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## Verification of Spent Nuclear Fuel Using Passive Gamma Emission Tomography (PGET)

After several decades of collaboration with several Member-State Support Programmes, the IAEA has authorized for inspection a passive gamma emission tomography (PGET) capability for the underwater verification of spent nuclear fuel. In a single five-minute measurement, the PGET system integrates three inspection methods: gross neutron and gamma-ray counting; medium-resolution gamma-ray spectroscopy; and imaging of the gamma-ray emission from a two dimensional cross section of the fuel assembly. The tomographic images created by PGET enable a partial-defect detection capability for spent fuel verification, which in many cases provides single defective pin detection. The PGET has been deployed four times to spent fuel ponds in Finland and Sweden and performed inspections on WWER-440, BWR, and PWR fuel assemblies with burnup in the range 5.7 –57.8 GWd/tU and cooling times from 1.9 –26.6 years. PGET has demonstrated a capability to allow detection of single or multiple missing or replaced pins in all fuel types examined to date. The ability to verify the content of closed containers has also been shown. Integrated neutron detection allows simultaneous consistency check of radiation history. The PGET system is intended to be used in combination with other instruments for verification of spent nuclear fuel. Possible plutonium diversion scenarios include collection of a few pins from many assemblies, or many pins from fewer assemblies. For the case of small defects spread over many assemblies, only a few spent-fuel assemblies need to be verified to ensure a high probability of detection using the PGET. A coordinated verification with the Digital Cherenkov Viewing Device (DCVD) then provides a high probability of detection for larger defects. Used in concert with the full set of verification tools, the new PGET device improves the capability to provide comprehensive verification across diversion scenarios.

### Which "Key Question" does your Abstract address?

NEW1.1

### Which alternative "Key Question" does your Abstract address? (if any)

### Topics

NEW1

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