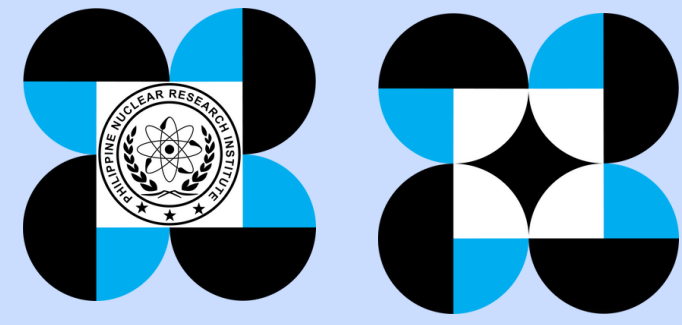




PNRI – SSDL Neutron Laboratory



Assessment of the Current Neutron Occupational Exposure Monitoring in the Philippines



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- There is a growing need to ensure the safety of radiation workers from neutron exposures in the Philippines.
- PNRI – Secondary Standard Dosimetry Laboratory (PNRI –SSDL) established a neutron dosimetry facility to develop capabilities in neutron occupational exposure monitoring following national and international standards.
- However, only few facilities are being monitored for neutron exposure due to various limitations. This may lead to under-assessment of radiation workers' exposures and facilities' RP measures on neutron sources.
- Doses of workers monitored by photon and neutron individual monitoring services (IMS) were compared.
- Photon and neutron doses per monitoring period were all below 1 mSv. However, higher doses of neutron doses may show associated risks of neutron exposure. Gaps discussed must be addressed in ensuring effective RP programs for neutron exposures.



Fig. 1–4. Facilities which utilize neutrons in the Philippines: Nuclear Medicine, Research Reactor, Radioactive Waste Management Facility

Arising need for strengthening neutron occupational exposure monitoring

- Increasing number nuclear medicine & RT facilities (including LINACs & PET/CT)
- Plans of constructing new medical cyclotrons and linear accelerator (LINACS)
- Commissioning of the Philippine Research Reactor-1 Subcritical Assembly for Training, Education, and Research (PRR-1 SATER) – sole nuclear reactor training facility
- Ensuring safety in the Radioactive Waste Management Facility which conditions neutron disused sealed radioactive sources
- Ensuring safety in research and development activities utilizing neutrons

Current capabilities of neutron exposure monitoring & assessment

- As of 2019, the Neutron Laboratory of the PNRI-SSDL was established with a characterized bare Cf-252 reference source.
- Start of procurement for neutron OSLD and TLD: late 2019
- Unfortunately, only nuclear facilities from PNRI are currently monitored:
 - RADIATION PROTECTION SERVICES SECTION (RPSS)
 - RADIOACTIVE WASTE MANAGEMENT FACILITY (RWMF)
 - NUCLEAR REACTOR OPERATION SECTION (NROS)
 - APPLIED PHYSICS RESEARCH SECTION (APRS)
- Neutron exposure – assessed by RPSS IMS



Fig. 9–14. Activities involved in the Neutron Laboratory such as calibration of neutron monitoring instrument and neutron dosimeters, testing of dosimeters, neutron education and research of students

Status of neutron occupational exposure monitoring & assessment

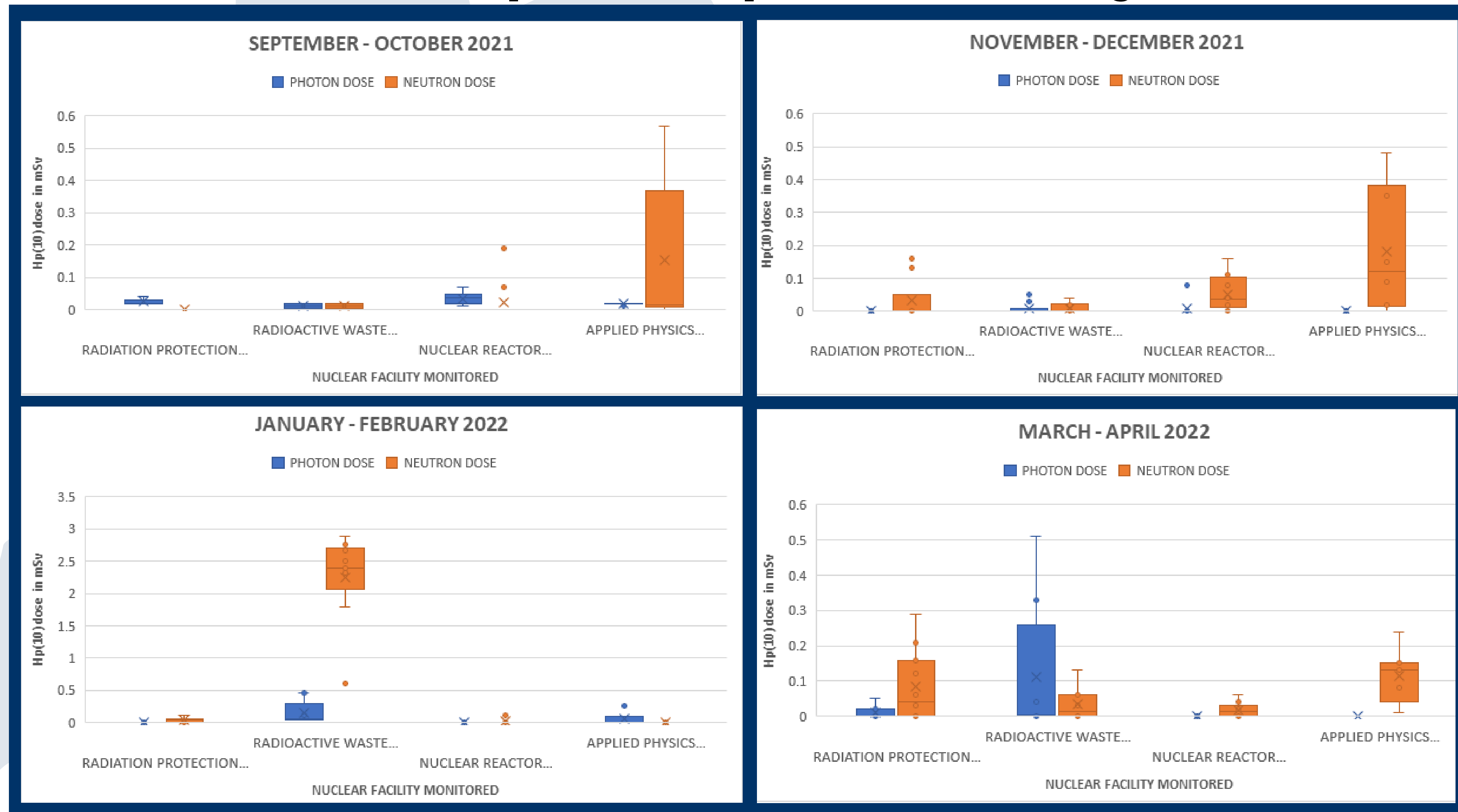


Fig. 5–8. Interquartile range boxplot of the distribution of photon and neutron Hp(10) doses per monitoring period. Neutron dose distributions are shown to be higher than most photon doses, especially in 2021.



Fig. 15–19. Neutron TLD, neutron TLD being tested, training and operations in the PRR-1 (Philippine Research Reactor)

Gaps and Challenges that need to be addressed!

- COVID-19 pandemic delayed many projects and procurement involving activities in the Neutron Laboratory
- Limited supply and availability of neutron dosimeters and neutron monitoring instruments to accommodate demand for neutron exposure monitoring
- There are no specific regulatory requirements and guidance yet on use of neutron dosimeters
- Operators may have limited considerations in including neutron monitoring in their RP programs due to no specific regulations

Looking Forward: Recommendations and Plans!

- Regulatory should review existing safety and regulatory requirements on use of neutron sources to determine whether provisions must be made.
- TSPs must assess whether current capabilities on neutron occupational exposure monitoring are sufficient to address demands of nuclear facilities
- TSPs must develop capacities in neutron occupational exposure monitoring – additional dosimetry supplies and equipment in line with national standards and regulations
- Operators of neutron facilities should have initiative to develop capabilities in neutron monitoring and safety assessment by working hand in hand with TSP and regulatory body
- Improve human resource development in neutron monitoring and assessment by training personnel of TSPs and regulatory body



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