

LA-UR-14-21221

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Title: NGSI technologies Coming Down the Road - Fast Neutron Collar

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Intended for: NNSA Briefing for IAEA in Washington, Thursday March 13th 2014

Issued: 2014-02-26



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Description of Technology: New neutron collar design using ${}^3\text{He}$ detectors to give good precision results in much shorter measurement time

Safeguards Significance:

- The existing neutron collar is used extensively for safeguards measurements of fresh LWR fuel assemblies
- Thermal mode measurements are short (~20 mins) but are dependent on operator declarations of poison rods
- Fast mode measurements are much less dependent on declarations but take of the order of 1 hour
- This new collar operates permanently in fast mode but gives precision equivalent to the thermal mode in ~ 20 mins
- New fuel designs are using higher enrichments and more poison pins, making this issue more important

NGSI Technologies Coming Down the Road

Fast Neutron Collar



Performance Measurements:

- Monte Carlo design for PWR assemblies: L. G. Evans et al. NIM A 729 (2013) 740
- Measurements at LANL in Feb 2014 confirm the modeling performance – calibration slope = 0.824 compared to 0.851 (more linear than thermal mode).
- Poison pin effect reduced from over 20% to 3.6% for 12 pins with 5.2% Gd
- The size and shape are similar to the existing collar and the technology is the same as currently deployed making for easy implementation

Future Plans for Development:

- Field trial in European facility planned for summer 2014. IAEA liquid scintillator collar could be added to trial
- Application to other fuel types could be considered BWR, WWER...

