Science & Technology

Initiative Calls for Reversal of Belgian Nuclear Power Phaseout

In a letter written Aug. 21 to Belgian Prime Minister Alexander de Croo, the Horizon 238 think tank (named after uranium-238) states that so-called renewable energy sources on their own can never provide sufficient power to cover the needs of Belgium. The public debate on nuclear technology should be freed from "dogmatism and emotion" and return to the facts which speak for the atom, the letter says.

The authors point to the high expertise which Belgium has developed in 60 years' use of nuclear technology, emphasizing the pioneering role of Belgian nuclear physicists in the development of technology to recycle used nuclear fuels and prepare them for reuse:

"Our country has the opportunity to use this expertise to prepare its future more serenely. Today, the MYRRHA [Multi-Purpose hYbrid Research Reactor for High-tech Applications] project developed at the Belgian nuclear research center, is a research pioneer for recycling nuclear waste. In the near future, Belgian nuclear engineering could take the forefront of the hydrogen economy and of the deep decarbonization of industrial sectors that are difficult to electrify, leveraging new, more versatile and more sustainable nuclear technologies."

Horizon 238 started out with a membership of engineers and specialists employed at Belgian nuclear sector firms; it has since been joined by predominantly young Belgians of all sectors who have a genuine interest in nuclear power development.

For China, Landing Humans on the Moon Is 'National Strategy'

A brief news report from Xiamen University School of Aeronautics and Astronautics July 1 names individuals leading projects pertinent to China's human lunar landing plans and notably refers to the landing project as a "national strategy." However, a human lunar landing project was not specifically identified in China's 14th 5-Year Plan (2021-2025) approved in March.

Zhou Yanfei, deputy general designer of China's human spaceflight program, had told Chinese media during a conference last year that, along with progress on launchers and spacecraft, also development of a lander, life support, mission experience, and ground support capacity for operations beyond low Earth orbit are all required before crewed lunar missions are possible. China's main spacecraft maker is developing a human landing system for lunar missions, and China is already known to be developing and testing new launch vehicles and a new-generation spacecraft capable of sending astronauts to the Moon.

There are fundamentally two approaches to carrying out crewed lunar missions. One, demonstrated by NASA, is to carry everything—crew and equipment—for the entire mission on one multi-stage rocket. That was the superbooster, NASA's Saturn V. The fewer the number of launches, the lower the risk.

Alternatively, however, each mission could be split into two rocket launches. While this approach doubles the number of launches, each would use proven and well-tested rocket technology, lowering the overall risk, according to Long Lehao, chief designer of China's Long March rocket series. One rocket would carry the lander and the other a crewed vehicle. The two spacecraft would rendezvous and mate in lunar orbit before executing the landing process.

China's Chang'e-5 lunar sample return mission last November successfully tested just this lunar orbit rendezvous strategy. The complexity of the mission was seen in part as a test of technologies needed to get astronauts back from the lunar surface and docked with an orbiting spacecraft for the journey home.

Last June, the China National Space Administration (CNSA) revealed a roadmap for an International Lunar Research Station (ILRS) to be developed jointly with Russia. That project envisions crewed landings in the 2030s.

In a presentation at the 35th China Adolescents Science and Technology Innovation Contest on August 30, Long Lehao explained that China's currently most capable rocket, the Long March 5, will be tailored for a dual-rocket mission as Long March 5DY (*deng yue,* or "Walk on the Moon"). A new, heavy lift version of the Long March 5, Long said, is also more likely to meet the 2030 timetable for China's first crewed lunar mission.

Meanwhile, the United States is working on returning astronauts to the Moon. In April, NASA awarded a contract to SpaceX for Option A of the Human Landing System program. SpaceX could potentially land a version of its two-stage Starship vehicle on the Moon in 2024 as part of the Artemis program.

Breakthrough in Organic Nanotubes Expands Biomedical Potential

With the development of an electrochemical actuator that uses specialized organic semiconductor nanotubes (OSNTs), University of Houston researchers have achieved a breakthrough in the field of materials science and engineering. As reported Sept. 3 by Science X on its Phys.org website: "Currently in the early stages of development, the actuator will become a key part of research contributing to the future of robotic, bioelectronic and biomedical science.

"'Electrochemical devices that transform electrical energy to mechanical energy have potential use in numerous applications, ranging from soft robotics and micropumps to autofocus microlenses and bioelectronics,' said Mohammad Reza Abidian, Associate professor of Biomedical Engineering in the UH Cullen College of Engineering. He's the lead author of the article, 'Organic Semiconductor Nanotubes for Electrochemical Devices,' published in *Advanced Functional Materials,* which details the discovery."

The organic semiconductors used are conjugated polymers, which are attractive for many applications due to their unique properties. The potential lies in the virtually infinite possibilities for creating new materials for specific applications by simply chemically tuning the molecular structure. Conjugated polymers have the potential to achieve electrical properties similar to those of non-crystalline inorganic semiconductors; however, their chemical structure is much more complex and somewhat resembles that of biomacromolecules.

The significance is that this can mean breakthroughs in the fields of soft robotics (both on Earth and in space), the creation of artificial muscles (which could be used in prosthetics for amputees) and biomedical devices.

A 'Green' Food Emergency in Sri Lanka

Sri Lanka's state of economic emergency declared Aug. 31 is being linked in some Asian news coverage to a currency crisis limiting how much the country can import; but the underlying cause is greatly reduced harvests caused directly by 'green' food policy. An Italian blogger on the subject reported Sept 1:

"Sri Lanka yesterday declared a state of economic emergency after a series of bad harvests that threaten to plunge the country into a very serious famine. The situation is already critical, so much so that food for the population is being rationed by the army.

"Sri Lanka had launched a trial for '100% organic' agriculture, abolishing GMOs, pesticides and fertilizers." The bans were announced in March, 2021 by President Rajapkasa, who said Sri Lanka would grow only organic food, according to the *Indian Express*.

"The government consultant who inspired this disastrous project is Vandana Shiva, a master of global environmentalism who thrives on philanthropic donations and millionaire consultancy…. Vandana Shiva was also a consultant to [Italian Education] Minister Fioramonti and was the protagonist of the campaign against the felling of the olive trees in Puglia [which had become infected with *Xylella fastidiosa* —ed.] … Her activism achieved its goals, and the result was the desertification of half the region."

The EU Commission identifies *Xylella fastidiosa* as "one of the most dangerous plant bacteria worldwide, causing a variety of diseases…. *Xylella fastidiosa* has the potential of causing in the EU, an annual production loss of €5.5 billion, affecting 70% of the EU production value of older olive trees (over 30 years old), and 35% value of younger ones; 11% of citrus; 13% of almond and between 1-2% of grape production in a scenario of full spread across the entire EU."

The blogger concludes rightly that "Environmentalism without science is anti-human ecofascism."

This Day in Space History: Voyager I Was Launched

Sept. 5 marked the 44th anniversary of the launch of Voyager I from Cape Canaveral, Florida. Its companion, Voyager II had launched 16 days earlier. Their mission: explore the outer planets of our solar system, and take photos of Jupiter and Saturn (and its 53 confirmed moons), among other things. The "Pale Blue Dot" photo of Earth, as seen from the vicinity of Saturn's rings, is now famous. Its remarkable photos were only surpassed by the more recent Juno mission in 2016.

Both probes successfully performed their primary missions and were then directed to study the regions and boundaries of the outer heliosphere and then begin exploring the interstellar medium. On Aug. 25, 2012, Voyager I's path took it out of the heliosphere and into interstellar space, becoming the first spacecraft to cross that boundary, although scientists debate exactly where that boundary lies. Voyager II followed on Nov. 5, 2018. These two probes are now over 22.5 billion km (14 billion miles) from Earth, 2.5 times the diameter of our solar system. They remain in contact with Earth, transmitting data to and receiving instructions from the NASA Deep Space Network.

Around 2025 their radioisotope thermoelectric generators will no longer supply enough electric power to operate their instruments.

The next mission of the Voyagers is due in about 40,000 years, when each will fly past another, distant solar system, carrying with it its time capsule from Earth—if there is anybody out there. By way of comparison, 40,000 years ago, mankind was making stone tools. Let's ensure mankind has ventured far into space, 40,000 years hence.