are three major reasons for why nuclear power remains an important option for many countries: improving energy security, reducing the impact of volatile fossil fuels prices and mitigating the effects of climate change.

Food and Agriculture

1. Nuclear techniques have comparative advantage to address specific problems in food and agriculture:
 - a. The sterile insect technique is a proven and reliable way to control selected major insect pests in food and agriculture, with significant impact on environment protection and international trade.
 - b. Plant mutation techniques help to develop new and more varieties better adapted to climate change and increase biodiversity.
 - c. Isotope techniques improve farming systems' resilience to the impacts of climate change, by contributing to soil erosion assessment and control, effective agricultural water management, and improved crop nutrition.
 - d. Nuclear techniques support effective food traceability and food contamination control, improve food safety and quality, and promote agricultural food trade.
 - e. Nuclear applications contribute to improved livestock productivity and development of diagnostic tools and measures for the control of important animal disease, including zoonotic diseases such as Ebola.
 - f. Nuclear applications contribute to climate-smart agriculture to ensure better adaptation to and mitigation of climate change, which improve the sustainable intensification of agricultural productivity.

Environment

Nuclear techniques and isotopes are also utilised to monitor and understand environmental challenges, including tracking the global consumption by oceans of carbon dioxide leading to ocean acidification. Scientific monitoring has revealed the negative impact of ocean acidification on fragile marine eco-systems. These impacts endanger food supply for coastal and island communities.

Water Resources

Today it is possible countries to undertake isotopic analysis of water to accurately assess the age, origin and evolution of groundwater resources, as well as its quality and risk of contamination. Determining the age of an aquifer and how quickly it is being replenished is crucial to estimate how much water can be sustainably withdrawn from potentially fragile systems.

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scientific terms water can be dated using radioactive isotopes, especially carbon-14 and krypton-81. These unstable isotopes release energy as they decay and are transformed into stable isotopes. Based upon the time necessary for the radioisotopes to decay and the isotope content presently in water, scientists can measure the water's age. These precise measurements create a valuable data bank which helps to establish protective measures for the appropriate and knowledgeable use of the world's precious underground water heritage

Human Health

An important focus on human health is cancer control. With the increase in non-communicable diseases (NCDs), nuclear technology continues to play a critical role in treatment and assessment of disease. Cancer treatment can often include radiotherapy through gamma rays, electrons and charged particles (protons and carbon ions). These treatments involve significant investments in infrastructure and equipment as well as training for qualified professionals to man these departments and supervise quality assurance protocols. The IAEA is working closely with partners such as the World Health Organisation in this regard. The IAEA has also developed innovative e-learning initiatives which offer specialised training for health professionals in areas such as radiotherapy, medical physics and nutrition.

Industrial Applications

Radiation technologies have a successful history of innovating new products and processes that are environmental friendly and economically feasible. Radiation sterilization of medical devices alleviates the use of toxic ethylene oxide gas, surface curing using radiation processing besides being energy efficient, enables users to comply with restrictions on the emissions of toxic volatile organic compounds. Radiation crosslinking of polymers has led to inception of an industry to produce crosslinked wires & cables, heat-shrink materials, foamed materials, rubber products and packaging materials which are free from chemical additives and possess unparalleled physical and chemical characteristics. At a very conservative estimate, over 200 industrial gamma irradiation plants and nearly 1600 electron beam accelerators process materials worth nearly US\$ 85 billion per year world over.

The industrial applications of nuclear technology are far reaching and a whole range of new 'greener' industrial applications are contributing to sustainable development and production of high quality products while the wealth of data accumulated through nuclear spectrometry and accelerator science is leading to further developments in the peaceful and beneficial applications of nuclear technology.