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## Ultra-sensitive gamma-spectrometry measurements of environmental samples from the Hartlepool Nuclear Power Station

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Two ultra-sensitive gamma-spectrometry systems are being used to measure environmental samples collected from the Hartlepool Nuclear Power Station in the United Kingdom. The work is being performed as part of the Xenon Environmental Nuclide Analysis at Hartlepool (XENAH) collaboration between Pacific Northwest National Laboratory (PNNL, USA), the Atomic Weapons Establishment (AWE, UK) and EDF Energy (UK). The coincidence-based gamma-spectrometry systems are located at the Shallow Underground Laboratory (USA) and Boulby Underground Laboratory (UK), and they are being used to measure radionuclides that are relevant for nuclear explosion monitoring purposes. Stack filters for particulate fission and activation products, charcoal cartridges for gaseous iodine, and other environmental samples are being collected and measured. The advanced systems have detection sensitivities some orders of magnitude better than standard laboratory systems (e.g., for  $^{106}\text{Ru}/^{106}\text{Rh}$ ,  $^{134}\text{Cs}$ ,  $^{144}\text{Ce}$ ), and they shall improve the understanding of the trace-level radionuclide emissions of the Advanced Gas-cooled Reactor (AGR) at Hartlepool. This is important for interpreting the radionuclide measurements performed at International Monitoring System (IMS) stations and determining whether detections are attributable to civilian nuclear sources or nuclear explosive tests.

### Promotional text

These next-generation ultra-sensitive gamma-spectrometry systems are advancing the capabilities of the radionuclide laboratories and the understanding of background source terms, such as the Advanced Gas-cooled Reactor at Hartlepool, UK.

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