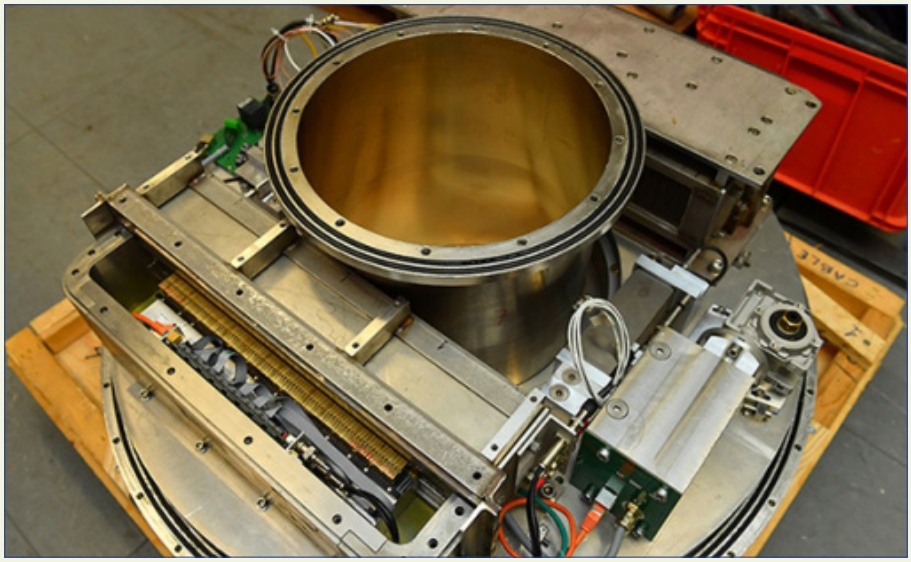
New safeguards tool bolsters IAEA's verification of spent nuclear fuel



The components inside the PGET tool, which is used to verify spent nuclear fuel. (Photo: D. Calma/IAEA)

For all States with a comprehensive safeguards agreement in force, the IAEA seeks to verify that all nuclear material remains in peaceful activities. It achieves this through the application of technical measures known as safeguards. The new passive gamma emission tomography (PGET) tool will enable the IAEA to verify the number of fuel rods — or pins — in spent nuclear fuel assemblies.

Unlike other tools used for verifying the content of spent nuclear fuel, such as the digital Cerenkov viewing device and the spent fuel attribute tester, the PGET tool can also confirm the absence of missing pins from a spent fuel assembly in a closed container. This is very useful for applying safeguards at nuclear power plants, underwater storage facilities and encapsulation plants at geological repositories. According to Tim White, an IAEA technology expert, the use of passive gamma emission tomography to verify nuclear material will be a "very valuable addition to the IAEA safeguards toolkit".

At the end of their useful lives in a reactor, fuel rods are stored and eventually disposed of or, in some cases, reprocessed. Verifying that the nuclear material in the rods is not diverted from peaceful use is a crucial part of assuring the international community that States are honouring their non-proliferation obligations.

To detect the presence of uranium or plutonium, the PGET tool takes three simultaneous measurements — of gross neutron and gamma ray counts, gamma ray spectrometry and tomographic imaging of spent fuel pin positions. It takes the tool only five minutes to take these measurements and an additional minute to process and analyse the data. In this way PGET "offers inspectors an additional data point," said White. "It allows for a more complete picture of activities and increases the robustness of the verification process."

The IAEA is still in the early stages of integrating PGET into its safeguards activities. It has been tested in spent fuel ponds at three nuclear power plants and is now ready for deployment in safeguards verification practices and for use in the field by safeguards inspectors. The European Atomic Energy Community (Euratom) has also expressed an interest in utilizing this technology for verification activities and a number of countries may follow suit.

— By Matt Fisher

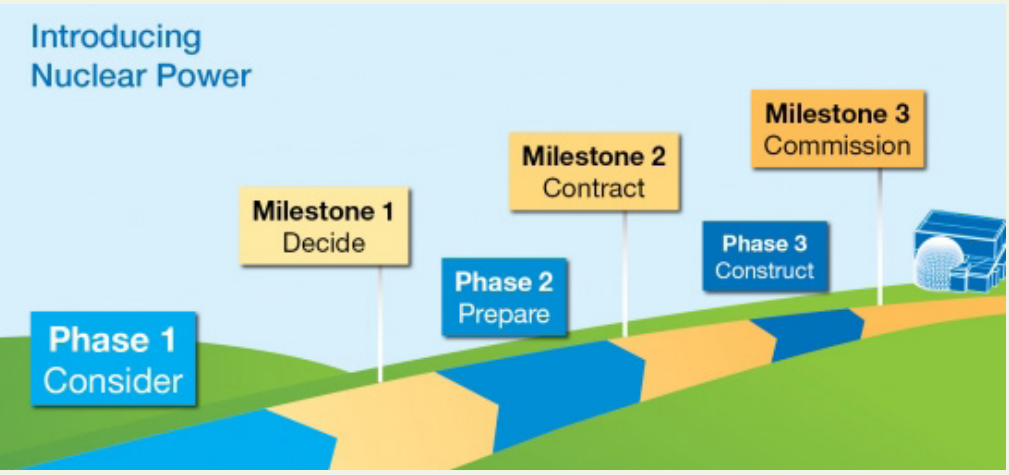
Siting and site evaluation for nuclear power plants in focus at IAEA workshop in Uzbekistan

Uzbekistan, the latest country to launch a nuclear power programme, has initiated the process to select a site for a nuclear power plant and aims to grant a site licence in September 2020, local officials have confirmed. Uzbekistan is among about 30 countries that are considering, planning or actively working to include nuclear power into their energy mix.

At the request of Uzbekistan's Government, the IAEA and the newly established nuclear energy development agency Uzatom held a workshop in February 2019 in Tashkent on safety and non-safety aspects to be considered in siting and site evaluation for nuclear power plants.

The workshop with participation of Uzatom, the nuclear regulatory body, and other relevant national organizations, focused on IAEA safety review services, safety standards and other resources supporting the siting and site evaluation for nuclear power plants.

"Embarking on a nuclear power programme requires a long-term commitment to nuclear safety that starts as soon as the decision to proceed is taken," said Greg Rzentkowski, Director of the Division of Nuclear Installation Safety of the IAEA. "Two important steps early in the process are the establishment of an effective legal and regulatory framework and ensuring that



The Milestones approach for nuclear power is a phased, comprehensive method to assist countries that are considering or planning their first nuclear power plant.
(Image: IAEA)

potential sites are properly evaluated before being selected for a nuclear installation. The IAEA safety standards provide clear guidance in both areas, and we encourage all countries to apply them."

The workshop introduced the IAEA Milestones approach for the development of a new nuclear power programme. It lists 'site and supporting facilities' as one of 19 nuclear infrastructure topics that would require action during the development of a nuclear power programme.

In line with the Milestones approach, the IAEA provides integrated services, including on safety, security, legal and regulatory frameworks, human resource development, emergency planning and safeguards. These include peer reviews and advisory missions such as the Integrated Nuclear Infrastructure Review and the Site and External Events Design review service.

— By Ayhan Altinyollar

How nuclear techniques help feed China

The use of nuclear technologies is fully integrated into agricultural research at the China Academy of Agricultural Sciences. Here a technician is preparing samples for a food safety test. (Photo: M. Gaspar/IAEA)

With 19% of the world's population but only 7% of its arable land, China is in a bind: how to feed its growing and increasingly affluent population while protecting its natural resources. The country's agricultural scientists have made growing use of nuclear and isotopic techniques in crop production over the past decades. In cooperation with the IAEA and the Food and Agriculture Organization of the United Nations (FAO), they are now helping experts from Asia and beyond in the development of new crop varieties, using irradiation.

While in many countries, nuclear research in agriculture is carried out by nuclear agencies that work independently from the country's agricultural research establishment, in China the use of nuclear techniques in agriculture is integrated into the work of the Chinese Academy of Agricultural Sciences (CAAS) and provincial academies of agricultural sciences. This ensures that the findings are put to use immediately.

And indeed, the second most widely used wheat mutant variety in China, Luyuan 502, was developed by CAAS's Institute of Crop Sciences and the Shandong Academy of Agricultural Sciences, using space induced mutation breeding (see The Science box). It has a yield that is 11% higher than the traditional variety and is also more tolerant to drought and main diseases, said Luxiang Liu, Deputy Director General of the Institute. It has been planted on over 3.6 million hectares — almost as large an area as Switzerland. It is one of 11 wheat varieties developed for improved salt and drought tolerance, grain quality and yield, Liu said.

Through close cooperation with the IAEA and FAO, China has released over 1000 mutant crop varieties in the past 60 years, and varieties developed in China account for a quarter of mutants listed currently in the IAEA/FAO's database of mutant varieties produced worldwide, said Sobhana Sivasankar, Head of the Plant Breeding and Genetics Section at the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture.