***Comments on***

***“Fuel Integrity Analysis for Bushehr NPP, Unit 1, Fuel Cycle 4 Report”***

**General Comments**:

* The Present report has not a report standard format. For example it has no title, table of contents, introduction and etc.
* Almost all of explanations have been presented without any justifications or references.
* In all of presented method for distinguishing leaking fuel rods have not given numerical criteria.
* For all plotted data, normalization factor have not presented.
* It is recommended that the revised version of report should be updated based on the last BNPP-1 received data.

**Wording Comments:**

* Page 3, Section 1.1, Fist Para, “April 13” shall be changed to “May 13”.
* Page 5, Section 2.1, First Para,”131I and 134I” shall be changed to “131I to 134I”.
* In all of report the unit of activity “Cu/kg” shall be changed to “Ci/kg”

**Other Comments:**

1. Page 1, Fig1, Calculated ratio of activity of 131I to 134I which given in this figure is different from one calculated by equation 5.10 of operation guideline “РД ЭО 1.1.2.10.0521-2009”. This contradiction shall be clarified.
2. Page 2, Fig 5, this figure shows the significant increase in Kr isotopes activities after 02.06.17 to end of time interval. It is suggested to discuss about reasons of this phenomena.
3. Page 3, Section 1.1, Third Para,

- The normalization factor shall be given.

- The numerical criteria for ratio of 132-135I to 134I which use for distinguishing types of leakages shall be presented. (For instance, the criterion below 2 is presented for fuel rods with gas release).

- The reference(s) shall be given.

1. Page 3, Section 1.1, Second Para, in this Para it is said that “Activities of all the radionuclides did not exceed or were lower than the corresponding activities during the previous fuel cycle no.3 with no leaking fuel in the core “, while this is not true for 131I isotope. This sentence shall be corrected.
2. Page 5, Section 1.2, First Para:

- The numerical criteria for ratio of 133Xe to 135Xe and also ratio of 131I to 134I which use for distinguishing types of leakages shall be presented.

- The reference(s) shall be given.

- The figure including plots of ratio of 133Xe to 135Xe and ratio of 131I to 134I in mentioned time interval shall be given.

1. Page 7, Section 1.5, In This Section introduced a new technique to assess how severe is cladding degradation based on analysis of relations between Xe and I activities.

- The numerical criteria for ratio of 133Xe to 133I and 135Xe to 135I which use for distinguishing types of failure in fuel rods shall be presented.

- Does this method is only research method or well-established method for distinguishing types of failure in fuel rods?

- The given references are not available. More details about this method shall be given.

1. Page 8, Section 1.6, second Para,

Gentle power changes and avoiding step changes should be explained based on standards, international experience and WWER-1000 reactors. Moreover, the exact velocity should be mentioned in different power levels.

1. Page 8, Section 1.6, 4th Para, it is mentioned that calculating burnup would be possible based on noble gas activity.

* The reference(s) shall be given.
* More details about this method shall be added to the report.

1. Page 9, Section 1.7, the last Para,

-It is required to explain about fuel visual inspection by using FHM camera in the end of cycle due to the unavailability of visual inspection stand of the irradiated fuel in BNPP-1.

-The visual inspection just clarifies the outer row of the fuel rods’ cladding. Therefore, no information would be gained about the other fuel rows’ condition.

1. It is suggested to present any differences –if any- between Operation Guideline “РД ЭО 1.1.2.10.0521-2009” and the last version of it.
2. No solution has been presented for finding fuel leakage in case of no monitoring and recording of spike effect based on iodine 131 or long-lived Cesium radionuclides such as Cs134 and Cs137 till the end of 4th cycle.