**BNPP Response (dated 12-10-2022) to ABmerit response (dated 29-09-2022).**

| **Item** | **Suggestions and comments from the End-User** | **Response of ABmerit** | **Response of BNPP** |
| --- | --- | --- | --- |
| 1 | Updating the dose coefficients (absorption coefficients, transfer coefficients, etc.) and Urgent Protective Actions in the ESTE system based on INRA requirements(I.R. of Iran Nuclear Regulatory Authority); | Please provide a list of coefficients which should be updated, and provide new/updated values of those coefficients: what dose coefficients do you mean?what transfer coefficients do you mean?what urgent protective measures do you mean? | We will prepare and send list of the coefficients (dose coefficients, transfer coefficients) in 3 weeks. About Protective Actions:According to table 1 (INRA requirements(I.R. of Iran Nuclear Regulatory Authority)) and table 2 presented in the ESTE BNPP (Document code: ABmerit/2018/BNPP/02 rev.02), it is suggested to consider the most efficient possible mode to provide protective measures and implement them in the system be made. |
| 2 | Providing the Administrator with access and authorization for making changes in the following items: Correcting some of units used in the ESTE BNPP system; | What units do you mean? Please provide explicit explanation. | For example the true unit of the parameter of 10TA10R001 is Gy/h, but at the present moment it is wrongly taken as Bq/m3 instead of Gy/h.So, if Administrator wants to change the unit of the parameter 10TA10R001 (from parameters of primary circuit ), how can it do this?  |
| Making changes in the ebb and flood (tide) data in the ESTE AI system. | Ebb and flood is not modelled by Euler model of ESTE AI. Marine model could be updated to Lagrangean particle model and then the ebb and flood would be included. But such update is out of frame of this service-maintenance contract. | Regarding updating the mentioned data, if possible, please provide the appropriate method or solution? Is it possible to obtain data from reliable source or sites?  |
| 3 | Correcting the size of the calculation grid of the ESTE BNPP system according to the document (Document code: ABmerit/2018/BNPP/02 rev.02) submitted to the BNPP by the ABmerit Company. It should be noted that the current square size is 10 Km × 10Km, however, in the mentioned document, the square sizes should be as follows: 200m x 200m, up to distance of 5.6 km from BNPP;600m x 600m, from 5.6 km to 34.8 km from BNPP;5400m x 5400m, from 34.8 km to 300 km from BNPP.50m x 50m, for the BNPP (on-site). | Square size is not 10 km x 10 km. Calculation grid is correct as stated in the User Manual, ABmerit/2018/BNPP/02 rev.02. | In real situation, we only could see the meteorological data with resolution of 10 Km × 10Km.In this regard, a necessary follow-up was also done from the WRF system developer company (our native company as you remember) and they answered that depending on the resolution considered in the ESTE BNPP system, the numerical meteorological system data can be displayed on the map. They also answered their system has capability to provide meteorological data in each desired resolution. |
| 4 | Updating the background maps in the ESTE BNPP and ESTE AI. For example, in the ESTE BNPP, the roads built from the “Tangak-1” to “Aali shahr” and the road from “Morvarid residential settlement” to “Aali shahr” should be added on the map. Moreover, we suggest that other information layers such as roads, settlements and agricultural lands (as Shapefile) be added to the system. | Yes, this can be done. Please provide us maps in geo-data format (e.g. \*.shp, \*.geojson,...), the update will be done in the frame of this service-maintenance contract. | We will prepare and send The required shape files in 2 weeks.  |
| Additionally, the option to export the radiological maps in the software as Shapefile should be provided. | No, this feature/this option is not available in ESTE delivered to the IAEA for Iran. |  Is it possible to export the radiological maps in \*.tif or \*.jpeg or other format… ? |
| 5 | Updating the user manuals of the ESTE BNPP and ESTE AI system, providing the BNPP with the mathematical formulas and coefficients used in the software, completing the dimensions of all the parameters used in the documents submitted to the BNPP, and providing the BNPP with dose coefficients (absorption coefficients, transfer coefficients, etc.) and their references used in the software. | ESTE AI system: Coefficients are reported to the End-User in the Chapter 10 "Constants of the Program".Mathematical formulas are reported to the End-User in the Chapter 11, Chapter 12 and Chapter 13 of the User Manual.ESTE BNPP: Coefficients and factors are reported in tables under button "Tools\Constants". The user can study them and also can change values of constants and parameters. We will add tables of constants into updated version of User Manual. |  1.Regarding the ESTE BNPP, (Document code: ABmerit/2018/BNPP/02 rev.02), it is noted that no mathematical relationship or equation is mentioned. we like to have mention the mathematical equation and relationships used in the model in this document.2.in the ESTE documents we like to have the references and sources used in the document.3.due to the necessary of updating the coefficients and constants used in the program, we’d like to have the sources and references used to update the coefficients and constants in the references section.  |
| 6 | Providing explanations related to the calculation range and radius of settlements (towns and villages) in the ESTE system. Since the settlements are considered as points in the ESTE system, it is necessary to include the calculation range and radius for settlements (town and village) in the user manuals of ESTE BNPP (Document code: ABmerit/2018/BNPP/02 rev.02) and ESTE AI (Document code: ABmerit /2018/BNPP /01 rev.02). | Settlement (town / village) is defined by the centroid, point. This point accumulates the inhabitants of the town / village to one point on the map. Therefore in case of collective doses, results are displayed on the map output only to one "calculation unit - square, where the village centroid belongs". We do not know distribution of inhabitants in settlements (town / village). | In the output of the program:1- what is difference between the sector with the highest dose received by the representative person and the populated sector with the highest dose received by the representative person2- the difference between the rows of the sector with the highest effective dose received by the representative person due to liquid discharge and the dispersion of radionuclides in the sea environment, the inhabited sector with the highest effective dose received by the representative person due to the liquid discharge and the dispersion of radionuclides in the sea environment and the inhabited sector with the highest the effective dose received by the representative person should be mentioned. |
| 7 | In case of disconnection of (online) transfer of technological data or online radiation network data/Early Warning System (EWS), it is necessary to make arrangements for notification of user in the ESTE BNPP system. For example, preset messages could be shown to the user. | State of input data is monitored through the main user interface, see "EPZ and Data", see "Technological Data" / "Radiological Data" / "Meteo Data, On-site Monitors". Data are assumed by ESTE BNPP as non-valid, if they are older than 10 minutes. If there is reported state of input data (for example):on-site monitors = 0/9ortechnological data Unit 1 = 0/152etc.It means that for more than 10 minutes actual data were not uploaded into ESTE. | Not comment |
| 8 | In the following items, the ESTE system user interface should be made more user friendly to the extent possible: When the ESTE AI and ESTE BNPP system are running, conduct of calculations and analyses could be shown to user through a sign or signal. | In case of ESTE AI, the progress of calculation is reported and can be followed by the End-User through the window "Calculations".In case of ESTE BNPP, the calculations run continuously, 24/7. | Not comment |
| Dimensions of user interface of the ESTE BNPP system (window size in display) are not changeable and the option to change them could be added to the system. | Architecture of ESTE BNPP does not allow us to implement this option. It could be implemented in case of big program update, but such update is out of frame of this of this service-maintenance contract. | Not comment |
| Option for continuous display (animation) of time changes of results obtained from the ESTE system could be added. | Yes, we will implement new feature to ESTE BNPP. On the map of "Prognose of Impacts" an animation of time changes of results will be deployed and made available for the End-User. | Not comment |
| We suggest that the Bushehr city map be put as the background in the EPZ scheme (in the section for providing suggestions for response and protective actions) of the EPZ and DATA module of the ESTE BNPP system. | Yes, we will implement contours of the city Bushehr into the EPZ scheme. | Not comment |
| 9 | Correcting the number of scenarios of the ESTE BNPP system according to the document ABmerit/2018/BNPP/02 rev.02 (there are 73 Source Terms available for the user in the “Diagnostics” module and the “Source Term” tab in the form of tree structure and without sequence, but there are 77 Source Terms listed on the page 110 in the section “Database of pre-calculated source terms in ESTE BNPP”). | Yes, we will make correction. The "Source Term" tab will be updated in order to display all 77 source terms from the database. Some of these source terms are not associated with recognizable symptoms by algorithms of ESTE BNPP, therefore release pathways which could lead to such source terms are not identified in "Diagnostics" module of ESTE BNPP. But such source term can be chosen and uploaded to ESTE in specific situation, according to decision and expertise of the End-User. | Not comment |
| 10 | The method and manner of developing and creating scenarios in theESTS BNPP system should be added to the user manual of the system (Document code: ABmerit/2018/BNPP/02 rev.02). | For developing and creating scenarios for ESTE we use our specific tool, the ESTE Simulator, which can be on-line/off-line connected to data from "full-scope reactor simulator" of your NPP. Scenario is running at full-scope reactor simulator and simulated technological data are transferred to ESTE Simulator. Then, the ESTE Simulator models radiation measurements and other data which are not simulated by "full-scope reactor simulator" and which are need for scenario. | Not comment |

**Table 1**: Generic Criteria for Protection Action and other Response Actions in an Emergency to Reduce the Risk of Stochastic Effects (INRA requirements(I.R. of Iran Nuclear Regulatory Authority)

|  |  |
| --- | --- |
| Examples of Protective Actions and other Response Actions | Generic Criteria |
| **Projected dose that exceeds the following generic criteria**: Take Urgent Protective Actions and Other Response Actions |
| Iodine Thyroid Blocking | 50 mSv in the first 7 days | $$H\_{Thyroid}$$ |
| Sheltering, Evacuation, Decontamination , Restriction of Consumption of Food, Milk and Water, Contamination Control, Public Reassurance | 100 mSv in the first 7 days100 mSv in the first 7 days | E$$H\_{Fetus}$$ |
| **Projected dose that exceeds the following generic criteria**: Take Early Protective Actions and Other Response Actions |
| Temporary Relocation , Decontamination, Replacement of Food, Milk and Water, Public Reassurance | 100 mSv per Annum | E |
| 100 mSv for the full period of in utero developement | $$H\_{Fetus}$$ |
| **Dose that has been received and that exceeds the following generic criteria**: Take Longer Term Medical Actions to Detect and to Effectively Treat Radiation Induced Health Effects |
| Screening based on Equivalent Dose to Specific Radiosensitive Organs (as a basis for Medical Follow-up), Counselling | 100 mSv in a Month | E |
| Counseling to allow informed decisions to be made in individual circumstances | 100 mSv for the full period of in utero Developement | $$H\_{Fetus}$$ |

For the Thyroid, Iodine Thyroid Blocking is an Urgent Protective Action that is Prescribed:

* If Exposure due to Radioactive Iodine is Involved,
* Before or shortly after a Release of Radioactive Iodine, and
* Only within a short period before or after the Intake of Radioactive Iodine.

**Table 2:**Applied intervention levels for urgent protective measures in ESTE BNPP (Document code: ABmerit/2018/BNPP/02 rev.02):

|  |  |
| --- | --- |
| evacuation | effective dose during 7 days = 50 mSv |
| sheltering | effective dose during 2 days = 5 mSv |
| iodine prophylaxis | equivalent dose to thyroid due to inhalation of iodine = 50 mSv |

New considerations:

11. According to the results obtained in the ESTE AI software, the age group of less than one year will have the highest probability of receiving the dose. Considering that marine foods such as fish and shrimp are not directly used in the food consumption of the mentioned group, what is the reason that they are considered as an representative group?

12.Due to the change of the power plants fuel complexes to TVS 2M and since the data of the previous fuel complex of the power plant is used in the ESTE BNPP software, we like to have update and correct the Related data as soon as possible. Let us know if a documents is required.